

Minto Mine

Water Licence QZ14-031

Quartz Mining Licence QML-0001

2020 Annual Report

Prepared by:
Minto Explorations Ltd.
Minto Mine
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List of Acronyms

Acronym	Definition
ABA	Acid-Base Accounting
AMP	Adaptive Management Plan
AP	Acid Potential
CWTS	Constructed Wetland Treatment System
DSTSF	Dry Stack Tailings Storage Facility
EEM	Environmental Effects Monitoring
EMSRP	Environmental Monitoring, Surveillance and Reporting Plan
GCL	Geosynthetic Clay Liner
GPS	Global Positioning System
HDPE	High Density Polyethylene
LTF	Land Treatment Facility
MCDS	Minto Creek Detention Structure
Minto	Minto Explorations Ltd.
MMER	Metal Mining Effluent Regulations
MPTMF	Main Pit Tailings Management Facility
MVF	Mill Valley Fill
MVFE	Mill Valley Fill Extension
MWD	Main Waste Dump

NP	Neutralizing Potential
NPR	Neutralizing Potential Ratio
QA/QC	Quality Assurance and Quality Control
QML	Quartz Mining Licence QZ-0001
ROD	Reclamation Overburden Dump
SAT	Waste material destined for subaqueous long-term storage
SECP	Sediment and Erosion Control Plan
SDD	South Diversion Ditch
SMP	Seepage Monitoring Plan
SOP	Standard Operating Procedure
SWD	Southwest Dump
TDD	Tailings Diversion Ditch
TDS	Total dissolved solids
TSS	Total suspended solids
UG	Underground
UTM	Universal Transverse Mercator
WGS 84	World Geodetic System 1984
WSP	Water Storage Pond
WUL	Water Use Licence QZ14-031
YWB	Yukon Water Board

List of Units

Unit	Definition
BCM	Bank cubic meter
BTU	British Thermal Unit
dmt	Dry metric tonnes
g/t	Gram per tonne
kg	kilogram
L	Litre
m	meter
m^2	Square meter
m^3	Cubic meter
mg/m^2	Milligrams per square meter
Mlb	Million pounds
Mt	Million tonnes
oz	ounce
V	Volt

1 Introduction

The 2020 Annual Report has been prepared by Minto Explorations Ltd. (Minto), as required by Type A Water Use Licence (WUL) QZ14-031-01 and Quartz Mining Licence (QML) QML-0001. Specific requirements for the Annual Report, as outlined in the respective licences, are summarized in Table 1-1.

This report provides a summary of 2020 activities at the Minto Mine and includes production summaries, construction activities, environmental monitoring studies, physical stability monitoring, water management, and progressive reclamation.

A satellite photograph taken in June 2020, has been updated to include site infrastructure, is presented in Figure 1-1.

Table 1-1: Reporting Requirements as per WUL and QML (2020)

Licence	Licence Section	Clause	Requirement	Annual Report Section
WUL QZ14-031				
WUL QZ14-031	4.3	16	Summary review of the *Spill Contingency Plan* including any changes needed.	2.5.4 App. B
	4.3	18	Summary list of all spills for 2020.	2.5.3
	4.5	26	The Licensee shall submit Annual Reports to the Board no later than March 31 of the year following the reporting period. The reporting period is January 1 to December 31 of each year.	All
		26, a	Summary of all data collected as per the EMSRP, including analysis and interpretation by a qualified party and a discussion of any variances from baseline conditions, from previous years' data, and from expected performance.	5-8, 11-14
		26, b	Summary of actions as per the Operations Adaptive Management Plan, including analysis and interpretation by a qualified party and a discussion of any variances from baseline conditions, from previous years' data, and from expected performance.	10 App. I, J
		26, c	A record of any major maintenance carried out on any physical works.	2.2

Licence	Licence Section	Clause	Requirement	Annual Report Section
WUL QZ14-031	4.5	26, d	Detailed data on the volume of water used during the year including water withdrawal from each water source, water routed around and through the site as part of the water conveyance system, water diverted around the site, water routed for storage in the pits, water deposited with mine wastes in waste storage facilities, water routed to the Water Storage Pond, water routed to the treatment plant and water discharged to Minto Creek.	8
		26, e	Detailed data on tailings deposition in each of the tailings management facilities, including volume and tonnage of tailings slurry deposited, cumulative volume of tailings solids stored in the pits, tailings solids surface elevation and pit water elevation.	2.3.4
		26, f	Details of updates to the Water Balance and Water Quality Model.	8.2.4 App. F
		26, g	Results and interpretations of the QA/QC Program.	5.1.2
		26, h	Any other reports that are required to be submitted as part of the Annual Report by this Licence.	See Below
	5.7	70	The Licensee shall monitor, sample. and report on the maintenance and performance of the Mill Water Pond, in accordance with the procedures that are detailed in the Physical Monitoring Program, and include in the Annual Report	9
	5.1.1	86	The Licensee shall include data relating to the Surface Water Surveillance Program in the Monthly and Annual Reports.	5.3
	5.1.2	88	The Licensee shall complete a MMER Biological Monitoring Study including a site characterization, fish population survey, fish tissue sampling and benthic invertebrate sampling.	11.2
	5.1.2	89	The results of these studies and programs in clauses 87 and 88 shall be submitted to the Board as part of the Annual Report along with and any additional studies or revisions to studies required under the MDMER.	11 App. L
	5.1.4	93	The results of the seepage program shall be compared to the source terms used in the Water Balance and Water Quality Model Report and summarized in the Annual Report.	7 App. F
	5.1.5	94	The Licensee shall implement the updated Geochemical Monitoring Program, including the Waste Rock Verification Program, and the results from this program are to be included in the Annual Report.	13 App. O

Licence	Licence Section	Clause	Requirement	Annual Report Section
WUL QZ14-031	5.1.7	97, h	Reporting of all data obtained using physical monitoring instrumentation as a part of the Physical Monitoring Program in Monthly and Annual Reports.	9
		98	The Physical Monitoring Program shall be updated annually to reflect the installation of new instrumentation, replacement of damaged instrumentation, and changes in monitoring methods and procedures. The updated Physical Monitoring Program shall be provided as part of the Annual Report, along with a summary table outlining revisions to the plan from previous versions.	App. H
		99, b	The Licensee shall submit these Geotechnical Engineer's Inspection and Data Reviews as part of the Annual Report.	9.2
		100, f	For each operating year, the following information shall be provided as part of the Annual Report for the Physical Monitoring Program: i. interpretation of physical monitoring data, and summary of the stability, integrity and status of all the inspected structures, works, and installations inspected by the Professional Engineer; ii. a list of each of the Professional Engineer's recommendations for remedial action; iii. an explanation of how and when each recommendation was addressed, including supporting documentation, and iv. a list of outstanding recommendations (including previous inspection reports) and associated approach and timelines to address them.	9.1 9.2 Table 9-1
	5.1.8	102	The Licensee shall review and evaluate the Aquatic Environmental Monitoring Program design every three (3) years and submit the findings to the Board, along with any recommendations for further refinements, as part of the Annual Report, starting in 2016.	11.4
	5.1.9	104	Results and interpretations of the QA/QC program shall be provided in the Annual Report.	5.1.2
		108, a	The Licensee shall submit an updated Water Balance and Water Quality Model as part of the Annual Report. The updated models shall include without limitation all model assumptions.	App. F
		108, b	Updated site data collected as per the EMSRP including: i. water quality results and water levels from all groundwater monitoring wells; ii. the most current climatic, environmental and operational conditions and data; iii. surface water quality and quantity data;	6 12 5.3

Licence	Licence Section	Clause	Requirement	Annual Report Section
			iv. seepage monitoring quality and quantity data, and v. geochemical source terms from tailings and waste rock.	7 App. F
WUL QZ14-031	5.1.9	108, c	A comparison of the updated geochemistry for Phase V/VI tailings and waste rock with that of previously produced tailings and waste rock, and a comparison of model source term chemistry with equivalent operation monitoring results.	13 App. O App. F
		108, d	Updated predictions for operations and Permanent Closure water quality, including discussion of any variances identified and associated implications on site water management.	App. F
		109	Specifications for the Annual Report to include but not be limited to: i. activities undertaken in relation to the Adaptive Management Plan, ii. trend analysis and water levels in Minto and McGinty creeks, iii. proposed updates and revisions to the Adaptive Management Plan, and iv. any other revisions necessary to comply with the conditions of this Licence.	10 8.5 App. I, J Throughout
	6.2	114, a	Annual reporting on reclamation research activities.	16.2 App. S
QML-0001				
QML-0001	13.5		On or before March 31 of each year of the term of this License, the Licensee must submit an annual report, in writing, containing the information set out in Schedule D, covering the period of January 1 to December 31 of the prior year	This Report
	Schedule D	a	Summary of construction activities associated with the Undertaking	2.2
		b	Summary of mining activities	2.3
		c	Map showing the status of all structures, works, and installations associated with the Undertaking	Fig 1-1
		d	total amount of ore and waste removed from the underground workings and open pits for the year and for the life of the Undertaking	2.3
		e	Total amount and the average head grade of ore milled	

Licence	Licence Section	Clause	Requirement	Annual Report Section
				2.3.6
QML-0001	Schedule D – Site Activities	f	Total amount of concentrate produced and removed from the Undertaking	2.3.6
		g	Total amount of tailings deposited in each of the tailings facilities	2.3.4
		h	Total amount of waste rock removed from the mine and the amount deposited into each deposit location	2.3.3
		i	Total amount of waste rock stored in each waste rock storage facility;	2.3.3
		j	Details respecting any action taken as a result of the recommendations made by the engineer in relation to the inspection referred to in 13.2 of QML -0001	9.2
		k	Summary of any updates to estimates of ore reserves and the life of the mine, including reserve category, tonnage and grade	4
		l	Total amount and the average grade of each ore stockpiled	2.3.5
		m	remaining reserve life of the mine	4
	Schedule D - As-built Drawings	a	as-built drawings of the open pit and underground mines and of all engineered structures, works, and installations constructed or altered at the Undertaking during the year	2.2 App. A
		b	as-built drawing report of the 220 kW vertical stirred mill rougher/scavenger concentrate regrinding system the year following the installation	N/A
	Schedule D - Environmental Monitoring	a	Summary of the programs undertaken for environmental monitoring and surveillance as outlined in the *Environmental Monitoring, Surveillance and Reporting Plan* and the 2014 Wildlife Protection Plan, including an analysis of these data and any action taken or adaptive management strategies implemented to monitor or address any changes in environmental performance	5-9 11-14 10
		b	any update to the *Site Characterization Report* referred to in 13.1 of QML-0001	15
		c	summary of invasive plants that have been identified on site and measures taken to control or remove invasive plants	14.3
		d	summary of spills and accidents that occurred at the site and measures taken respond to any spills or accidents	2.5
		e	summary of the level of traffic, access control issues, wildlife incidents and other accidents, and any upgrade or maintenance work planned for the upcoming year	2.4

Licence	Licence Section	Clause	Requirement	Annual Report Section
QML-0001	Schedule D - Environmental Monitoring	f	summary of any site improvements undertaken to address sediment and erosion control	14.2
	Schedule D – Physical Monitoring	a	summary of any underground stability incidents	2.3.2
		b	summary of data collected to date as part of the Physical Monitoring Program	9
		c	details of results, including data collected, for the physical monitoring program	9
	Schedule D - Reclamation and Closure	a	any temporary closure or permanent closure that has occurred during the year	16
		b	summary of activities related to care and maintenance of the Undertaking, including any temporary closure activities if applicable	16
		c	summary of progressive and ongoing reclamation activities	16
		d	summary of proposed development and production and reclamation activities for the coming year	3 16.3
		e	summary of reclamation research and results	16.2 App. S
	Schedule D - Socio-Economic Monitoring	a	summary of action taken by the Licensee with respect to implementation of "Minto Socio-Economic Monitoring Program Framework" (the "Framework')	17 App. T
		b	a copy of the annual report prepared by Minto Explorations Ltd., identified in paragraph 6.1 of the Framework	App. T
		c	a summary of action taken by the Licensee with respect to implementing an approved socio-economic adjustment measures plan, as identified in the Framework	App. T

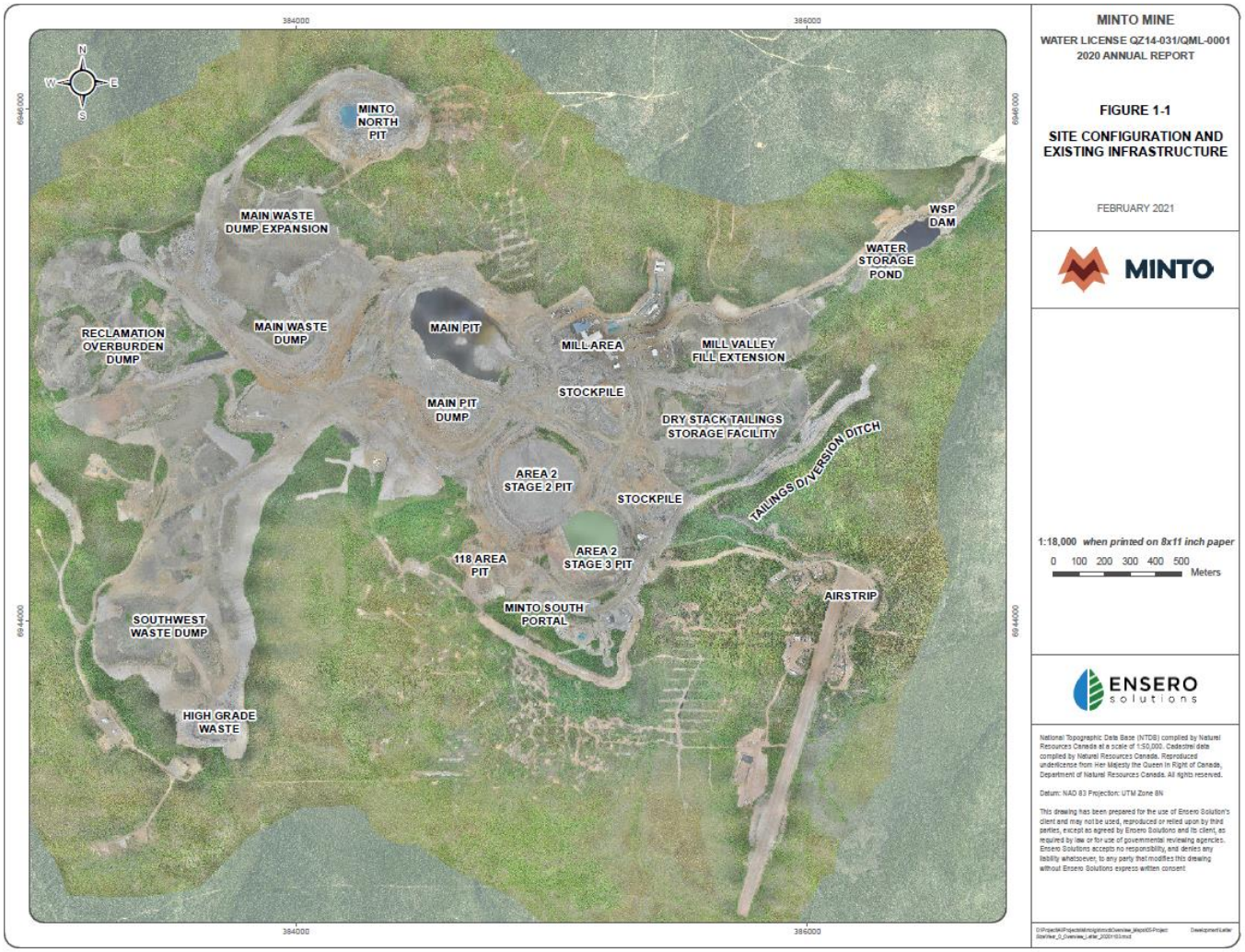


Figure 1-1: Site Layout (2020)

2 Site Activities

Mine and mill production operations continued in 2020 following a temporary care and maintenance period from October 2018 to Fall 2019. During the 2020 production period, operations produced 17.8 million pounds (Mlb) of copper from the milling of 629,077 tonnes (dmt) of ore.

In 2020, underground mining took place in the Minto East zone as well as the newly developed Copper Keel ore zone.

Waste rock produced from mining activities was hauled to surface for use as construction grade material and ramp repair. Potentially acid generating waste rock was processed through the mill. Milling included run-of-mine ore from underground operations, as well as ore stockpiled from previous mining.

Tailings produced from the milling process were deposited into the Area 2 Pit Tailings Management Facility as per the licensed Tailings Management Plan.

2.1 Exploration

2.1.1 In-Fill Drilling

During 2020, exploration work included 57 surface NQ diameter diamond drill holes (totalling 14,574 metres) and 20 underground NQ diameter diamond drill holes (totalling 3,936 metres). During the 2020 program, the Minto North II, Copper Keel South, North, and West deposits were drilled.

The Minto North II deposit is located southeast from the Minto North open pit. The main purpose of the 2020 drill program was to confirm the location of the ore body and its extent as there were only 10 historic drill holes drilled prior to 2020. The 2020 drill program was completed with 25m to 30m drill spacing totalling 5,609 meters with 31 NQ diameter drill holes.

Phase I of the drilling program occurred from May 27th, 2020 to June 13th, 2020 and focused on the central portion of the ore body with 17 holes drilling totalling of 2,863 metres. Results of the phase I program indicated that the Minto North II ore body is a flat-lying, shallow lens lying about 175 metres below surface and approximately 90 metres to the east of the Minto North ore body.

Due to successful results of the phase I program, the phase II drill program was initiated. The phase II program was completed from September 10 to 30, 2020 with the

targeted extension and definition of the ore body to the south and east based on information obtained from a high-resolution MAGTM drone survey in combination with a 3D inverted Titan 24 DC-IP geophysical survey. The phase II drill program drilled 14 holes for a total of 2,14+17746 metres. The phase II drilling results indicated that the Minto North II ore body extends to the south and is cut off by a major NNW-trending fault to the east

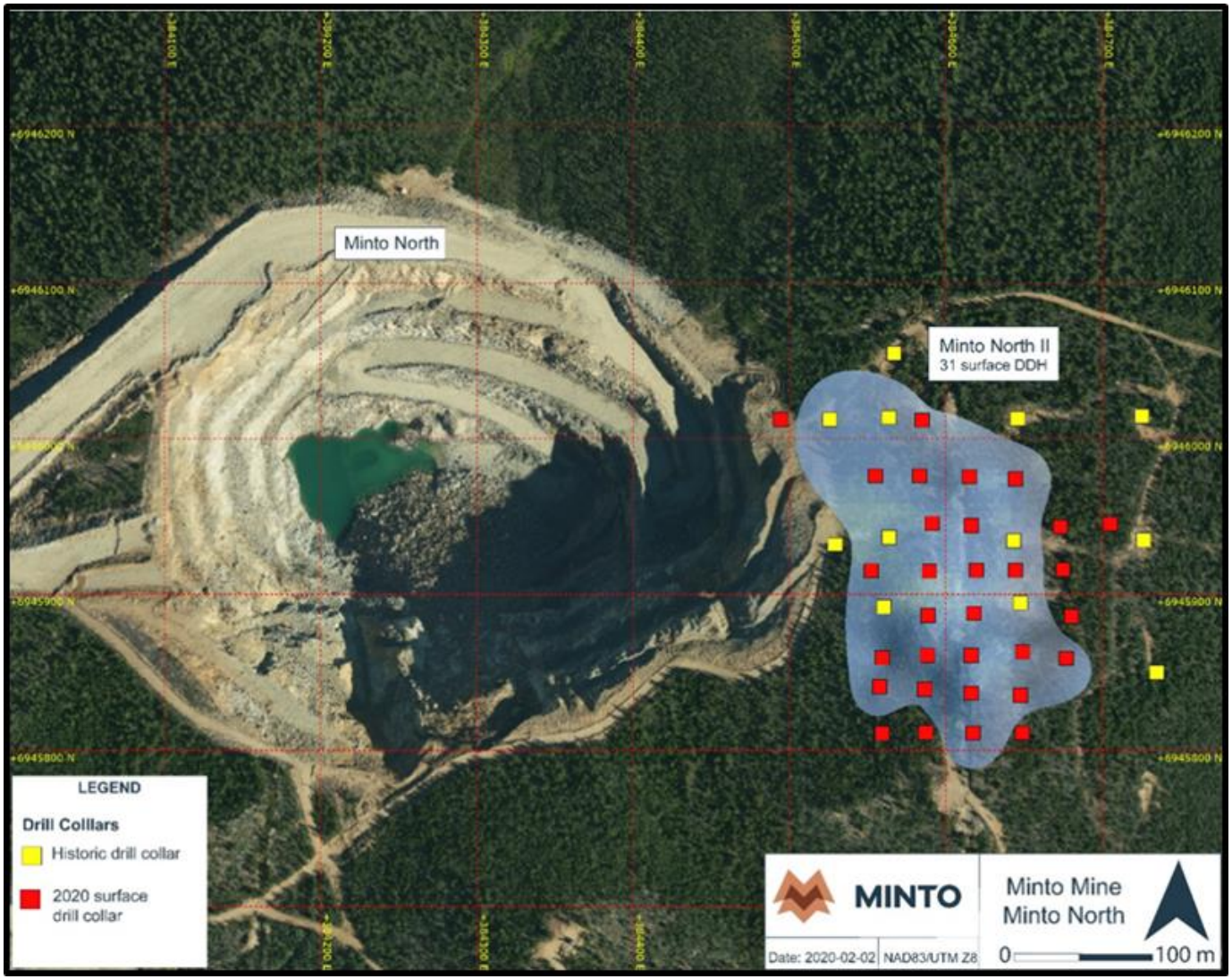


Figure 2-1: Plan Location of Phase I and Phase II holes at Minto North II

The Copper Keel South lens is located southwest from the Copper Keel Main mining area. The Copper Keel South deposit was drilled only from surface to test its extension towards the southwest. The Copper Keel South drill program occurred from March 13th, 2020 to April 3rd, 2020 and from May 1st to May 24th, 2020. The program consisted of 15 NQ diameter drill holes totaling 3,816 metres.

The Copper Keel North deposit is located north of the Copper Keel Main mining area. The surface dill program occurred from February 14th, 2020 to March 13th, 2020 which included 8 NQ diameter drill holes totalling 3540.20 metres of surface drilling. The surface drill program was followed up by an underground drill program consisting of 6 NQ diameter drill holes totalling 1,161 metres.

A total of 3 NQ drill holes (totaling 1,609 metres) were drilled targeting gaps of coverage in the ore lens. Due to difficult ground conditions and overburden this surface program was shortened and substituted with an underground drilling program which consisted of 12 NQ diameter drill holes totalling 2,618 metres to fill the gaps of coverage caused by the difficult drilling conditions on surface. An additional 2 condemnation drill holes (156m) were also completed from underground

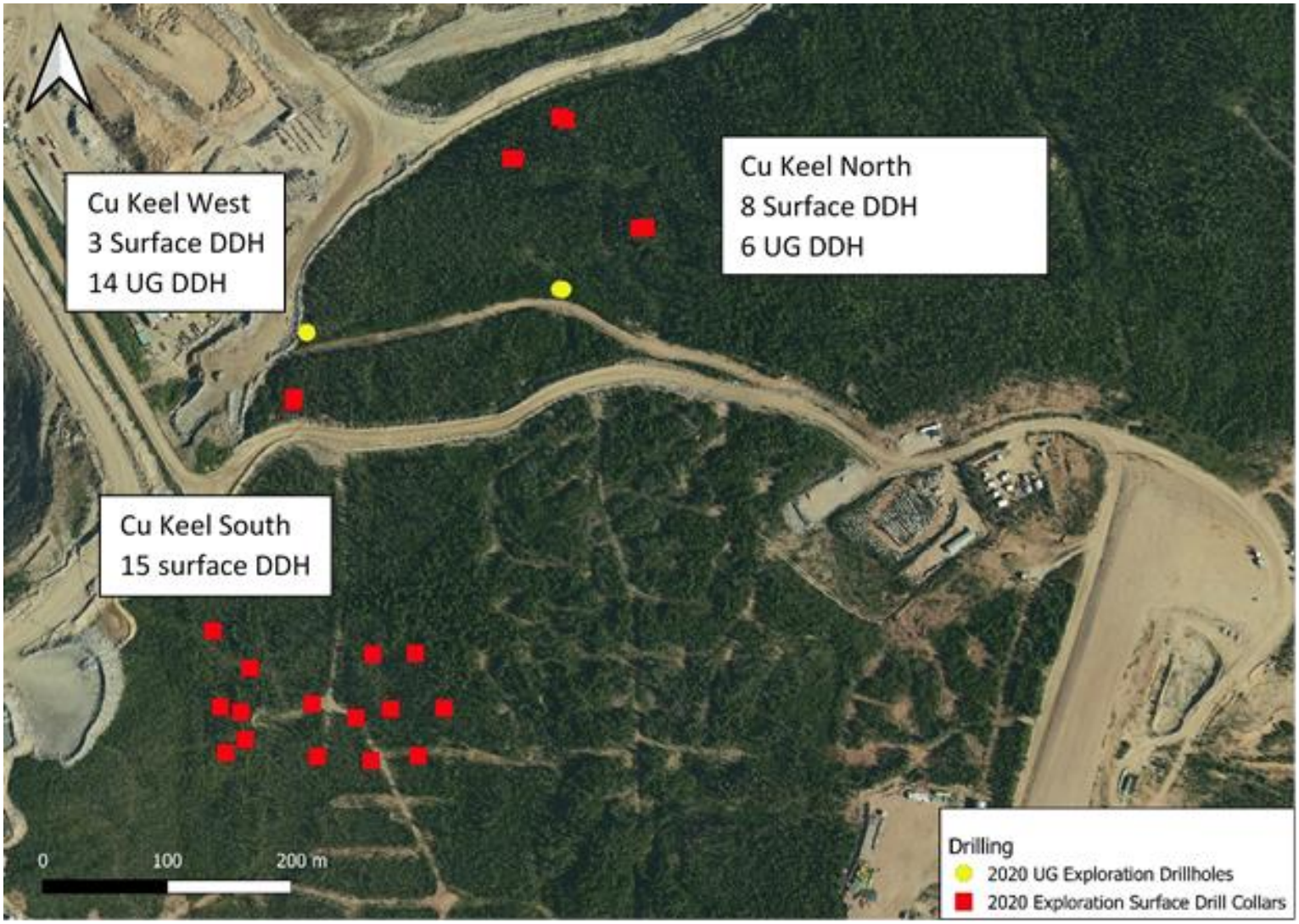


Figure 2-2: Map showing 2020 surface and UG holes

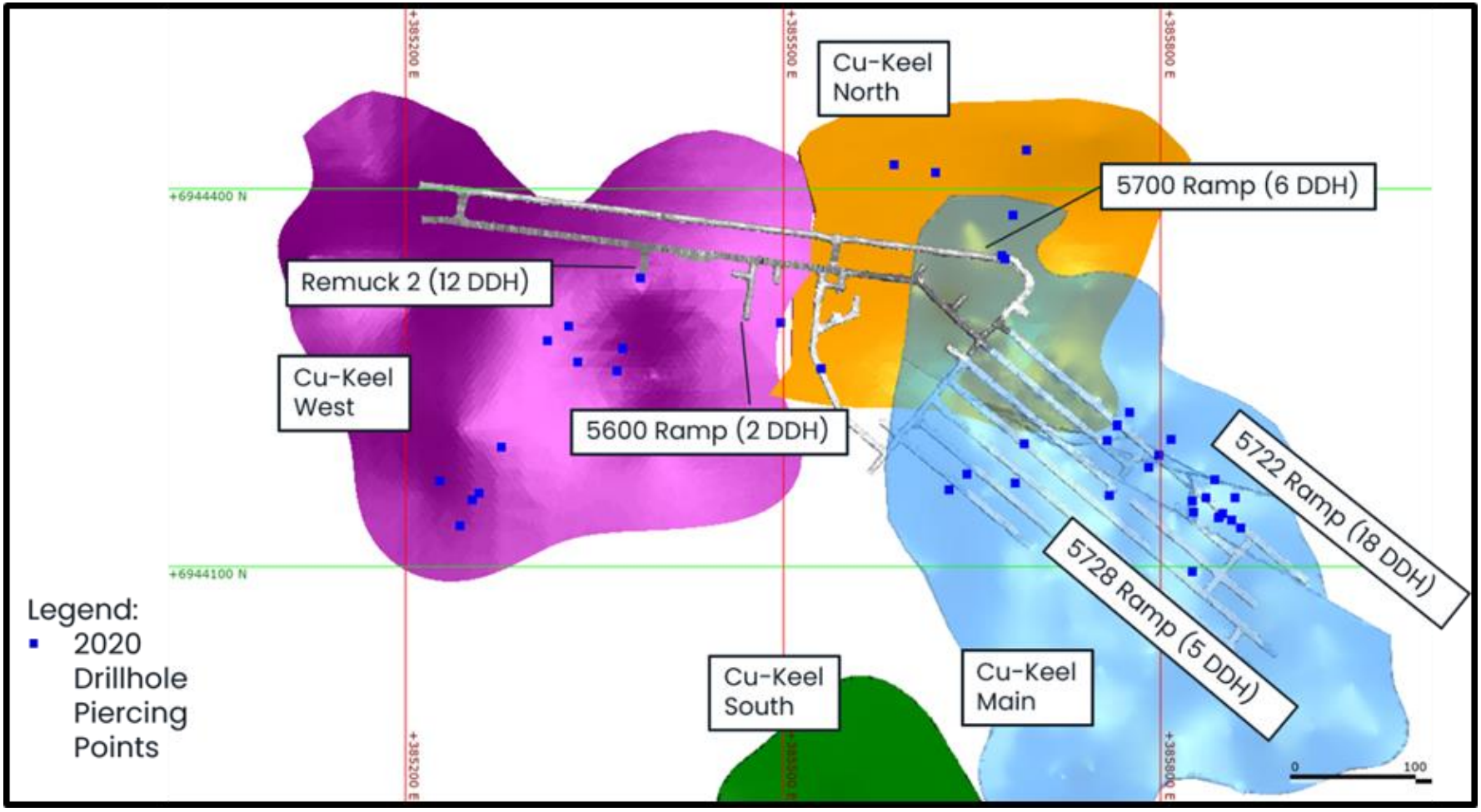


Figure 2-3: Map showing 2020 UG hole piercing points*. Note: also displayed are 23 holes drilled for mine development at Cu-Keel Main.*

2.1.2 Exploration

Exploration within the mine area entailed all infill drilling for 2020.

2.2 Maintenance, Infrastructure and Construction Projects

There were no major maintenance activities conducted in 2020 on the physical works.

2.3 Mining Activities

The following sections discuss the mining activities for 2020 including open pit and underground mining, waste rock and tailings management, ore stockpiles, operating results, and concentrate shipments.

2.2.1 Open Pit Mining

There was no Open Mining conducted in 2020.

2.2.2 Underground Mining

Production mining was ongoing in Minto East throughout all of 2020. Copper Keel was in Development at the beginning of the year and went into production mining in July of 2020.

A total of 3,919 m of development was completed between Copper Keel and Minto East. This included the capital development of a secondary egress, refuge chamber, truck load out, and the main access drive in Copper Keel to safely bring the area into production.

In 2020 the mine produced 651,945 tonnes of ore (between the Coper Keel and Minto East deposits) and 181,513 tonnes of waste rock which was hauled to surface. See Appendix A for the underground development maps.

2.3.1 Waste Rock Management

Waste rock dump development continued in 2020, as per the *Minto Mine Waste Rock and Overburden Management Plan*. Table 2-1 summarizes the waste materials and ultimate destinations, and the volumes deposited. Current waste rock inventory in the various waste rock and overburden dumps at the Minto Mine site are summarized in Table 2-2.

Table 2-1: Waste Rock Destination and Volumes – Unreconciled truck counts (2020)

Material Type	Destination	In Situ (m3))
Waste – Construction Grade	Roads/Ramps	36,570
Waste – Construction Grade	Tailings Diversion Ditch	0
Waste	Main Pit Dump	0
Waste	Main Waste Dump	103,350
Waste Rock – SAT	Main Pit Buttress	0
Waste Rock – SAT	A2S2 In Pit	20,150
Total		160,070

Table 2-2: Waste Dump Location and Storage Volumes (2020)

Dump Location	Quantity Stored as of December 31, 2017 (m^3)
Main Pit Buttress	4,230,000
A2S2 In – Pit	75,320
Main Pit Dump	1, 583,350
South West Dump	12,120,000
Mill Valley Fill Extension	1,440,000
Reclamation Overburden Dump	4,300,000
Main Waste Dump	8,360,000
Main Waste Dump Expansion	3,810,000
Mill Valley Fill Extension 2	1,360,000
Total Waste Dumped	**37,278,670**

2.3.2 Tailings Management

All tailings produced in 2020 were deposited in the Area 2 Pit Tailings Management Facility (A2PTMF). Table 2-3 lists the deposition schedule.

Table 2-3: Tailings Deposition Schedule in 2020

Tailings Management Facility	Date Range	Quantity Deposited (dry metric tonnes)
A2PTMF	January – December	606,298
Total 2020 Tailings		**606,298**

A total of 606,298 dry metric tonnes (dmt) of tailings were discharged to the A2PTMF in 2020. Since November 2012, the Main Pit Tailings Management Facility (MPTMF) has received 3,346,606 tonnes of tailings. Since March 2015, the Area 2 Pit has received 5,340,258 tonnes of tailings.

Deposition to the A2PTMF is from a point at the northeast corner of the pit. A discharge line runs from the pit crest at the 806m elevation to a point on the highwall past the overburden contact, at 787m: this ensures that the tailings stream runs down solid rock and does not cause erosion. As of year-end, the highest point of the tailings beach is at the 774.0m elevation and the water level in A2PTMF was 771.1m.

Deposition in the MPTMF is possible from two locations, near the middle of the pit via a floating tailings line and near the north wall of the pit. The highest point of the tailings beach is at 787.5m elevation. At year-end, the water level was measured at 784.3m.

The pipeline and pump which transfers supernatant water from A2PTMF to MPTMF, where the mill's process water intake is located, was re-established in 2020 once Area 2 Stage 4 water levels rose to a suitable elevation for the dewatering barge to be safely installed.

As in previous years, tailings were not observed to remain ponded on the ice surface of either tailings management facility during the winter months. The relatively high

tailings temperature, combined with the erosive effect of the tailings stream, melts through the ice at the discharge point.

2.3.3 Ore Stockpiles

Seven ore stockpiles exist on the property. Immediate to the milling complex are three stockpiles described below:

1. Mill Pond Pad and Live pile– Blended and crushed material for immediate mill feed
2. ROM Pad hosting the ROM and East Stockpiles –Sulphide and partially oxidized run of mine (ROM) ore stockpiles
3. South Stockpile –Partially oxidized run-of-mine (ROM) ore stockpiles

Further away from the mill complex is Top of the World (TOTW) Stockpile, lying West of the Main Pit, adjacent to the Main Waste Dump. This stockpile consists of partially oxidized run-of-mine (ROM) included in the low grade POX inventory.

The stockpile areas are displayed in Figure 2-1.

Ore is segregated by copper grade and percentage of acid-soluble copper as shown in Table 2-4.

Table 2-4: Ore Stockpiles

Material Type	Copper Grade Range	Soluble Copper
Blue Sulfide Ore	0.50 – 1.00% Cu	<15.0%
Green Sulfide Ore	1.00 – 2.00% Cu	<15.0%
Yellow Sulfide Ore	>2.00% Cu	<15.0%
Partially Oxidized Ore (POX)	>1.50% Cu	>15.0%
Low-Grade Partially Oxidized Ore (LG POX)	0.80 – 1.50% Cu	>15.0%

The higher-grade ores are fed to the mill as they are mined to maintain the highest possible head grade while mining ore. The lower-grade and partially oxidized stockpiles are depleted gradually and are used to supplement mill feed.

Table 2-5: Stockpile Inventory

	December 31, 2019			December 31, 2020		
	Mass (tonnes)	**Cu (%)**	**Ag (g/t)**	**Mass (tonnes)**	**Cu (%)**	**Ag (g/t)**
Red	-	-	-	-	-	-
Yellow	-	-	-	-	-	-
Green	14,173	1.38	4.70	0	0	0
Blue	28,556	0.61	1.90	0	0	0
POX	217,792	1.57	4.38	202,908	0.91	
LG POX	140,021	0.66	1.75	132,737	0.66	
Portal Ore Pad	4,430	2.84	8.32	41,432	1.20	
Live Pile	6,665	1.68	4.92	0	0	0
Total Ore	**411,637**	**1.20**	**3.38**	**377,077**	**0.86**	

Table 2-6: Ore Stockpile by Geographic Location

Location	Tonnes	Cu (%)	Dominant Material
ROM OS	0	0	
ROM A2S3	132,737	0.66	POX
ROM UG ore	0	0	
South SP	181, 106	0.93	POX
TOTW SP	21,802	0.81	POX
SWD	79,192	0.40	LG

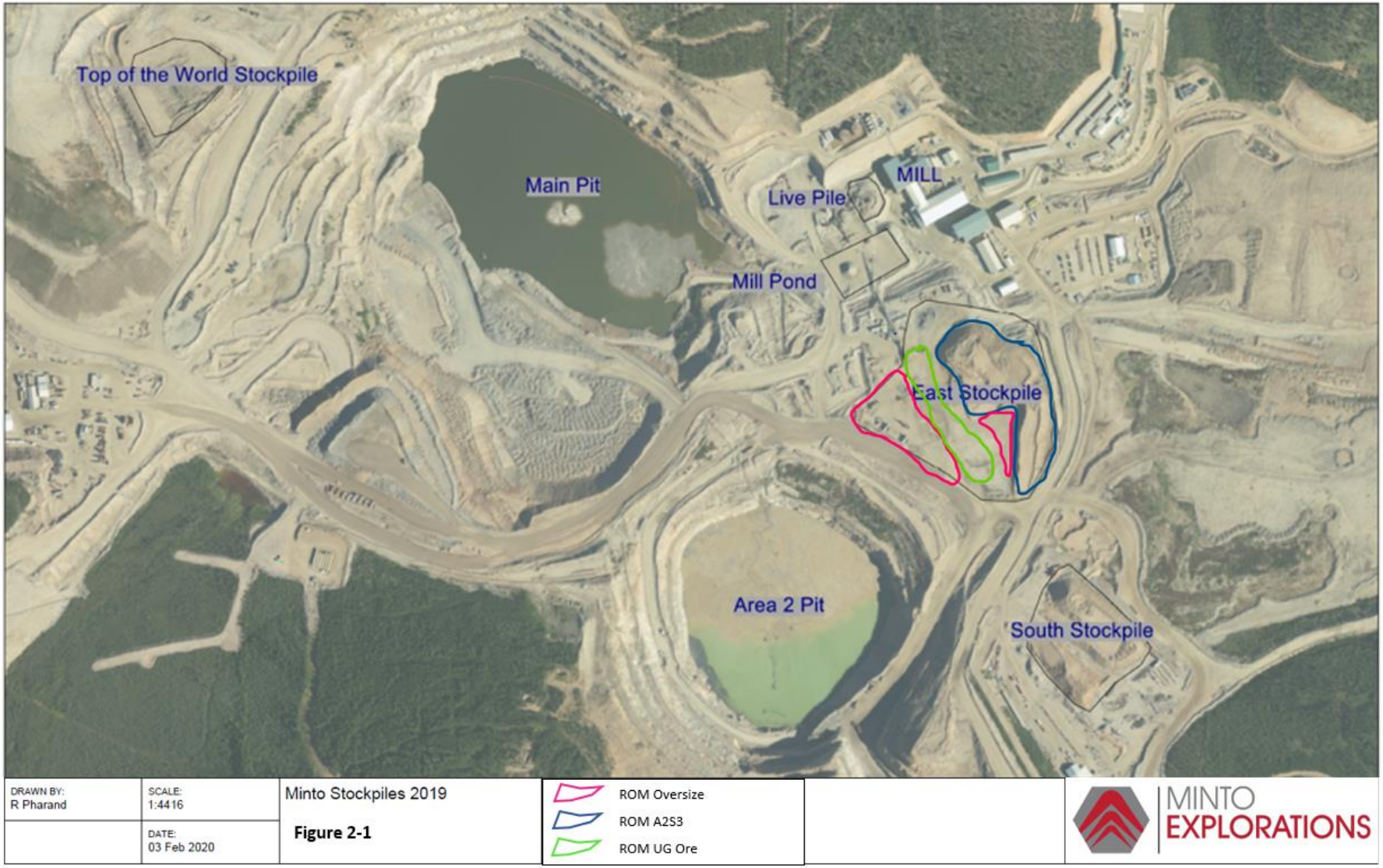


Figure 2-1: Ore Stockpiles - 2020

2.3.4 Operating Results

Ore processing and metal production results for the 2020 calendar year are summarized in Table 2-7, below.

Table 2-7: Operating Results (2020)

Metal Production	Quantity
Copper (dmt)	8,089.30
Gold (kg)	238.68
Silver (kg)	2099.18
Ore Milled	
Ore processed (t)	629,077.88
Copper grade (%)	1.38
Gold grade (g/t)	0.51
Silver grade (g/t)	4.28
Recoveries	
Copper (%)	93.40
Gold (%)	74.19
Silver (%)	77.93
Concentrates Produced	
Copper concentrate (dmt)	22,779.31
Copper (%)	35.51
Gold (g/t)	10.48
Silver (g/t)	92.15

2.3.5 Concentrate Shipments

Minto produced 28,469 wet metric tonnes of concentrate at 8.54% moisture content, which corresponds to 22,779 dmt. The average concentrate grades are listed in Table 2-7, above. 590 truckloads of concentrate were shipped from Minto in 2020: 298 via the winter ice bridge and 292 during the summer barge season.

2.4 Mine Access Road

2.4.1 Traffic

From January 21st to April 15th 2020, access across the Yukon River was over an ice bridge during which heavy trucks made 386 round trips, medium trucks made 65 round trips and light vehicles made 86.5 round trips to the Minto Mine via the mine access road.

Between April 15th and June 8th, 2020 there was no land access to the mine site. On June 8th, 2020, the summer tug and barge operation started for the season. During the barge operating season, heavy trucks made 351 round trips, medium trucks made 22.5 round trips, and light vehicles made 206 round trips to the Minto Mine via the mine access road. The barge operating season ended October 30th, 2020. Establishment of the 2021 ice bridge started in December 2020.

2.4.2 Access Control Issues

No access control issues were experienced in 2020.

2.4.3 Planned Access Road Maintenance for 2021

Beyond routine maintenance work, no major projects or upgrades are planned for 2021 regarding the access road.

2.5 Accidents and Incidents

2.5.1 Incidents

For the calendar year of 2020, the Minto Mine site experienced 60 incidents that required follow-up investigation. Three of these incidents were considered serious and

were reported to Yukon Workers Compensation Health and Safety Board as required. A full breakdown of the types of incidents is as follows:

- 0 Lost Time Accident (LTA)
- 2 Medical aids (MA)
- 48 First Aids (FA)
- 7 Property Damage (PD)
- 3 Near Misses (NM)

Minto maintains a Mine Emergency Response Plan supported by complement emergency response personnel trained and certified in advanced first aid, firefighting and mine rescue, along with equipment required for all response types. In addition, reporting and investigation of incidents is standard practice at the site.

2.5.2 Wildlife Incidents

No reportable wildlife incidents occurred on site for 2020.

2.5.3 Reportable Spills

There were no reportable spills in 2020. Non-reportable spills were tracked internally as per the WUL. Spills on site were cleaned up with a variety of methods including, but not limited to, absorbent spills pads, soil excavation, soil treatment in the LTF, and disposal in the Main Pit dump.

2.5.4 Spill Contingency Plan Review

A review and update to the Minto Mine Spill Contingency Plan is required annually as part of the Annual Report and the updated 2021 Minto Mine Spill Contingency Plan is provided in Appendix B.

3 Proposed Mining for 2021

Section 3 discusses the proposed mining for 2021 at the Minto Mine.

3.1 Proposed Open Pit Mining for 2021

There is no Open Pit mining planned for 2021.

3.2 Proposed Underground Mining for 2021

Mining of Minto East will have minimal activities remaining in 2021 and completion is expected in Q2. Development to the Minto East 2 mining area is planned to commence in Q2 from the bottom of the current Minto East ramp and is expected to reach the orebody in 2022.

Copper Keel mining continues all year in 2021 with production stopping in the main lens (zone 57) and development to additional lenses (Zone 56 and 62).

Development of the Minto North Underground is also planned to start in Q3 of 2021. This will occur via establishing a portal into the existing Minto North Open pit. Production in Minto North Underground is scheduled to commence in 2022.

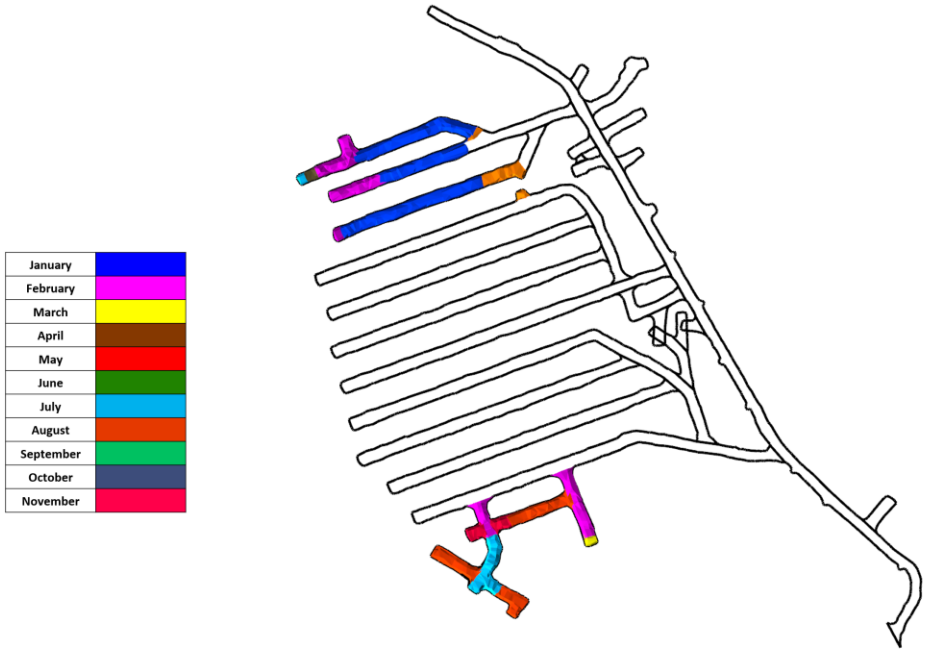


Figure 3-1: 2020 Minto East Development Map

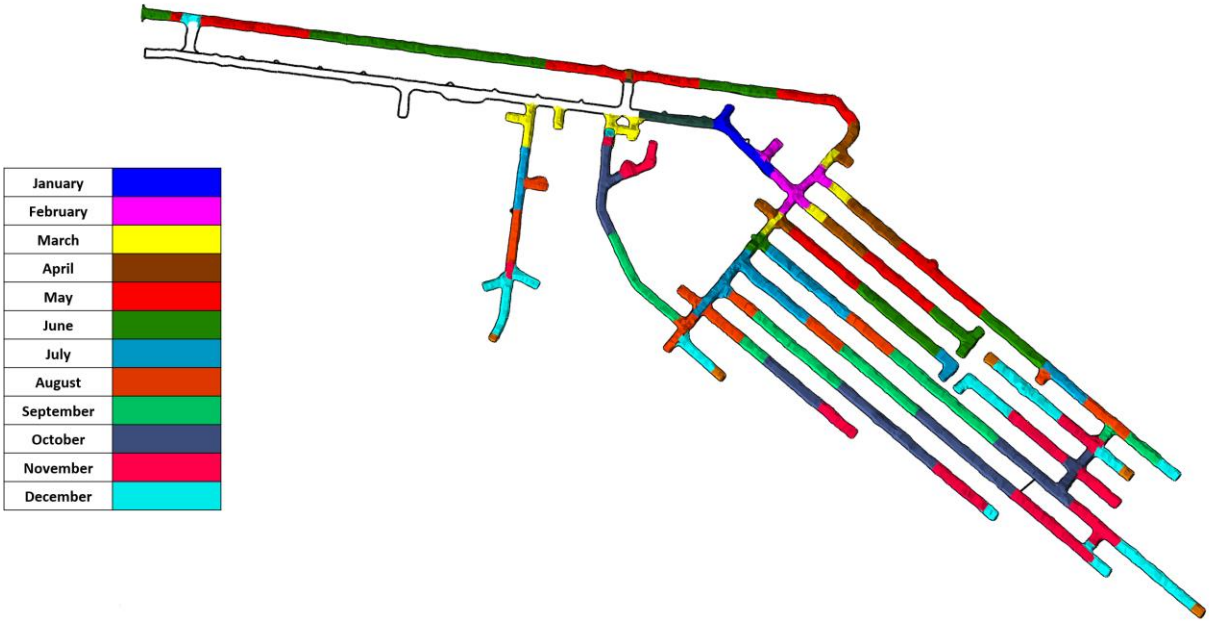


Figure 3-2: 2020 Copper Keel Development Map

4 Mineral Resources and Reserves

Minto Mine's updated mineral resources and reserves are provided in Tables 4-1 and 4-2 respectively, below. The most recent update is from December 31, 2016. There were no updates in 2020.

Table 4-1: Updated Mineral Resources for Minto Mine (most recent Dec. 31, 2016)

Classification	Tonnes (kt)	Copper (%)	Silver (g/t)	Gold (g/t)	Contained Copper (kt)	Contained Silver (koz)	Contained Gold (koz)
Minto South Deposit (MSD) (Open Pit and Underground)							
Measured	3,466	1.09	3	0.41	38	374	45.2
Indicated	17,723	1.08	3	0.37	192	1,893	212
Total Measured + Indicated	21,189	1.09	3	0.38	230	2,268	257.2
Inferred	12,445	0.8	2	0.22	100	969	89.3
Ridgetop (Open Pit)							
Measured	1,531	0.98	2	0.25	15	105	12.3
Indicated	3,534	0.87	3	0.3	31	326	34.1
Total Measured + Indicated	5,065	0.9	3	0.28	46	431	46.4
Inferred	318	0.75	2	0.13	2	16	1.3
Minto North (Open Pit)							
Measured	221	0.94	3	0.21	2	20	1.5
Indicated	257	1	6	0.61	3	46	5
Total Measured + Indicated	477	0.97	4	0.42	5	67	6.5
Inferred	28	0.7	3	0.32	0	3	0.3
Minto East (Underground)							
Measured	-	-	-	-	-	-	-
Indicated	919	2.35	7	1.01	22	204	29.8
Total Measured + Indicated	919	2.35	7	1.01	22	204	29.8
Inferred	124	1.48	5	0.6	2	20	2.5
Minto East 2 (Underground)							
Measured	-	-	-	-	-	-	-
Indicated	2,778	1.72	7	0.8	48	629	71.8
Total Measured + Indicated	2,778	1.72	7	0.8	48	629	71.8
Inferred	1,889	1.38	4	0.5	26	247	30.1
Minto North 2 (formerly Inferno North)							
Measured	-	-	-	-	-	-	-

Classification	Tonnes (kt)	Copper (%)	Silver (g/t)	Gold (g/t)	Contained Copper (kt)	Contained Silver (koz)	Contained Gold (koz)
Indicated	-	-	-	-	-	-	-
Total Measured + Indicated	-	-	-	-	-	-	-
Inferred	1,419	1.42	5	0.51	20	214	23.3
Stockpiles							
Measured	489	1.42	5	0.41	7	92	6.4
Total Mineral Resources							
Total Measured	5,707	1.09	3	0.36	62	592	65.5
Total Indicated	25,211	1.17	4	0.44	295	3,098	352.7
Total Measured + Indicated Resources	**30,918**	**1.15**	**4**	**0.42**	**357**	**3,690**	**418.2**
Total Inferred Resources	**16,223**	**0.93**	**3**	**0.28**	**150**	**1,470**	**146.8**

Table 4-2: Updated Mineral Reserves for Minto Mine (most recent Dec. 31, 2016)

Classification	Tonnes (kt)	Copper (%)	Silver (g/t)	Gold (g/t)	Contained Copper (kt)	Contained Silver (koz)	Contained Gold (koz)
Minto North Open Pit							
Proven	-	-	-	-	-	-	-
Probable	-	-	-	-	-	-	-
Total	**-**	**-**	**-**	**-**	**-**	**-**	**-**
MSD - Area 2 Open Pit							
Proven	-	-	-	-	-	-	-
Probable	807	1.21	1	0.41	10	26	10.6
Total	**807**	**1.21**	**1**	**0.41**	**10**	**26**	**10.6**
Minto East Underground							
Proven	-	-	-	-	-	-	-
Probable	625	2.07	6	0.89	13	120	17.9
Total	**625**	**2.07**	**6**	**0.89**	**13**	**120**	**17.9**
MSD - Area 2/118 Underground							
Proven	-	-	-	-	-	-	-
Probable	381	2.06	8	0.87	8	103	10.7
Total	**381**	**2.06**	**8**	**0.87**	**8**	**103**	**10.7**
MSD - Copper Keel Underground							

Classification	Tonnes (kt)	Copper (%)	Silver (g/t)	Gold (g/t)	Contained Copper (kt)	Contained Silver (koz)	Contained Gold (koz)
Proven	-	-	-	-	-	-	-
Probable	1,616	1.73	6	0.63	28	315	32.5
Total	**1,616**	**1.73**	**6**	**0.63**	**28**	**315**	**32.5**
MSD -Wildfire Underground							
Proven	-	-	-	-	-	-	-
Probable	-	-	-	-	-	-	-
Total	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Stockpiles							
Proven	489	1.42	6	0.41	7	92	6.4
Total	**489**	**1.42**	**6**	**0.41**	**7**	**92**	**6.4**
Total Mineral Reserves							
Proven	489	1.42	6	0.41	7	92	6.4
Probable	3,429	1.71	5	0.65	59	563	71.7
Total Mineral Reserves	**3,919**	**1.67**	**5**	**0.62**	**65**	**655**	**78.2**

5 Surface Water Quality Monitoring

Environmental monitoring programs are outlined in the *Environmental Monitoring, Surveillance and Reporting Plan* (EMSRP2016-02). The results for the surface water quality monitoring conducted in 2020 are provided in this section. Where possible, the 2020 results have been compared to historical results to identify trends and compare 2020 values with previous values.

5.1 Surface Water Quality Program

Details of the Surface Water Surveillance Program, including sampling station locations and monitoring frequency, are outlined in the EMSRP2016-02 and the results are presented in this section for water quality stations outlined in the WUL. Water quality result statistics including the mean, minimum and maximum are presented in summary tables. For the purposes of graphing results, values less than the detection limit were taken to be half of the detection limit.

The WUL effluent quality standards were compared to the water quality result statistic summaries at stations W16, W16A, W17, W50 and WTP/RO. The WUL water quality objectives were compared to the water quality result statistic summary at station W2, and at W50 when W35 and W15 are frozen.

As water quality stations, may be adjusted from year-to-year because of environmental changes or modifications to infrastructure, an update to the water quality station locations listed in the WUL is provided in Table 5-1 below. All surveillance monitoring sites in use in 2020 are confirmed with a Global Positioning System (GPS) unit to determine current UTM coordinates. Coordinates presented in Table 5-1 are associated with the World Geodetic System 1984 (WGS 84) coordinate system.

Table 5-1: Water Quality Site Descriptions and UTM Coordinates

Station	Description	UTM Coordinates – Zone 8	
		Easting	Northing
W1	Lower Reach of Minto Creek	392445	6948251
W2	Minto Creek, upstream of the Minto Creek/Yukon River confluence where the access road crosses Minto Creek	392584	6948402
W3	Minto Creek, at the federal MMER compliance point	387000	6945778
W4	Yukon River, upstream of the confluence with Minto Creek	394070	6948203
W5	Yukon River, downstream of the confluence with Minto Creek	392583	6949119
W6	Tributary on the North side of Minto Creek	387583	6946392
W7	Mouth of the tributary on the south side of Minto Creek, approximately 0.8 km downstream of W3	387546	6946034
W8	Western collection sump from the DSTSF	385629	6945076
W8A	Eastern collection sump from the DSTSF	385716	6945012
W10	Headwaters of Minto Creek (south-west fork at headwaters)	383855	6943364
W12	Main Pit and Main Pit Tailings Management Facility	384544	6945137
W12A	Discharge from Main pit	*	*
W14	Tailings thickener overflow	385223	6945089
W15	Upper Minto Creek storm water collection sump, downstream of the overburden dump, just upstream of Main Pit	384181	6944708
W16	Water Storage Pond	386402	6945559
W16A	Discharge from the Water Storage Pond	386679	6945664
W17	Water Storage Pond dam seepage	386679	6945664
W30	Headwaters Minto Creek (north-west fork)	383693	6945026
W33	Up-gradient of South Diversion Ditch	385351	6944072
W35	South Diversion Ditch	385223	6944427
W36	Minto Creek detention structure (MCDS) – Decommissioned in 2015	385892	6945191
W37	100 m downstream of MCDS (W36 collection sump) and upstream of Water Storage Pond – Decommissioned in 2015	386180	6945294
W45	Area 2 Pit and Area 2 Pit Tailings Management Facility	384912	6944068
W46	Minto Creek, downstream of W7 and W6 tributaries	387873	6946301
W47	Area 118 Pit water	384775	6944153
W50	Minto Creek, approximately 50 m downstream of the toe of the Water Storage Pond Dam and downstream of the inflow of the treated water	386747	6945682

Station	Description	UTM Coordinates – Zone 8	
		Easting	Northing
MC-1	Minto Creek upstream of Canyon	390967	6947528
WTP	Treated water from water treatment plant when RO not operating	385126	6945154
RO	Treated water from RO	385126	6945154
W51	Area 2 Stage 3 Pit	385160	6944240
W52	Ridgetop North Pit and Ridgetop North Pit Tailings Management Facility	*	*
W53	Ridgetop South Pit	*	*
W54	Main Dam seepage	*	*
W55	Tailings Diversion Ditch	386209	6945007
W62	MVFES2 Collection Sump	386079	6945335
C4	Tributary on the south side of Minto Creek, downstream of W3	388407	6946571
C10	Tributary on the south side of Minto Creek, downstream of W3	391868	6947914
MN	Minto North pit water	384342	6946090
MN-0.2	Upper west arm of McGinty Creek (Reference Station)	382267	6947299
MN-0.5	West arm of McGinty Creek just upstream of the confluence with the east arm	385251	6951262
MN-1.5	Upper east arm of McGinty Creek downstream of the Minto North deposit	384473	6947055
MN-2.5	East arm of McGinty Creek just upstream of confluence with the west arm	385493	6950788
MN-4.5	Lower mainstream McGinty Creek near confluence with Yukon River	386231	6952851
UG 1	Minto South underground mine dewatering	384916	6944098
UG 2	Wildfire underground mine dewatering	*	*
UG 3	Copper Keel underground mine dewatering**	*	*
UG 4	Minto East underground mine dewatering	384961	6945020

*Water quality sites not developed

** Copper keel dewatering is currently co-mingled with Minto South dewatering and reports to surface via UG1 sump

5.1.1 Water Quality Monitoring Conformance

2020 conformance with the external water sampling requirements is summarized in Table 5-2, below. Flow monitoring at water quality surveillance sites is highly variable because of site and seasonal conditions and is not presented in Table 5-2, however,

full details were provided in the Monthly Reports submitted to the YWB. Additionally, the specifics of non-conformance in relation to external and internal water sampling requirements are included in the Monthly Reports. Quality Assurance and Quality Control (QA/QC) sampling is not included in sampling events described in Table 5-2 but is provided in section 5.1.2.

Table 5-2: Water Quality Sampling Monitoring Conformance Summary (2020)

Site Name	2020 WQ sampling events	2020 Reason(s) for non-conformance events
W1	N/A	N/A
W2	29	Site was frozen during first quarter, intermittently dry from April through August, and frozen as of October 17th.
W3	55	Sampled as per schedule.
W4	4	Sampled as per schedule.
W5	3	Site frozen in Q1.
W6	5	Site frozen for 6 months of the year. Not sampled in July due to high bear activity in area.
W7	6	Site frozen for 6 months of the year.
W8	0	Site destroyed in 2017.
W8A	0	Site was dry throughout 2020.
W10	6	Site frozen for 6 months of the year.
W12	12	Sampled as per schedule.
W12A	0	No discharge from W12A in 2020.
W14	12	Sampled as per schedule.
W15	7	Site frozen for 5 months of 2020. Sampled as per schedule otherwise.
W16	34	Sampled as per schedule.
W16a	8	Sampled as per schedule.
W17	54	Sampled as per schedule.
W30	6	Site was frozen from January-April and November-December.
W33	0	Site destroyed in 2017, replaced with W33s.
W33s	6	Site was frozen from January-April and November-December.
W35	7	Site frozen from January-April and November-December.
W36	0	Decommissioned in 2015.
W37	0	Decommissioned in 2015.
W45	2	Site frozen from January-February and became filled with tailings in May. Water quality for the Area 2 Pit Complex will be sampled from W51 going forward.
W46	5	Site frozen from January-April and November-December and was not sampled in July due to high bear activity in area.
W47	0	Decommissioned and backfilled in 2017.
W50	23	Site frozen from January-March.
MC-1	25	Site frozen through first quarter, and November-December.
WTP	0	Water treatment plant did not operate in 2020.
RO		

Site Name	2020 WQ sampling events	2020 Reason(s) for non-conformance events
W51	7	Site frozen through first quarter and November-December.
W52	0	Site not established.
W53	0	Site not established.
W54	0	Site not established.
W55	6	Site frozen through first quarter, and frozen/dry through fourth quarter.
W62	11	July monthly sample missed due to staff error.
C4	5	Site frozen from January-April and November-December and was not sampled in July due to high bear activity in area.
C10	1	Site frozen or dry except in May 2020.
MN	5	Site frozen from January through April and October to December.
MN-0.2	6	Site frozen from January-April and November-December
MN-0.5	6	Site frozen from January-April and November-December
MN-1.5	6	Site frozen from January-April and November-December
MN-2.5	6	Site frozen from January-April and November-December
MN-4.5	6	Site frozen from January-April and November-December
UG1	12	Sampled as per schedule.
UG4	12	Sampled as per schedule.

5.1.2 Quality Assurance and Quality Control Program

As required by Clause 104 of the WUL, Minto is required to submit the results and interpretations of the Quality Assurance and Quality Control Program (QA/QC Program). The QA/QC program is directed through the EMSRP. Implementation of the Minto QA/QC Program occurred since November 2012.

The primary objective of the QA/QC Program is to ensure that data collected, analyzed and evaluated through the environmental monitoring programs at Minto are representative of the environmental conditions present at the time of sample collection.

The QA/QC Program has been developed using recognized QA/QC protocols. Specific procedures for data collection at the Minto Mine are detailed in Standard Operating Procedures (SOPs). SOPs are internal documents to the Minto Mine that may be modified or improved as required.

The main components of the QA/QC Program presented in the following sections include QA/QC with regards to water quality monitoring, external and on-site laboratory reporting, and environmental programs monitoring.

5.1.2.1 Water Quality QA/QC

Procedures for water quality monitoring at the Minto Mine are described in the EMSRP and further detailed in the Minto Mine Surface Water Quality Monitoring Standard Operating Procedure. The SOP is reviewed at the start of each field season and signed off by Minto Environment department staff to help ensure consistency in sampling procedures.

In 2020, 529 water quality samples (surface and groundwater) were collected for the water quality monitoring programs. QC samples represented 19.5% of the total number of samples collected in 2020, and included 91 field duplicates, 12 field blanks, and 4 trip blanks. The Minto Mine Surface Water Quality Monitoring Standard Operating Procedure describes a 1:10 quality control to routine sampling ratio and this ratio was achieved in 2020.

5.1.2.2 External Laboratory QA/QC

The 2020 external laboratory water quality analysis were performed by ALS Environmental in Burnaby, BC. As described in the EMSRP, all results provided by the external laboratory were accompanied by a Quality Control Report. If procedural deviations or exceedances in standard holding time occurred, the details of such nonconformities were included in each report. Additionally, each report contained QC batch numbers enhancing sample result traceability.

5.1.2.3 On-site Laboratory QA/QC

Procedures for analyzing water samples at the on-site laboratory are detailed in a variety of SOPs such as, but not limited to: The Laboratory QA/QC Guidelines SOP; Preparation of Dissolved and Total Metals (Cu, Al, Cd) SOP; Preparation of Dissolved and Total Selenium SOP; and Total Dissolved Solids SOP. All on-site laboratory equipment was calibrated per the manufacturer's specifications in 2020.

On-site laboratory analysis of water quality samples occurred at W2, W3, W16, W16a and W50 as per the WUL Schedule 1 – Part 2 monitoring requirements, as environmental conditions allowed. The weekly internal sample for W17 was missed

during the one week of active discharge. No internal samples were provided to the internal laboratory from W8 as the site was destroyed in 2017. W8A was found dry throughout 2020. Additionally, the on-site laboratory analyzed water from sites W15 and W35 during freshet to determine where best to route the run-off water.

The 2020 QC procedures performed by the on-site laboratory included spiked blanks and calibration checks. If two or more QC failures occurred, the 2020 QC procedures involved re-analyzing the entire batch of samples. Additionally, one replicate sample is analyzed for each batch analysis. In the event the replicate sample results do not match; the entire batch is reanalyzed.

QA/QC results such as duplicates, field splits, trip blanks and field blanks are verified monthly. Results are compared and reported internally to improve on sampling and analysis.

5.2 Compliance

5.2.1 Discharge Compliance – WQ Effluent Standards

5.2.1.1 W16A – EQS Compliance Point

Effluent Quality Standards (EQS) (Clause 9 of the WUL) were applied and met at W16A during active discharge from October 8th to 15th, 2020. The water quality statistics for this period are summarized below in Table 5-3 along with historical statistics from 2017 to 2019. There were no exceedances of the EQS at W16A in 2020. Results for dissolved aluminum, copper, cadmium and selenium are presented graphically in Figure 5-1 and 5-2 below (Note: No discharge occurred in 2019, therefore no samples were taken during that period).

Table 5-3: W16A Water Quality Results Summary (2017-2020)

W16A	Effluent Standards	2017 - 2019 Summary Statistics			2020 Sample
Parameters	(WUL Clause 9)	Mean	Min	Max	13-Oct-20
pH	6.0-9.0	8.24	7.87	8.43	8.09
TSS (mg/L)	15	3.44	<3.0	6.2	6.2

Nutrients (mg/L)					
Ammonia Nitrogen	0.75	0.0365	0.0071	0.146	0.0367
Nitrite Nitrogen	0.18	0.0312	0.0074	0.0808	0.0089
Nitrate Nitrogen	27.3	2.02	1.42	2.77	1.42
Dissolved Metals (mg/L)					
Aluminum	0.3	0.0097	0.0019	0.0149	0.0025
Arsenic	0.015	0.00038	0.00024	0.00049	0.00038
Cadmium	0.000435*	0.00001062	<0.0000050	0.0000273	0.000005
Chromium	0.003	0.000141	<0.00010	0.00022	0.00016
Copper	0.06	0.0301	0.0237	0.0394	0.0286
Iron	3.3	0.073	0.016	0.139	0.042
Lead	0.012	0.0002333	<0.000050	0.00173	0.00005
Molybdenum	0.219	0.0026	0.00221	0.00315	0.00315
Nickel	0.33	0.00088	0.0005	0.00111	0.0009
Selenium	0.006	0.000764	0.000568	0.00102	0.000976
Zinc	0.09	0.00164	<0.0010	0.0104	0.001

***Based on measured hardness at WQO station**

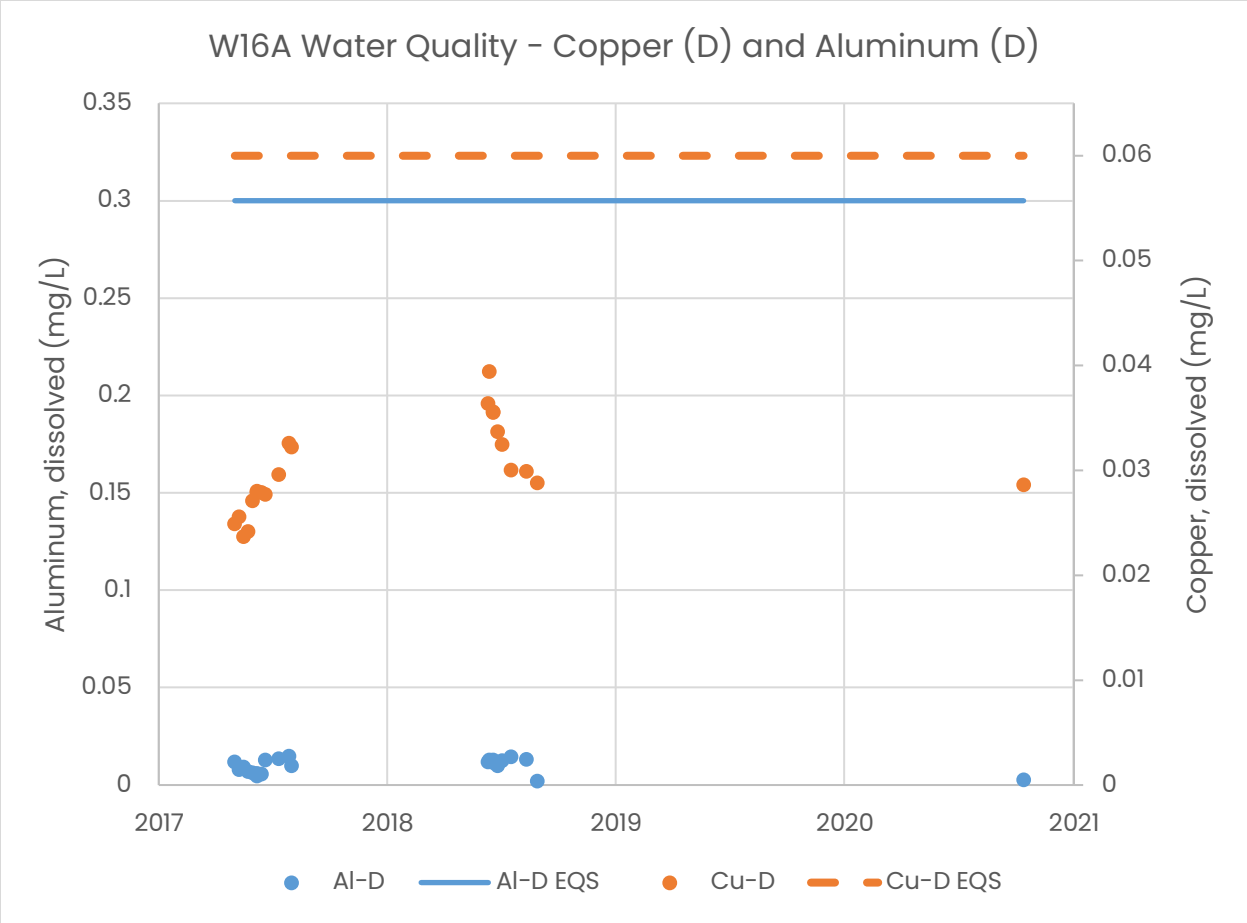
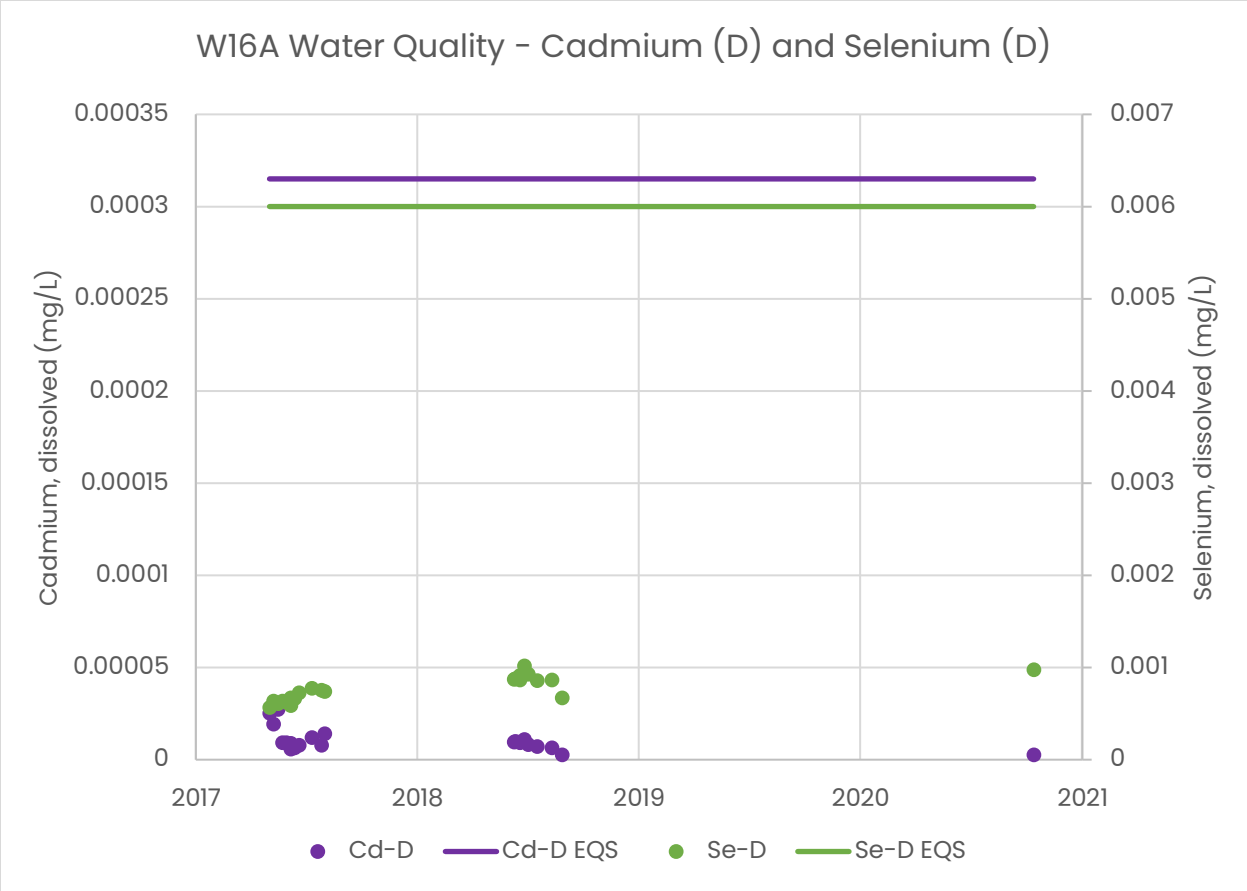


Figure 5-1: W16A Copper and Aluminum Concentrations (2017-2020)



***Note that the cadmium standard is based on a hardness of 172 mg/L at the WQO station.**

Figure 5-2: W16A Copper and Aluminum Concentrations (2017-2020)

5.2.1.2 W50 – EQS Compliance Point

The EQS were applied and met at W50 during active discharge from October 8th to 15th, 2020. The water quality results for this period are presented Table 5-4, below. A detailed summary of all samples collected at W50 during 2020 is presented in Section 5.2.4.1.

Table 5-4: W50 Water Quality Results During Active Discharge Period, 2020

W50 Parameters	Effluent Quality Standard (WUL Clause 9)	2020 Sample 13-Oct-20
pH	6.0-9.0	8.1
TSS (mg/L)	15	3.8
Nutrients (mg/L)		
Ammonia Nitrogen	0.75	0.0198
Nitrite Nitrogen	0.18	0.0074
Nitrate Nitrogen	27.3	1.38
Dissolved Metals (mg/L)		
Aluminum	0.3	0.0026
Arsenic	0.015	0.00038
Cadmium	0.000315*	0.0000056
Chromium	0.003	0.00012
Copper	0.06	0.027
Iron	3.3	0.028
Lead	0.012	<0.000050
Molybdenum	0.219	0.00316
Nickel	0.33	0.00087
Selenium	0.006	0.00102
Zinc	0.09	<0.0010

***Based on measured hardness at WQO Station**

5.2.1.3 W17 – EQS Compliance Point

During 2020, there was no water discharged from W17 to Minto Creek, therefore EQS were not applied to this station.

5.2.1.4 WTP – EQS Compliance Point

The WTP did not operate in 2019, therefore EQS were not applied to this station.

5.2.2 Discharge Compliance – Bioassays

Monthly and quarterly bioassays are conducted at several surface water quality sites, as per WUL requirements. These tests are to ensure the water is not toxic for aquatic organisms.

All quarterly LC50, 72-hour algae growth and Ra226 tests were conducted, and passed, at W3 during 2020. Quarterly lab results were submitted with the monthly reports in which they were received. Annual MDMER sub-lethal tests were conducted in October. Both tests passed and the results were included in the December monthly report. 48- and 96-hour LT50 samples were collected during active discharge in October and both tests passed.

At W2 station, bioassay sampling was not completed in the first quarter of 2020, as the water quality station was frozen until April. CA-72A and CD-7 day were completed and passed for Quarters 2, 3 and 4. CT-30 day tests were completed and passed in Quarters 2 and 3 but could not be completed in Quarter 4 due to the station freezing over on October 17th.

Due to lack of water, monthly bioassay testing at W50 could only be completed in July, August, September and October. The 48- and 96-hour LT50, and Cd-7d tests all passed during this period.

48- and 96-hour LT50 samples were collected at W3, W16A, and W50 during active discharge in October and all tests passed. Results were included with the November monthly report.

5.2.3 Discharge Compliance – RO

There was no RO discharge in 2020, therefore no samples were taken.

5.2.4 Water Quality Objectives Compliance – Minto Creek

5.2.4.1 W2 – WQO Compliance Point

Water Quality Objectives (WQO) (Clause 11 of the WUL) were applied at W2 during the period between April 20th and October 17th, 2020. As of April 20th, W15 and W35 were no longer frozen and W2 became the WQO station until the site froze on October 17th. Apart from dissolved aluminum, which exceeded the WQO on May 5th, all other parameters met the WQO's for 2020. Elevated concentrations of both dissolved aluminum and copper are common during freshet; no active discharge was taking place and mine loading was not considered to be a factor. The 2020 water quality statistics for W2 are summarized below in Table 5-5. Dissolved copper and aluminum at W2 are illustrated in Figure 5-3, and dissolved cadmium and selenium in Figure 5-4, below.

Table 5-5: W2 Water Quality Results Summary (2020)

W2	Water Quality Objective	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**(WUL Clause 11)**	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	6.0-9.0	8.21	7.57	8.52	8.09	7.49	8.27
TSS (mg/L)		24.9	<3.0	527	5.5	<3.0	44.9
Nutrients (mg/L)							
Ammonia Nitrogen	0.25	0.009	<0.0050	0.0726	0.00739	<0.0050	0.0214
Nitrite Nitrogen	0.06	0.00126	<0.0010	0.0047	0.00104	<0.0010	0.0017
Nitrate Nitrogen	9.1	0.08434	<0.0050	0.381	0.02055	<0.0050	0.12
Dissolved Metals (mg/L)							
Aluminum	0.1	0.01299	0.0029	0.0736	0.0132	0.0046	0.105
Arsenic	0.005	0.00048	0.00034	0.00083	0.00049	0.0004	0.00058
Cadmium	0.00015*	0.0000074	<0.0000050	0.0000217	0.0000072	<0.0000050	0.0000287
Chromium	0.001	0.000219	<0.00010	0.00051	0.000253	<0.00010	0.00053
Copper	0.013 ([DOC] ≤ 10mg/L) 0.02 ([DOC] > 10mg/L)	0.00429	0.00145	0.0184	0.0032	0.00177	0.013
Iron	1.1	0.081	0.018	0.338	0.066	0.029	0.213
Lead	0.004	0.0000541	<0.000050	0.00023	0.00005	<0.000050	0.000125
Molybdenum	0.073	0.001292	0.000382	0.00219	0.001353	0.000247	0.00186
Nickel	0.11	0.001047	<0.00050	0.0017	0.00099	0.00066	0.00175
Selenium	0.002	0.000159	0.000074	0.000537	0.000147	0.000094	0.000225
Zinc	0.03	0.00144	<0.0010	0.0058	0.00118	<0.0010	0.0034

*Based on measured hardness

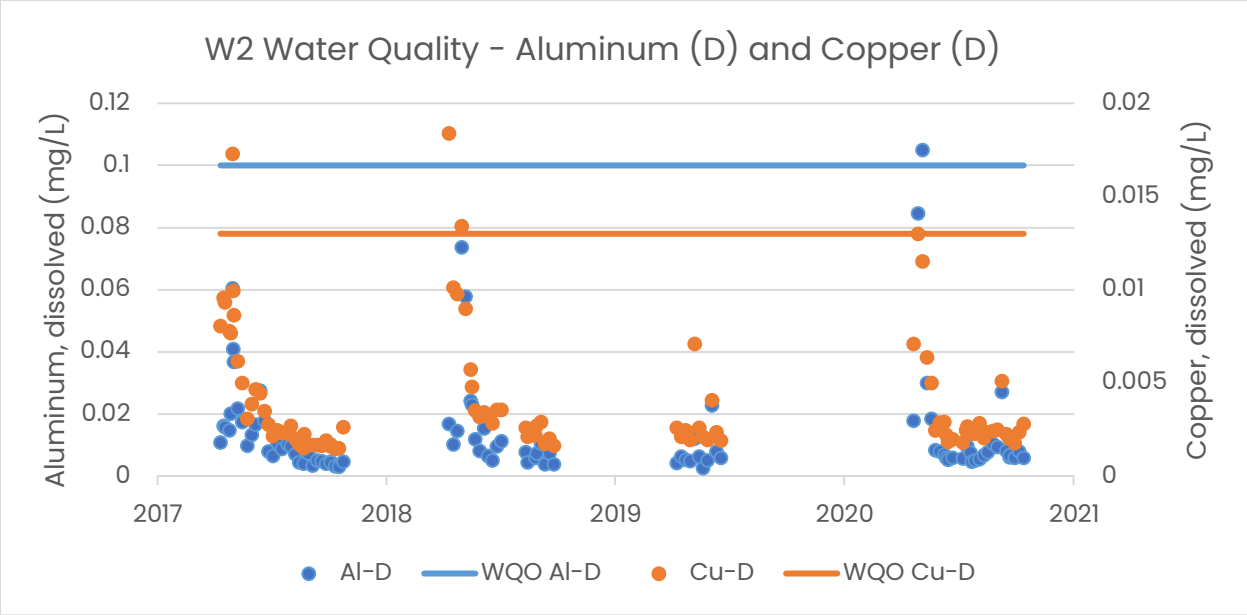


Figure 5-3: W2 Copper and Aluminum Concentrations (2017-2020)

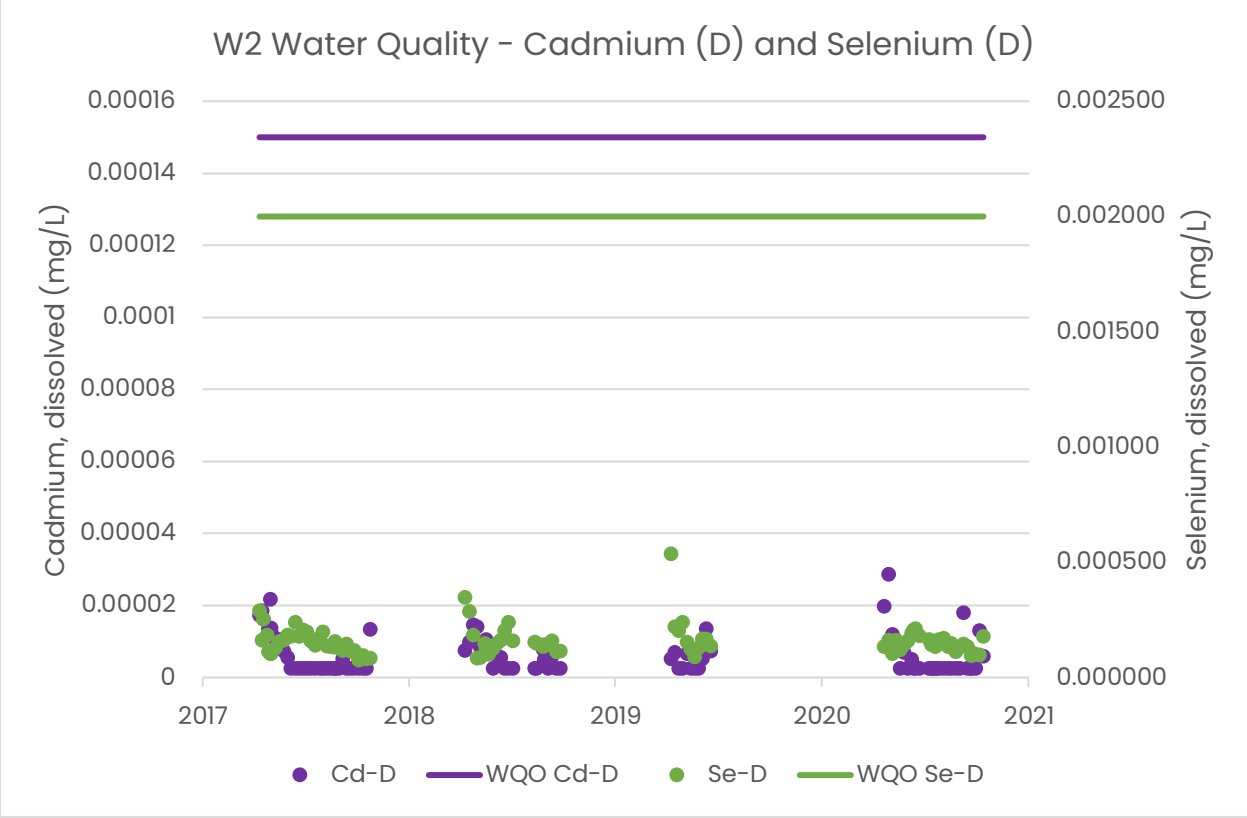


Figure 5-4: W2 Cadmium and Selenium Concentrations (2017-2020)

5.2.4.1 W50 – WQO Compliance Point

As per Clause 5 of the WUL, W50 was the designated WQO station during the first quarter when W15 and W35 were frozen; no samples were taken as W50 was frozen as well. As of April 20th, W15 and W35 were no longer frozen and W2 became the WQO station until W15 and W35 froze again on October 17th, 2020. W50 became the WQO station at this time and was sampled until it was discovered frozen on December 21st, 2020. No exceedances of the WQO occurred when W50 was the designated WQO station.

The 2020 water quality statistics for W50 are summarized below in Table 5-6. Dissolved copper and aluminum at W50 are illustrated in Figure 5-5, and dissolved cadmium and selenium in Figure 5-6, below.

Table 5-6: W50 Water Quality Results Summary (2017-2020)

W50	Water Quality Objectives (WUL Clause 11)	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters		**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	6.0-9.0	8.2	7.82	8.42	7.77	7.36	8.26
TSS (mg/L)	15	3.83	<3.0	10.2	5.63	<3.0	29.9
Nutrients (mg/L)							
Ammonia Nitrogen	0.75	0.0635	0.0063	0.282	0.2317	0.0198	0.297
Nitrite Nitrogen	0.18	0.02276	<0.0010	0.0717	0.0016	<0.0010	0.0074
Nitrate Nitrogen	27.3	1.69367	<0.0050	3.27	0.13475	<0.0050	1.4
Dissolved Metals (mg/L)							
Aluminum	0.3	0.0082	0.0034	0.0127	0.01	0.0026	0.0279
Arsenic	0.015	0.00039	0.00025	0.0005	0.00048	0.00038	0.00064
Cadmium	0.00045*	0.00002151	<0.0000050	0.000239	0.0000588	0.0000056	0.000135
Chromium	0.003	0.000162	<0.00010	0.00037	0.00037	0.00012	0.00051
Copper	0.039	0.02254	0.00126	0.0321	0.00401	0.00201	0.027
Iron	3.3	0.055	0.015	0.095	0.158	0.028	0.405
Lead	0.012	0.000121	<0.000050	0.00059	0.00005	<0.00005	<0.00005
Molybdenum	0.219	0.00312	0.0022	0.00585	0.00635	0.00316	0.00736
Nickel	0.33	0.00201	0.00054	0.0102	0.00913	0.00087	0.0106
Selenium	0.006	0.000666	0.000211	0.00101	0.000232	0.000145	0.00102
Zinc	0.09	0.00125	<0.0010	0.0026	0.00187	<0.0010	0.0066

***Based on measured hardness at WQO Station**

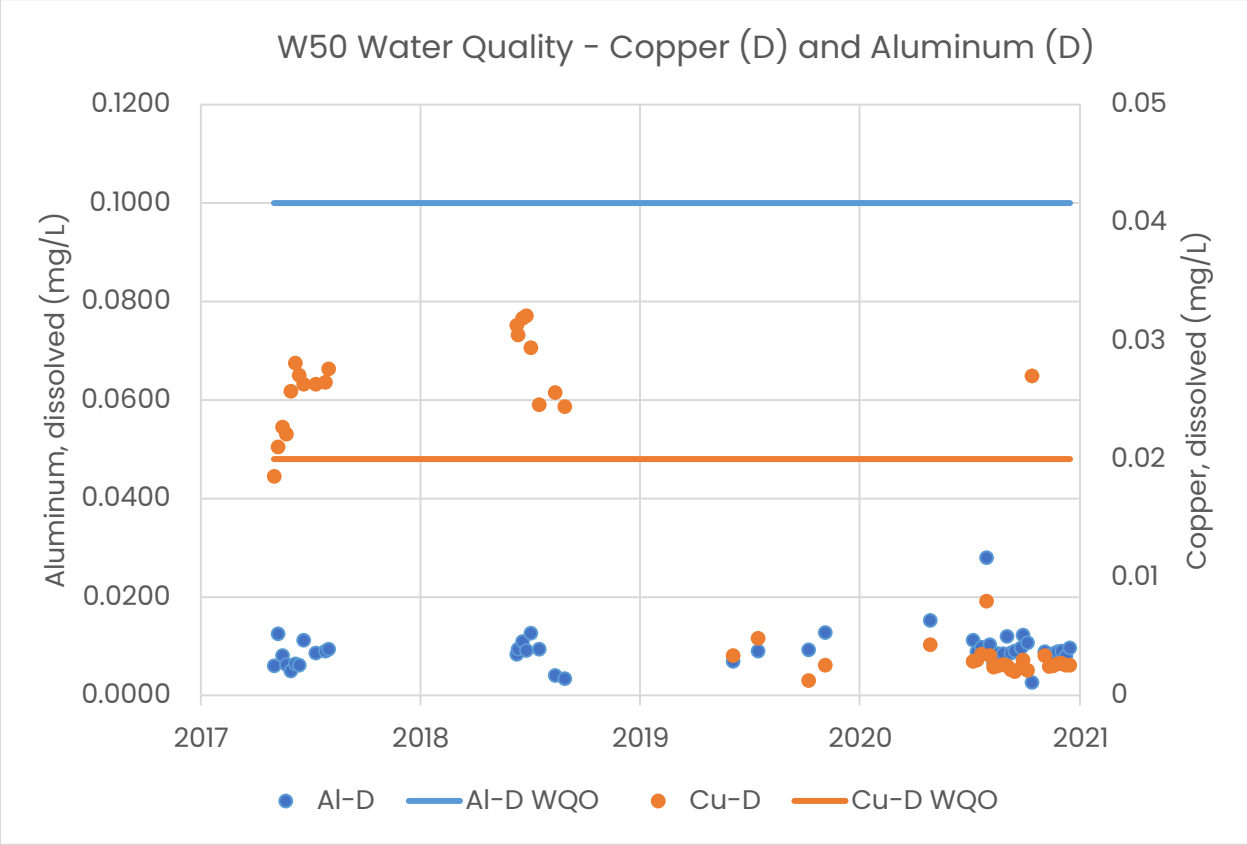
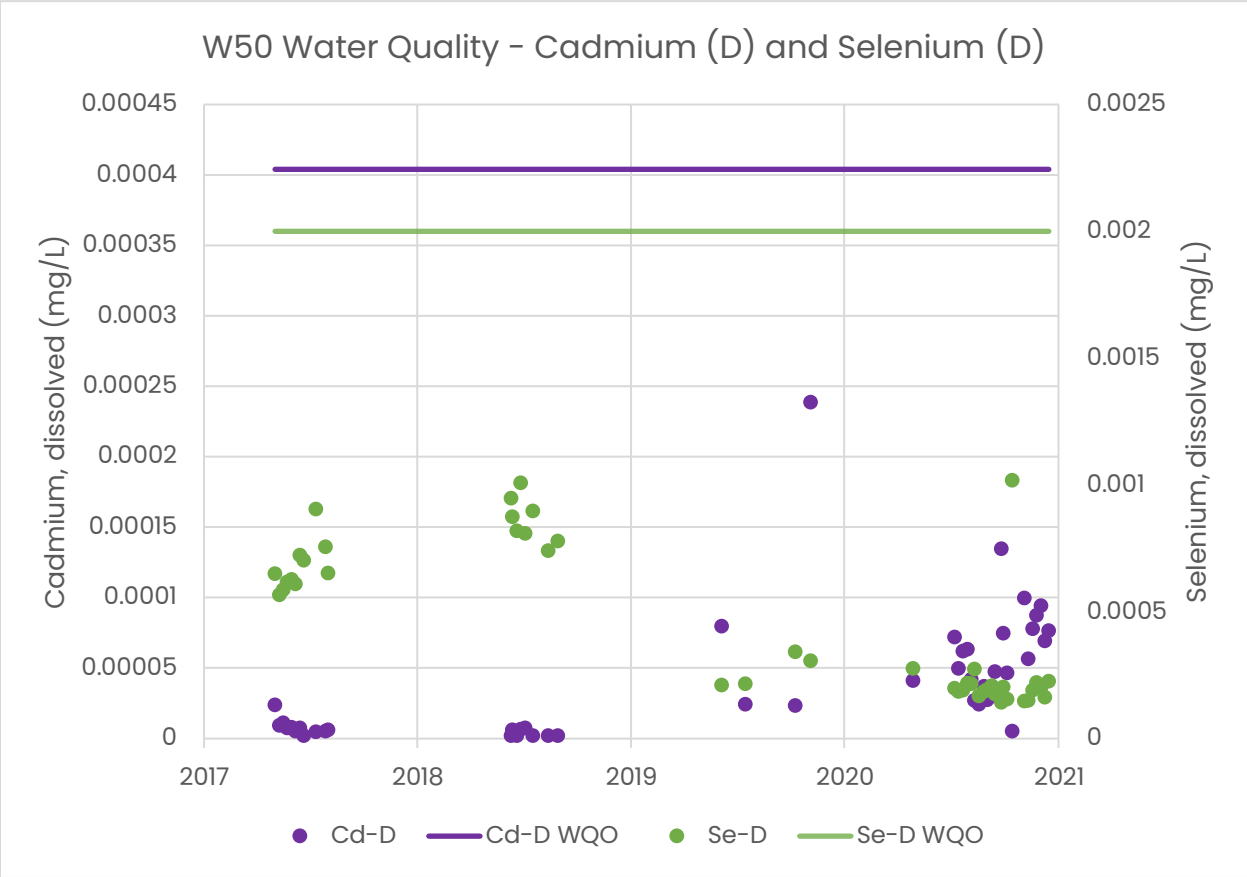


Figure 5-5: W50 Copper and Aluminum Concentrations (2017-2020)



***Note that the cadmium standard is based on a hardness of 241 mg/L which is a conservative estimate of hardness at the WQO station for the period between October 17th and December 15th, 2020.**

Figure 5-6: W50 Cadmium and Selenium Concentrations (2017-2020)

5.3 Surface Water Quality Surveillance Stations

5.3.1 W2 – Minto Creek at Lower Road Crossing Water Quality

Water quality statistics for W2 from 2017 to 2020 are presented in Section 5.2.3.1 above.

5.3.2 W3 – Minto Creek, at the Federal (MDMER) Compliance Point

Water quality statistics for W3 from 2017 to 2020 are summarized below in Table 5-7. A total of 55 routine samples were collected from station W3 during the 2020 monitoring period. The results for dissolved copper, dissolved aluminum, dissolved cadmium, and dissolved selenium for W3 from 2007 to 2020 are also presented in Figure 5-7 and Figure 5-8 below.

Table 5-7: W3 Water Quality Results Summary (2017-2020)

W3	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.25	7.77	8.62	8.12	7.57	8.47
TSS (mg/L)	3.99	<3.0	33.2	3.66	<3.0	22.6
Nutrients (mg/L)						
Ammonia Nitrogen	0.01484	<0.0050	0.143	0.0202	0.0063	0.631
Nitrite Nitrogen	0.00187	<0.0010	0.0511	0.0012	<0.0010	0.0075
Nitrate Nitrogen	0.23956	<0.0050	1.91	0.1122	0.0375	0.846
Dissolved Metals (mg/L)						
Aluminum	0.00414	<0.0010	0.0657	0.00881	<0.0010	0.113
Arsenic	0.000265	0.00012	0.00166	0.00026	0.00018	0.0006
Cadmium	0.00000988	<0.0000050	0.0000759	0.00000978	<0.0000050	<0.0000500
Chromium	0.000121	<0.00010	0.00164	0.000155	<0.00010	0.00057
Copper	0.00445	0.00152	0.0291	0.00479	0.00172	0.0463
Iron	0.0297	<0.010	0.203	0.028	<0.010	0.186
Lead	0.0000507	<0.000050	0.000135	0.00005	<0.000050	<0.000050
Molybdenum	0.00462	0.00185	0.00623	0.00484	0.00177	0.00577
Nickel	0.00093	<0.00050	0.00246	0.00118	0.00062	0.00306
Selenium	0.0003272	<0.000050	0.000834	0.000295	0.000198	0.00059
Zinc	0.00262	<0.0010	0.034	0.00218	<0.0010	0.0478

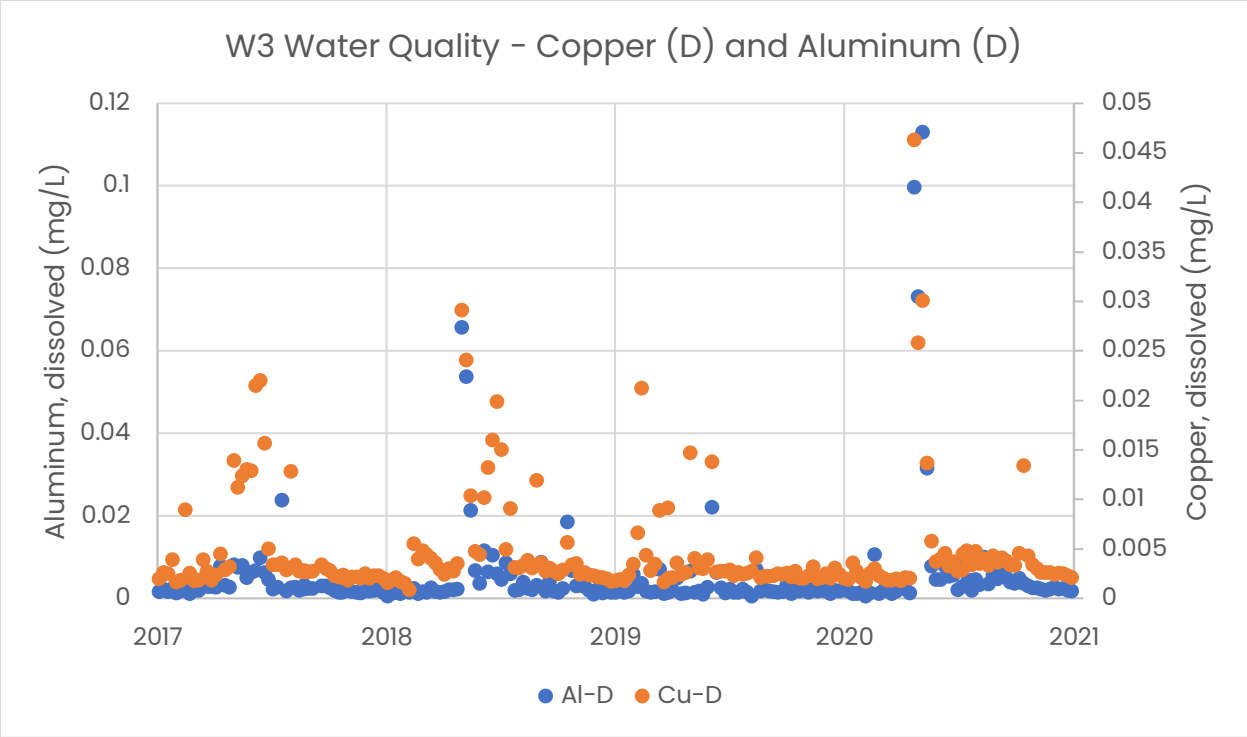


Figure 5-7: W3 Copper and Aluminum Concentrations (2017-2020)

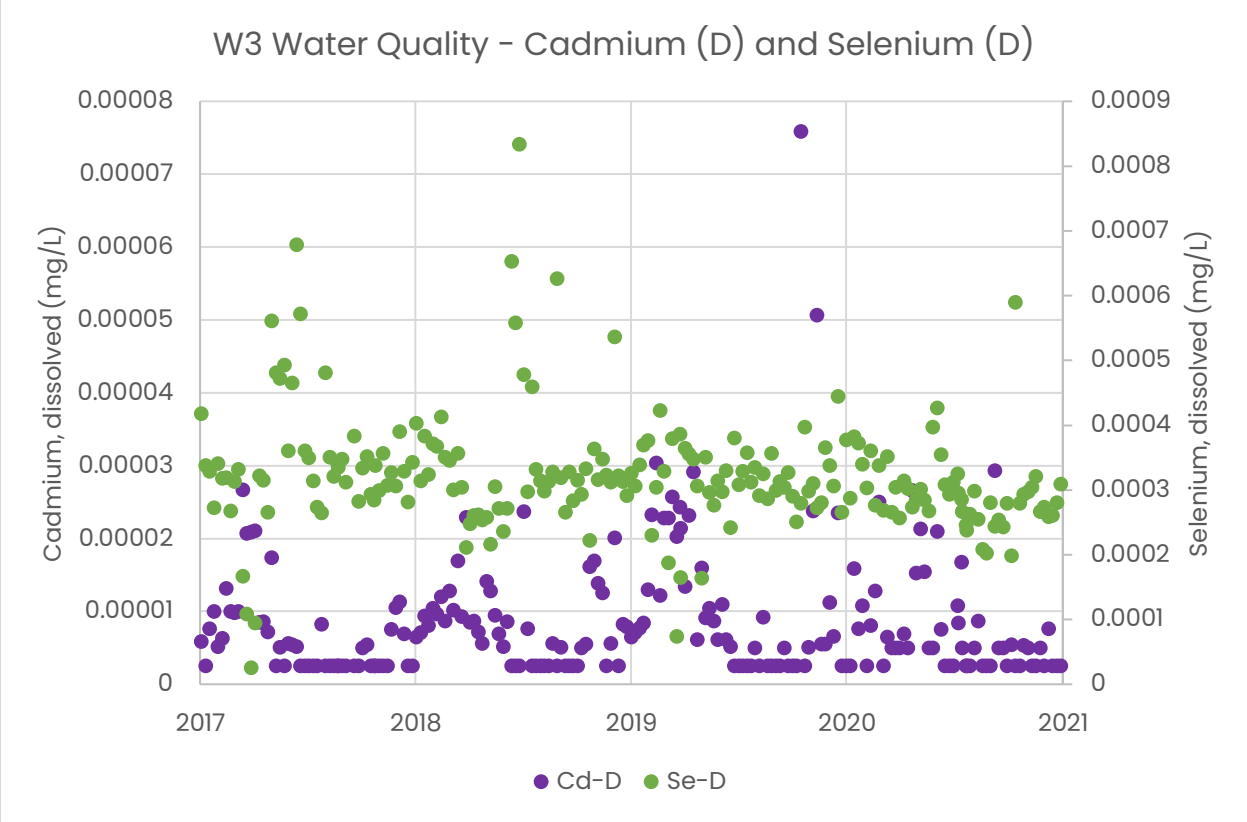


Figure 5-8: W3 Cadmium and Selenium Concentrations (2017-2020)

5.3.3 W4 – Yukon River, Upstream of the confluence with Minto Creek

Water quality statistics for W4 from 2017 to 2020 are summarized below in Table 5-8. A total of four routine samples were collected from station W4 during the 2020 monitoring period.

Table 5-8: W4 Water Quality Results Summary (2017-2020)

W4	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8	7.52	8.24	7.97	7.91	8.06
TSS (mg/L)	27.06	<3.0	211	14.38	<3.0	31.3
Nutrients (mg/L)						
Ammonia Nitrogen	0.00602	<0.0050	0.0148	0.005	<0.0050	<0.0050
Nitrite Nitrogen	0.001	<0.0010	<0.0010	0.001	<0.0010	<0.0010
Nitrate Nitrogen	0.0664	0.0115	0.189	0.0422	0.0152	0.104
Dissolved Metals (mg/L)						
Aluminum	0.01556	<0.0010	0.088	0.0154	0.0019	0.0315
Arsenic	0.00048	0.00034	0.00086	0.00046	0.00038	0.00055
Cadmium	0.00000646	<0.0000050	0.0000133	0.000005	<0.0000050	<0.0000050
Chromium	0.000139	<0.00010	0.00034	0.000138	<0.00010	0.00021
Copper	0.0016	0.00031	0.00819	0.00091	0.00053	0.00128
Iron	0.038	0.011	0.219	0.031	0.012	0.066
Lead	0.0000526	<0.000050	0.000081	0.00005	<0.000050	<0.000050
Molybdenum	0.000966	0.00039	0.00127	0.00108	0.000921	0.0013
Nickel	0.00065	<0.00050	0.00173	0.000555	<0.00050	0.00064
Selenium	0.000146	0.000112	0.000221	0.000168	0.000144	0.000179
Zinc	0.00127	<0.0010	0.0035	0.001	<0.0010	<0.0010

5.3.4 W5 – Yukon River, Downstream of the Confluence with Minto Creek

Water quality statistics for W5 from 2017 to 2020 are summarized below in Table 5-9. A total of 3 routine samples were collected from station W5 during the 2020 monitoring period. The Q1 sample could not be taken due to ice depth greater than the auger length.

Table 5-9: W5 Water Quality Results Summary (2017-2020)

W5	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	7.99	7.69	8.1	7.96	7.88	8.03
TSS (mg/L)	29.4	<3.0	153	21	5	36.6
Nutrients (mg/L)						
Ammonia Nitrogen	0.00805	<0.0050	0.0229	0.0062	0.0052	0.0069
Nitrite Nitrogen	0.00104	<0.0010	0.0014	0.001	<0.0010	<0.0010
Nitrate Nitrogen	0.0429	0.0067	0.122	0.0181	0.0134	0.026
Dissolved Metals (mg/L)						
Aluminum	0.0168	0.0046	0.0637	0.0179	0.0083	0.0269
Arsenic	0.00049	0.00041	0.00072	0.00051	0.00047	0.00055
Cadmium	0.00003	<0.0000050	0.000213	6.7E-06	<0.0000050	0.0000101
Chromium	0.000159	<0.00010	0.00031	0.00015	0.00011	0.00019
Copper	0.00219	0.00049	0.00554	0.00103	0.00076	0.00121
Iron	0.0459	<0.010	0.203	0.039	0.028	0.06
Lead	0.0000557	<0.000050	0.000083	0.00005	<0.000050	<0.000050
Molybdenum	0.001199	0.000868	0.00159	0.00116	0.00102	0.0013
Nickel	0.000649	<0.00050	0.00174	0.00054	<0.00050	0.00058
Selenium	0.000155	0.000125	0.000211	0.00015	0.000121	0.000194
Zinc	0.00591	<0.0010	0.0322	0.001	<0.0010	<0.0010

5.3.5 W6 – Tributary on the North side of Minto Creek

Water quality statistics for W6 from 2017 to 2020 are summarized below in Table 5-10. A total of five routine samples were collected from station W6 during the 2020 monitoring period. The July sample was not taken due to high bear activity in the area deeming the sampling unsafe.

Table 5-10: W6 Water Quality Results Summary (2017-2020)

W6	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.11	7.82	8.34	7.85	7.51	7.93
TSS (mg/L)	28	<3.0	294	20.21	<3.0	66.1
Nutrients (mg/L)						
Ammonia Nitrogen	0.00885	<0.0050	0.0311	0.0092	0.0062	0.0119
Nitrite Nitrogen	0.001	<0.0010	<0.0010	0.001	<0.0010	<0.0010
Nitrate Nitrogen	0.00964	<0.0050	<0.025	0.00617	<0.0050	0.0132
Dissolved Metals (mg/L)						
Aluminum	0.0085	0.004	0.0194	0.0098	0.0081	0.0125
Arsenic	0.0005	0.00041	0.0006	0.00044	0.00038	0.00047
Cadmium	0.00000519	<0.0000050	7.3E-06	0.00000617	<0.0000050	0.0000124
Chromium	0.000231	0.00017	<0.00030	0.0003	0.00025	0.00037
Copper	0.00149	0.00092	0.00294	0.00175	0.00149	0.00198
Iron	0.081	0.049	0.162	0.067	0.047	0.116
Lead	0.00005	<0.000050	<0.000050	0.00005	<0.000050	<0.000050
Molybdenum	0.000481	0.000354	0.00071	0.000368	0.00032	0.000426
Nickel	0.00146	0.00105	0.00184	0.00145	0.00123	0.00157
Selenium	0.000082	0.000056	0.00012	0.000104	0.000055	0.000147
Zinc	0.00103	<0.0010	0.0015	0.001	<0.0010	<0.0010

5.3.6 W7 – North Flowing Tributary to Minto Creek

Water quality statistics for W7 from 2017 to 2020 are summarized below in Table 5-11. A total of 11 routine samples were collected from station W7 during the 2020 monitoring period. The monitoring schedule was changed from monthly to weekly in August as part of a QP Adaptive Management Plan recommendation.

Table 5-11: W7 Water Quality Results Summary (2017-2020)

W7	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.18	7.96	8.42	8.04	7.97	8.1
TSS (mg/L)	16.61	<3.0	64.2	7.95	<3.0	20.3
Nutrients (mg/L)						
Ammonia Nitrogen	0.0161	0.007	0.0504	0.0127	0.0066	0.0173
Nitrite Nitrogen	0.00107	<0.0010	0.0022	0.00114	<0.0010	0.0025
Nitrate Nitrogen	0.10491	<0.0050	0.186	0.04912	<0.0050	0.0833
Dissolved Metals (mg/L)						
Aluminum	0.0103	0.003	0.0389	0.0116	0.0058	0.0186
Arsenic	0.00045	0.00037	0.00061	0.00041	0.00037	0.00048
Cadmium	0.00000696	<0.0000050	3.2E-05	0.00000612	<0.0000050	0.0000121
Chromium	0.00023	0.00012	0.00041	0.00035	0.00023	0.00048
Copper	0.00179	0.00066	0.00671	0.00241	0.00115	0.00578
Iron	0.122	0.02	0.601	0.09	0.041	0.158
Lead	0.00005	<0.000050	<0.000050	0.00005	<0.000050	<0.000050
Molybdenum	0.001347	0.000699	0.00161	0.00136	0.0011	0.00244
Nickel	0.00101	0.00053	0.00185	0.00111	0.00088	0.00144
Selenium	0.000176	0.000119	0.00025	0.000151	0.000088	0.000271
Zinc	0.0022	<0.0010	0.0302	0.00125	<0.0010	0.0034

5.3.7 W8A – Eastern Collection Sump from DSTSF

Station W8A has been dry since March 2019. Water quality statistics from 2017 to 2019 are summarized below in Table 5-12.

Table 5-12: Water Quality Result Summary (2017-2019)

W8A	2017 - 2019 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**
pH	7.83	7.19	8.36
TSS (mg/L)	41.6	3.3	200
Nutrients (mg/L)			
Ammonia Nitrogen	0.277	0.0362	0.58
Nitrite Nitrogen	0.3029	0.0125	1.18
Nitrate Nitrogen	3.961	0.058	16.9
Dissolved Metals (mg/L)			
Aluminum	0.01158	0.0044	0.143
Arsenic	0.00064	0.00038	0.00145
Cadmium	0.0002211	0.0000791	0.000518
Chromium	0.000615	0.00021	0.00151
Copper	0.0725	0.0278	0.167
Iron	0.685	0.078	7
Lead	0.0000648	<0.000050	0.00102
Molybdenum	0.01076	0.0041	0.0172
Nickel	0.00167	0.00099	0.00289
Selenium	0.00501	0.00101	0.0104
Zinc	0.2823	0.0467	0.983

5.3.8 W10 – Minto Creek Headwaters (South-West Fork)

Water quality statistics for W10 from 2017 to 2019 are summarized below in Table 5-13. A total of 6 routine samples were collected from station W10 during the 2020 monitoring period.

Table 5-13: W10 Water Quality Results Summary (2017-2020)

W10	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	7.79	6.89	8.53	7.37	6.87	7.91
TSS (mg/L)	68.7	<3.0	948	6.72	<3.0	16.3
Nutrients (mg/L)						
Ammonia Nitrogen	0.3475	0.0067	3.25	0.0427	0.0178	0.0782
Nitrite Nitrogen	0.02558	<0.0010	0.248	0.0076	<0.0010	0.014
Nitrate Nitrogen	9.03538	<0.0050	41.4	3.72313	<0.0050	14
Dissolved Metals (mg/L)						
Aluminum	0.0309	0.0017	0.235	0.1057	0.0031	0.265
Arsenic	0.000412	<0.00010	0.00268	0.00039	0.00014	0.00047
Cadmium	0.00001041	<0.0000050	0.0000666	0.00000621	<0.0000050	0.0000099
Chromium	0.000239	<0.00010	0.00241	0.000394	<0.00010	0.00061
Copper	0.01044	0.00067	0.0876	0.02941	0.00411	0.0793
Iron	3.8019	<0.010	76.5	0.833	0.057	1.6
Lead	0.00005	<0.000050	<0.000050	0.00005	<0.000050	<0.000050
Molybdenum	0.000779	0.000084	0.00493	0.000387	0.000117	0.000751
Nickel	0.00096	<0.00050	0.00573	0.001082	<0.00050	0.00182
Selenium	0.0001799	<0.000050	0.000967	0.000132	0.000085	0.000169
Zinc	0.0033	<0.0010	0.0132	0.003	0.0012	0.0058

5.3.9 W12 – Water in the Main Pit

Water quality statistics for W12 from 2017 to 2019 are summarized below in Table 5-14. A total of twelve routine samples were collected from station W12 during the 2019 monitoring period.

Table 5-14: W12 Water Quality Results Summary (2017-2020)

W12	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.11	7.83	8.41	8.00	7.68	8.27
TSS (mg/L)	8.97	<3.0	42.8	5.51	<3.0	12.6
Nutrients (mg/L)						
Ammonia Nitrogen	2.89698	<0.0050	6.94	1.974	0.984	3.00
Nitrite Nitrogen	2.9689	<0.010	8.49	1.425	0.63	2.84
Nitrate Nitrogen	11.37	3.32	28.9	11.97	7.29	19.2
Dissolved Metals (mg/L)						
Aluminum	0.0061	0.0018	0.043	0.0039	0.002	0.0133
Arsenic	0.0005	0.00032	0.00103	0.000415	<0.00020	0.00057
Cadmium	0.0001076	<0.000010	0.000217	0.0001249	0.0000794	0.000229
Chromium	0.000188	<0.00010	0.00132	0.00013	<0.00010	<0.00020
Copper	0.0539	0.0117	0.22	0.0783	0.041	0.113
Iron	0.0214	<0.010	0.084	0.0185	<0.010	0.058
Lead	0.0000866	<0.000050	0.00021	0.0000871	<0.000050	0.000338
Molybdenum	0.05772	0.00826	0.0975	0.0303	0.0199	0.0384
Nickel	0.002892	<0.00050	0.0065	0.00218	0.00111	0.00366
Selenium	0.00836	0.00166	0.0153	0.0063	0.00433	0.00932
Zinc	0.00496	<0.0010	0.0132	0.0044	0.0025	0.0092

5.3.10 W12A – Discharge from the Main Pit

There was no discharge from the Main Pit in 2020 and no discharge from the Main Pit in previous years.

5.3.11 W14 – Tailings Thickener Overflow

Water quality statistics for W14 from 2017 to 2019 are summarized below in Table 5-15. A total of 12 routine samples were collected from station W14 during the 2020.

Table 5-15: W14 Water Quality Results Summary (2017-2020)

W14	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.1	7.79	8.29	7.99	7.52	8.22
TSS (mg/L)	54.6	3.5	155	26.5	5.2	44.9
Nutrients (mg/L)						
Ammonia Nitrogen	5.358	0.439	12.3	9.06	2.06	18.1
Nitrite Nitrogen	3.925	0.066	8.42	1.47847	<0.0200	2.88
Nitrate Nitrogen	23.28	6.64	46.7	21.7233	<0.100	42.2
Dissolved Metals (mg/L)						
Aluminum	0.0275	0.0051	0.0684	0.02468	<0.0020	0.0578
Arsenic	0.00039	0.00021	0.00056	0.00038	0.00025	0.00046
Cadmium	0.0000606	<0.000010	0.000302	0.00006081	<0.0000100	0.000284
Chromium	0.000179	<0.00010	<0.00020	0.000183	<0.00010	<0.00020
Copper	0.01041	0.00066	0.0951	0.015129	<0.00040	0.0806
Iron	0.0242	<0.010	0.121	3.1158	<0.010	21.6
Lead	0.0000962	<0.000050	0.00026	0.0000917	<0.000050	<0.000100
Molybdenum	0.1107	0.0309	0.17	0.0583	0.0283	0.0851
Nickel	0.00421	0.0016	0.0109	0.00391	0.00169	0.00695
Selenium	0.01383	0.00501	0.023	0.00572	0.00378	0.00757
Zinc	0.00223	<0.0010	0.0064	0.00329	<0.0020	0.0082

5.3.12 W15 – Upper Minto Creek Stormwater Collection Point

Water quality statistics for W15 from 2017 to 2020 are summarized below in Table 5-16. A total of seven routine samples were collected from station W15 during the 2020 monitoring period. The results for dissolved copper, dissolved aluminum, dissolved cadmium, and dissolved selenium for W15 from 2017 to 2020 are also presented in Figure 5-9 and Figure 5-10 below.

Table 5-16: W15 Water Quality Results Summary (2017-2020)

W15	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.19	7.63	8.55	8.01	7.6	8.26
TSS (mg/L)	27.52	<3.0	878	6.07	<3.0	21.2
Nutrients (mg/L)						
Ammonia Nitrogen	0.105	0.0095	1.03	0.0189	0.0066	0.0392
Nitrite Nitrogen	0.1045	0.0034	0.548	0.02142	<0.0050	0.0449
Nitrate Nitrogen	12.57	1.14	58.8	7.53	3.74	13.1
Dissolved Metals (mg/L)						
Aluminum	0.01909	0.0039	0.164	0.0343	0.0058	0.119
Arsenic	0.00045	0.0002	0.00102	0.00035	0.00025	0.0004
Cadmium	0.0000178	<0.0000050	0.0000988	0.0000119	<0.0000050	0.0000245
Chromium	0.000188	<0.00010	0.00037	0.000223	<0.00010	0.00036
Copper	0.02771	0.00719	0.172	0.0232	0.0101	0.0355
Iron	0.113	<0.010	0.33	0.08	0.019	0.218
Lead	0.0000512	<0.000050	<0.00010	0.00005	<0.000050	<0.000050
Molybdenum	0.00339	0.0013	0.0126	0.00301	0.00178	0.00444
Nickel	0.00096	<0.00050	0.00217	0.000707	<0.00050	0.00091
Selenium	0.004314	0.000509	0.0273	0.00438	0.00199	0.00868
Zinc	0.00357	<0.0010	0.0231	0.00128	<0.0010	0.0033

Figure 5-9: W15 Copper and Aluminum Concentrations (2017-2020)

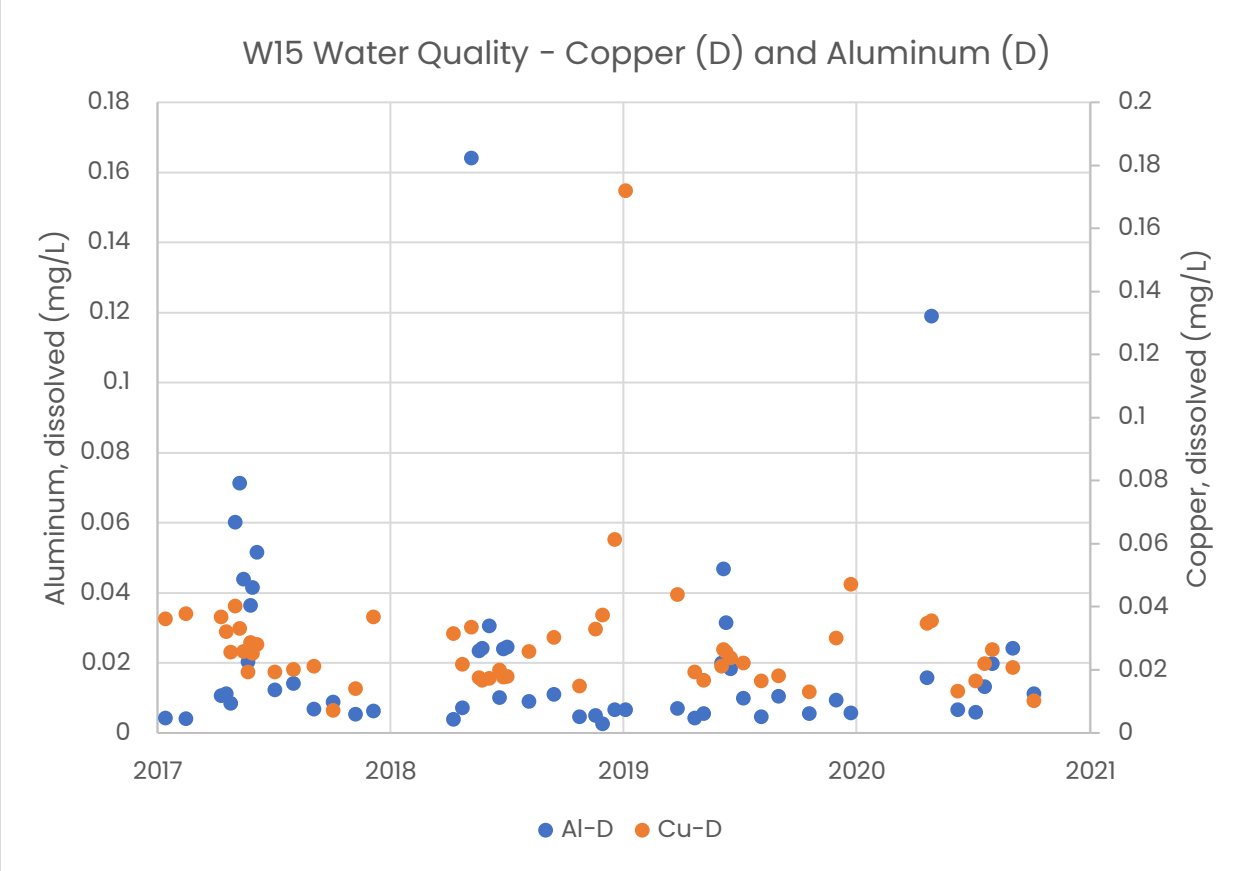
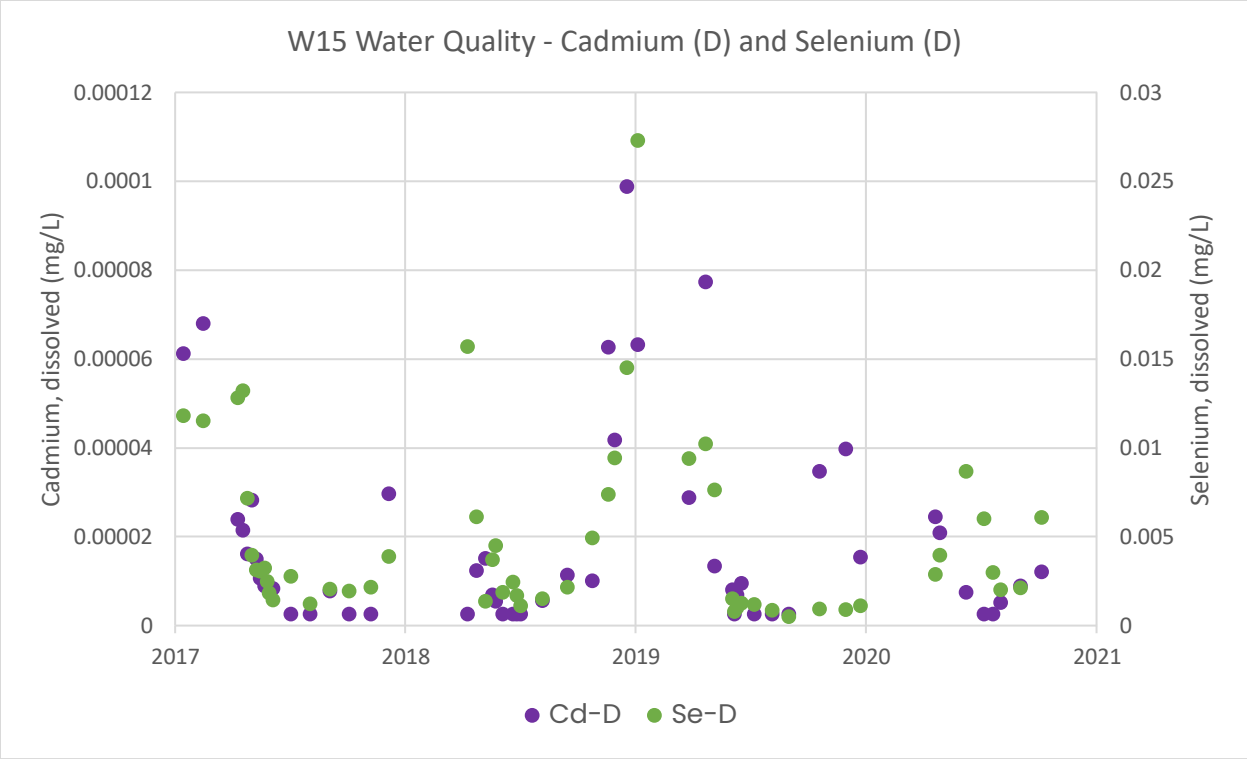


Figure 5-10: W15 Cadmium and Selenium Concentrations (2017-2020)



5.3.13 W16 – Water Storage Pond

External laboratory water quality statistics for W16 from 2017 to 2020 are summarized below in Table 5-17. A total of 34 routine samples were collected (16 external lab samples, 18 internal lab samples) from station W16 during the 2020 monitoring period. The external laboratory results for dissolved copper, dissolved aluminum, dissolved cadmium, and dissolved selenium for W16 from 2017 to 2020 are also presented in Figure 5-11 and Figure 5-12 below.

Table 5-17: W16 Water Quality Results Summary (2017-2020)

W16	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.21	7.55	8.54	7.93	7.58	8.16
TSS (mg/L)	10.02	<3.0	123	6.43	<3.0	27.2
Nutrients (mg/L)						
Ammonia Nitrogen	0.04099	<0.0050	0.163	0.0763	0.0135	0.273
Nitrite Nitrogen	0.01972	<0.0010	0.118	0.0169	0.001	0.0587
Nitrate Nitrogen	1.62462	<0.0050	4.86	1.1641	0.0164	3.1
Dissolved Metals (mg/L)						
Aluminum	0.0096	0.0011	0.0485	0.0149	<0.0010	0.0689
Arsenic	0.000399	<0.00010	0.00062	0.00049	0.00036	0.00064
Cadmium	0.00002048	<0.0000050	0.000181	0.00001904	<0.0000050	0.0000567
Chromium	0.000133	<0.00010	0.00029	0.000208	<0.00010	0.00034
Copper	0.02729	0.00643	0.0574	0.04059	0.00872	0.0778
Iron	0.0569	<0.010	0.209	0.159	0.036	0.851
Lead	0.0000516	<0.000050	0.000112	0.0000523	<0.000050	0.000098
Molybdenum	0.002861	0.000653	0.00511	0.00299	0.00208	0.0039
Nickel	0.000819	<0.00050	0.00128	0.00105	0.00053	0.00164
Selenium	0.000702	0.000145	0.0015	0.000852	0.000282	0.00144
Zinc	0.00301	<0.0010	0.0281	0.00567	<0.0010	0.0302

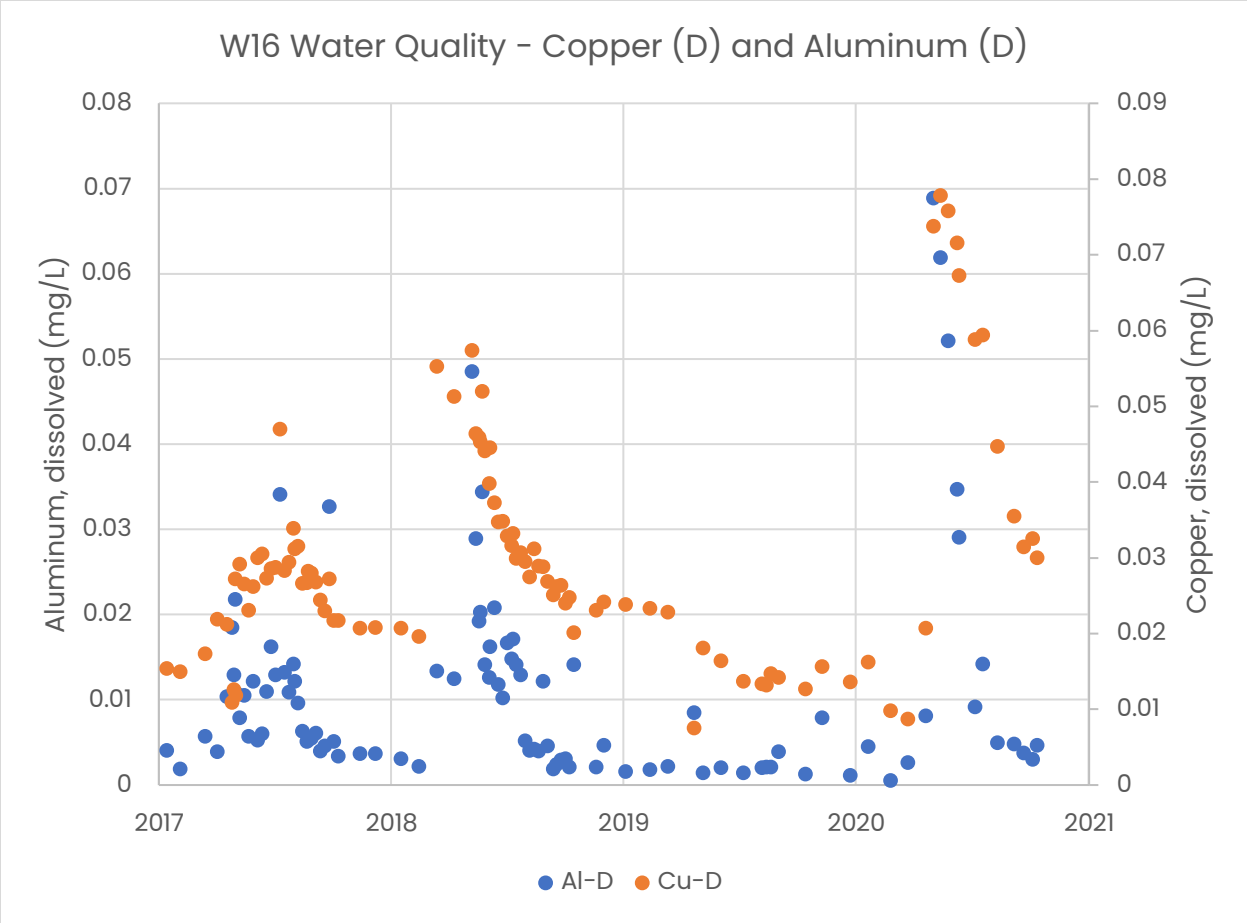


Figure 5-11: W16 Copper and Aluminum Concentrations (2017-2020)

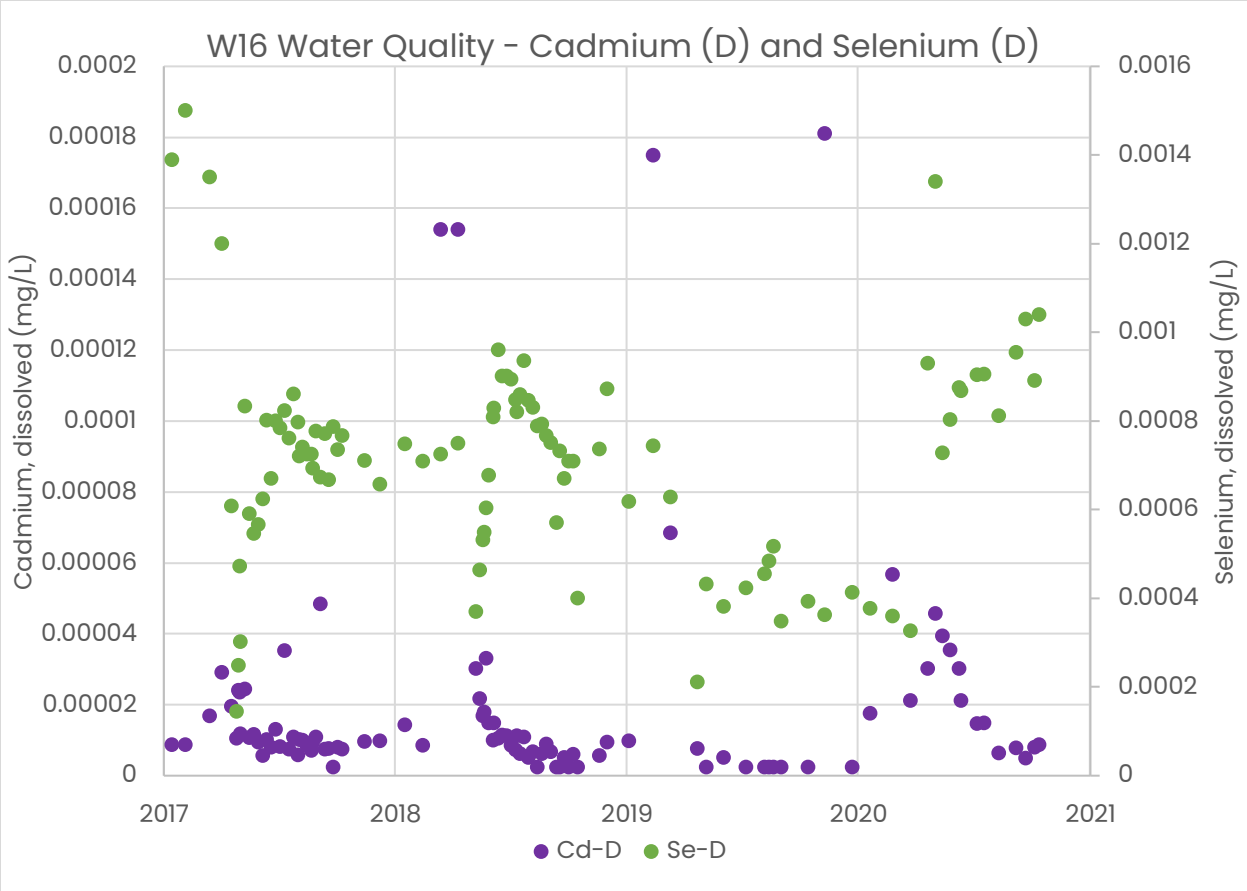


Figure 5-12: W16 Cadmium and Selenium Concentrations (2017-2020)

5.3.14 W17 – Water Storage Pond Dam Seepage

The summary results for this station are presented in the seepage section 7.4 along with trend analyses for dissolved copper, aluminum, cadmium and selenium concentrations throughout the years. A total of 54 samples were collected at this station during the 2020 monitoring period. The sample on January 21st could not be taken as the sump was fully frozen.

5.3.15 W30 – Headwaters Minto Creek (northwest fork)

The water quality statistics for W30 from 2017 to 2020 are summarized below in Table 5-18. A total of six routine samples were collected from station W30 during the 2020 monitoring period.

Table 5-18: W30 Water Quality Results Summary (2017-2020)

W30	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.24	7.71	8.42	8.23	8.06	8.34
TSS (mg/L)	7.95	<3.0	45.3	5.48	<3.0	15.8
Nutrients (mg/L)						
Ammonia Nitrogen	0.0559	0.0058	0.599	0.0252	0.0061	0.0659
Nitrite Nitrogen	0.01101	<0.0010	0.0564	0.0074	0.004	0.0178
Nitrate Nitrogen	0.50082	<0.0050	3.01	0.938	0.403	1.6
Dissolved Metals (mg/L)						
Aluminum	0.0065	0.001	0.0336	0.0029	0.001	0.0081
Arsenic	0.00074	0.00044	0.00132	0.00047	0.0004	0.00056
Cadmium	0.00000801	<0.0000050	0.0000356	0.00000808	<0.0000050	<0.0000100
Chromium	0.000103	<0.00010	0.00015	0.0001	<0.00010	<0.00010
Copper	0.01955	0.00835	0.0699	0.0148	0.0119	0.0202
Iron	0.063	0.012	0.165	0.058	0.018	0.121
Lead	0.00005	<0.000050	<0.000050	0.00005	<0.000050	<0.000050
Molybdenum	0.00417	0.00137	0.00922	0.00994	0.00754	0.0116
Nickel	0.000544	<0.00050	0.00093	0.0005	<0.00050	<0.00050
Selenium	0.001792	0.000665	0.00515	0.00331	0.00182	0.0064
Zinc	0.00152	<0.0010	<0.0060	0.00192	<0.0010	0.0062

5.3.16 W33/W33s – Above Tailings Diversion Ditches

The water quality statistics for W33 from 2017 to 2020 are summarized below in Table 5-19. A total of six routine samples were collected from station W33 during the 2020 monitoring period. W33 was buried during construction at the end of December 2017. In 2018, the water was found seeping out of the road construction about 50 meters north of the original site and the samples were collected from that site onward.

Table 5-19: W33 Water Quality Results Summary (2017-2020)

W33s	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	7.99	7.75	8.13	7.48	7.44	7.54
TSS (mg/L)	21.74	<3.0	101	3	<3.0	<3.0
Nutrients (mg/L)						
Ammonia Nitrogen	0.1547	0.0056	0.976	0.0094	0.0076	0.0124
Nitrite Nitrogen	1.69138	<0.0010	15.5	0.00127	<0.0010	0.0018
Nitrate Nitrogen	18.13817	<0.0050	139	0.0221	0.0095	0.046
Dissolved Metals (mg/L)						
Aluminum	0.1452	0.0073	1.13	0.0279	0.0206	0.0384
Arsenic	0.00048	0.00031	0.00109	0.00032	0.00029	0.00037
Cadmium	0.00002123	<0.0000050	0.0001	0.000037	<0.0000050	0.000101
Chromium	0.00043	0.00019	0.00089	0.00045	0.00038	0.00051
Copper	0.03573	0.00665	0.136	0.01084	0.00811	0.0152
Iron	0.248	0.044	1.4	0.081	0.062	0.096
Lead	0.0001284	<0.000050	0.00083	0.00005	<0.000050	<0.000050
Molybdenum	0.002558	0.000494	0.0101	0.000577	0.000519	0.000664
Nickel	0.00149	0.00107	0.00163	0.0013	0.00087	0.00169
Selenium	0.000758	0.000087	0.00317	0.000169	0.000091	0.000307
Zinc	0.00238	<0.0010	0.0099	0.0044	<0.0010	0.0112

5.3.17 W35 – Storm Water Collection Point – South Diversion Ditch

The water quality statistics for W35 from 2017 to 2020 are summarized below in Table 5-20. It should be noted that the location of W35 changed in 2017, with the construction of the Tailings Diversion Ditch intake structure. The water reporting to W35 also changed from a primarily unimpacted water to water potentially impacted from blast residues from the new Fresh Air Raise access road, as well as water running off the portal access road.

A total of seven routine samples were collected from station W35 during the 2020 monitoring period. The results for dissolved copper, dissolved aluminum, dissolved cadmium, and dissolved selenium for W35 from 2017 to 2020 are also presented in Figure 5-13 and Figure 5-14 below. Depending on water quality the water is re-routed to the TDD or to the A2 Pit. The elevated TSS values from 2020 were due to re-grading of the haul road allowing run-off to enter the South diversion ditch. This issue will be addressed in the spring of 2021 to keep road run-off and unimpacted water separate.

Table 5-20: W35 Water Quality Results Summary (2017-2020)

W45	2017-2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.01	7.52	8.48	7.8	7.56	7.98
TSS (mg/L)	15.91	<3.0	197	6790.84	<3.0	57000
Nutrients (mg/L)						
Ammonia Nitrogen	0.0275	0.006	0.197	0.7658	0.0093	6.51
Nitrite Nitrogen	0.0208	0.0012	0.0851	0.1668	0.0038	1.39
Nitrate Nitrogen	12.354	0.179	90.8	13.78	1.34	34
Dissolved Metals (mg/L)						
Aluminum	0.0232	0.0034	0.0666	0.0257	0.0074	0.0682
Arsenic	0.00038	0.00026	0.00066	0.00033	0.00026	0.00044
Cadmium	0.00001456	<0.0000050	0.0000373	0.0000403	0.0000066	0.0000828
Chromium	0.000279	<0.00010	0.00061	0.00032	0.00017	0.00049
Copper	0.0505	0.0157	0.109	0.0641	0.0192	0.156
Iron	0.064	<0.010	0.15	0.0509	0.014	0.13
Lead	0.0000511	<0.000050	0.000081	0.0000637	<0.000050	0.000123
Molybdenum	0.002008	0.000378	0.00828	0.004498	0.000696	0.0231
Nickel	0.001164	<0.00050	0.00178	0.000974	0.00064	0.00122
Selenium	0.000414	0.000102	0.00255	0.001056	0.000316	0.00278
Zinc	0.00214	<0.0010	0.028	0.00167	<0.0010	0.0036

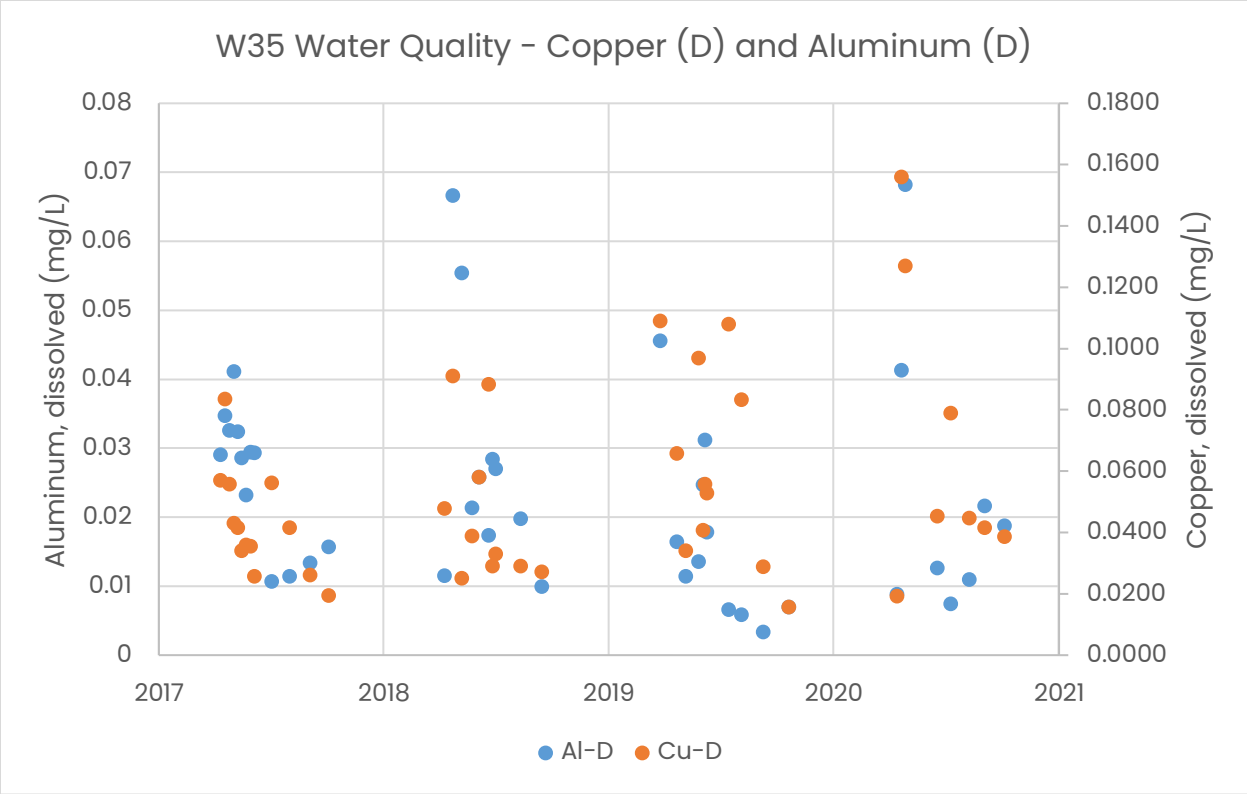


Figure 5-13: W35 Copper and Aluminum Concentrations (2017-2020)

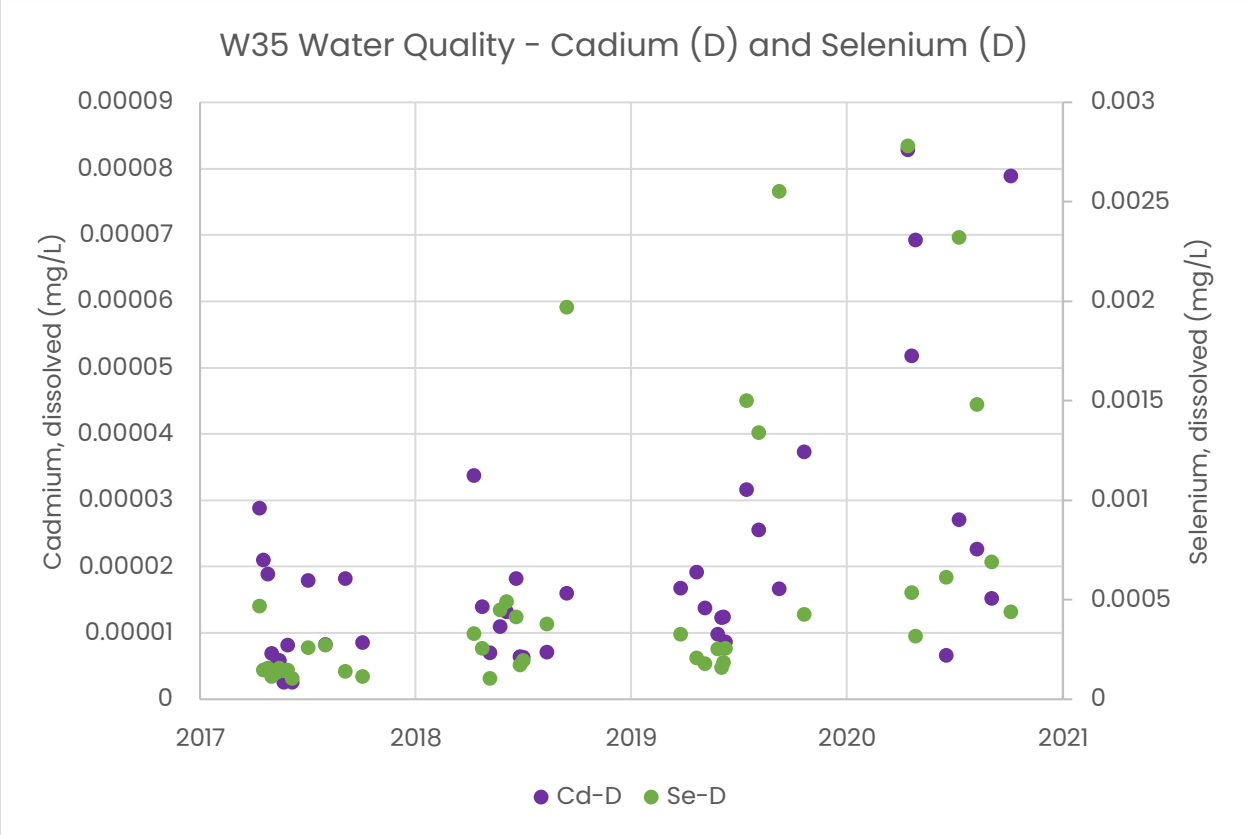


Figure 5-14: W35 Cadmium and Selenium Concentrations (2017-2020)

5.3.18 W36 – Minto Creek Detention Structure Pond

W36 was decommissioned during the construction of the Mill Valley Fill Extension Phase 2 (MVFE2) in 2015. As such, no samples were taken in 2020.

5.3.19 W37 – 100 m downstream of MCDS (W37 Collection Sump) and upstream of Water Storage Pond

W37 was decommissioned during the construction of the Mill Valley Fill Extension Phase 2 (MVFE2) in 2015 and replaced by W62. As such, no samples were taken in 2020.

5.3.20 W45– Area 2 Pit

The water quality statistics for W45 from 2017 to 2020 are summarized below in Table 5-21. A total of two routine samples were collected from station W45 during the 2020 monitoring period. The samples taken were predominantly tailings explaining the elevated TSS levels. No samples were taken from March onwards due to W45 being filled with tailings. W51 will be the primary water quality station for the Area 2 Pit going forward.

Table 5-21: W45 Water Quality Results Summary (2017-2020)

W45	2017-2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	7.99	7.76	8.14	7.88	7.87	7.89
TSS (mg/L)	67.8	9.5	283	128150	66300	190000
Nutrients (mg/L)						
Ammonia Nitrogen	5.67	1.83	9.63	16.7	13.4	20
Nitrite Nitrogen	3.6226	<0.020	11.4	1.68	1.5	1.85
Nitrate Nitrogen	17.02	0.39	35.5	33.9	24.4	43.4
Dissolved Metals (mg/L)						
Aluminum	0.0111	0.0032	0.0174	0.0197	0.014	0.0254
Arsenic	0.000372	<0.00010	0.00056	0.00045	0.00043	0.00047
Cadmium	0.0000782	<0.000010	<0.00020	0.0000275	<0.0000250	<0.0000300
Chromium	0.000193	<0.00010	<0.00020	0.00024	<0.00020	0.00028
Copper	0.00653	0.001	0.0208	0.00215	0.001	0.00331
Iron	0.0366	<0.010	0.172	0.0875	<0.020	0.155
Lead	0.0000989	<0.000050	0.00014	0.0001	<0.000100	<0.000100
Molybdenum	0.0893	0.0162	0.134	0.0759	0.0751	0.0768
Nickel	0.00582	0.00183	0.0095	0.00528	0.00393	0.00662
Selenium	0.01029	0.00095	0.0181	0.00366	0.00355	0.00378
Zinc	0.00545	<0.0010	0.0851	0.002	<0.0020	<0.0020

5.3.21 W46 – Minto Creek, Downstream of W7 and W6

The water quality statistics for W46 from 2017 to 2020 are summarized below in Table 5-22. A total of five routine samples were collected from station W46 during the 2020 monitoring period. The July sample was not taken due to high bear activity in the area deeming the sampling unsafe.

Table 5-22: W46 Water Quality Results Summary (2017-2020)

W46	2017-2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.23	8.01	8.48	8.04	7.95	8.11
TSS (mg/L)	61.67	<3.0	693	34.59	<3.0	86.9
Nutrients (mg/L)						
Ammonia Nitrogen	0.01817	<0.0050	0.069	0.0165	0.0118	0.0231
Nitrite Nitrogen	0.00145	<0.0010	0.0063	0.001	<0.0010	<0.0010
Nitrate Nitrogen	0.11509	<0.0050	0.338	0.07939	<0.0050	0.254
Dissolved Metals (mg/L)						
Aluminum	0.0067	0.0027	0.0253	0.0069	0.0051	0.0106
Arsenic	0.00045	0.00035	0.00061	0.00051	0.00046	0.00059
Cadmium	0.00000804	<0.0000050	0.0000238	0.00000507	<0.0000050	0.0000056
Chromium	0.000153	<0.00010	0.00022	0.0002	0.00014	0.00032
Copper	0.00233	0.00137	0.00483	0.00284	0.00221	0.00445
Iron	0.133	0.022	0.34	0.127	0.071	0.186
Lead	0.00005	<0.000050	<0.000050	0.00005	<0.000050	<0.000050
Molybdenum	0.00202	0.00119	0.00293	0.00199	0.00148	0.00239
Nickel	0.000916	<0.00050	0.00135	0.001	0.00087	0.00118
Selenium	0.000201	0.000114	0.00033	0.000225	0.000131	0.000321
Zinc	0.00134	<0.0010	<0.0050	0.001	<0.0010	<0.0010

5.3.22 W47 – Area 118 Pit Water

W47 was decommissioned and backfilled during the construction of the Area 2 Stage 3 pit in January 2017. As such, no samples were taken in 2020.

5.3.23 W50 – Minto Creek, 50m Downstream of the Toe of the WSP Dam

The water quality statistics for W50 are presented in Section 5.2.1.2 above.

5.3.24 W51 – Area 2 Stage 3 Pit

The water quality statistics for W51 from 2017 to 2020 are summarized below in Table 5-23. W51 was developed in 2017 with the mining activities in the Area 2 Stage 3 pit. A total of seven routine samples were collected from station W51 during the 2020 monitoring period. No other samples were collected because the pit was inaccessible for safety reasons.

Table 5-23: W51 Water Quality Results Summary (2017-2020)

W51	2017-2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.23	7.88	8.41	7.91	7.72	8.06
TSS (mg/L)	58.58	<3.0	505	11	3	26.8
Nutrients (mg/L)						
Ammonia Nitrogen	3.971	0.627	12.2	5.23	3.96	6.17
Nitrite Nitrogen	1.851	0.126	3.11	3.76	1.5	6.69
Nitrate Nitrogen	10.73	3.08	34.8	7.1	2.85	8.69
Dissolved Metals (mg/L)						
Aluminum	0.0034	0.0012	0.0055	0.0048	0.0028	0.0072
Arsenic	0.00062	0.00028	0.00169	0.00033	0.00028	0.0004
Cadmium	0.0000956	0.0000142	0.00023	0.00004054	<0.0000250	<0.0000600
Chromium	0.000148	<0.00010	<0.00020	0.000224	<0.00020	0.00042
Copper	0.053	0.017	0.161	0.00262	0.00126	0.00771
Iron	0.019	<0.010	0.067	0.0637	<0.020	0.279
Lead	0.0000823	<0.000050	0.00022	0.0001	<0.000100	<0.000100
Molybdenum	0.03478	0.00436	0.0435	0.0441	0.0266	0.0513
Nickel	0.002306	<0.00050	0.0038	0.00476	0.00282	0.00822
Selenium	0.00386	0.00273	0.00551	0.00429	0.00394	0.00502
Zinc	0.00459	<0.0010	0.0222	0.00311	<0.0020	0.0055

5.3.25 W52 – Ridgetop North Pit

The Ridgetop North Pit was not developed in 2020; therefore, water quality results are not available.

5.3.26 W53 – Ridgetop South Pit

The Ridgetop South Pit was not developed in 2020; therefore, water quality results are not available.

5.3.27 W54 – Main Pit Dam Seepage

The Main Pit Dam was not developed in 2020; therefore, water quality results are not available.

5.3.28 W55 – Tailings Diversion Ditch

The water quality statistics for W55 from 2017 to 2020 are summarized below in Table 5-24. Six routine samples were collected from station W55 during the 2020 monitoring period.

Table 5-24: W55 Water Quality Results Summary (2017-2020)

W55	2017-2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.01	7.71	8.31	7.52	7.2	7.75
TSS (mg/L)	8.58	<3.0	43.3	12.73	<3.0	30
Nutrients (mg/L)						
Ammonia Nitrogen	0.0254	0.0067	0.0819	0.0154	0.0124	0.018
Nitrite Nitrogen	0.01324	<0.0010	0.144	0.00731	<0.0010	0.0175
Nitrate Nitrogen	5.82417	<0.0050	20.9	0.2864	0.0256	0.749
Dissolved Metals (mg/L)						
Aluminum	0.0329	0.0116	0.0691	0.0689	0.0162	0.152
Arsenic	0.00062	0.00044	0.00114	0.00064	0.00042	0.00099
Cadmium	0.0000147	0.0000056	0.0000404	0.0000444	0.0000136	0.0000712
Chromium	0.00034	0.0002	0.00047	0.00045	0.00021	0.00064
Copper	0.062	0.0149	0.14	0.0689	0.0288	0.119
Iron	0.093	0.023	0.338	0.12	0.061	0.224
Lead	0.0001896	<0.000050	0.00247	0.0000527	<0.000050	0.000067
Molybdenum	0.001752	0.000633	0.00343	0.003766	0.000719	0.0093
Nickel	0.00138	0.0008	0.00219	0.0016	0.00113	0.00228
Selenium	0.000568	0.000158	0.00176	0.001512	0.000292	0.00435
Zinc	0.00173	<0.0010	0.0047	0.0033	0.0014	0.0052

5.3.29 W62 – Mill Valley Fill Extension Phase 2 Collection Sump

The water quality statistics for W62 from 2017 to 2020 are summarized below in Table 5-25. A total of eleven routine samples were collected from station W62 during the 2020 monitoring period. The July sample was missed due to human error.

Table 5-25: W62 Water Quality Results Summary (2017-2020)

W62	2017-2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.28	7.89	8.46	8.12	7.94	8.37
TSS (mg/L)	6.97	<3.0	35.3	10.6	<3.0	39.2
Nutrients (mg/L)						
Ammonia Nitrogen	0.01292	<0.0050	0.0563	0.0112	0.0063	0.0256
Nitrite Nitrogen	0.02859	<0.0050	0.0786	0.01127	<0.0050	0.0351
Nitrate Nitrogen	7.89	3.88	26.5	15.14	9.44	24.8
Dissolved Metals (mg/L)						
Aluminum	0.0047	0.0017	0.0308	0.0041	0.002	0.0186
Arsenic	0.00046	0.00034	0.00072	0.00051	0.00039	0.00061
Cadmium	0.0000245	0.0000117	0.0000798	0.0000476	0.0000165	0.000115
Chromium	0.000194	<0.00010	0.00037	0.00023	0.00014	0.00029
Copper	0.0537	0.0379	0.0711	0.0516	0.035	0.0724
Iron	0.0312	<0.010	0.074	0.032	0.018	0.06
Lead	0.0000513	<0.000050	0.000092	0.00005	<0.000050	<0.000050
Molybdenum	0.00776	0.00506	0.0138	0.00997	0.00736	0.0143
Nickel	0.00108	0.00074	0.00159	0.00104	0.00058	0.00134
Selenium	0.00346	0.00159	0.0115	0.00621	0.00372	0.0107
Zinc	0.0655	0.0062	0.193	0.1358	0.0105	0.482

5.3.30 MC-1 – Minto Creek Upstream of Canyon near Km 8 on Mine Access Road

The water quality statistics for MC-1 from 2017 to 2020 are summarized below in Table 5-26. A total of 25 routine samples were collected from station MC-1 during the 2020 monitoring period.

Table 5-26: MC-1 Water Quality Results Summary (2017-2020)

MC1	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.29	7.68	8.55	8.09	7.51	8.34
TSS (mg/L)	34.8	<3.0	793	33.85	<3.0	236
Nutrients (mg/L)						
Ammonia Nitrogen	0.01024	<0.0050	0.0838	0.01067	<0.0050	0.0246
Nitrite Nitrogen	0.00123	<0.0010	0.0056	0.00103	<0.0010	0.0016
Nitrate Nitrogen	0.09112	<0.0050	0.444	0.03621	<0.0050	0.147
Dissolved Metals (mg/L)						
Aluminum	0.00997	0.0027	0.0678	0.0232	0.0036	0.121
Arsenic	0.00052	0.00031	0.00076	0.00057	0.00048	0.0007
Cadmium	0.00000713	<0.0000050	0.0000359	0.00000674	<0.0000050	0.0000343
Chromium	0.000196	<0.00010	0.0004	0.00032	0.00016	0.00064
Copper	0.00305	0.00115	0.0138	0.00393	0.00154	0.019
Iron	0.086	0.018	0.322	0.117	0.048	0.288
Lead	0.0000504	<0.000050	0.000077	0.0000512	<0.000050	0.000075
Molybdenum	0.001594	0.000365	0.00311	0.001399	0.000268	0.00203
Nickel	0.000972	<0.00050	0.00173	0.00115	0.00081	0.00192
Selenium	0.000174	0.000082	0.000715	0.000143	0.000093	0.000219
Zinc	0.00136	<0.0010	0.007	0.00142	<0.0010	0.0073

5.3.31 WTP and RO – Treated Water

The WTP was not operational in 2020, therefore no samples were taken.

5.3.32 C4 – Tributary on the south side of Minto Creek

The water quality statistics for C4 from 2017 to 2020 are summarized below in Table 5-27. A total of five routine samples were collected from station C4 during the 2020 monitoring period. The July sample was not taken; sampling was deemed unsafe due to high bear activity in the area.

Table 5-27: C4 Water Quality Results Summary (2017-2020)

C4	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.18	7.82	8.53	7.89	7.73	7.98
TSS (mg/L)	6.68	<3.0	62.8	3	<3.0	<3.0
Nutrients (mg/L)						
Ammonia Nitrogen	0.01152	<0.0050	0.0225	0.01012	<0.0050	0.0156
Nitrite Nitrogen	0.00113	<0.0010	0.0019	0.001	<0.0010	<0.0010
Nitrate Nitrogen	0.02504	<0.0050	0.0568	0.00956	<0.0050	0.0165
Dissolved Metals (mg/L)						
Aluminum	0.0099	0.0042	0.0298	0.0123	0.0068	0.0185
Arsenic	0.00069	0.00034	0.00104	0.00054	0.00052	0.00057
Cadmium	0.00000724	<0.0000050	0.0000337	0.00000646	<0.0000050	0.0000123
Chromium	0.000306	<0.00010	0.00045	0.0004	0.0003	0.00053
Copper	0.00229	0.00082	0.0102	0.00188	0.00144	0.00231
Iron	0.302	0.015	0.606	0.162	0.131	0.192
Lead	0.00005	<0.000050	<0.000050	0.00005	<0.000050	<0.000050
Molybdenum	0.00076	0.000439	0.00177	0.000594	0.000529	0.000661
Nickel	0.001691	<0.00050	0.00211	0.00142	0.00109	0.00155
Selenium	0.000117	0.000056	0.000386	0.000093	0.000056	0.000146
Zinc	0.0014	<0.0010	0.0059	0.001	<0.0010	<0.0010

5.3.33 C10 – Tributary on the south side of Minto Creek

The water quality statistics for C10 from 2017 to 2020 are summarized below in Table 5-28. Though the site was monitored five times during the 2020 monitoring period, C10 was found to be dry after freshet meaning only one sample was collected, on May 10th.

Table 5-28: C10 Water Quality Results Summary (2017-2020)

C10	2017 - 2019 Summary Statistics			2020 Summary Results
Parameters	**Mean**	**Min**	**Max**	**10-May-2020 Results**
pH	8.22	7.99	8.52	7.74
TSS (mg/L)	13.51	<3.0	66	<3.0
Nutrients (mg/L)				
Ammonia Nitrogen	0.00969	<0.0050	0.0289	0.0169
Nitrite Nitrogen	0.00175	<0.0010	0.0066	<0.0010
Nitrate Nitrogen	0.07179	<0.0050	0.226	<0.0050
Dissolved Metals (mg/L)				
Aluminum	0.0082	0.0064	0.0107	0.0305
Arsenic	0.00053	0.00039	0.00071	0.00054
Cadmium	0.00000956	<0.0000050	0.0000187	0.0000077
Chromium	0.00021	0.00016	0.0003	0.00044
Copper	0.0024	0.00142	0.00607	0.0033
Iron	0.221	0.027	0.94	0.186
Lead	0.00005	<0.000050	<0.000050	<0.000050
Molybdenum	0.000882	0.000321	0.00184	0.000438
Nickel	0.00114	0.0007	0.00166	0.00176
Selenium	0.0001229	<0.000050	0.000294	0.000108
Zinc	0.0014	<0.0010	0.0024	<0.0010

5.3.34 MN – Minto North Pit Water

The water quality statistics for MN from 2017 to 2020 are summarized below in Table 5-29. Five routine samples were collected from station MN during the 2020 monitoring period, once safe access to the pit water could be established. The water was frozen as of October 2020.

Table 5-29: MN Water Quality Results Summary (2017-2020)

MN	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.09	7.84	8.25	8.08	8.02	8.13
TSS (mg/L)	139.71	<3.0	1040	3.08	<3.0	3.4
Nutrients (mg/L)						
Ammonia Nitrogen	0.7503	0.0204	7.1	0.0428	0.0141	0.0947
Nitrite Nitrogen	0.0922	0.0126	0.318	0.0374	0.0155	0.0578
Nitrate Nitrogen	17.78	7.71	26.5	9.57	6.48	11.9
Dissolved Metals (mg/L)						
Aluminum	0.0072	0.0018	0.0196	0.0076	0.0028	0.0138
Arsenic	0.00044	0.00035	0.00057	0.00042	0.00039	0.00046
Cadmium	0.0000702	0.0000312	0.000152	0.000034	0.0000237	<0.0000400
Chromium	0.000126	<0.00010	0.00047	0.00011	<0.00010	0.00015
Copper	0.027	0.00837	0.1	0.00982	0.00772	0.0115
Iron	0.0136	<0.010	0.046	0.011	<0.010	0.013
Lead	0.0002785	<0.000050	0.00225	0.00005	<0.000050	<0.000050
Molybdenum	0.0216	0.0165	0.0262	0.0171	0.0116	0.0218
Nickel	0.0005	<0.00050	<0.00050	0.0005	<0.00050	<0.00050
Selenium	0.01562	0.00957	0.0199	0.01226	0.00992	0.014
Zinc	0.00978	<0.0010	0.0884	0.0015	<0.0010	0.0035

5.3.35 MN-0.2 – Upper West Arm of McGinty Creek

The water quality statistics for MN-0.2 from 2017 to 2020 are summarized below in Table 5-30. A total of six routine samples were collected from station MN-0.2 during the 2020 monitoring period.

Table 5-30: MN-0.2 Water Quality Results Summary (2017-2020)

MN-0.2	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	7.55	7.18	7.91	7.15	6.92	7.36
TSS (mg/L)	20.15	<3.0	395	8.69	<3.0	42.2
Nutrients (mg/L)						
Ammonia Nitrogen	0.00999	<0.0050	0.0282	0.0088	0.0055	0.0136
Nitrite Nitrogen	0.001	<0.0010	<0.0010	0.001	<0.0010	<0.0010
Nitrate Nitrogen	0.00622	<0.0050	0.0176	0.00509	<0.0050	0.0056
Dissolved Metals (mg/L)						
Aluminum	0.082	0.0178	0.169	0.1331	0.0594	0.178
Arsenic	0.00051	0.00018	0.00081	0.0004	0.00037	0.00044
Cadmium	0.00000575	<0.0000050	0.0000137	0.00000631	<0.0000050	0.0000142
Chromium	0.000506	0.00021	<0.00070	0.00061	0.00048	0.00073
Copper	0.00255	0.00112	0.00842	0.00494	0.00202	0.0106
Iron	0.537	0.126	1.65	0.332	0.28	0.444
Lead	0.0000527	<0.000050	0.000103	0.00005	<0.000050	0.00005
Molybdenum	0.00021	0.000121	0.000267	0.00014	0.00009	0.000178
Nickel	0.00132	0.00052	0.00177	0.00132	0.00104	0.00172
Selenium	0.0000792	<0.000050	0.000123	0.0000916	<0.000050	0.000111
Zinc	0.00188	<0.0010	0.0063	0.00126	<0.0010	0.0024

5.3.36 MN-0.5 – West Arm of McGinty Creek

The water quality statistics for MN-0.5 from 2017 to 2020 are summarized below in Table 5-31. A total of six routine samples were collected from station MN-0.5 during the 2020 monitoring period.

Table 5-31: MN-0.5 Water Quality Results Summary (2017-2020)

MN-0.5	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.1	7.74	8.42	7.51	5.59	8.03
TSS (mg/L)	12.73	<3.0	64.7	7.07	<3.0	26
Nutrients (mg/L)						
Ammonia Nitrogen	0.00584	<0.0050	0.0132	0.00806	<0.0050	0.016
Nitrite Nitrogen	0.001	<0.0010	<0.0010	0.001	<0.0010	<0.0010
Nitrate Nitrogen	0.05056	<0.0050	0.159	0.01654	<0.0050	0.0524
Dissolved Metals (mg/L)						
Aluminum	0.0361	0.0032	0.58	0.03326	<0.0010	0.0904
Arsenic	0.00038	0.00026	0.00089	0.000347	<0.00010	0.00043
Cadmium	0.00001348	<0.0000050	0.000186	0.00000579	<0.0000050	0.0000077
Chromium	0.000248	<0.00010	0.00126	0.00037	<0.00010	0.0005
Copper	0.00256	0.00074	0.0264	0.002503	<0.00020	0.00452
Iron	0.0876	<0.010	0.929	0.0879	<0.010	0.225
Lead	0.0000892	<0.000050	0.000991	0.00005	<0.000050	<0.000050
Molybdenum	0.001074	0.000423	0.00169	0.0006734	<0.000050	0.00122
Nickel	0.000995	<0.00050	0.00432	0.001079	<0.00050	0.00157
Selenium	0.000199	0.000097	0.000372	0.0001634	<0.000050	0.000208
Zinc	0.00314	<0.0010	0.0459	0.00143	<0.0010	0.0031

5.3.37 MN-1.5 – Upper East Arm of McGinty Creek

The water quality statistics for MN-1.5 from 2017 to 2020 are summarized below in Table 5-32. A total of six routine samples were collected from station MN-1.5 during the 2020 monitoring period.

Table 5-32: MN-1.5 Water Quality Results Summary (2017-2020)

MN-1.5	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	7.78	7.36	8.07	7.4	7.15	7.64
TSS (mg/L)	13.44	<3.0	69.9	21.57	<3.0	112
Nutrients (mg/L)						
Ammonia Nitrogen	0.0106	<0.0050	0.0239	0.0111	0.0058	0.0242
Nitrite Nitrogen	0.001	<0.0010	<0.0010	0.001	<0.0010	<0.0010
Nitrate Nitrogen	0.0116	<0.0050	0.0434	0.00525	<0.0050	0.0065
Dissolved Metals (mg/L)						
Aluminum	0.051	0.0232	0.129	0.0958	0.0377	0.193
Arsenic	0.00042	0.00026	0.00057	0.0003	0.00024	0.00039
Cadmium	0.00000675	<0.0000050	0.0000249	0.0000058	<0.0000050	0.000008
Chromium	0.000477	0.0003	0.00071	0.00058	0.00043	0.0007
Copper	0.00472	0.00278	0.00918	0.00763	0.00423	0.016
Iron	0.372	0.074	0.637	0.214	0.132	0.334
Lead	0.00005	<0.000050	<0.000050	0.00005	<0.000050	<0.000050
Molybdenum	0.000341	0.000215	0.000484	0.00022	0.000134	0.000263
Nickel	0.00108	0.00081	0.00139	0.00097	0.00054	0.00167
Selenium	0.0000716	<0.000050	0.000122	0.000073	0.00005	0.000094
Zinc	0.00124	<0.0010	0.004	0.00103	<0.0010	0.0012

5.3.38 MN-2.5 – East Arm of McGinty Creek

The water quality statistics for MN-2.5 from 2017 to 2020 are summarized below in Table 5-33. A total of six routine samples were collected from station MN-2.5 during the 2020 monitoring period.

Table 5-33: MN-2.5 Water Quality Results Summary (2017-2020)

MN-2.5	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.05	7.8	8.32	7.81	7.63	7.98
TSS (mg/L)	28.07	<3.0	226	40.2	7	78
Nutrients (mg/L)						
Ammonia Nitrogen	0.00829	<0.0050	0.0248	0.0111	0.0068	0.0148
Nitrite Nitrogen	0.001	<0.0010	<0.0010	0.001	<0.0010	<0.0010
Nitrate Nitrogen	0.01887	<0.0050	0.0599	0.00667	<0.0050	0.011
Dissolved Metals (mg/L)						
Aluminum	0.012	0.005	0.0393	0.0213	0.0075	0.0518
Arsenic	0.00031	0.00016	0.00044	0.00035	0.00028	0.00043
Cadmium	0.00001037	<0.0000050	0.000109	0.00000517	<0.0000050	0.0000062
Chromium	0.000206	<0.00010	0.00046	0.00036	0.0002	0.00054
Copper	0.00225	0.00104	0.0122	0.00291	0.00154	0.00598
Iron	0.058	0.019	0.208	0.08	0.038	0.168
Lead	0.0000604	<0.000050	0.0003	0.00005	<0.000050	<0.000050
Molybdenum	0.000645	0.000289	0.000897	0.000505	0.00034	0.000614
Nickel	0.001058	<0.00050	0.00171	0.00127	0.00084	0.00242
Selenium	0.0000841	<0.000050	0.000129	0.000083	<0.000050	0.000148
Zinc	0.0016	<0.0010	0.0088	0.00137	<0.0010	0.0036

5.3.39 MN-4.5 – McGinty Creek near confluence with Yukon River

The water quality statistics for MN-4.5 from 2017 to 2020 are summarized below in Table 5-34. A total of six routine samples were collected from station MN-4.5 during the 2020 monitoring period.

Table 5-34: MN-4.5 Water Quality Results Summary (2017-2020)

MN-4.5	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.08	7.78	8.28	7.88	7.72	7.98
TSS (mg/L)	14.48	<3.0	201	4.19	<3.0	7.4
Nutrients (mg/L)						
Ammonia Nitrogen	0.00655	<0.0050	0.0167	0.0086	0.006	0.0126
Nitrite Nitrogen	0.001	<0.0010	<0.0010	0.001	<0.0010	<0.0010
Nitrate Nitrogen	0.06027	<0.0050	0.262	0.03017	<0.0050	0.0931
Dissolved Metals (mg/L)						
Aluminum	0.0121	0.0041	0.0363	0.0253	0.0049	0.0786
Arsenic	0.00034	0.00019	0.00046	0.00037	0.00027	0.0005
Cadmium	0.0000061	<0.0000050	0.0000172	0.00000506	<0.0000050	0.0000055
Chromium	0.000195	<0.00010	0.00032	0.00036	0.0002	0.0005
Copper	0.00198	0.00101	0.00511	0.00255	0.00175	0.00512
Iron	0.0447	<0.010	0.179	0.07	0.01	0.211
Lead	0.0000546	<0.000050	0.000146	0.00005	<0.000050	<0.000050
Molybdenum	0.000912	0.000474	0.00117	0.000737	0.000508	0.00097
Nickel	0.000912	<0.00050	0.00182	0.00108	0.00073	0.00188
Selenium	0.000195	0.00012	0.000444	0.00017	0.000128	0.000216
Zinc	0.00128	<0.0010	0.0037	0.00105	<0.0010	0.0015

5.3.40 UG1 – Minto South Underground Mine Dewatering

The water quality statistics for UG1 from 2017 to 2020 are summarized below in Table 5-35. A total of 12 routine samples were collected from station UG1 during the 2020 monitoring period.

Table 5-35: UG1 Water Quality Results Summary (2017-2020)

UG1	2017-2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	7.93	7.79	8.23	7.93	7.74	8.10
TSS (mg/L)	160.5	3	886	186.3	3.3	557
Nutrients (mg/L)						
Ammonia Nitrogen	7.609	0.404	32.2	3.656	0.876	12.7
Nitrite Nitrogen	0.8314	0.014	2.53	0.598	0.111	4.6
Nitrate Nitrogen	16.33	1.32	59.6	5.79	2.29	21.1
Dissolved Metals (mg/L)						
Aluminum	0.012	0.0024	0.0609	0.0082	0.005	0.0167
Arsenic	0.00095	0.00042	0.00319	0.00055	0.00033	0.00067
Cadmium	0.0002412	0.000014	0.000732	0.00033088	<0.0000350	0.000876
Chromium	0.00032	<0.00010	0.00261	0.0002	<0.00020	<0.00020
Copper	0.03737	0.0043	0.158	0.09742	0.00259	0.243
Iron	0.017	<0.010	0.036	0.02	<0.020	<0.020
Lead	0.0000811	<0.000050	<0.00010	0.0001078	<0.000100	0.000193
Molybdenum	0.0205	0.0145	0.0302	0.0215	0.0167	0.0512
Nickel	0.001908	<0.00050	0.0056	0.001804	<0.00100	0.0078
Selenium	0.001247	0.00051	0.00226	0.003187	0.00079	0.00448
Zinc	0.0171	0.0015	0.0854	0.0131	0.0035	0.0505

5.3.41 UG2 – Wildfire Underground Mine Dewatering

This station was not established in 2020.

5.3.42 UG3 – Copper Keel Underground Mine Dewatering

This station was not established in 2020, and dewatering water from Copper Keel is comingled with Minto South water and pumped to surface via UG1.

5.3.43 UG4 – Minto East Underground Mine Dewatering

This station was established in 2018, and a total of twelve routine samples were collected in 2020. Water quality statistics from 2018 to 2020 are summarized in Table 5-36 below.

Table 5-36: UG4 Water Quality Results Summary (2018-2020)

UG4	2018-2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.06	7.9	8.32	7.93	7.74	8.1
TSS (mg/L)	182.32	<3.0	1230	186.3	3.3	557
Nutrients (mg/L)						
Ammonia Nitrogen	2.8411	0.0556	31.8	3.656	0.876	12.7
Nitrite Nitrogen	0.1481	<0.010	0.642	0.598	0.111	4.6
Nitrate Nitrogen	4.476	0.258	40.2	5.79	2.29	21.1
Dissolved Metals (mg/L)						
Aluminum	0.0058	<0.0010	0.0154	0.0082	0.005	0.0167
Arsenic	0.00093	0.00055	0.00134	0.00055	0.00033	0.00067
Cadmium	0.0001472	0.0000398	0.000258	0.00033088	<0.0000350	0.000876
Chromium	0.000153	<0.00010	0.00038	0.0002	<0.00020	<0.00020
Copper	0.02838	0.00167	0.0753	0.09742	0.00259	0.243
Iron	0.0183	<0.010	0.051	0.02	<0.020	<0.020
Lead	0.0001256	<0.000050	0.000626	0.0001078	<0.000100	0.000193
Molybdenum	0.0183	0.0153	0.0241	0.0215	0.0167	0.0512
Nickel	0.000967	<0.00050	0.0032	0.001804	<0.00100	0.0078
Selenium	0.00201	0.0009	0.00855	0.003187	0.00079	0.00448
Zinc	0.0093	0.0018	0.0344	0.0131	0.0035	0.0505

6 Groundwater Monitoring Program

Groundwater monitoring program details are provided in section 2.2 of the Minto Mine Environmental Monitoring, Surveillance and Reporting Plan. The primary monitoring objective of the groundwater monitoring program is to identify potential impacts on groundwater from Minto Mine.

Mine facilities that are monitored for groundwater impacts include, but are not limited to the DSTSF, Mill area, Main Pit, Area 2 Pit, Minto North Pit, waste rock dumps, and the Water Storage Pond. The Groundwater Monitoring Program is comprised of operational and baseline monitoring. Water quality samples for the program are collected per standard procedures such as those summarized in the ASTM (2007) *Standard Guide for Sampling Ground-Water Monitoring Wells*. The main components of the groundwater monitoring program include groundwater quality, vibrating wire piezometers, and ground temperature cable monitoring.

6.1 Groundwater Quality Monitoring Conformance

Minto's 2020 conformance with groundwater sampling requirements is summarized in Table 6-1, below. Quality Assurance and Quality Control (QA/QC) sampling is described in Section 6-2.

Wells and drive point sampling was conducted as per the EMSRP and GW Plan 2016-02 requirements and the AMP for groundwater as monthly or quarterly frequency. Groundwater AMP exceedances are discussed in Sections 10.3 and 10.4 of this report.

Table 6-1: Groundwater Quality Monitoring Conformance Summary (2020)

Mine Project Component	Monitoring Installation	Quality	Level	Monitoring Frequency	2020 Groundwater Compliance
Up-gradient of Mine Activities	MW17-08-01	X	X	Quarterly	4 of 4 collected. Sampled as per schedule.
	MW17-08-02	X	X	Quarterly	4 of 4 collected. Sampled as per schedule.
	MW17-08-03	X	X	Quarterly	4 of 4 collected. Sampled as per schedule.
	MW17-08-04	X	X	Quarterly	No samples collected. Port was found dry throughout 2020.

Southwest Waste Dump	MW12-DP1	X	X	Quarterly	No samples collected. Destroyed in August 2017.
	MW12-DP2	X	X	Quarterly	No samples collected. DP was dry or frozen in 2020.
	MW12-DP3	X	X	Quarterly	No samples collected. DP was dry or frozen in 2020.
	MW17-09-01	X	X	Quarterly	No samples collected. Well is damaged and no longer operational. Westbay probe cannot reach ports.
Main Waste Dump	MW09-01-01	X	X	Quarterly	Since MW09-01 has been dry since October 2014 it was replaced by MW17-10.
	MW09-01-02	X	X	Quarterly	Since MW09-01 has been dry since October 2014 it was replaced by MW17-10.
	MW09-01-03	X	X	Quarterly	Since MW09-01 has been dry since October 2014 it was replaced by MW17-10.
	MW17-10-01	X	X	Quarterly	4 of 4 collected. Sampled as per schedule.
	MW17-10-02	X	X	Quarterly	4 of 4 collected. Sampled as per schedule.
	MW17-10-03	X	X	Quarterly	4 of 4 collected. Sampled as per schedule.
	MW17-10-04	X	X	Quarterly	No samples were collected. Port was found dry throughout 2020
Dry Stack Tailings Storage Facility and Mill Valley Fill Expansion	MW12-06-01		X	Quarterly	4 of 4 collected. Samples likely contaminated with glycol from well casing.
	MW12-06-02	X	X	Quarterly	4 of 4 collected. Sampled as per schedule.
	MW12-06-03		X	Quarterly	4 of 4 collected. Sampled as per AMP schedule.
	MW12-06-04	X	X	Quarterly	4 of 4 collected. Sampled as per schedule.
	MW12-06-05		X	Quarterly	4 of 4 collected. Sampled as per AMP schedule.
	MW12-06-06	X	X	Quarterly	4 of 4 collected. Sampled as per schedule.
Main Pit	MW12-07-01	X	X	Monthly	4 of 4 samples collected. Port is likely damaged, as all samples contaminated with glycol.
	MW12-07-02	X	X	Monthly	5 of 5 samples collected. Sampling frequency reduced to quarterly in March.

	MW12-07-03		X	Monthly	No samples were collected. The port was found dry during all of 2020.
	MW17-DP01	X	X	Quarterly	2 of 4 collected. Well dry or frozen in Q1 and Q4.
	MW17-DP02	X	X	Quarterly	2 of 4 collected. Well dry or frozen in Q1 and Q4.
	MW17-DP03	X	X	Quarterly	2 of 4 collected. Well dry or frozen in Q1 and Q4.
Mine Project Component	**Monitoring Installation**	**Quality**	**Level**	**Monitoring Frequency**	**2020 Groundwater Compliance**
Minto North Pit	MW09-03-01	X	X	Monthly	11 of 12 collected, Westbay equipment offsite for calibration in January.
	MW09-03-02	X	X	Monthly	11 of 12 collected, Westbay equipment offsite for calibration in January.
	MW09-03-03	X	X	Monthly	No samples were collected. Port found dry throughout 2020.
	MW17-11-01	X	X	Quarterly	4 of 4 collected. Sampled as per schedule.
	MW17-11-02	X	X	Quarterly	4 of 4 collected. Sampled as per schedule.
	MW17-11-03	X	X	Quarterly	4 of 4 collected. Sampled as per schedule.
	MW17-11-04	X	X	Quarterly	1 of 4 collected. Port found dry except in Q2.
	MW17-11-05	X	X	Quarterly	1 of 4 collected. Port found dry except in Q2.
Water Storage Pond	MW12-05-01	X	X	Quarterly	4 of 4 collected. Sampled as per schedule.
	MW12-05-02	X	X	Quarterly	4 of 4 collected. Sampled as per schedule.
	MW12-05-03	X	X	Quarterly	4 of 4 collected. Sampled as per schedule.
	MW12-05-04	X	X	Quarterly	4 of 4 collected. Sampled as per schedule.
	MW12-05-05	X	X	Quarterly	4 of 4 collected. Sampled as per schedule.
	MW12-05-06	X	X	Quarterly	4 of 4 collected. Sampled as per schedule.
	MW12-05-07	X	X	Quarterly	3 of 4 collected. Port dry in Q2.
	MW17-12-01	X	X	Quarterly	4 of 4 collected. Sampled as per schedule.

	MW17-12-02	X	X	Quarterly	4 of 4 collected. Sampled as per schedule.
	MW17-12-03	X	X	Quarterly	4 of 4 collected. Sampled as per schedule.
	MW17-12-04	X	X	Quarterly	4 of 4 collected. Sampled as per schedule.
	MW17-12-05	X	X	Quarterly	4 of 4 collected. Sampled as per schedule.
	MW17-12-06	X	X	Quarterly	4 of 4 collected. Sampled as per schedule.
	MW17-12-07	X	X	Quarterly	4 of 4 collected. Sampled as per schedule.
	MW17-12-08	X	X	Quarterly	4 of 4 collected. Sampled as per schedule.

6.2 Groundwater Quality Control and Assurance

In 2020, 158 groundwater samples were taken at Minto. A total of 20 duplicate QC samples were taken from groundwater sampling sites, representing 12.66% of the total number of samples collected in 2020.

The EMSRP recommends field duplicate sampling be conducted at a frequency of one field duplicate sample per ten groundwater monitoring samples. The recommended rate of field duplicate sampling was achieved in 2020.

Minto currently employs compliance management system software to track programs and actions that meet licence requirements. To achieve the QA/QC objective of 1:10 samples, the compliance system was updated in 2016 and used successfully in the following years to ensure that environmental staff completed the required field duplicates.

6.3 Groundwater Monitoring Stations

The EMSRP details the groundwater wells at the Minto Mine, including operative and inoperative wells. Figure 6-1 shows a location map of the operative wells. Stations that were collected more than twice in 2020 have results presented as follows: Mean, Minimum and Maximum values and are compared to their historical results from 2017 to 2019.

Complete results for the 2020 Groundwater Monitoring Program groundwater wells are presented in Appendix C.

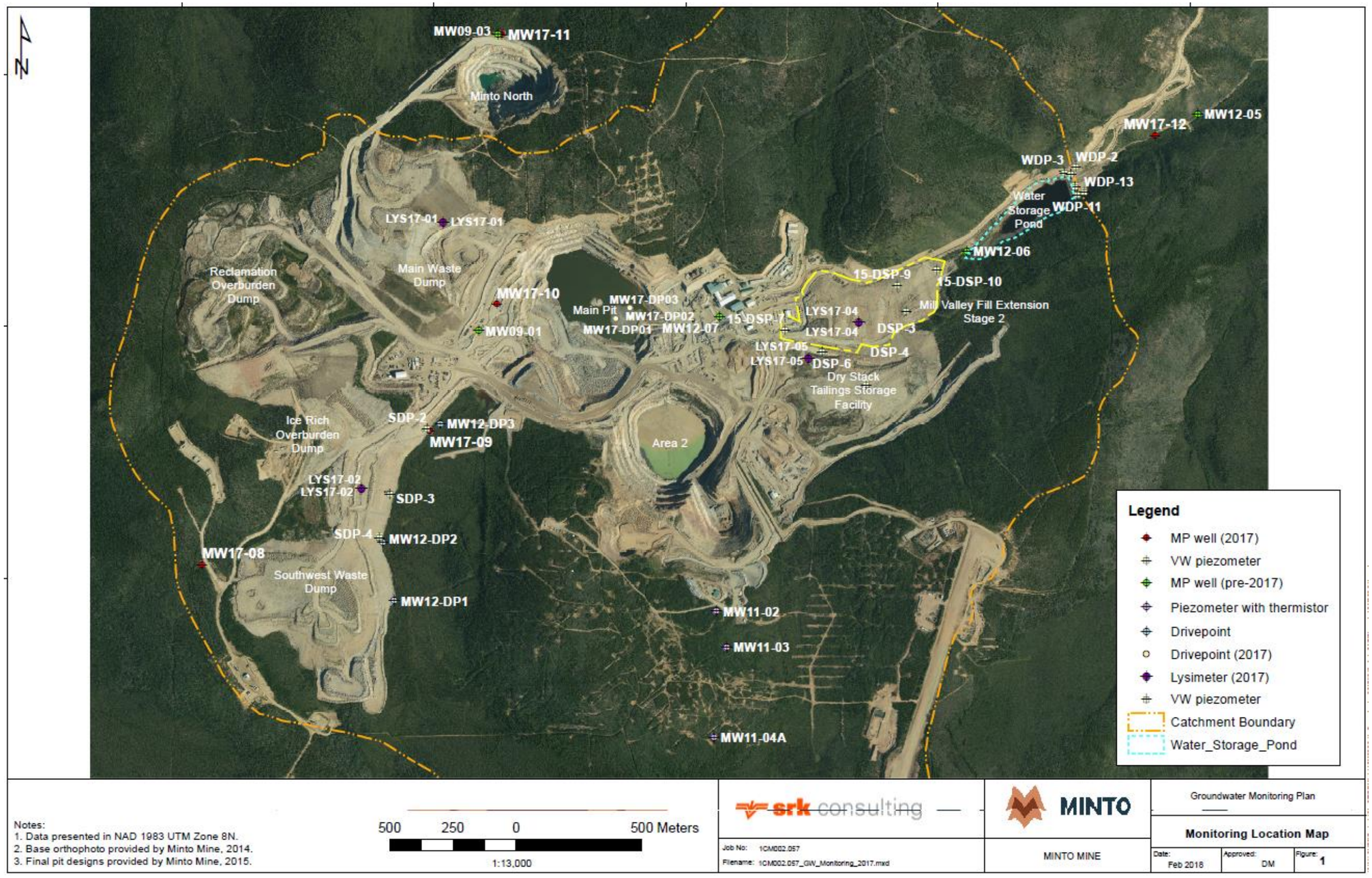


Figure 6-1: Minto Mine Groundwater Well Locations 2020

6.3.1 MW09-03

Groundwater well MW09-03 water quality results from 2019 are summarized in Table 6-2 and Table 6-3 and compared to historical data. MW09-03 produced results from sampling zones 01 and 02, while zone 03 produced no water during 2020. As such, only results for zones 01 and 02 are presented below. Per the AMP, this well is sampled monthly. The well was not sampled in January as the sampling equipment was off site for calibration and maintenance.

Table 6-2: MW09-03-01 Water Quality Results Summary (2017 - 2020)

MW09-03-01	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.27	8	8.41	8.12	7.91	8.35
TDS (mg/L)	173.8	162	188	181.3	174	195
Sulfate-dissolved (mg/L)	18.7	17.6	20.3	16.9	12.7	18.2
Nutrients (mg/L)						
Ammonia Nitrogen	0.0404	0.0312	0.0544	0.0354	0.0259	0.0627
Nitrate Nitrogen	0.01271	<0.0050	0.0397	0.01309	<0.0050	0.0403
Nitrite Nitrogen	0.3162	0.0261	2.04	0.03219	<0.0010	0.126
Dissolved Metals (mg/L)						
Silver	0.00001	<0.000010	<0.000010	0.00001	<0.000010	<0.000010
Aluminum	0.00490	0.0013	0.0198	0.0026	0.0012	0.0077
Arsenic	0.00139	0.00068	0.00933	0.00114	0.00087	0.00258
Cadmium	0.00005058	<0.0000050	0.000336	0.00014764	<0.0000050	0.001040
Chromium	0.000155	<0.00010	0.00073	0.000104	<0.00010	0.00014
Copper	0.001027	<0.00020	0.00411	0.000397	<0.00020	0.0013
Lead	0.000053	<0.000050	0.000088	0.00005	<0.000050	<0.000050
Molybdenum	0.00528	0.00442	0.0096	0.00507	0.00419	0.00980
Nickel	0.000815	<0.00050	0.00132	0.000666	<0.00050	0.00126
Selenium	0.0001535	<0.000050	0.000972	0.0000743	<0.000050	0.000223
Zinc	0.0344	0.0062	0.0964	0.0277	0.0035	0.183

Table 6-3: MW09-03-02 Water Quality Results Summary (2017-2020)

MW09-03-02	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.23	7.83	8.42	8.05	7.97	8.22
TDS (mg/L)	205	145	354	212	183	301
Sulfate-dissolved (mg/L)	6.37	4.61	8.86	5.56	4.9	6.4
Nutrients (mg/L)						
Ammonia Nitrogen	0.00764	<0.0050	0.017	0.00576	<0.0050	0.01
Nitrate Nitrogen	5.69	2.25	19.1	9.69	5.67	15.8
Nitrite Nitrogen	0.1549	0.026	0.321	0.01847	<0.0010	0.134
Dissolved Metals (mg/L)						
Silver	0.0000103	<0.000010	0.000016	0.00001	<0.000010	<0.000010
Aluminum	0.00422	<0.0010	0.0187	0.00315	<0.0010	0.0198
Arsenic	0.000207	<0.00010	0.0014	0.000133	<0.00010	0.00027
Cadmium	0.0000891	0.0000167	0.000459	0.0000862	0.0000346	0.000185
Chromium	0.000157	<0.00010	0.00064	0.000118	<0.00010	0.00029
Copper	0.00255	0.00127	0.00494	0.002	0.00113	0.00732
Lead	0.0000584	<0.000050	0.000184	0.0000515	<0.000050	0.000066
Molybdenum	0.00455	0.00266	0.00779	0.00366	0.00304	0.005
Nickel	0.000509	<0.00050	0.00066	0.0005	<0.00050	<0.00050
Selenium	0.000315	0.000151	0.000635	0.000296	0.000172	0.000404
Zinc	0.0465	0.0179	0.164	0.0317	0.022	0.0524

6.3.2 MW11-02

MW11-02 was dry during the 2020 sampling events, thus water quality results are not presented.

6.3.3 MW11-03

MW11-03 was dry during the 2020 sampling events, thus water quality results are not presented.

6.3.4 MW11-04A

MW11-04A has been dry since summer 2017 and was dry during the 2020 sampling events. The results presented below in Table 6-4 are the outcomes of the 2017 sampling season.

Table 6-4: MW11-04A Water Quality Results Summary (2017)

MW11-04A	2017 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**
pH	11.11	11.11	11.11
TDS (mg/L)	148	148	148
Sulfate-dissolved (mg/L)	5.49	5.49	5.49
Nutrients (mg/L)			
Ammonia Nitrogen	0.0246	0.0191	0.0302
Nitrate Nitrogen	1.1	1.1	1.1
Nitrite Nitrogen	0.0085	0.0085	0.0085
Dissolved Metals (mg/L)			
Silver	0.000011	<0.000010	0.000012
Aluminum	0.64	0.572	0.707
Arsenic	0.00295	0.00238	0.00352
Cadmium	0.0000074	0.0000063	0.0000085
Chromium	0.00196	0.00188	0.00204
Copper	0.0607	0.0362	0.0852
Lead	0.0000545	<0.000050	0.000059
Molybdenum	0.00249	0.00226	0.00271
Nickel	0.0005	<0.00050	<0.00050
Selenium	0.00256	0.0025	0.00261
Zinc	0.002	0.0016	0.0024

6.3.5 MW12-DP1

MW12-DP1 was destroyed in August 2017 when the permafrost into which the well had been installed, degraded, compromising the ground integrity and the well. As such, water quality results are not presented.

6.3.6 MW12-DP2

MW12-DP2 was dry or frozen during the 2020 sampling events, thus water quality results are not presented.

6.3.7 MW12-DP3

MW12-DP3 was dry or frozen during the 2020 sampling events, thus water quality results are not presented.

6.3.8 MW12-05

Groundwater well MW12-05 water quality results from 2020 are summarized in Table 6-5 through Table 6-11 and compared to historical data. Zones 01 to 07 were sampled and analyzed during 2020 under the Groundwater Monitoring Plan. Ongoing AMP results are discussed in Section 10.3.

Table 6-5: MW12-05-01 Water Quality Results Summary (2017 - 2020)

MW12-05-01	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8	7.72	8.25	7.9	7.72	8.25
TDS (mg/L)	1870	1780	1990	2023.3	1980	2070
Sulfate-dissolved (mg/L)	1231	1170	1330	1322.5	1270	1350
Nutrients (mg/L)						
Ammonia Nitrogen	0.0513	0.0131	0.174	0.0235	0.0142	0.044
Nitrate Nitrogen	0.0682	<0.025	<0.10	0.0875	<0.0500	<0.100
Nitrite Nitrogen	0.0245	0.0082	0.043	0.0198	<0.0100	0.029
Dissolved Metals (mg/L)						
Silver	0.0000164	<0.000010	<0.000020	0.0000200	<0.000020	<0.000020
Aluminum	0.005	0.0035	0.0092	0.0085	0.0029	0.0167
Arsenic	0.00105	0.00053	0.00498	0.00069	0.00047	0.00107
Cadmium	0.00004683	<0.0000050	0.000192	0.0000567	<0.0000100	0.000193
Chromium	0.00025	0.00014	0.00034	0.00029	<0.00020	0.00042
Copper	0.000328	<0.00020	<0.00040	0.000522	<0.00040	0.00079
Lead	0.0000818	<0.000050	<0.00010	0.0001000	<0.000100	<0.000100
Molybdenum	0.000217	0.000125	0.0004	0.000262	0.000233	0.000302
Nickel	0.000818	<0.00050	<0.0010	0.001000	<0.00100	<0.00100
Selenium	0.00152	<0.00010	0.00951	0.000942	0.000124	0.00327
Zinc	0.00415	<0.0020	0.0153	0.0153	0.0088	0.0268

Table 6-6: MW12-05-02 Water Quality Results Summary (2017-2020)

MW12-05-02	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.15	7.89	8.37	8.12	8.03	8.33
TDS (mg/L)	1923	1700	3080	1913	1880	1980
Sulfate-dissolved (mg/L)	1271	1070	2400	1227	1180	1280
Nutrients (mg/L)						
Ammonia Nitrogen	0.0326	0.0175	0.0779	0.0145	0.012	0.0176
Nitrate Nitrogen	0.0625	<0.025	<0.10	0.1	<0.100	<0.100
Nitrite Nitrogen	0.0233	<0.010	0.058	0.02	<0.0200	<0.0200
Dissolved Metals (mg/L)						
Silver	0.000019	<0.000010	<0.000050	0.00002	<0.000020	<0.000020
Aluminum	0.0052	0.004	0.0088	0.0055	0.0048	0.0066
Arsenic	0.00052	0.00024	0.0019	0.0004	0.00031	0.00048
Cadmium	0.00001	<0.0000050	<0.000025	0.00001	<0.0000100	<0.0000100
Chromium	0.00030	0.00015	<0.00050	0.00027	<0.00020	0.00037
Copper	0.00038	<0.00020	<0.0010	0.000435	<0.00040	0.00054
Lead	0.000095	<0.000050	<0.00025	0.0001	<0.000100	<0.000100
Molybdenum	0.000229	0.00014	0.0004	0.000281	0.000173	0.000392
Nickel	0.00095	<0.00050	<0.0025	0.001	<0.00100	<0.00100
Selenium	0.000687	<0.00010	0.00222	0.00109	0.000179	0.00255
Zinc	0.00278	<0.0010	0.0065	0.002	<0.0020	<0.0020

Table 6-7: MW12-05-03 Water Quality Results Summary (2017 - 2020)

MW12-05-03	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.1	7.85	8.32	8	7.87	8.27
TDS (mg/L)	1386	1280	1450	1356.0	1220	1450
Sulfate-dissolved (mg/L)	828	730	883	784	728	847
Nutrients (mg/L)						
Ammonia Nitrogen	0.0233	0.0122	0.0413	0.0156	0.0118	0.0183
Nitrate Nitrogen	0.0482	<0.025	0.105	0.04375	<0.0250	<0.0500
Nitrite Nitrogen	0.02199	<0.0050	0.044	0.00875	<0.0050	<0.0100
Dissolved Metals (mg/L)						
Silver	0.0000149	<0.000010	0.000021	0.0000125	<0.000010	<0.000020
Aluminum	0.0053	0.0029	0.0144	0.0041	0.0025	0.0055
Arsenic	0.0004	0.00017	0.0022	0.000222	0.00016	0.00033
Cadmium	0.00001281	<0.0000050	0.00004	0.00000625	<0.0000050	<0.0000100
Chromium	0.000195	<0.00010	0.00028	0.000235	0.00014	0.00045
Copper	0.000517	<0.00020	0.0017	0.000303	<0.00020	0.00041
Lead	0.0000682	<0.000050	<0.00010	0.0000625	<0.000050	<0.000100
Molybdenum	0.000262	0.00017	0.00041	0.000448	0.00022	0.000702
Nickel	0.000682	<0.00050	<0.0010	0.000625	<0.00050	<0.00100
Selenium	0.0005051	<0.000050	0.00408	0.000235	0.000059	0.000541
Zinc	0.00502	0.0012	0.019	0.00145	<0.0010	<0.0020

Table 6-8: MW12-05-04 Water Quality Results Summary (2017 - 2020)

MW12-05-04	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.23	7.97	8.56	8.11	7.9	8.59
TDS (mg/L)	287.8	262	312	324.3	316	338
Sulfate-dissolved (mg/L)	38.7	25.2	47.9	50.4	44.4	54.7
Nutrients (mg/L)						
Ammonia Nitrogen	0.0197	0.0095	0.0405	0.0156	0.0133	0.0203
Nitrate Nitrogen	0.01687	<0.0050	0.0677	0.01773	<0.0050	0.0408
Nitrite Nitrogen	0.0104	<0.0010	0.029	0.00388	<0.0010	0.0125
Dissolved Metals (mg/L)						
Silver	0.0000100	<0.000010	<0.000010	0.0000100	<0.000010	<0.000010
Aluminum	0.0072	0.0022	0.0338	0.0028	0.0022	0.0034
Arsenic	0.00045	0.0001	0.0033	0.00016	0.00012	0.00028
Cadmium	0.00003227	<0.0000050	0.000251	0.00000750	<0.0000050	<0.0000100
Chromium	0.000145	<0.00010	0.00023	0.00023	<0.00010	0.00038
Copper	0.000435	<0.00020	0.00171	0.00038	0.0003	0.00046
Lead	0.0000554	<0.000050	0.000104	0.00005	<0.000050	<0.000050
Molybdenum	0.00276	0.00142	0.00418	0.0034	0.00268	0.00378
Nickel	0.000500	<0.00050	<0.00050	0.000500	<0.00050	<0.00050
Selenium	0.000865	0.000056	0.00328	0.001178	0.000704	0.00184
Zinc	0.00211	<0.0010	<0.0035	0.00103	<0.0010	0.0011

Table 6-9: MW12-05-05 Water Quality Results Summary (2017 - 2020)

MW12-05-05	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.19	7.79	8.56	8.07	7.86	8.56
TDS (mg/L)	295.7	269	325	332	328	339
Sulfate-dissolved (mg/L)	51.2	47.5	60	55.8	54.4	57.3
Nutrients (mg/L)						
Ammonia Nitrogen	0.01726	<0.0050	0.0479	0.00648	<0.0050	0.008
Nitrate Nitrogen	0.0691	<0.0050	0.259	0.02493	<0.0050	0.0597
Nitrite Nitrogen	0.019	0.0041	0.0438	0.00428	<0.0010	0.0102
Dissolved Metals (mg/L)						
Silver	0.0000106	<0.000010	0.000017	0.0000100	<0.000010	<0.000010
Aluminum	0.0034	0.002	0.0072	0.003	0.0021	0.0045
Arsenic	0.00035	0.00013	0.00151	0.00015	0.00013	0.00021
Cadmium	0.00001213	<0.0000050	0.0000238	0.0000111	0.000006	0.0000181
Chromium	0.0001	<0.00010	0.0001	0.000105	<0.00010	0.00012
Copper	0.00111	0.00069	0.00142	0.00105	0.00091	0.00116
Lead	0.00005	<0.000050	<0.000050	0.0000500	<0.000050	<0.000050
Molybdenum	0.00451	0.00371	0.00542	0.00509	0.0048	0.00523
Nickel	0.000541	<0.00050	0.00064	0.000505	<0.00050	0.00052
Selenium	0.000262	<0.000050	0.00112	0.000136	0.0001	0.000217
Zinc	0.0136	0.0026	0.0628	0.0073	0.0039	0.0114

Table 6-10: MW12-05-06 Water Quality Results Summary (2017 – 2020)

MW12-05-06	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.18	7.87	8.55	8.08	7.87	8.58
TDS (mg/L)	295.4	272	318	335.7	331	340
Sulfate-dissolved (mg/L)	52.3	48.5	56.6	57.1	56.1	58.1
Nutrients (mg/L)						
Ammonia Nitrogen	0.00545	<0.0050	0.0074	0.00660	<0.0050	0.0081
Nitrate Nitrogen	0.1031	0.0246	0.311	0.04842	<0.0050	0.0892
Nitrite Nitrogen	0.0168	0.0024	0.047	0.00832	<0.0010	0.0282
Dissolved Metals (mg/L)						
Silver	0.0000100	<0.000010	<0.000010	0.0000100	<0.000010	<0.000010
Aluminum	0.0118	0.0017	0.0808	0.0023	0.0017	0.0031
Arsenic	0.00023	0.00012	0.00054	0.00038	0.00014	0.00092
Cadmium	0.0000212	0.0000077	0.0000453	0.0000236	0.0000102	0.0000418
Chromium	0.0001	<0.00010	<0.00010	0.000150	<0.00010	0.0003
Copper	0.00298	0.00118	0.0148	0.00114	0.00102	0.00134
Lead	0.0000500	<0.000050	<0.000050	0.0000500	<0.000050	<0.000050
Molybdenum	0.00457	0.00372	0.00521	0.00473	0.0046	0.00507
Nickel	0.000941	<0.00050	0.00195	0.000880	0.00074	0.00115
Selenium	0.000197	0.000070	0.000600	0.000161	0.000119	0.000222
Zinc	0.0148	0.0054	0.0373	0.0183	0.0059	0.0435

Table 6-11: MW12-05-07 Water Quality Results Summary (2017 - 2020)

MW12-05-07	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.15	7.86	8.52	7.88	7.81	7.92
TDS (mg/L)	300.3	270	321	340	340	340
Sulfate-dissolved (mg/L)	49.2	28.5	56.6	55	53.8	56
Nutrients (mg/L)						
Ammonia Nitrogen	0.1871	0.0146	0.335	0.22500	0.208	0.258
Nitrate Nitrogen	0.00599	<0.0050	0.0105	0.00727	<0.0050	0.011
Nitrite Nitrogen	0.00487	<0.0010	0.0124	0.00143	<0.0010	0.0023
Dissolved Metals (mg/L)						
Silver	0.0000100	<0.000010	<0.000010	0.0000100	<0.000010	<0.000010
Aluminum	0.0045	0.0018	0.016	0.0012	<0.0010	0.0016
Arsenic	0.00103	0.00035	0.00165	0.00136	0.00123	0.00155
Cadmium	0.00000814	<0.0000050	0.00003	0.00000923	<0.0000050	0.0000177
Chromium	0.000177	<0.00010	0.00049	0.000203	<0.00010	0.00026
Copper	0.00049	<0.00020	0.00186	0.000253	<0.00020	0.00036
Lead	0.0000500	<0.000050	<0.000050	0.0000693	<0.000050	0.000108
Molybdenum	0.00279	0.00109	0.0035	0.00322	0.00284	0.00357
Nickel	0.000573	<0.00050	0.00096	0.000500	<0.00050	<0.00050
Selenium	0.000331	0.000058	0.001490	0.0001277	<0.000050	0.000278
Zinc	0.00497	<0.0010	0.011	0.003	0.0017	0.0047

6.3.9 MW12-06

Groundwater well MW12-06 water quality results from 2020 are summarized in Table 6-12 through Table 6-17 and compared to historical data. Zones 02, 04, and 06 were sampled and analyzed during 2020 under the Groundwater Monitoring Plan, while Zones 01, 03, and 05 were also sampled in response to the Adaptive Management Plan.

Table 6-12: MW12-06-01 Water Quality Results Summary (2017 - 2020)

MW12-06-01	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	7.9	7.4	8.33	7.45	7.03	7.81
TDS (mg/L)	465	387	609	812	648	1000
Sulfate-dissolved (mg/L)	7.09	0.42	53.3	223.5	85	414
Nutrients (mg/L)						
Ammonia Nitrogen	0.2409	0.0067	1.17	0.57200	0.278	0.872
Nitrate Nitrogen	0.1028	0.0139	0.421	0.1325	0.0610	0.256
Nitrite Nitrogen	0.3174	0.0379	1.22	0.2056	0.0722	0.355
Dissolved Metals (mg/L)						
Silver	0.0000117	<0.000010	0.000027	0.0000100	<0.000010	<0.000010
Aluminum	0.0212	0.015	0.0277	0.0246	0.0148	0.0326
Arsenic	0.00805	0.0059	0.0106	0.00972	0.00481	0.0178
Cadmium	0.00001595	<0.0000050	0.0000327	0.0000132	0.000005	0.0000288
Chromium	0.00408	0.00312	0.00504	0.003750	0.00234	0.0049
Copper	0.000832	<0.00020	0.00337	0.000238	<0.00020	0.00035
Lead	0.0000515	<0.000050	0.000064	0.0000500	<0.000050	<0.000050
Molybdenum	0.00114	0.000938	0.00189	0.00134	0.000511	0.00265
Nickel	0.000621	<0.00050	0.00086	0.000710	0.00054	0.00084
Selenium	0.001921	0.000262	0.006320	0.003	0.002	0.00341
Zinc	0.00585	0.0022	0.0155	0.0056	0.0042	0.0072

Table 6-13: MW12-06-02 Water Quality Results Summary (2017 - 2020)

MW12-06-02	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	7.95	7.66	8.23	7.84	7.46	7.97
TDS (mg/L)	642.5	621	664	673.5	666	684
Sulfate-dissolved (mg/L)	215.3	209	224	213.5	198	223
Nutrients (mg/L)						
Ammonia Nitrogen	0.0479	0.0252	0.0694	0.03540	0.0266	0.0406
Nitrate Nitrogen	0.037	0.0105	0.083	0.03022	<0.0250	0.0353
Nitrite Nitrogen	0.1275	0.0401	0.266	0.0921	0.0798	0.108
Dissolved Metals (mg/L)						
Silver	0.0000164	<0.000010	<0.000050	0.0000102	<0.000010	0.000011
Aluminum	0.00204	<0.0010	<0.0050	0.0016	<0.0010	0.0022
Arsenic	0.0039	0.00344	0.00595	0.00369	0.00329	0.0041
Cadmium	0.00002205	<0.0000050	0.00016	0.00000528	<0.0000050	0.0000061
Chromium	0.000168	<0.00010	<0.00050	0.000100	<0.00010	<0.00010
Copper	0.000337	<0.00020	<0.0010	0.0002	<0.00020	<0.00020
Lead	0.0000818	<0.000050	<0.00025	0.0000500	<0.000050	<0.000050
Molybdenum	0.00862	0.00715	0.0101	0.0102	0.00961	0.0106
Nickel	0.000818	<0.00050	<0.0025	0.000500	<0.00050	<0.00050
Selenium	0.0002558	<0.000050	0.000643	0.0001865	<0.000050	0.000351
Zinc	0.00473	0.0022	0.0072	0.0028	0.0017	0.0043

Table 6-14: MW12-06-03 Water Quality Results Summary (2017 - 2020)

MW12-06-03	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.06	7.74	8.34	7.99	7.68	8.11
TDS (mg/L)	636.8	619	671	652	618	668
Sulfate-dissolved (mg/L)	206.7	196	221	191.5	171	206
Nutrients (mg/L)						
Ammonia Nitrogen	0.0607	0.015	0.0849	0.06280	0.0481	0.0736
Nitrate Nitrogen	0.0305	0.0094	0.077	0.0362	0.0314	0.0463
Nitrite Nitrogen	0.0982	0.0342	0.314	0.1195	0.0841	0.152
Dissolved Metals (mg/L)						
Silver	0.0000100	<0.000010	<0.000010	0.0000115	<0.000010	0.000016
Aluminum	0.00292	<0.0010	0.0177	0.0015	<0.0010	0.0023
Arsenic	0.0007	0.00052	0.00156	0.00079	0.00048	0.00148
Cadmium	0.00000679	<0.0000050	0.0000247	0.00000538	<0.0000050	0.0000065
Chromium	0.000188	<0.00010	0.00026	0.000160	0.00015	0.00017
Copper	0.000435	<0.00020	0.00267	0.000353	<0.00020	0.00072
Lead	0.0000507	<0.000050	0.000058	0.0000500	<0.000050	<0.000050
Molybdenum	0.00228	0.00118	0.004	0.00125	0.00108	0.00164
Nickel	0.0005	<0.00050	<0.00050	0.000500	<0.00050	<0.00050
Selenium	0.0001873	<0.000050	0.000422	0.000121	<0.000050	0.000201
Zinc	0.00428	<0.0010	0.0096	0.0036	0.0011	0.0078

Table 6-15: MW12-06-04 Water Quality Results Summary (2017 - 2020)

MW12-06-04	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.08	7.83	8.37	7.93	7.6	8.09
TDS (mg/L)	628.8	619	651	661	647	675
Sulfate-dissolved (mg/L)	186.7	180	197	189.5	181	196
Nutrients (mg/L)						
Ammonia Nitrogen	0.0092	0.0062	0.013	0.00990	0.0085	0.0108
Nitrate Nitrogen	0.0242	0.0129	0.034	0.0384	<0.0250	0.0459
Nitrite Nitrogen	0.0683	0.0473	0.118	0.096	0.0711	0.15
Dissolved Metals (mg/L)						
Silver	0.0000100	<0.000010	<0.000010	0.0000105	<0.000010	0.000012
Aluminum	0.00181	<0.0010	0.0031	0.0017	0.0014	0.0019
Arsenic	0.00246	0.00223	0.00339	0.00254	0.00214	0.00296
Cadmium	0.00000702	<0.0000050	0.0000162	0.0000054	<0.0000050	0.0000066
Chromium	0.000132	<0.00010	0.0003	0.000175	<0.00010	0.00038
Copper	0.0002	<0.00020	<0.00020	0.0002	<0.00020	<0.00020
Lead	0.0000500	<0.000050	<0.000050	0.0000500	<0.000050	<0.000050
Molybdenum	0.00843	0.00771	0.00906	0.00839	0.00779	0.00893
Nickel	0.0005	<0.00050	<0.00050	0.000500	<0.00050	<0.00050
Selenium	0.0001372	<0.000050	0.000346	0.0000718	<0.000050	0.0001
Zinc	0.0119	0.0058	0.0218	0.007	0.0041	0.01

Table 6-16: MW12-06-05 Water Quality Results Summary (2017 - 2020)

MW12-06-05	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.1	7.78	8.37	7.96	7.63	8.1
TDS (mg/L)	622	541	641	666	637	714
Sulfate-dissolved (mg/L)	176.5	98.3	189	190.2	177	200
Nutrients (mg/L)						
Ammonia Nitrogen	0.00767	<0.0050	0.0131	0.00800	0.0062	0.0107
Nitrate Nitrogen	0.0242	0.0155	0.034	0.0367	<0.0250	0.0501
Nitrite Nitrogen	0.0561	0.0328	0.117	0.0945	0.067	0.153
Dissolved Metals (mg/L)						
Silver	0.0000100	<0.000010	<0.000010	0.0000100	<0.000010	0.00001
Aluminum	0.0017	0.0011	0.0024	0.0016	<0.0010	0.0023
Arsenic	0.00076	0.00052	0.00146	0.00065	0.00044	0.0011
Cadmium	0.00001007	<0.0000050	0.0000187	0.00000625	<0.0000050	<0.0000100
Chromium	0.000108	<0.00010	0.00019	0.000108	<0.00010	0.00013
Copper	0.000227	<0.00020	0.00033	0.0002	<0.00020	<0.00020
Lead	0.0000500	<0.000050	<0.000050	0.0000500	<0.000050	<0.000050
Molybdenum	0.00943	0.0085	0.0103	0.00981	0.00917	0.0103
Nickel	0.000622	<0.00050	0.00083	0.000620	0.00058	0.00068
Selenium	0.0001052	<0.000050	0.000238	0.0000752	<0.000050	0.000087
Zinc	0.0179	0.01	0.0326	0.0105	0.0055	0.015

Table 6-17: MW12-06-06 Water Quality Results Summary (2017 - 2020)

MW12-06-06	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.17	7.84	8.58	8.01	7.67	8.17
TDS (mg/L)	524	513	533	535.5	529	545
Sulfate-dissolved (mg/L)	153.8	148	157	154.8	147	162
Nutrients (mg/L)						
Ammonia Nitrogen	0.00646	<0.0050	0.0133	0.00500	<0.0050	<0.0050
Nitrate Nitrogen	0.951	0.744	1.1	0.637	0.6180	0.646
Nitrite Nitrogen	0.0712	0.0455	0.124	0.0396	0.026	0.0527
Dissolved Metals (mg/L)						
Silver	0.0000100	<0.000010	<0.000010	0.0000100	<0.000010	<0.000010
Aluminum	0.00203	<0.0010	0.0074	0.0024	0.0012	0.0053
Arsenic	0.000181	<0.00010	0.00065	0.000182	<0.00010	0.00043
Cadmium	0.00002841	<0.0000050	0.000196	0.00000935	0.0000054	0.0000129
Chromium	0.000106	<0.00010	0.00016	0.000100	<0.00010	<0.00010
Copper	0.000522	<0.00020	0.00187	0.000313	<0.00020	0.00051
Lead	0.0000500	<0.000050	<0.000050	0.0000500	<0.000050	<0.000050
Molybdenum	0.00575	0.00514	0.00612	0.00592	0.00553	0.00616
Nickel	0.0005	<0.00050	<0.00050	0.000500	<0.00050	<0.00050
Selenium	0.000342	0.000239	0.000513	0.000328	0.000296	0.000386
Zinc	0.0252	0.0116	0.0427	0.0126	0.0083	0.0211

6.3.10 MW12-07

Groundwater obtained from Zone 1 (01) was likely contaminated with glycol from the Westbay well casing during all sampling sessions in 2020, indicating a possible damaged sampling port. Groundwater results from 2017 to 2020 for Zone 1 are summarized in Table 6-18. Groundwater quality results for Zone 2 (02) from 2017 to 2020 are summarized in Table 6-19.

Table 6-18: MW12-07-01 Water Quality Results Summary (2017 - 2020)

MW12-07-01	2017 - 2018 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	7.9	7.83	7.96	8.09	7.93	8.33
TDS (mg/L)	798	599	956	1063.3	1040	1090
Sulfate-dissolved (mg/L)	265.5	12.4	473	623.3	586	646
Nutrients (mg/L)						
Ammonia Nitrogen	0.684	0.218	1.23	0.10150	0.0815	0.118
Nitrate Nitrogen	0.154	0.044	0.225	1.51	0.5100	2.95
Nitrite Nitrogen	0.3684	0.0891	0.561	3.66	1.34	7.06
Dissolved Metals (mg/L)						
Silver	0.0000100	<0.000010	<0.000010	0.0000167	<0.000010	0.00002
Aluminum	0.0036	0.002	0.0049	0.0024	0.0022	0.0027
Arsenic	0.00051	0.00034	0.0008	0.00988	0.00609	0.0153
Cadmium	0.00000533	<0.0000050	0.000006	0.00003833	<0.0000250	<0.0000600
Chromium	0.00031	0.00025	0.0004	0.000193	0.00012	0.00026
Copper	0.0002	<0.00020	<0.00020	0.00085	<0.00020	0.00131
Lead	0.0001600	<0.000050	0.00038	0.0000667	<0.000050	<0.000100
Molybdenum	0.000877	0.000252	0.00141	0.0223	0.0204	0.0246
Nickel	0.0005	<0.00050	<0.00050	0.001203	<0.00050	0.00211
Selenium	0.00183	0.001280	0.002760	0.002725	0.000902	0.00631
Zinc	0.0044	0.0039	0.0053	0.1056	0.0078	0.197

Table 6-19: MW12-07-02 Water Quality Results Summary (2017 – 2020)

MW12-07-02	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.12	7.86	8.35	8.02	7.75	8.27
TDS (mg/L)	676	551	1150	656.7	644	678
Sulfate-dissolved (mg/L)	370	283	754	299.2	288	307
Nutrients (mg/L)						
Ammonia Nitrogen	0.0165	0.0081	0.0387	0.01210	0.0087	0.0159
Nitrate Nitrogen	0.551	0.08	1.24	1.47	1.3500	1.57
Nitrite Nitrogen	0.208	0.0963	0.666	0.0865	0.0738	0.0992
Dissolved Metals (mg/L)						
Silver	0.0000100	<0.000010	<0.000010	0.0000100	<0.000010	<0.000010
Aluminum	0.004	0.0017	0.0215	0.1820	0.0019	0.721
Arsenic	0.00093	0.00024	0.00592	0.00227	0.00026	0.00739
Cadmium	0.00007005	<0.0000050	0.000191	0.0001165	<0.0000150	0.000175
Chromium	0.000101	<0.00010	0.00011	0.000103	<0.00010	0.00011
Copper	0.00249	0.00037	0.00911	0.01058	0.00734	0.0153
Lead	0.0000500	<0.000050	<0.000050	0.0000500	<0.000050	<0.000050
Molybdenum	0.0251	0.0178	0.0331	0.0205	0.0186	0.0248
Nickel	0.0005	<0.00050	<0.00050	0.000788	<0.00050	0.00164
Selenium	0.000627	0.000193	0.001340	0.000768	0.000504	0.00117
Zinc	0.0606	0.0032	0.152	0.02385	<0.0010	0.0352

6.3.11 MW17-08

This well was installed in July 2017 to monitor the background groundwater quality up-gradient of the Southwest Waste Dump and other mine activities. Three zones were sampled and analyzed in 2020, the results are summarized in Table 6-20 to 6-23 below alongside historical results. The shallowest zone, MW17-08-04, was found to be dry throughout 2020.

Table 6-20: MW17-08-01 Water Quality Results Summary (2017 - 2020)

MW17-08-01	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.17	7.81	8.57	7.95	7.8	8.08
TDS (mg/L)	262.3	224	281	270.8	265	285
Sulfate-dissolved (mg/L)	37.2	33.4	43.1	31.6	31.2	32.9
Nutrients (mg/L)						
Ammonia Nitrogen	0.02723	<0.0050	0.201	0.01190	<0.0050	0.0218
Nitrate Nitrogen	0.3501	0.016	0.453	0.443	0.4030	0.49
Nitrite Nitrogen	0.00524	<0.0010	0.0163	0.0037	0.0018	0.0074
Dissolved Metals (mg/L)						
Silver	0.0000112	<0.000010	<0.000020	0.0000120	<0.000010	<0.000020
Aluminum	0.00199	<0.0010	0.0029	0.0025	<0.0010	0.0072
Arsenic	0.000774	<0.00010	0.00523	0.000278	<0.00010	0.00089
Cadmium	0.0004167	0.0000159	0.00325	0.0001086	0.0000426	0.000161
Chromium	0.000121	<0.00010	<0.00020	0.000125	<0.00010	<0.00020
Copper	0.00129	0.00023	0.0062	0.0015	0.00031	0.00532
Lead	0.0000556	<0.000050	<0.00010	0.0000600	<0.000050	<0.000100
Molybdenum	0.00847	0.00525	0.00922	0.0094	0.00925	0.00954
Nickel	0.00077	<0.00050	0.00166	0.000600	<0.00050	<0.00100
Selenium	0.000646	0.000399	0.001160	0.000544	0.000475	0.000673
Zinc	0.0402	0.0239	0.0692	0.0436	0.0276	0.0563

Table 6-21: MW17-08-02 Water Quality Results Summary (2017 - 2020)

MW17-08-02	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.2	7.93	8.47	7.98	7.86	8.09
TDS (mg/L)	164.8	138	180	175	164	183
Sulfate-dissolved (mg/L)	11.4	10.2	12	9.94	9.76	10.2
Nutrients (mg/L)						
Ammonia Nitrogen	0.00583	<0.0050	0.0133	0.00608	<0.0050	0.0104
Nitrate Nitrogen	0.68	0.657	0.703	0.635	0.5630	0.696
Nitrite Nitrogen	0.00194	<0.0010	0.0045	0.00554	<0.0010	0.0148
Dissolved Metals (mg/L)						
Silver	0.0000100	<0.000010	<0.000010	0.0000100	<0.000010	<0.000010
Aluminum	0.0023	0.0014	0.0038	0.0021	0.0018	0.0028
Arsenic	0.00072	0.00014	0.00479	0.00029	0.00018	0.00065
Cadmium	0.0000434	0.0000099	0.000234	0.0000755	0.0000221	0.000104
Chromium	0.000172	<0.00010	0.00082	0.000120	<0.00010	0.00018
Copper	0.00233	0.00175	0.00259	0.00292	0.00267	0.00338
Lead	0.0000500	<0.000050	<0.000050	0.0000500	<0.000050	<0.000050
Molybdenum	0.00313	0.00289	0.00372	0.00297	0.00287	0.00307
Nickel	0.00052	<0.00050	0.0007	0.000500	<0.00050	<0.00050
Selenium	0.000715	0.000514	0.001270	0.000503	0.00047	0.000578
Zinc	0.0187	0.0084	0.036	0.0185	0.0112	0.0232

Table 6-22: MW17-08-03 Water Quality Results Summary (2017 - 2020)

MW17-08-03	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.16	7.92	8.37	7.96	7.89	8.09
TDS (mg/L)	137	98.3	160	117	103	153
Sulfate-dissolved (mg/L)	4.56	2.43	5.7	3.19	2.7	4.8
Nutrients (mg/L)						
Ammonia Nitrogen	0.00577	<0.0050	0.0127	0.00508	<0.0050	0.0054
Nitrate Nitrogen	0.768	0.663	0.851	0.629	0.6180	0.654
Nitrite Nitrogen	0.00145	<0.0010	0.0029	0.0067	<0.0010	0.0206
Dissolved Metals (mg/L)						
Silver	0.0000100	<0.000010	<0.000010	0.0000100	<0.000010	<0.000010
Aluminum	0.0044	0.003	0.0094	0.0043	0.0033	0.0048
Arsenic	0.000495	<0.00010	0.00332	0.00026	0.00011	0.00082
Cadmium	0.00003494	<0.0000050	0.000172	0.0000656	0.0000179	0.000109
Chromium	0.000111	<0.00010	0.00021	0.000160	0.00011	0.00022
Copper	0.0007	0.00044	0.0014	0.00157	0.00033	0.00524
Lead	0.0000500	<0.000050	<0.000050	0.0000500	<0.000050	<0.000050
Molybdenum	0.000949	0.000774	0.00116	0.000818	0.000738	0.000978
Nickel	0.0005	<0.00050	<0.00050	0.000500	<0.00050	<0.00050
Selenium	0.000435	0.000260	0.000682	0.000259	0.000198	0.000407
Zinc	0.0174	0.0074	0.0381	0.0192	0.0091	0.0272

Table 6-23: MW17-08-04 Water Quality Results Summary (2017 - 2018)

MW17-08-04	2017 - 2018 Summary Statistics		
Parameters	**Mean**		
pH	8.05	8.03	8.07
TDS (mg/L)	77.9	71.2	81.6
Sulfate-dissolved (mg/L)	3.18	2.20	<5.0
Nutrients (mg/L)			
Ammonia Nitrogen	0.01393	<0.0050	0.0184
Nitrate Nitrogen	0.605	0.594	0.618
Nitrite Nitrogen	0.00270	<0.0010	0.0051
Dissolved Metals (mg/L)			
Silver	0.00001	<0.000010	<0.000010
Aluminum	0.0042	0.0035	0.0056
Arsenic	0.00136	0.00013	0.00489
Cadmium	0.00003973	<0.0000050	0.000091
Chromium	0.000118	<0.00010	0.00017
Copper	0.00056	0.00036	0.00096
Lead	0.00005	<0.000050	<0.000050
Molybdenum	0.000552	0.000433	0.000714
Nickel	0.000695	<0.00050	0.001
Selenium	0.000334	0.000158	0.000659
Zinc	0.0467	0.0045	0.137

6.3.12 MW17-09

This well was installed in July 2017 to monitor groundwater down-gradient of the Southwest Waste Dump. One zone was identified below an ice-rich layer, it was sampled and analyzed once in 2017. In 2018 the well was frozen in Q1 and Q2 and was found dry during the Q3 and Q4 sampling events. In 2019 and 2020, the groundwater probe could not reach the sampling port. It is likely that the well has been destroyed.

6.3.13 MW17-10

This well was installed in July 2017 to monitor groundwater down-gradient of the Main Waste Dump. All three ports were sampled in 2020, the results are summarized in Table 6-24 to 6-26 below alongside historical results. The shallowest zone, MW17-10-04, was found to be dry throughout 2020.

Table 6-24: MW17-10-01 Water Quality Results Summary (2017 - 2020)

MW17-10-01	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.13	7.96	8.24	7.9	7.63	8.05
TDS (mg/L)	234.5	191	269	290.8	284	302
Sulfate-dissolved (mg/L)	53.1	41.8	61.9	49	47.4	51
Nutrients (mg/L)						
Ammonia Nitrogen	0.02198	<0.0050	0.0588	0.02790	0.0135	0.0411
Nitrate Nitrogen	7.82	1.96	13.4	15.8	14.9000	17.2
Nitrite Nitrogen	0.0616	0.0014	0.476	0.0059	0.0028	0.0092
Dissolved Metals (mg/L)						
Silver	0.0000136	<0.000010	0.000028	0.0000125	<0.000010	0.000015
Aluminum	0.0052	0.0036	0.0084	0.0040	0.0035	0.0046
Arsenic	0.00054	0.00014	0.00244	0.0035	0.00018	0.0124
Cadmium	0.0001986	<0.000015	0.0015	0.0000989	0.0000544	0.00019
Chromium	0.0001	<0.00010	<0.00010	0.000100	<0.00010	<0.00010
Copper	0.00441	0.00321	0.0089	0.00389	0.00316	0.00429
Lead	0.0000560	<0.000050	0.000116	0.0000500	<0.000050	<0.000050
Molybdenum	0.0234	0.0149	0.0381	0.0141	0.0135	0.0146
Nickel	0.01104	0.0089	0.0137	0.012500	0.0119	0.0138
Selenium	0.001205	0.000718	0.002900	0.00188	0.00171	0.00198
Zinc	0.0287	0.0133	0.0463	0.0496	0.0367	0.0748

Table 6-25: MW17-10-02 Water Quality Results Summary (2017 - 2020)

MW17-10-02	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.11	7.94	8.22	7.86	7.76	7.98
TDS (mg/L)	274.1	234	308	355.5	335	386
Sulfate-dissolved (mg/L)	24.3	22.1	25.9	29.5	27.5	31.2
Nutrients (mg/L)						
Ammonia Nitrogen	0.01304	<0.0050	0.0831	0.26990	0.0074	0.62
Nitrate Nitrogen	23	15.6	29.4	33.1	29.4000	37.7
Nitrite Nitrogen	0.00321	<0.0010	0.0135	0.01802	<0.0010	0.0579
Dissolved Metals (mg/L)						
Silver	0.0000100	<0.000010	<0.000010	0.0000100	<0.000010	<0.000010
Aluminum	0.0027	0.0019	0.0044	0.0022	0.0017	0.0029
Arsenic	0.000743	<0.00010	0.00654	0.00026	<0.00010	0.00039
Cadmium	0.0000693	0.00001	0.000336	0.0000578	0.0000325	0.000121
Chromium	0.0001	<0.00010	<0.00010	0.000100	<0.00010	<0.00010
Copper	0.00239	0.00107	0.00524	0.00119	0.00082	0.00176
Lead	0.0000500	<0.000050	<0.000050	0.0000500	<0.000050	<0.000050
Molybdenum	0.00789	0.00694	0.00931	0.00706	0.00664	0.00734
Nickel	0.00367	0.00112	0.0106	0.001450	0.00104	0.00162
Selenium	0.00191	0.001180	0.003170	0.00424	0.0037	0.00462
Zinc	0.0323	0.0163	0.0629	0.0324	0.0262	0.0452

Table 6-26: MW17-10-03 Water Quality Results Summary (2017 - 2020)

MW17-10-03	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.04	7.67	8.21	7.68	7.26	7.99
TDS (mg/L)	281.4	240	320	350	288	398
Sulfate-dissolved (mg/L)	23.1	21.9	25.2	29.6	27.5	31.7
Nutrients (mg/L)						
Ammonia Nitrogen	0.01055	<0.0050	0.0432	0.14970	0.0107	0.345
Nitrate Nitrogen	24.6	17.4	30.4	30.7	15.9000	39.8
Nitrite Nitrogen	0.00342	<0.0010	0.0113	0.68915	<0.0010	2.68
Dissolved Metals (mg/L)						
Silver	0.0000100	<0.000010	<0.000010	0.0000115	<0.000010	0.000016
Aluminum	0.0028	0.0014	0.0077	0.0021	0.0014	0.0032
Arsenic	0.00063	<0.00010	0.00502	0.001333	<0.00010	0.00289
Cadmium	0.0000449	0.0000117	0.000166	0.000074	0.0000268	0.00014
Chromium	0.0001	<0.00010	<0.00010	0.000108	<0.00010	0.00013
Copper	0.00195	0.00111	0.00356	0.00098	0.00078	0.0012
Lead	0.0000500	<0.000050	<0.000050	0.0000500	<0.000050	<0.000050
Molybdenum	0.00755	0.00648	0.00966	0.00658	0.0062	0.00717
Nickel	0.00385	0.00169	0.00805	0.002060	0.00136	0.00309
Selenium	0.00216	0.001200	0.003540	0.00559	0.00404	0.00802
Zinc	0.045	0.0184	0.116	0.0554	0.0266	0.131

6.3.14 MW17-11

This well was installed in July 2017 to monitor groundwater down-gradient of the Minto North Pit. Quarterly samples were collected from zones 01, 02, and 03,while ports 04 and 05 were sampled once in Q2 but were found dry in Q1, Q3 and Q4. The results are summarized in Table 6-27 to 6-31 below.

Table 6-27: MW17-11-01 Water Quality Results Summary (2017 - 2020)

MW17-11-01	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.22	7.96	8.42	8.09	7.96	8.26
TDS (mg/L)	189.1	171	201	213.6	207	230
Sulfate-dissolved (mg/L)	38.3	36.2	40.1	39.1	37.2	42
Nutrients (mg/L)						
Ammonia Nitrogen	0.0099	<0.0050	0.0206	0.01080	<0.0050	0.0161
Nitrate Nitrogen	0.04783	<0.0050	0.339	0.01248	<0.0050	0.023
Nitrite Nitrogen	0.01152	<0.0010	0.0435	0.0446	<0.0010	0.11
Dissolved Metals (mg/L)						
Silver	0.0000100	<0.000010	<0.000010	0.0000100	<0.000010	<0.000010
Aluminum	0.0078	0.0046	0.0229	0.0047	0.0044	0.005
Arsenic	0.00141	0.00063	0.00219	0.00733	0.00184	0.0152
Cadmium	0.00010635	<0.0000050	0.000673	0.00002364	<0.0000100	0.0000576
Chromium	0.000118	<0.00010	0.00021	0.000100	<0.00010	<0.00010
Copper	0.000743	<0.00020	0.00317	0.000244	<0.00020	0.00042
Lead	0.0000500	<0.000050	<0.000050	0.0000500	<0.000050	<0.000050
Molybdenum	0.0181	0.012	0.0273	0.00947	0.00917	0.00993
Nickel	0.000673	<0.00050	0.0012	0.000522	<0.00050	0.00061
Selenium	0.0003796	<0.000050	0.001250	0.0001742	<0.000050	0.000386
Zinc	0.0207	0.0094	0.0429	0.0083	0.0048	0.0165

Table 6-28: MW17-11-02 Water Quality Results Summary (2017 - 2020)

MW17-11-02	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.2	7.92	8.44	8.14	8.07	8.27
TDS (mg/L)	193.3	178	203	218	213	222
Sulfate-dissolved (mg/L)	37.4	28.7	43.4	43.2	41.9	44.5
Nutrients (mg/L)						
Ammonia Nitrogen	0.00548	<0.0050	0.0087	0.00500	<0.0050	<0.0050
Nitrate Nitrogen	0.02117	<0.0050	0.0872	0.02042	<0.0050	0.0667
Nitrite Nitrogen	0.00156	<0.0010	0.0053	0.01362	<0.0010	0.0515
Dissolved Metals (mg/L)						
Silver	0.0000100	<0.000010	<0.000010	0.0000100	<0.000010	<0.000010
Aluminum	0.0035	0.0018	0.0066	0.0064	0.0012	0.0197
Arsenic	0.0009	0.00055	0.00183	0.00178	0.0013	0.00227
Cadmium	0.0000304	0.0000056	0.000128	0.00003262	0.0000092	0.00006
Chromium	0.0001	<0.00010	<0.00010	0.000118	<0.00010	0.00017
Copper	0.000341	<0.00020	0.00065	0.000495	<0.00020	0.00138
Lead	0.0000532	<0.000050	0.000082	0.0000500	<0.000050	<0.000050
Molybdenum	0.00624	0.00572	0.00743	0.0061	0.00591	0.00634
Nickel	0.000613	<0.00050	0.00099	0.000500	<0.00050	<0.00050
Selenium	0.0003424	<0.000050	0.002610	0.00011	<0.000050	0.000223
Zinc	0.0232	0.0121	0.0656	0.0227	0.0138	0.0338

Table 6-29: MW17-11-03 Water Quality Results Summary (2017 - 2020)

MW17-11-03	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.24	8.02	8.46	8.13	8.02	8.33
TDS (mg/L)	172.5	160	194	185.6	177	200
Sulfate-dissolved (mg/L)	19	15.7	23.8	16.6	16.4	17.3
Nutrients (mg/L)						
Ammonia Nitrogen	0.005	<0.0050	<0.0050	0.00500	<0.0050	<0.0050
Nitrate Nitrogen	0.07151	<0.0050	0.335	0.005	<0.0050	<0.0050
Nitrite Nitrogen	0.01519	<0.0010	0.103	0.00168	<0.0010	0.0027
Dissolved Metals (mg/L)						
Silver	0.0000100	<0.000010	<0.000010	0.0000100	<0.000010	<0.000010
Aluminum	0.0051	0.0038	0.0066	0.0064	0.0040	0.0097
Arsenic	0.00039	0.00021	0.00068	0.00044	0.0003	0.0006
Cadmium	0.00004322	<0.0000050	0.000347	0.0000713	0.0000065	0.000306
Chromium	0.0001	<0.00010	<0.00010	0.000100	<0.00010	<0.00010
Copper	0.000429	<0.00020	0.00211	0.000624	<0.00020	0.0013
Lead	0.0000506	<0.000050	0.000056	0.0000500	<0.000050	<0.000050
Molybdenum	0.0053	0.00406	0.00789	0.00432	0.00417	0.00458
Nickel	0.000676	<0.00050	0.00154	0.000500	<0.00050	<0.00050
Selenium	0.0001288	<0.000050	0.000586	0.0000938	<0.000050	0.000221
Zinc	0.0162	0.0063	0.0307	0.0221	0.0097	0.0416

Table 6-30: MW17-11-04 Water Quality Results Summary (2017 - 2020)

MW17-11-04	2017 - 2019 Summary Statistics			2020 Summary Statistics
Parameters	**Mean**	**Min**	**Max**	**24-May**
pH	8.07	7.62	8.31	8.09
TDS (mg/L)	350	197	557	174
Sulfate-dissolved (mg/L)	17.4	6.3	29	9.18
Nutrients (mg/L)				
Ammonia Nitrogen	0.04563	<0.0050	0.145	<0.0050
Nitrate Nitrogen	6.5349	0.0173	11.1	0.637
Nitrite Nitrogen	0.0081	0.0020	0.0316	0.0584
Dissolved Metals (mg/L)				
Silver	0.0000168	<0.000010	0.000033	0.0000150
Aluminum	0.0044	0.0029	0.0087	0.0056
Arsenic	0.00031	0.00011	0.00067	0.00038
Cadmium	0.0000786	0.0000062	0.000472	0.0000362
Chromium	0.0001	<0.00010	<0.00010	<0.00010
Copper	0.00399	0.0008	0.01	0.00104
Lead	0.0000500	<0.000050	<0.000050	<0.000050
Molybdenum	0.00956	0.00407	0.0198	0.00462
Nickel	0.003033	<0.00050	0.00823	0.001250
Selenium	0.000373	0.000133	0.000929	0.000289
Zinc	0.0394	0.0137	0.0834	0.0284

Table 6-31: MW17-11-05 Water Quality Results Summary (2017 - 2020)

MW17-11-05	2017 - 2019 Summary Statistics			2020 Summary Statistics
Parameters	**Mean**			**24-May**
pH	7.66	7.41	8.28	7.86
TDS (mg/L)	784	305	971	707
Sulfate-dissolved (mg/L)	12.9	4.7	17.8	8.25
Nutrients (mg/L)				
Ammonia Nitrogen	0.02362	<0.0050	0.0594	0.07070
Nitrate Nitrogen	22.66	9.2300	29.7	17.9
Nitrite Nitrogen	0.1365	0.0045	0.51	0.713
Dissolved Metals (mg/L)				
Silver	0.0000402	0.000011	0.000063	0.0000380
Aluminum	0.0028	0.0014	0.0053	0.0057
Arsenic	0.000354	0.0001	0.00054	0.00034
Cadmium	0.0000416	0.0000083	0.0000834	0.0000697
Chromium	0.000180	<0.00010	<0.00050	<0.00010
Copper	0.00467	0.00229	0.0093	0.00331
Lead	0.0000900	<0.000050	<0.00025	<0.000050
Molybdenum	0.00588	0.00114	0.00952	0.00619
Nickel	0.004790	0.00067	0.00789	0.015300
Selenium	0.001004	0.000349	0.00155	0.000629
Zinc	0.0652	0.0396	0.101	0.0555

6.3.15 MW17-12

This well was installed in July 2017 to monitor groundwater down-gradient of the Dry Stack Tailing Storage Facility (DSTSF) and all other mine activities. All eight zones were sampled and analyzed in 2020, the results are summarized in Table 6-32 to 6-39 below alongside historical results.

Table 6-32: MW17-12-01 Water Quality Results Summary (2017 - 2020)

MW17-12-01	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	7.96	7.68	8.27	7.85	7.68	7.97
TDS (mg/L)	2073	1940	2170	2086.7	2040	2120
Sulfate-dissolved (mg/L)	1314	1210	1410	1282	1230	1340
Nutrients (mg/L)						
Ammonia Nitrogen	0.00522	<0.0050	0.0062	0.00728	<0.0050	0.0121
Nitrate Nitrogen	0.085	<0.050	<0.10	0.0875	<0.0500	<0.100
Nitrite Nitrogen	0.0198	<0.010	0.044	0.01763	<0.0100	0.0205
Dissolved Metals (mg/L)						
Silver	0.0000210	<0.000010	<0.000050	0.0000200	<0.000020	<0.000020
Aluminum	0.0039	0.0023	0.0157	0.0025	<0.0020	0.0027
Arsenic	0.00264	0.00223	0.00425	0.00181	0.0017	0.00191
Cadmium	0.0000659	0.0000087	0.000211	0.0000592	0.0000126	0.000151
Chromium	0.00021	<0.00010	<0.00050	0.000220	<0.00020	0.00028
Copper	0.000612	<0.00020	0.0028	0.000938	<0.00040	0.00149
Lead	0.0001050	<0.000050	<0.00025	0.0001000	<0.000100	<0.000100
Molybdenum	0.00781	0.00689	0.00839	0.00767	0.00736	0.00784
Nickel	0.001081	<0.00050	<0.0025	0.001000	<0.00100	<0.00100
Selenium	0.000223	0.000060	0.000960	0.000132	<0.000100	0.000193
Zinc	0.0411	0.0164	0.0621	0.0984	0.0751	0.146

Table 6-33: MW17-12-02 Water Quality Results Summary (2017 - 2020)

MW17-12-02	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.01	7.78	8.25	7.85	7.7	8
TDS (mg/L)	1763	1670	1840	1833.3	1820	1850
Sulfate-dissolved (mg/L)	1083	1020	1140	1100	1090	1110
Nutrients (mg/L)						
Ammonia Nitrogen	0.005	<0.0050	<0.0050	0.00505	<0.0050	0.0052
Nitrate Nitrogen	0.0675	<0.025	<0.10	0.0875	<0.0500	<0.100
Nitrite Nitrogen	0.0135	<0.0050	<0.020	0.0175	<0.0100	<0.0200
Dissolved Metals (mg/L)						
Silver	0.0000230	<0.000010	<0.000050	0.0000200	<0.000020	<0.000020
Aluminum	0.0039	0.0012	0.0134	0.0033	0.0022	0.006
Arsenic	0.00238	0.00157	0.00405	0.00243	0.00226	0.00275
Cadmium	0.0000232	0.000006	0.0000541	0.00001948	<0.0000100	0.0000241
Chromium	0.00023	<0.00010	<0.00050	0.000200	<0.00020	<0.00020
Copper	0.00046	<0.00020	<0.0010	0.00097	<0.00040	0.0023
Lead	0.0001150	<0.000050	<0.00025	0.0001000	<0.000100	<0.000100
Molybdenum	0.0079	0.00732	0.0084	0.00755	0.00734	0.00769
Nickel	0.001198	<0.00050	<0.0025	0.001000	<0.00100	<0.00100
Selenium	0.0002047	<0.000050	0.000930	0.0001048	<0.000100	0.000119
Zinc	0.0433	0.0127	0.0893	0.0434	0.0255	0.0521

Table 6-34: MW17-12-03 Water Quality Results Summary (2017 - 2020)

MW17-12-03	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.14	7.85	8.38	8.04	7.94	8.12
TDS (mg/L)	533.7	513	561	543.7	537	549
Sulfate-dissolved (mg/L)	131.4	112	142	123.8	122	127
Nutrients (mg/L)						
Ammonia Nitrogen	0.00511	<0.0050	0.0061	0.00562	<0.0050	0.0068
Nitrate Nitrogen	0.0477	0.006	0.274	0.025	<0.0250	<0.0250
Nitrite Nitrogen	0.00565	0.0016	0.0108	0.005	<0.0050	<0.0050
Dissolved Metals (mg/L)						
Silver	0.0000100	<0.000010	<0.000010	0.0000100	<0.000010	<0.000010
Aluminum	0.0032	0.0019	0.0106	0.0019	0.0017	0.0023
Arsenic	0.00134	0.00097	0.00165	0.00092	0.00071	0.00104
Cadmium	0.00001579	<0.0000050	0.0000437	0.0000172	0.0000124	0.0000218
Chromium	0.0001	<0.00010	<0.00010	0.000105	<0.00010	0.00012
Copper	0.00032	<0.00020	0.00137	0.000225	<0.00020	0.0003
Lead	0.0000579	<0.000050	0.000129	0.0000500	<0.000050	<0.000050
Molybdenum	0.00575	0.00521	0.0062	0.00554	0.0054	0.00566
Nickel	0.000749	<0.00050	0.00186	0.000500	<0.00050	<0.00050
Selenium	0.000126	<0.000050	0.000647	0.00008	0.00007	0.000084
Zinc	0.0314	0.0103	0.0648	0.033	0.0189	0.0392

Table 6-35: MW17-12-04 Water Quality Results Summary (2017 - 2020)

MW17-12-04	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.21	7.86	8.54	8.07	7.95	8.14
TDS (mg/L)	449.8	423	480	482	470	492
Sulfate-dissolved (mg/L)	103.4	93.6	126	105.2	102	109
Nutrients (mg/L)						
Ammonia Nitrogen	0.005	<0.0050	0.005	0.00500	<0.0050	<0.0050
Nitrate Nitrogen	0.232	0.159	0.335	0.129	0.1250	0.137
Nitrite Nitrogen	0.00386	<0.0010	0.0069	0.005	<0.0050	<0.0050
Dissolved Metals (mg/L)						
Silver	0.0000148	<0.000010	0.000026	0.0000135	<0.000010	0.000019
Aluminum	0.003	0.0018	0.0053	0.0029	0.0020	0.0041
Arsenic	0.00046	0.00014	0.00226	0.00014	0.00012	0.00019
Cadmium	0.0000222	0.0000052	0.0000542	0.0000248	0.0000152	0.0000443
Chromium	0.0001	<0.00010	0.0001	0.000110	<0.00010	0.00014
Copper	0.00175	0.00077	0.00374	0.00083	0.00064	0.00116
Lead	0.0000500	<0.000050	<0.000050	0.0000500	<0.000050	<0.000050
Molybdenum	0.00599	0.00497	0.0089	0.00508	0.00491	0.00541
Nickel	0.000811	<0.00050	0.00272	0.000500	<0.00050	<0.00050
Selenium	0.000692	0.000423	0.000994	0.000528	0.000444	0.000617
Zinc	0.0372	0.0105	0.101	0.0325	0.0171	0.04

Table 6-36: MW17-12-05 Water Quality Results Summary (2017 - 2020)

MW17-12-05	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.22	7.94	8.51	8.09	7.95	8.17
TDS (mg/L)	458.3	441	486	470.7	460	481
Sulfate-dissolved (mg/L)	94.4	85.7	120	89.7	86.4	92.8
Nutrients (mg/L)						
Ammonia Nitrogen	0.0051	<0.0050	0.006	0.00520	<0.0050	0.0058
Nitrate Nitrogen	0.267	0.199	0.415	0.303	0.2710	0.318
Nitrite Nitrogen	0.00541	<0.0010	0.0165	0.00612	<0.0050	0.0095
Dissolved Metals (mg/L)						
Silver	0.0000100	<0.000010	<0.000010	0.0000100	<0.000010	<0.000010
Aluminum	0.0051	0.0026	0.0177	0.0030	0.0024	0.004
Arsenic	0.000191	<0.00010	0.00047	0.000108	<0.00010	0.00013
Cadmium	0.0000279	0.0000151	0.0000505	0.0000312	0.0000188	0.0000444
Chromium	0.000228	<0.00010	0.00138	0.000120	<0.00010	0.00018
Copper	0.00251	0.00086	0.00347	0.00226	0.00184	0.00299
Lead	0.0000500	<0.000050	<0.000050	0.0000500	<0.000050	<0.000050
Molybdenum	0.01384	0.00474	0.0207	0.00594	0.00422	0.0101
Nickel	0.00283	0.00117	0.0043	0.001170	0.00065	0.00214
Selenium	0.000392	0.000213	0.000643	0.000196	0.000168	0.000226
Zinc	0.0389	0.013	0.0737	0.0352	0.0239	0.0443

Table 6-37: MW17-12-06 Water Quality Results Summary (2017 - 2020)

MW17-12-06	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.26	7.94	8.52	8.09	8.04	8.18
TDS (mg/L)	450.4	422	466	465.3	456	479
Sulfate-dissolved (mg/L)	92.1	88	101	87.6	84.8	90.1
Nutrients (mg/L)						
Ammonia Nitrogen	0.00747	<0.0050	0.0253	0.00500	<0.0050	<0.0050
Nitrate Nitrogen	0.16955	<0.0050	0.281	0.24	0.2330	0.253
Nitrite Nitrogen	0.00665	<0.0010	0.0152	0.005	<0.0050	<0.0050
Dissolved Metals (mg/L)						
Silver	0.0000100	<0.000010	<0.000010	0.0000100	<0.000010	<0.000010
Aluminum	0.0039	0.0024	0.0093	0.0030	0.0027	0.0033
Arsenic	0.000205	<0.00010	0.00058	0.000118	<0.00010	0.00017
Cadmium	0.0000351	0.0000223	0.0000598	0.00003532	<0.0000300	0.0000455
Chromium	0.000102	<0.00010	0.00012	0.000100	<0.00010	<0.00010
Copper	0.00226	0.00062	0.00347	0.00353	0.00332	0.00392
Lead	0.0000506	<0.000050	0.000056	0.0000500	<0.000050	<0.000050
Molybdenum	0.0292	0.0189	0.0607	0.018	0.0171	0.0189
Nickel	0.00327	0.00254	0.00457	0.002360	0.0023	0.00251
Selenium	0.000388	0.000136	0.000850	0.000099	0.000064	0.000122
Zinc	0.0805	0.011	0.524	0.0305	0.0219	0.0363

Table 6-38: MW17-12-07 Water Quality Results Summary (2017 - 2020)

MW17-12-07	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.23	7.98	8.49	8.11	8.03	8.2
TDS (mg/L)	327.2	304	343	358.7	344	367
Sulfate-dissolved (mg/L)	63.3	60.6	67.4	63.1	62.2	63.7
Nutrients (mg/L)						
Ammonia Nitrogen	0.005	<0.0050	<0.0050	0.00500	<0.0050	<0.0050
Nitrate Nitrogen	0.78	0.55	0.997	0.442	0.4010	0.495
Nitrite Nitrogen	0.00143	<0.0010	0.0027	0.00122	<0.0010	0.0017
Dissolved Metals (mg/L)						
Silver	0.0000102	<0.000010	0.000012	0.0000105	<0.000010	0.000012
Aluminum	0.004	0.0019	0.0135	0.0028	0.0020	0.0036
Arsenic	0.000213	<0.00010	0.00048	0.00012	0.0001	0.00017
Cadmium	0.00001682	<0.0000050	0.0000489	0.0000229	0.0000144	0.0000369
Chromium	0.000104	<0.00010	0.00013	0.000100	<0.00010	<0.00010
Copper	0.00096	0.00056	0.00207	0.00074	0.00062	0.0009
Lead	0.0000500	<0.000050	<0.000050	0.0000500	<0.000050	<0.000050
Molybdenum	0.00688	0.00588	0.00966	0.00573	0.00535	0.00605
Nickel	0.000525	<0.00050	0.00068	0.000500	<0.00050	<0.00050
Selenium	0.000365	0.000224	0.000809	0.00019	0.000155	0.000217
Zinc	0.056	0.0108	0.281	0.0422	0.0193	0.0874

Table 6-39: MW17-12-08 Water Quality Results Summary (2017 - 2020)

MW17-12-08	2017 - 2019 Summary Statistics			2020 Summary Statistics		
Parameters	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
pH	8.28	8.05	8.52	8.08	7.99	8.14
TDS (mg/L)	332.6	321	344	361.7	349	371
Sulfate-dissolved (mg/L)	62.9	60.8	65.7	63.2	62.6	63.7
Nutrients (mg/L)						
Ammonia Nitrogen	0.005	<0.0050	<0.0050	0.00508	<0.0050	0.0053
Nitrate Nitrogen	0.775	0.562	0.963	0.449	0.4090	0.504
Nitrite Nitrogen	0.00217	<0.0010	0.0058	0.00122	<0.0010	0.0019
Dissolved Metals (mg/L)						
Silver	0.0000101	<0.000010	0.000011	0.0000100	<0.000010	<0.000010
Aluminum	0.0041	0.0013	0.0113	0.0020	0.0013	0.0029
Arsenic	0.000203	<0.00010	0.00069	0.000112	<0.00010	0.00015
Cadmium	0.00001633	<0.0000050	0.0000471	0.0000231	0.0000109	0.0000345
Chromium	0.000102	<0.00010	0.00012	0.000133	<0.00010	0.00023
Copper	0.00138	0.00061	0.00494	0.00074	0.00063	0.00089
Lead	0.0000500	<0.000050	<0.000050	0.0000500	<0.000050	<0.000050
Molybdenum	0.00878	0.00712	0.0137	0.00693	0.00668	0.00717
Nickel	0.000798	<0.00050	0.00348	0.000500	<0.00050	<0.00050
Selenium	0.000306	0.000224	0.000569	0.000207	0.000188	0.000239
Zinc	0.0452	0.0121	0.165	0.029	0.0203	0.045

6.4 Vibrating Wire Piezometers

At the end of 2020, there were 21 operating vibrating wire piezometers installed on site, listed in Table 6-40. SDP-4 became inoperative in late 2019 and DSP-8 became inoperative in 2020. Summaries of data collected from each piezometer are provided in the following sections.

Table 6-40: Vibrating Wire Piezometer Summary

Vibrating Wire Piezometer	Location	Operational Status
DSP-5	DSTSF	Operational but suspect readings: 5B Inoperative: 5A (2019)
DSP-6	DSTSF	Operational
DSP-7	DSTSF	Operational but suspect readings: 1, 2, 3, 4 Inoperative: 5 and 6 (2018)
DSP-8	DSTSF	Inoperative: 2020
SDP-2	Southwest Dump	Operational: 2A Inoperative: 2B (2017)
SDP-3	Southwest Dump	Operational
SDP-4	Southwest Dump	Inoperative (2019)
WDP-2	Water Storage Pond Dam	Operational
WDP-3A	Water Storage Pond Dam	Operational
WDP-3	Water Storage Pond Dam	Operational
WDP-4	Water Storage Pond Dam	Operational
WDP-5	Water Storage Pond Dam	Operational
WDP-6	Water Storage Pond Dam	Operational
WDP-7	Water Storage Pond Dam	Operational
WDP-8	Water Storage Pond Dam	Operational
WDP-9	Water Storage Pond Dam	Operational
WDP-10	Water Storage Pond Dam	Operational
WDP-11	Water Storage Pond Dam	Operational
WDP-12	Water Storage Pond Dam	Operational
WDP-13	Water Storage Pond Dam	Operational

6.4.1 DSTSF Piezometers

Data collected from DSTSF vibrating wire piezometers are presented in Figure 6-2 to 6-4. Sensor DSP-6A is reading negative pressures and has not been included in the figure.

Pore water pressures in DSP-5 and DSP-7 A and DSP-5B have been gradually increasing since installation in 2013. Temperature readings at these locations indicate frozen ground conditions and it is suspected that the sensors are damaged due to the ice formation. Analysis carried out by SRK Consulting in 2015 and 2018 to consider the increasing pressures indicated high FOS values (FOS>2) even without consideration of the constructed MVFE2. The analysis also considered a review of survey hub data in the piezometer locations that indicated no accelerations or stability concerns and as a result, replacement of the damaged piezometers was not recommended.

DSTSF piezometer readings are collected quarterly.

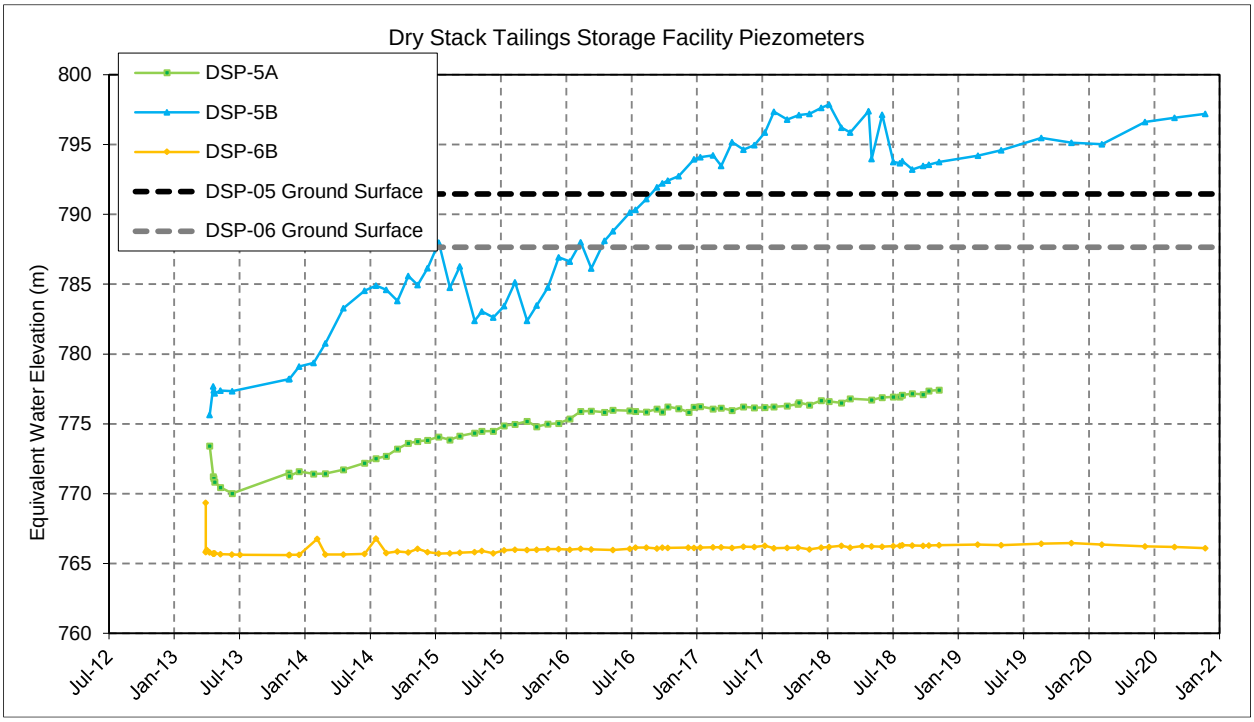


Figure 6-2: DSTSF Piezometer Data – DSP-05 and DSP-06 (2013-2020)

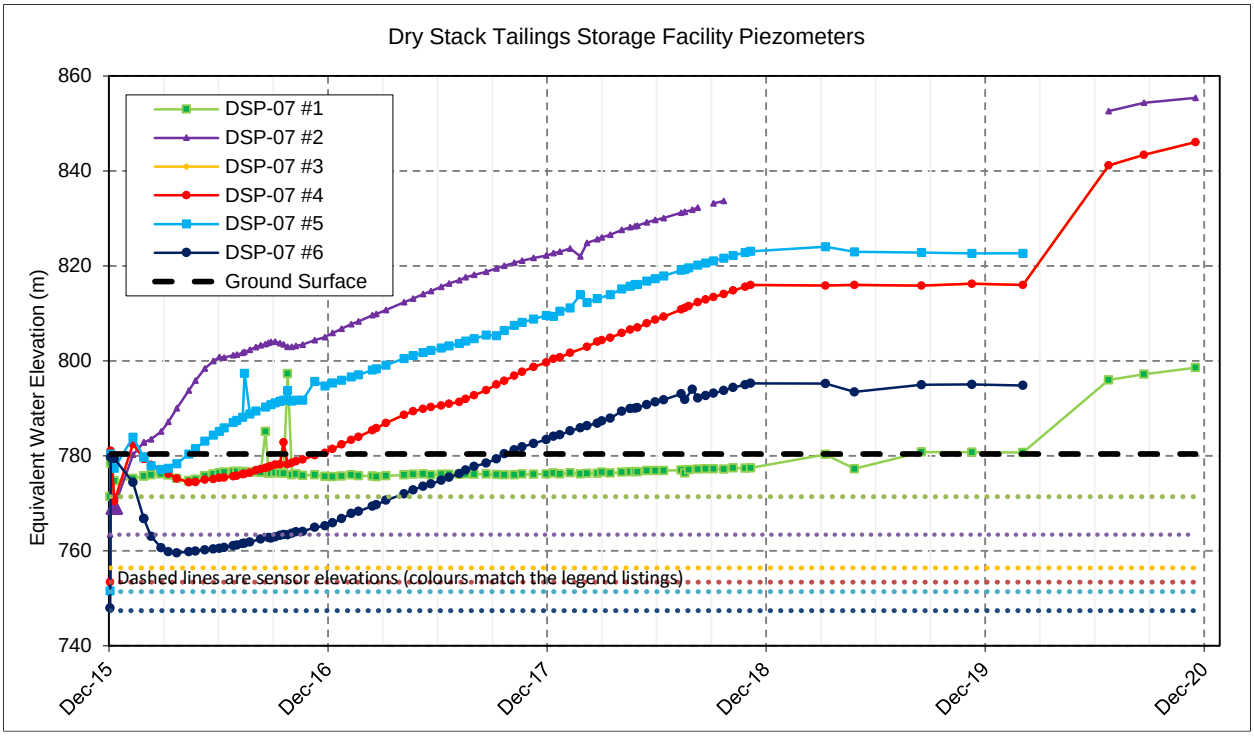


Figure 6-3: DSTSF Piezometer Data – DSP-07 (2015-2020)

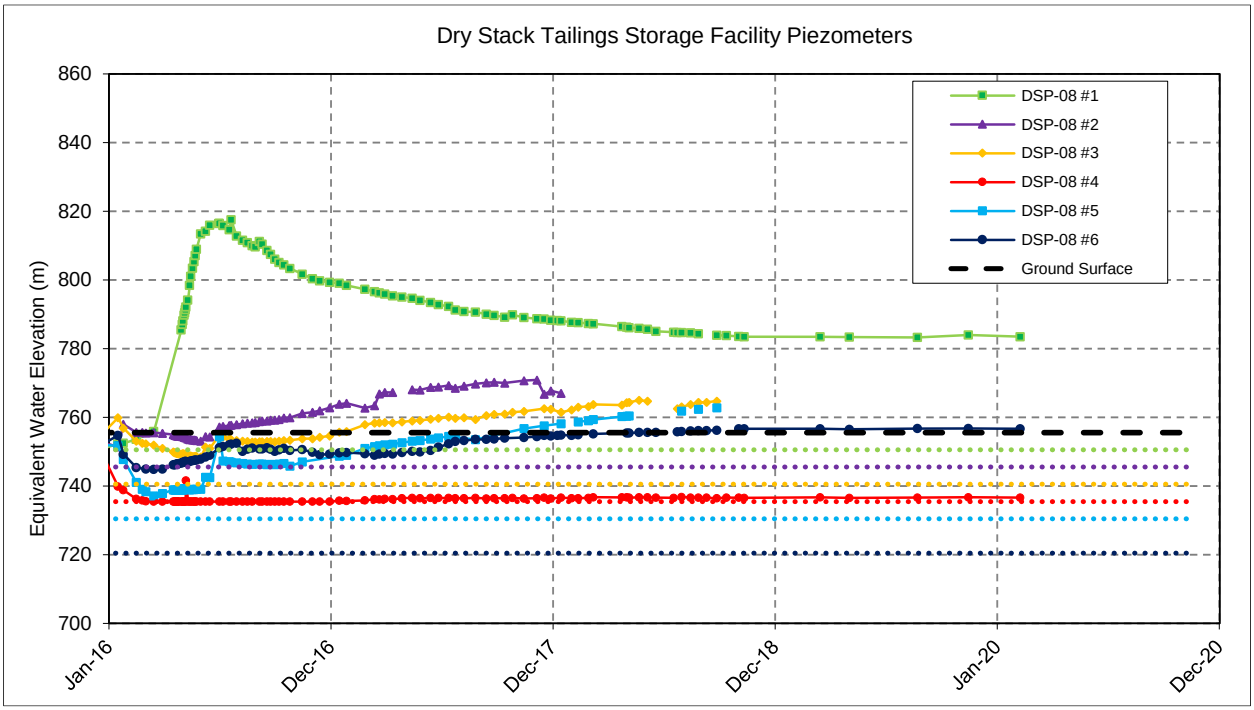


Figure 6-4: DSTSF Piezometer Data – DSP-08 (2015-2019)

6.4.2 Southwest Dump Piezometers

Data collected from Southwest Dump vibrating wire piezometers are presented in Figure 6-5. Sensors SDP-3A and SDP-3B are reading negative pressures and have not been included in the figure. Data are collected quarterly. Data indicates stable conditions with some seasonal changes in pore pressure.

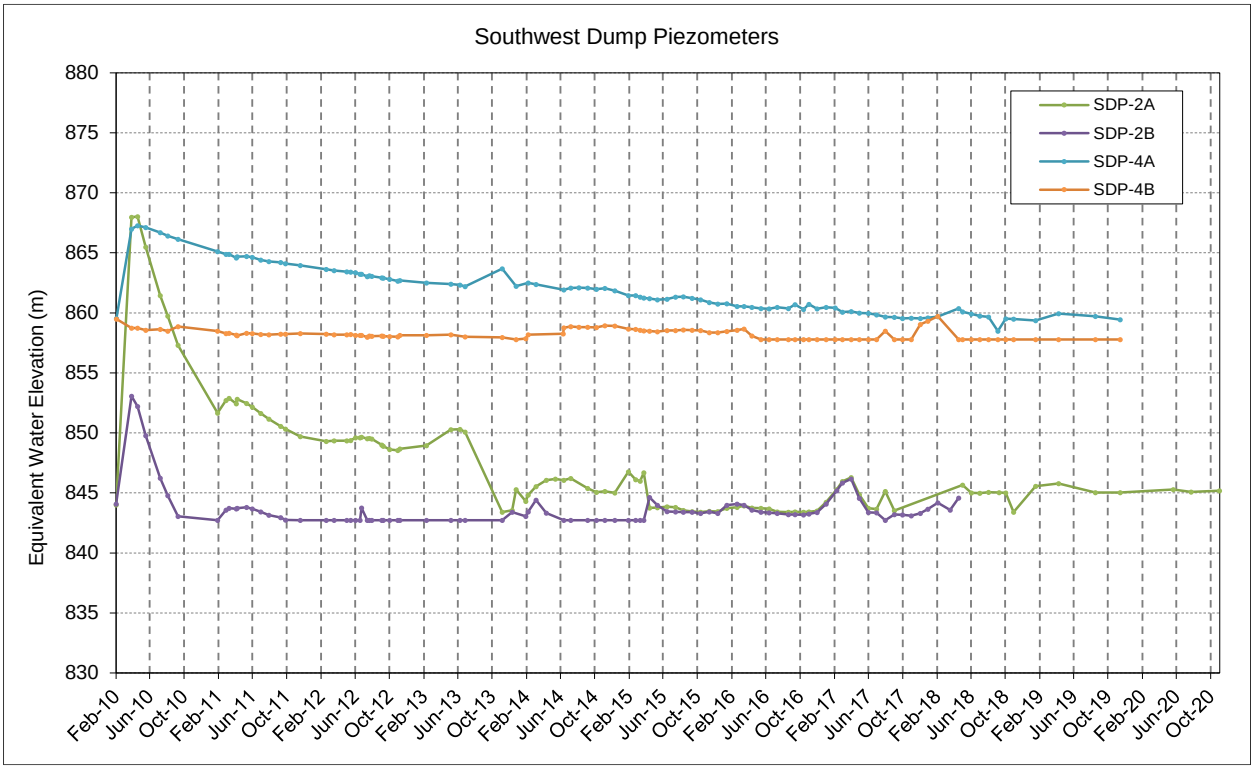


Figure 6-5: Southwest Dump Piezometer Data (2010-2020)

6.4.3 Water Storage Pond Dam Piezometers

Data collected from WSP Dam vibrating wire piezometers are presented in Figure 6-6. WDP-2, WDP-3, WDP-5, and WDP-11 are reading negative pressures and have not been included in the figure. Data are collected monthly. Pressures in 2020 generally followed the trend of the water level in the water storage pond as in previous years.

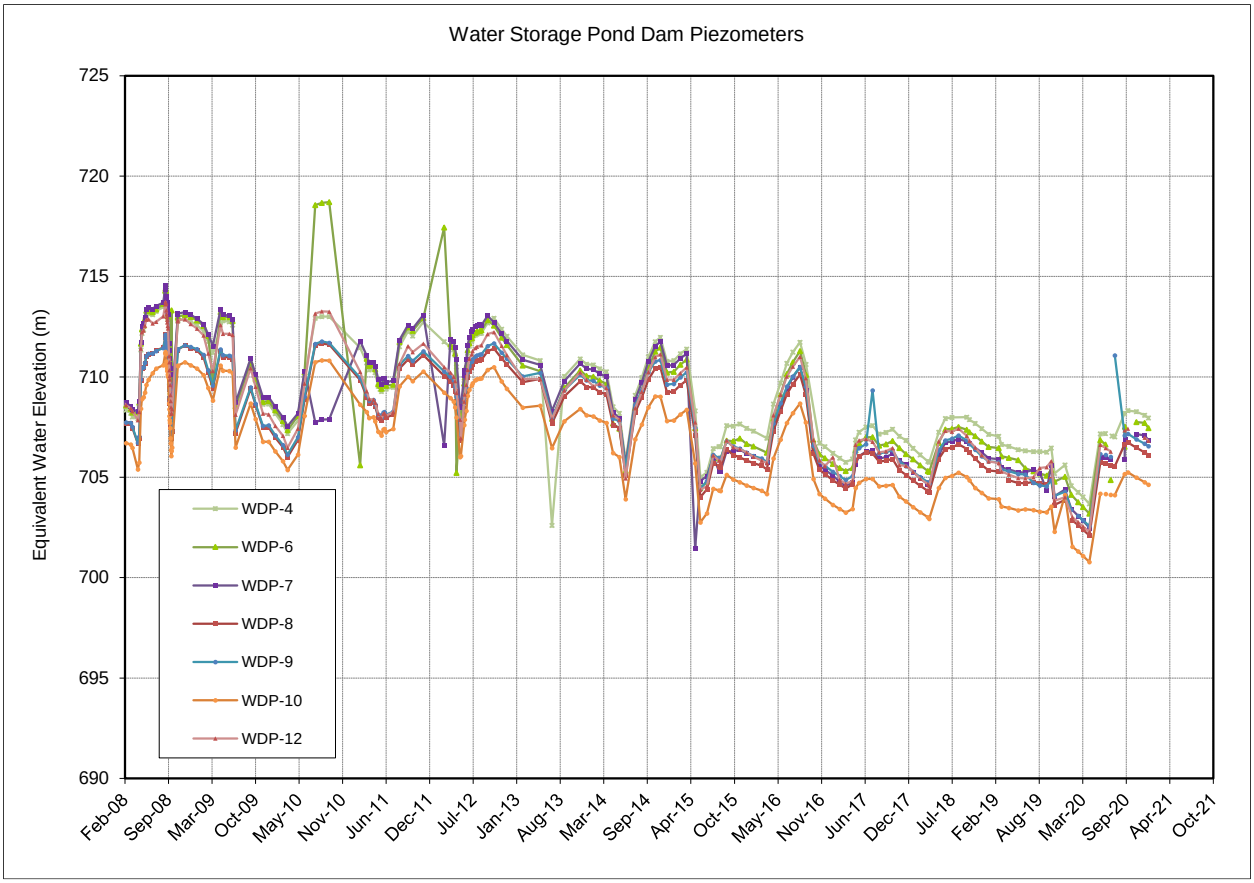


Figure 6-6: WSP Dam Piezometer Data (2008-2020)

6.5 Ground Temperature Cables

There are currently 19 operating thermistors (ground temperature cables) installed on site, listed in Table 6-41. There were no changes to the operational status of any of the existing thermistors in 2020. Summaries of data collected from each thermistor are contained in the following sections.

Table 6-41: Thermistor Summary (2020)

Thermistor	Location	Operational Status
A2T-1	DSTSF	Operational
DST-10	DSTSF	Operational
DST-11	DSTSF	Operational
DST-13	DSTSF	Operational
DST-14	DSTSF	Operational
DST-15	DSTSF	Operational
MW-11-02	Ridgetop	Operational
MW-11-03	Ridgetop	Operational
SDT-1	Southwest Dump	Operational
SDT-2	Southwest Dump	Operational
SDT-3	Southwest Dump	Operational
WDT – 1	Water Storage Pond Dam	Operational
WDT – 2	Water Storage Pond Dam	Operational
WDT – 3	Water Storage Pond Dam	Operational
WDT – 4	Water Storage Pond Dam	Operational
WDT – 5	Water Storage Pond Dam	Operational
WDT – 6	Water Storage Pond Dam	Operational
WDT – 7	Water Storage Pond Dam	Operational
WDT – 8	Water Storage Pond Dam	Operational

6.5.1 Ridgetop Thermistors

Data collection has reduced to annually for both Ridgetop thermistors. No major changes to ground temperatures at the Ridgetop were observed in 2020.

6.5.2 Southwest Dump Thermistors

Data collected from SWD thermistors are presented in Figures 6-14 through 6-16. Data are collected quarterly. No major changes to ground temperatures at the SWD were observed in 2020.

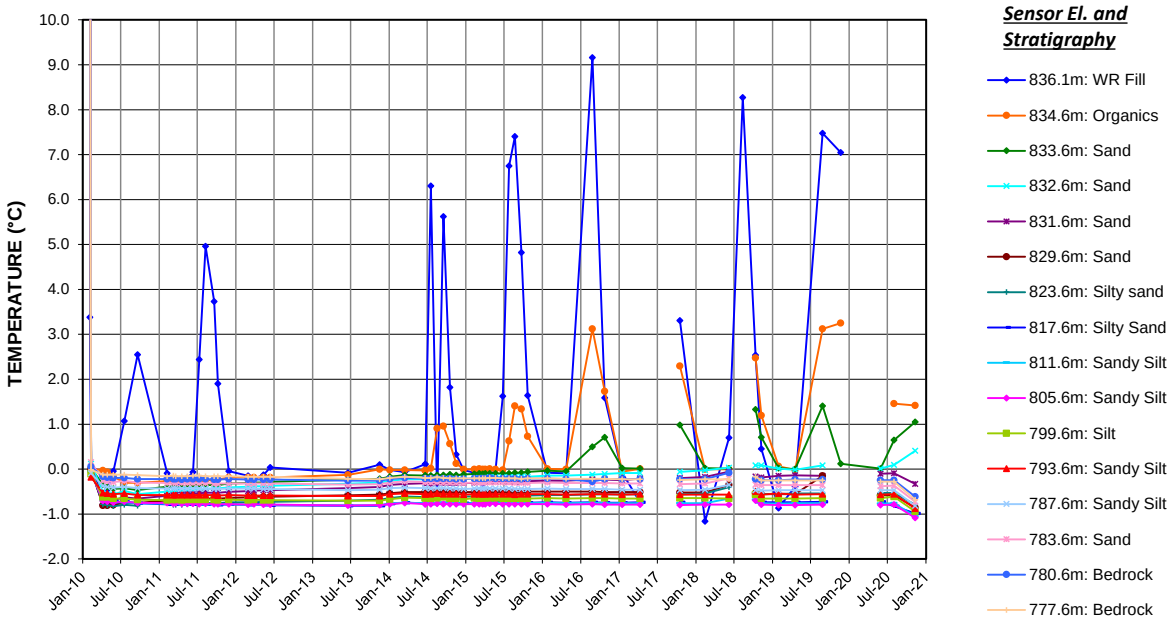


Figure 6-5: Thermistor SDT-1 (2015-2020)

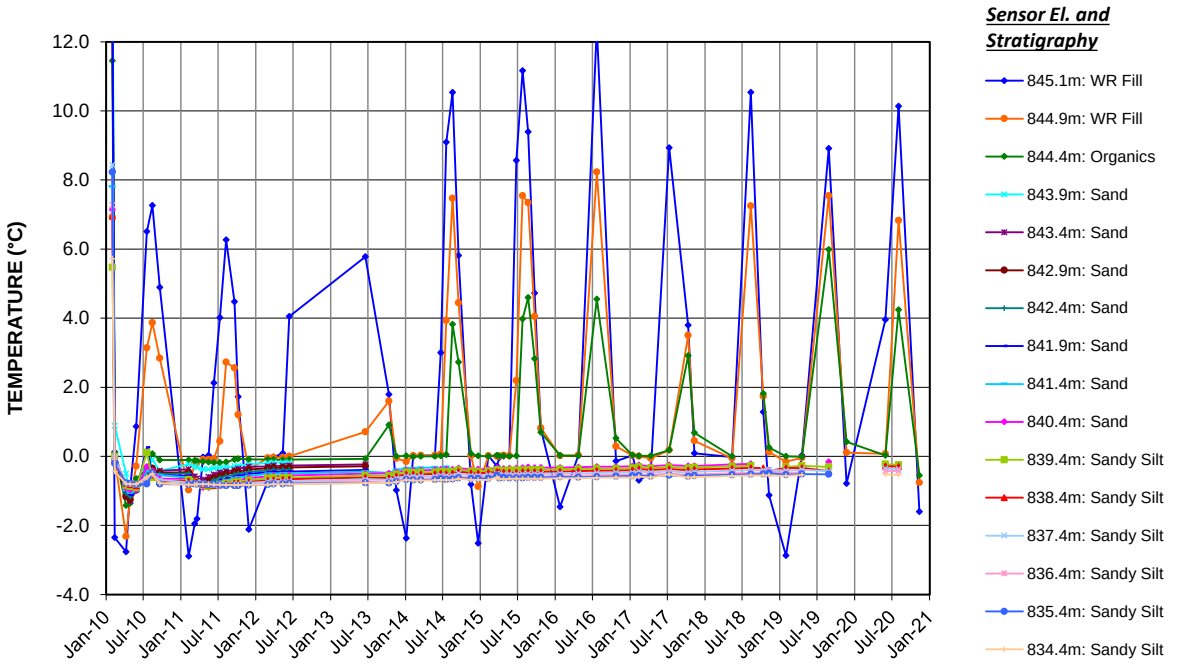


Figure 6-6: Thermistor SDT-2 (2015-2020)

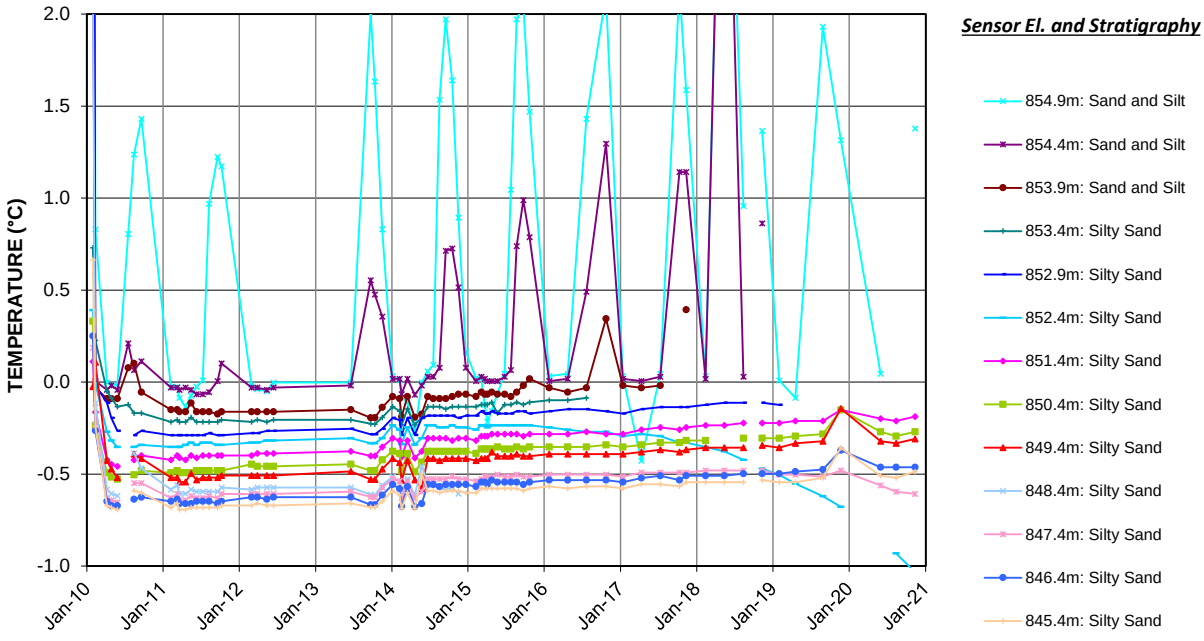


Figure 6-7: Thermistor SDT-3 (2015-2020)

Note: Bead 9 (852.4 m: Silty Sand) appears to be damages with readings drifting colder in temperature.

6.5.3 Water Storage Pond Dam Thermistors

Data are collected monthly from all water retention dam thermistors. All thermistors continue to show temperatures well above zero since installation.

7 Seepage Water Quality Monitoring Program

Minto Mine implements a Seepage Monitoring Plan (SMP) to assess acid rock drainage and metal leaching conditions from several sources, including: pit wall seepage, ore stockpile areas, overburden dumps, waste rock dumps, DSTSF, Mill Valley Fill Extension 1 and 2, the mill area and other seepage locations. Analysis of seepage results and water quality analysis assists in improving understanding of water chemistry, load, and water balance issuing from waste dumps, overburden dumps, ore stockpiles, and tailings facilities.

Seepage monitoring conducted in 2020 was carried out in accordance with the EMSRP. The EMSRP states that seepage surveys will be conducted twice a year, during spring runoff and in early fall, by walking the toe of each waste dump, stockpile or other areas of interest. The survey routes and sampling locations for each seepage monitoring event are recorded using GPS data. Samples are taken within ±5m of the original GPS point. If there is no seepage within the 5m buffer, the site is considered dry during that sampling session. Observations from past seepage surveys indicate that many identified seepage sites are seasonally variable. It has also been observed that weather patterns have an impact, where snow melt or rain contribute to observable flows that are absent during warm, dry weather. A map showing the 2020 survey routes and monitoring locations can be found in Figure 7-1.

WUL QZ14-031 identifies a Surface Water Surveillance Program which requires regular monitoring of seepage at several permanent seepage water quality stations. These stations include: W8 (Destroyed in 2017), W8A, W17, (W36, W37 – destroyed in 2016), and W62. The water quality results for these permanent seepage quality stations are additionally reported to the Yukon Water Board (YWB) monthly. Prior to WUL QZ14-031, Minto operated under WUL QZ96-006 which included seepage monitoring sites W32, W38, W39 and W40 in the Surface Water Surveillance Program.

Constituents of concern, namely dissolved copper, dissolved cadmium, dissolved iron, dissolved selenium, ammonia, nitrate, and nitrite have been graphed below for each site sampled. In the event of results below the detection limit (DL), the limit is plotted, and the results are presented as 0.5*DL. In cases where a graph's trend is skewed due to visual outliers (i.e. data points that are larger than the mean by an order of

magnitude), a second graph with outliers removed is provided. All lab results for 2020 spring and fall seepage monitoring programs are provided in Appendix D.

Per current EMSRP, field data and observations including coordinates, weather, field measurements (pH, conductivity and temperature), a sketch of the location, water conditions and color of sediment and number of filters used. The original field sheets are presented with the pictures that were obtained at each site in Appendix E.

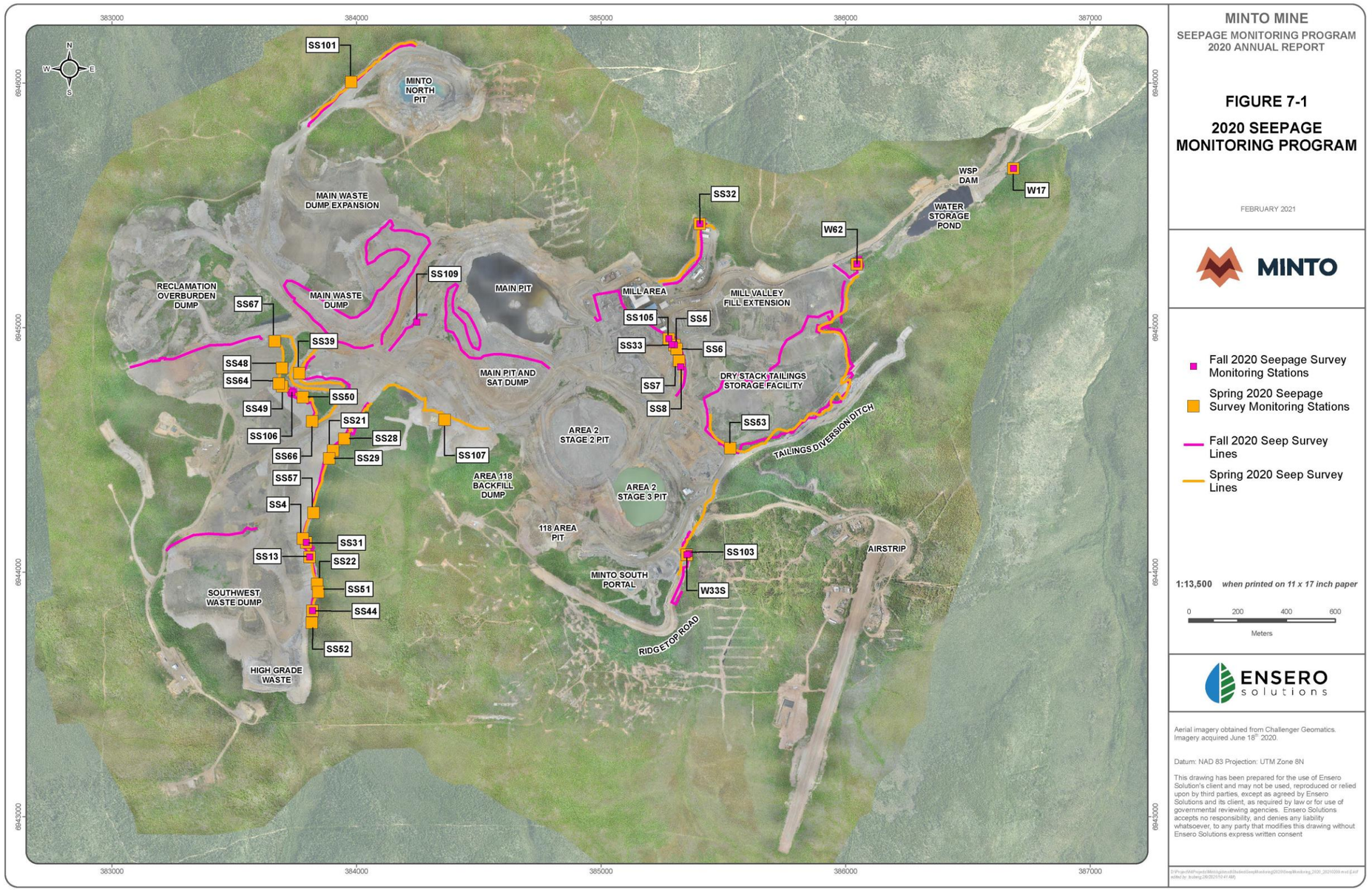


Figure 7-1: Seepage Monitoring Survey Routes and Monitoring Locations (2020)

7.1 Southwest Dump

Seepage samples were collected from the Southwest Waste Dump (SWD) area at sites SS4, SS13, SS21, SS22, SS28, SS29, SS31, SS44, SS51, SS52, during the spring survey, and sites SS13, SS31, SS44 were sampled in the fall seepage survey. The ice-rich overburden dump (IROD) area of the SWD was also surveyed and historic sites SS39, SS48, SS49, SS50, SS64, SS66 and SS67 were sampled during the spring survey. All historic seeps were found dry in the fall; however, a new seep, SS106, was identified and sampled.

Historical data and 2020 seepage water quality results for the SWD are presented in Figures 7-2to 7-27. Data has been separated into three locations within the SWD: SWD North (Figures 7-2 to 7-10), SWD South (Figures 7-11 to 7-21) and the IROD (Figures 7-22 to 7-27). The figures include water quality results for dissolved copper, dissolved cadmium, dissolved iron, dissolved selenium, and nutrient levels for ammonia, nitrite, and nitrate.

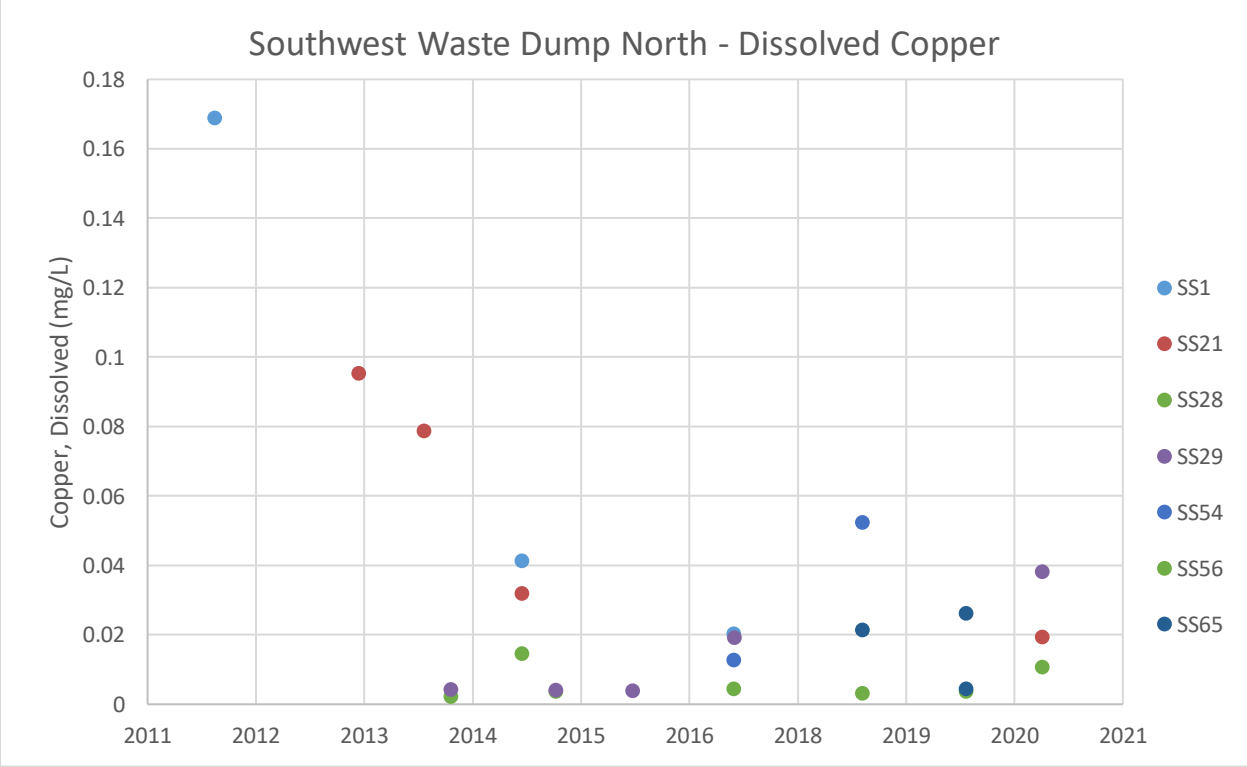


Figure 7-2: Southwest Waste Dump North Dissolved Copper

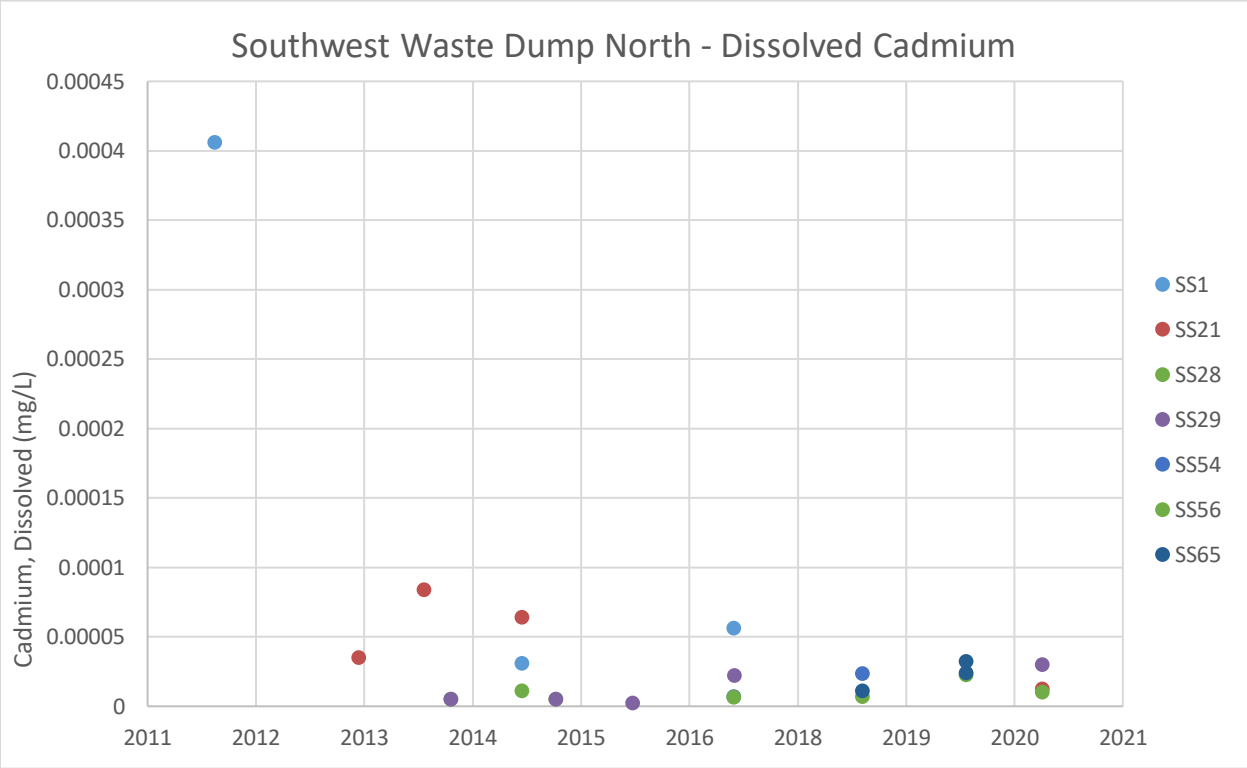


Figure 7-3: Southwest Waste Dump North Dissolved Cadmium

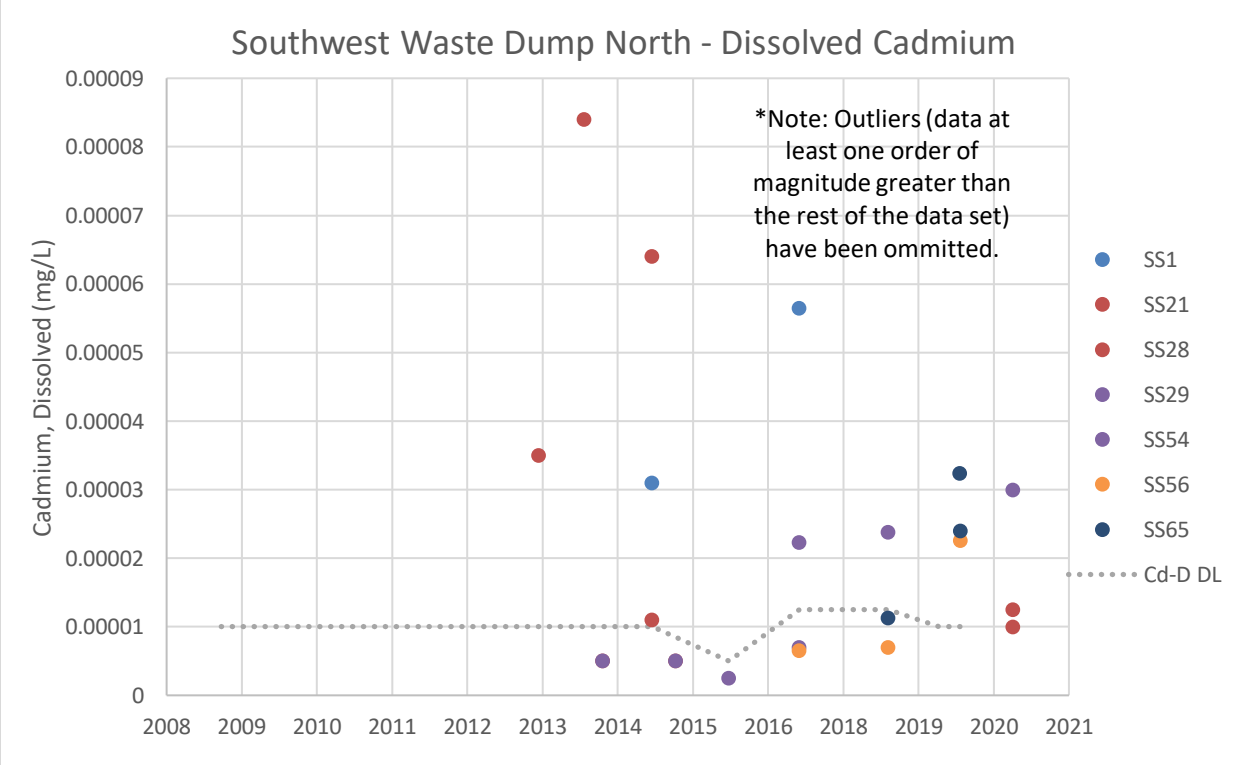


Figure 7-4: Southwest Waste Dump North Dissolved Cadmium, Outliers Removed

DL is Analytical Detection Limit

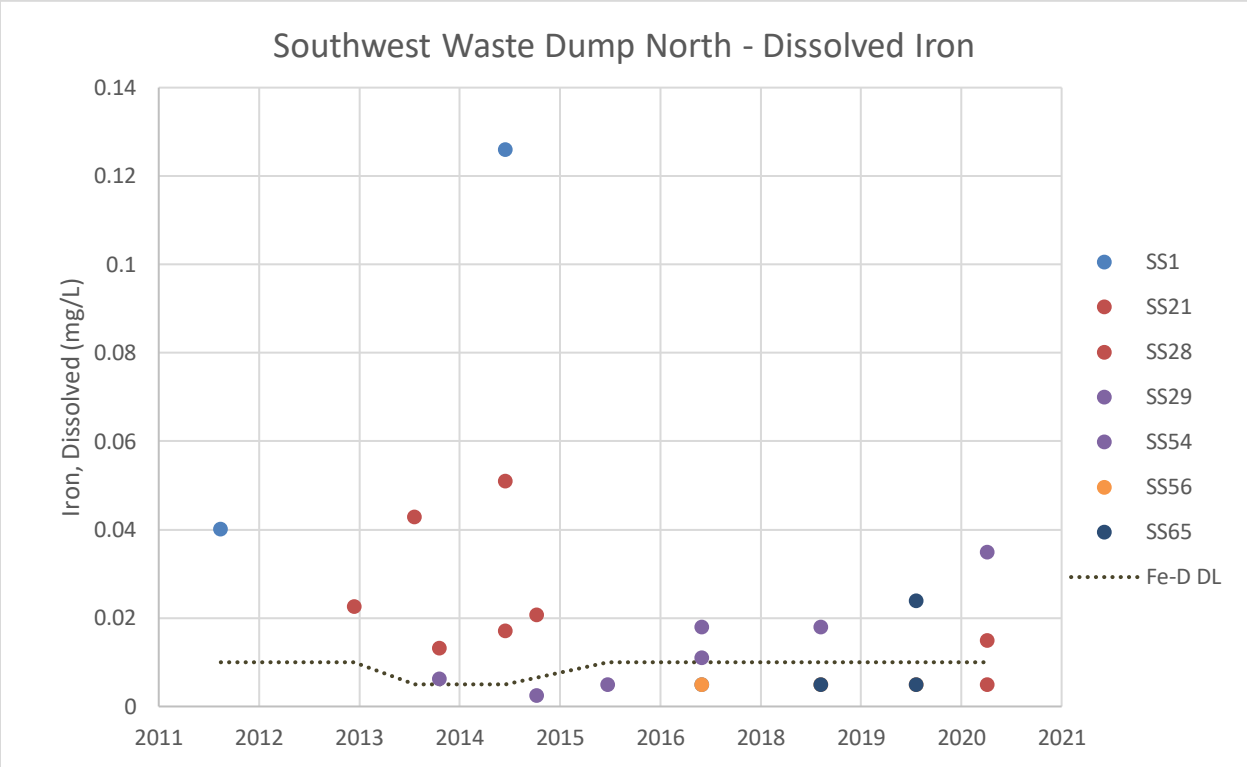


Figure 7-5: Southwest Waste Dump North Dissolved Iron

DL is Analytical Detection Limit

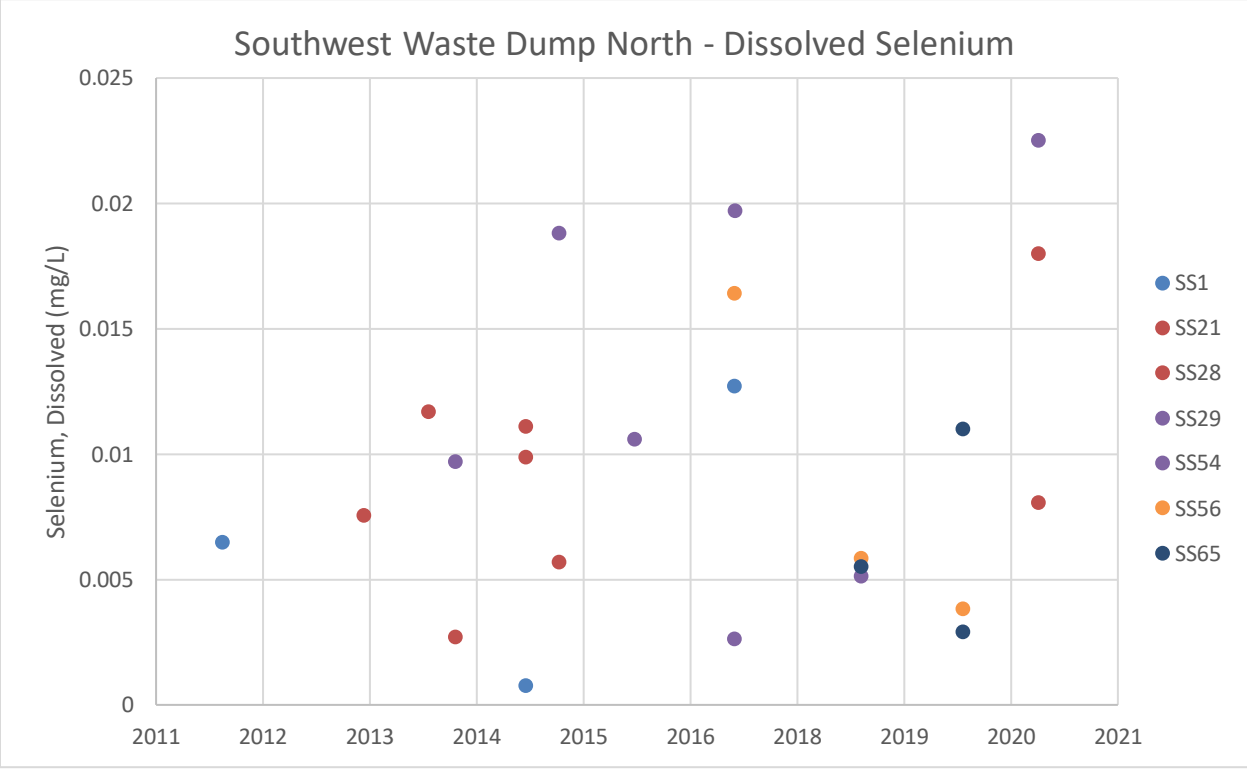


Figure 7-6: Southwest Waste Dump North Dissolved Selenium

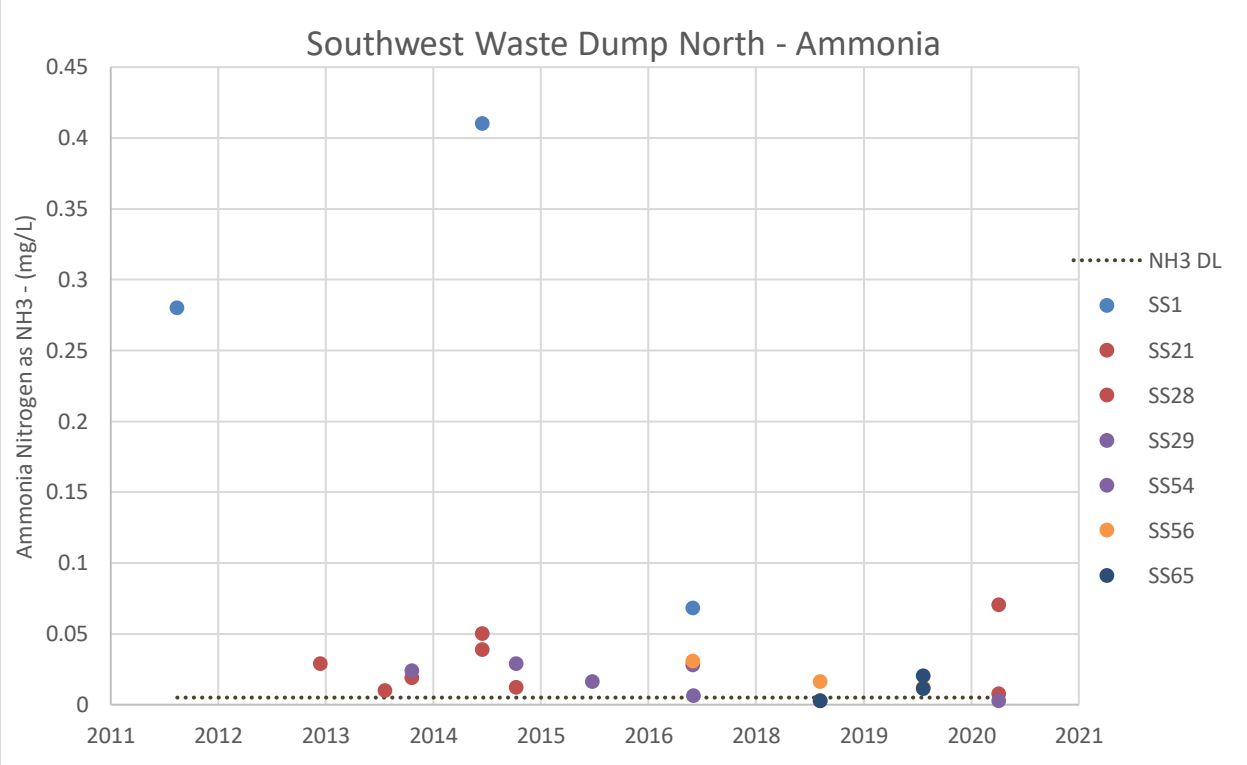


Figure 7-7: Southwest Waste Dump North Ammonia

DL is Analytical Detection Limit

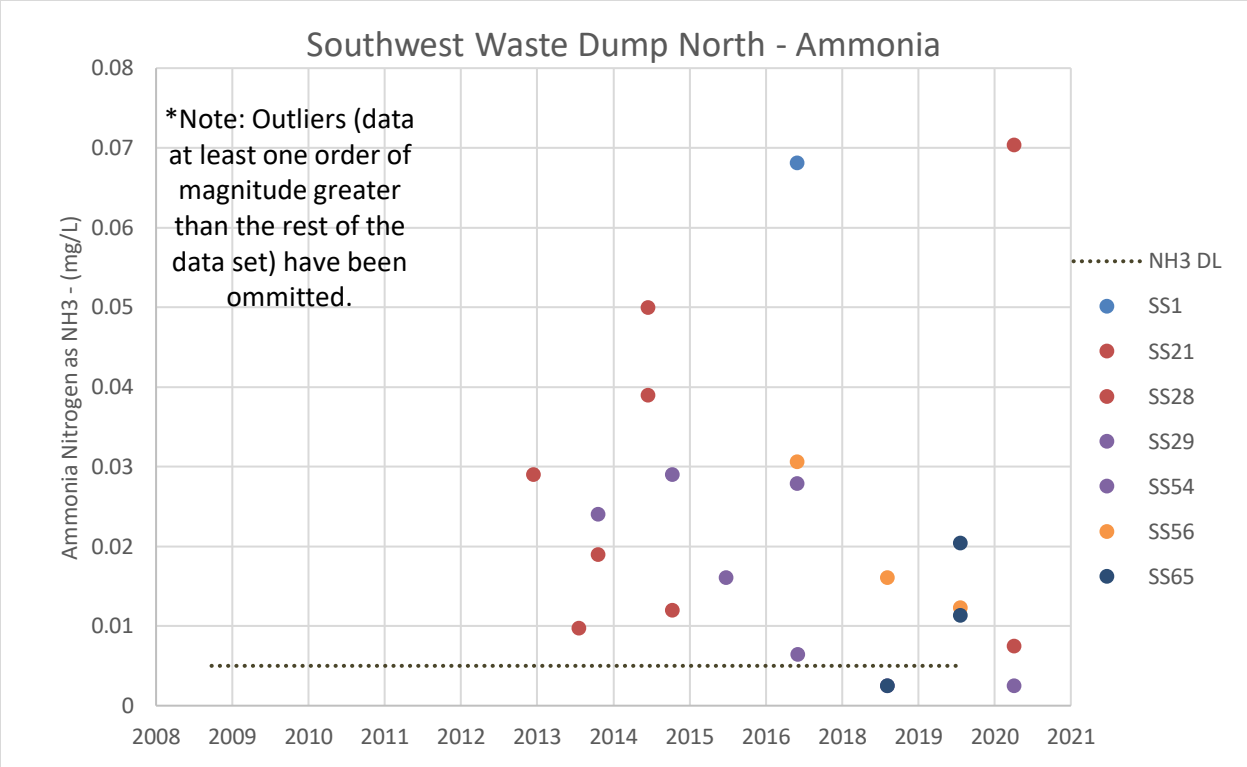


Figure 7-8: Southwest Waste Dump North Ammonia, Outliers Removed

DL is Analytical Detection Limit

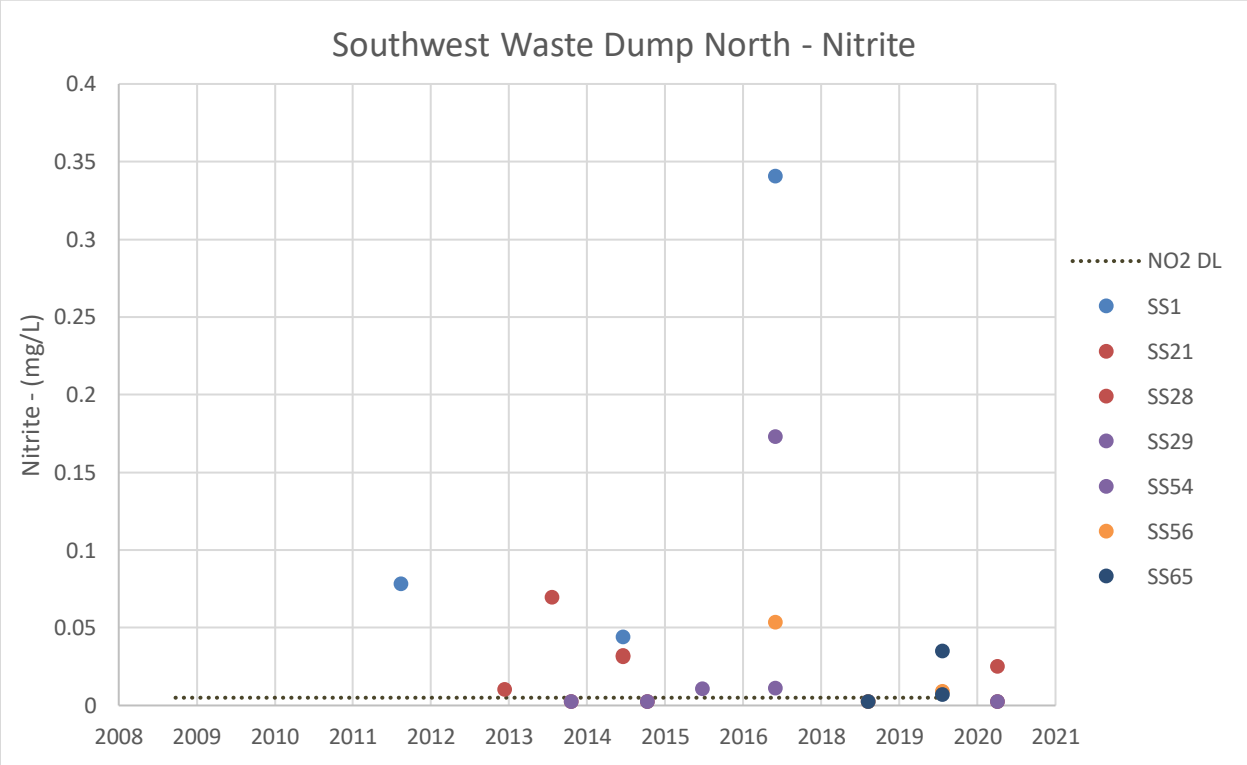


Figure 7-9: Southwest Waste Dump North Nitrite

DL is Analytical Detection Limit

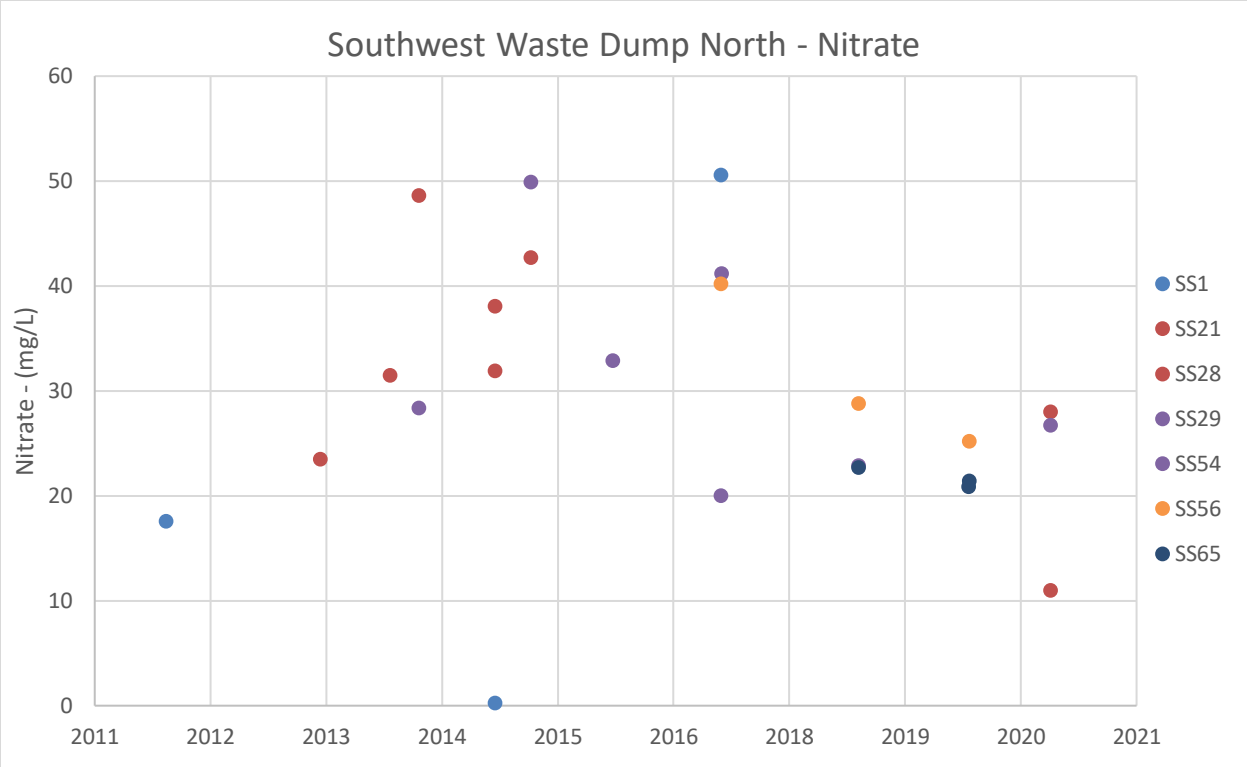


Figure 7-10: Southwest Waste Dump North Nitrate

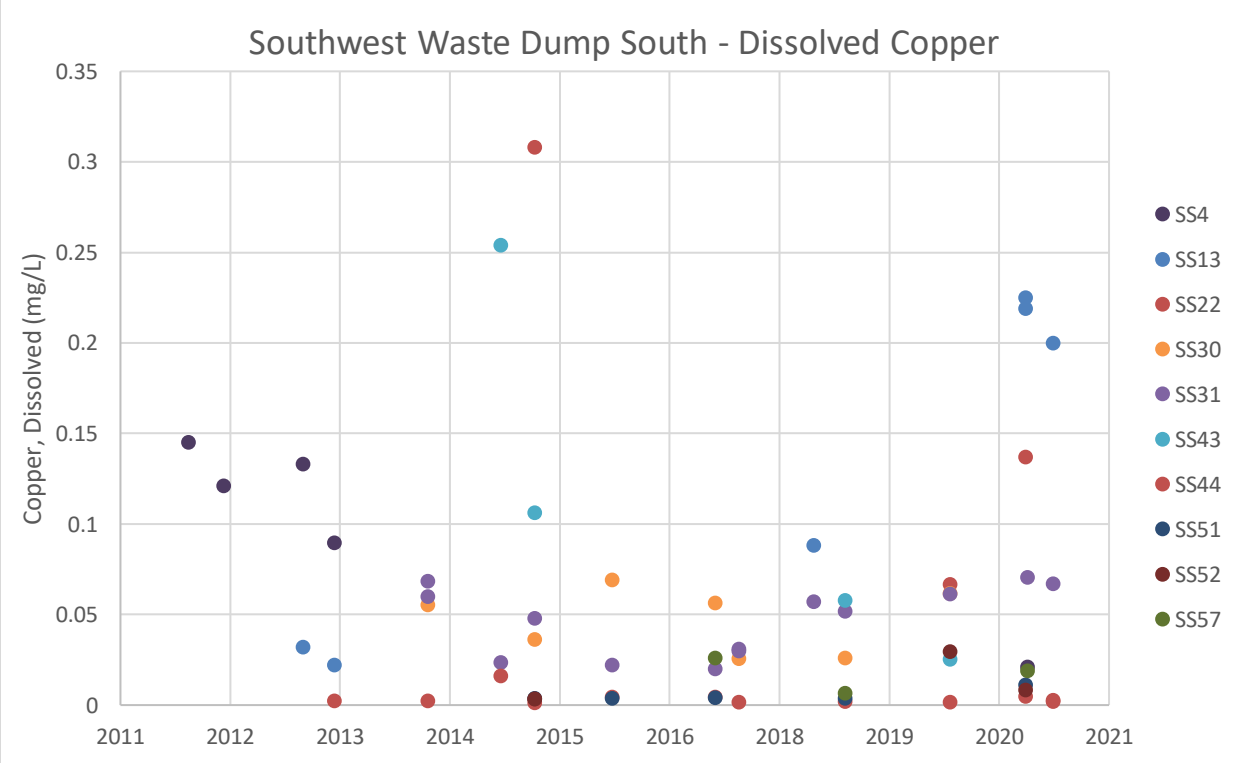


Figure 7-11: Southwest Waste Dump South Dissolved Copper

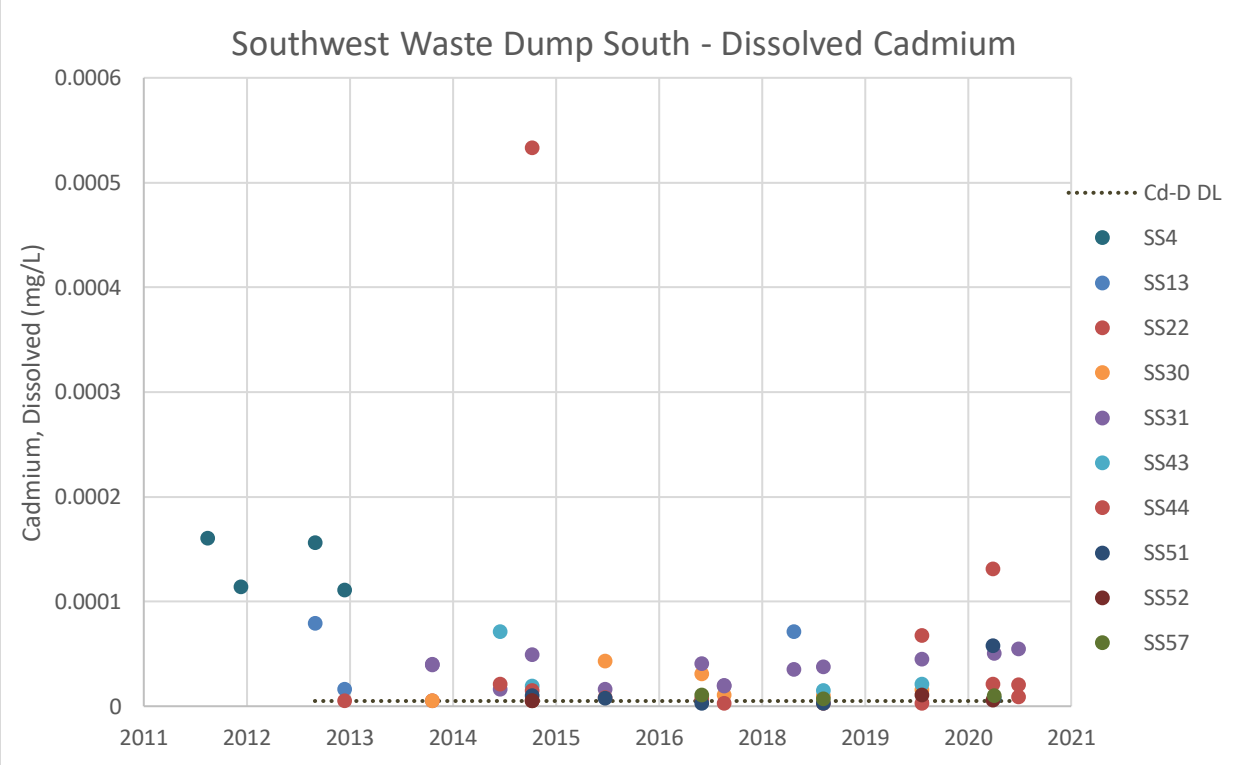


Figure 7-12: Southwest Waste Dump South Dissolved Cadmium

DL is Analytical Detection Limit

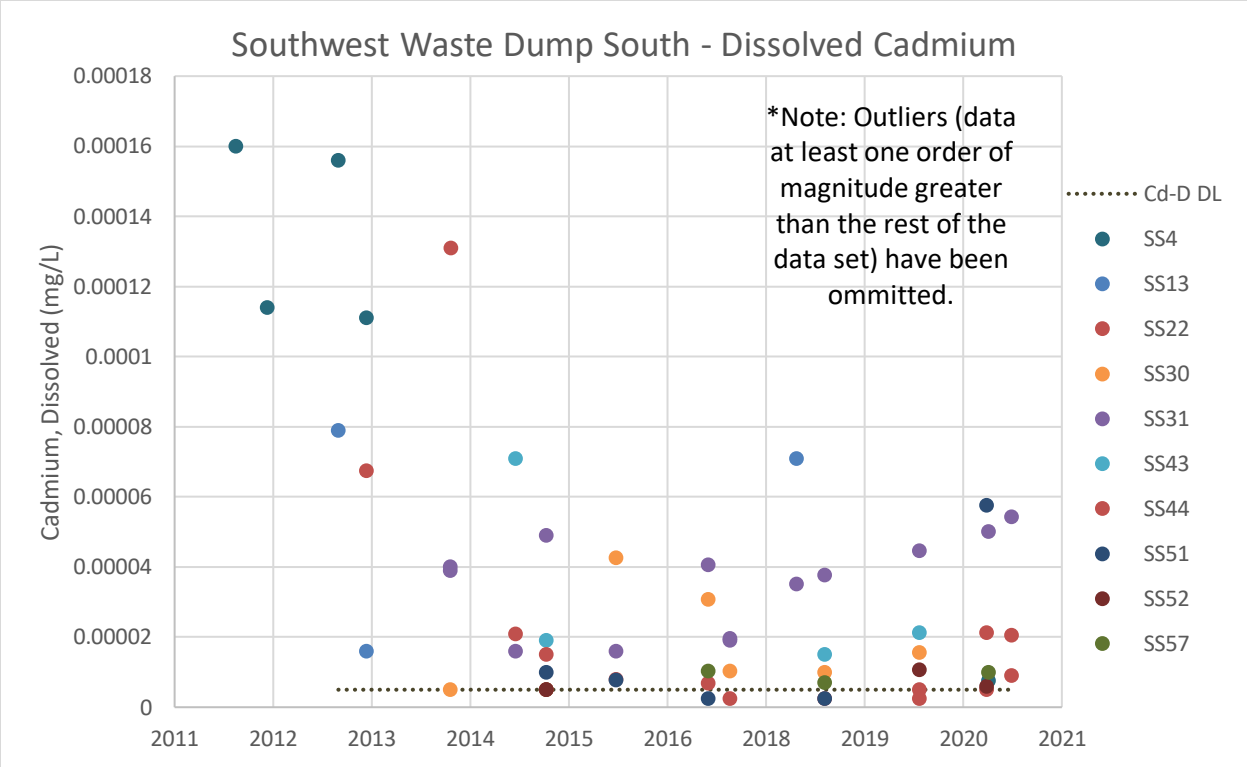


Figure 7-13: Southwest Waste Dump South Dissolved Cadmium, Outliers Removed
DL is Analytical Detection Limit

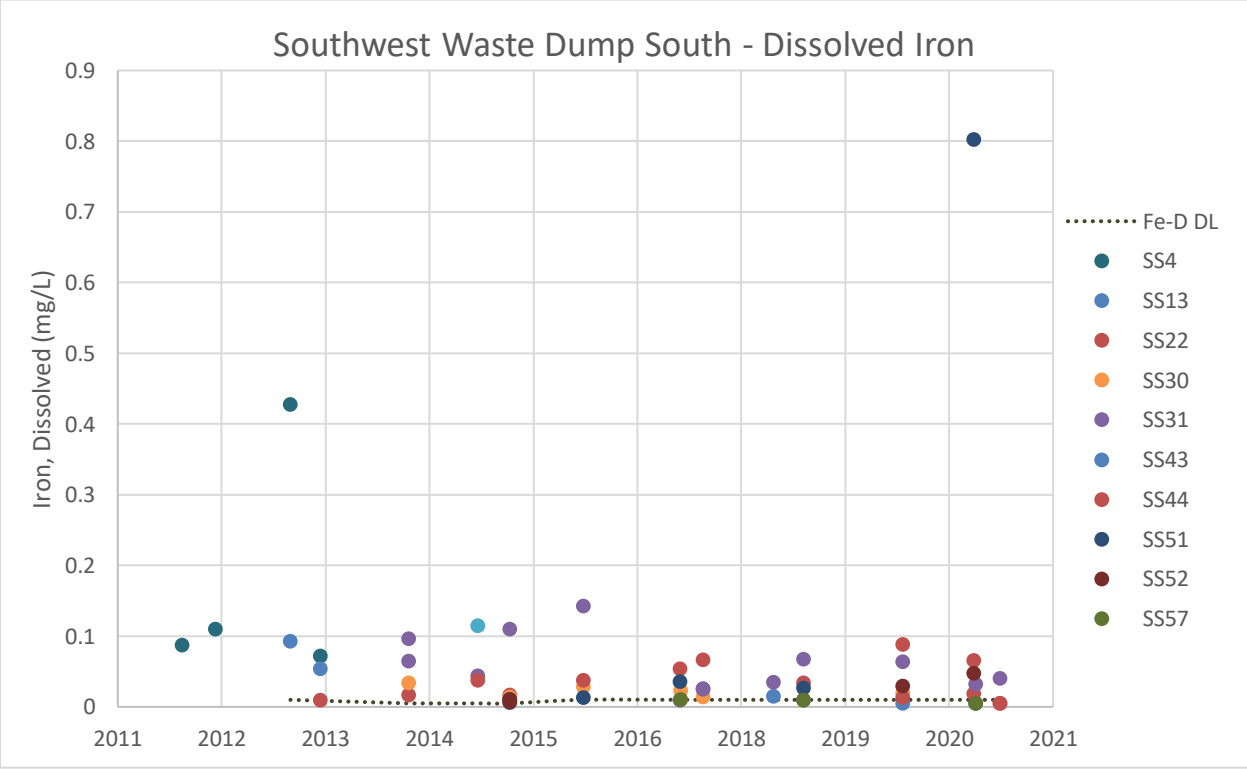


Figure 7-14: Southwest Waste Dump South Dissolved Iron

DL is Analytical Detection Limit

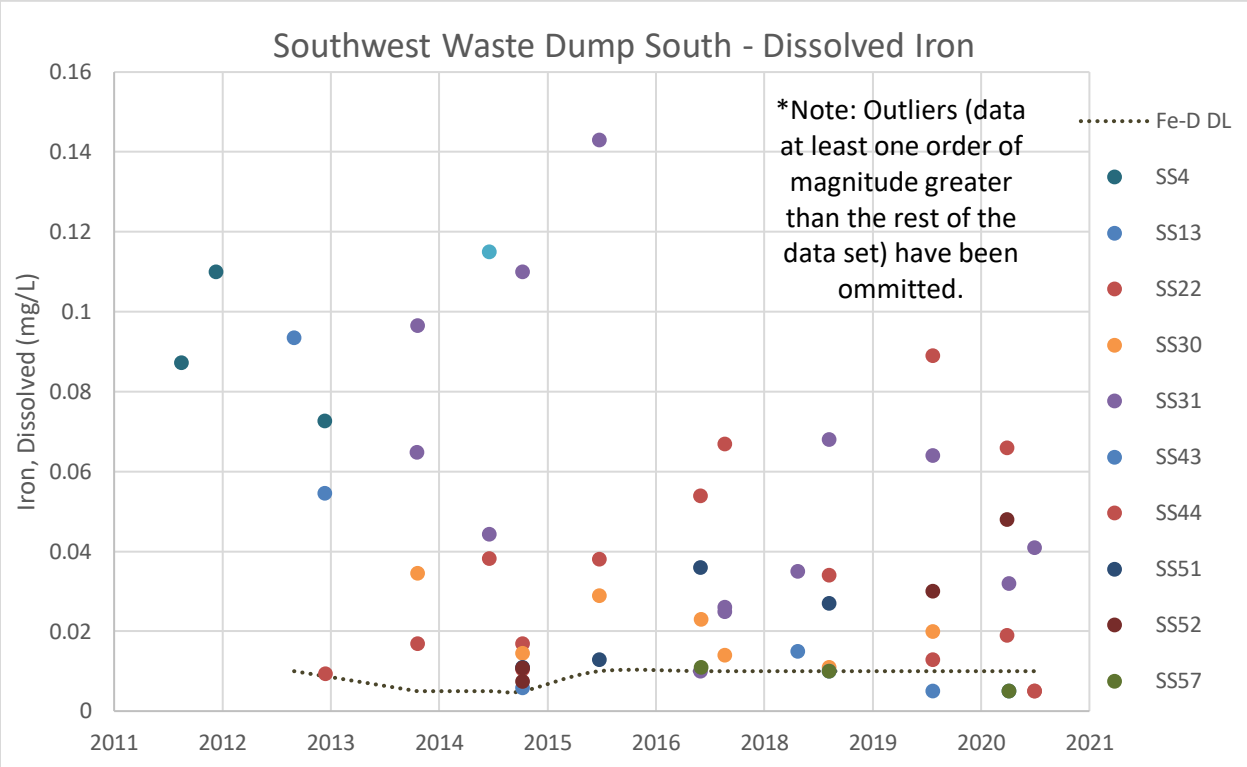


Figure 7-15: Southwest Waste Dump South Dissolved Iron, Outliers Removed

DL is Analytical Detection Limit

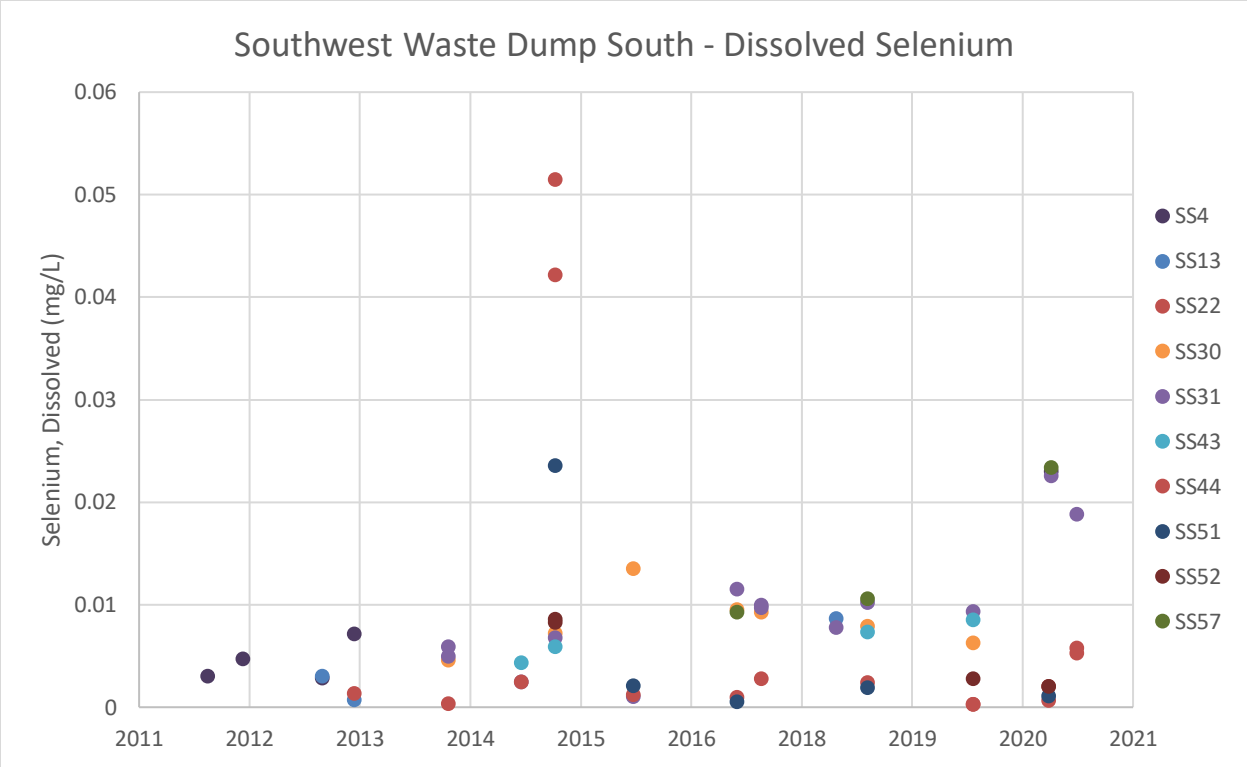


Figure 7-16: Southwest Waste Dump South Dissolved Selenium

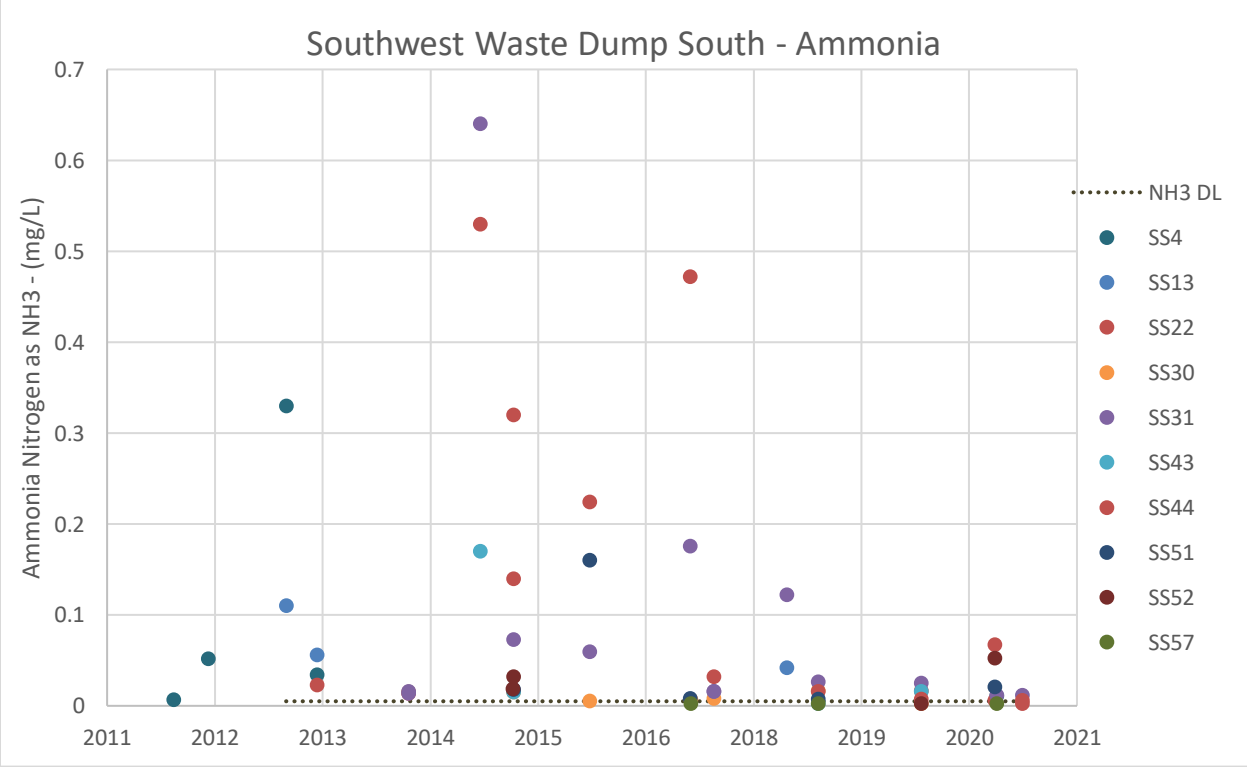


Figure 7-17: Southwest Waste Dump South Ammonia

DL is Analytical Detection Limit

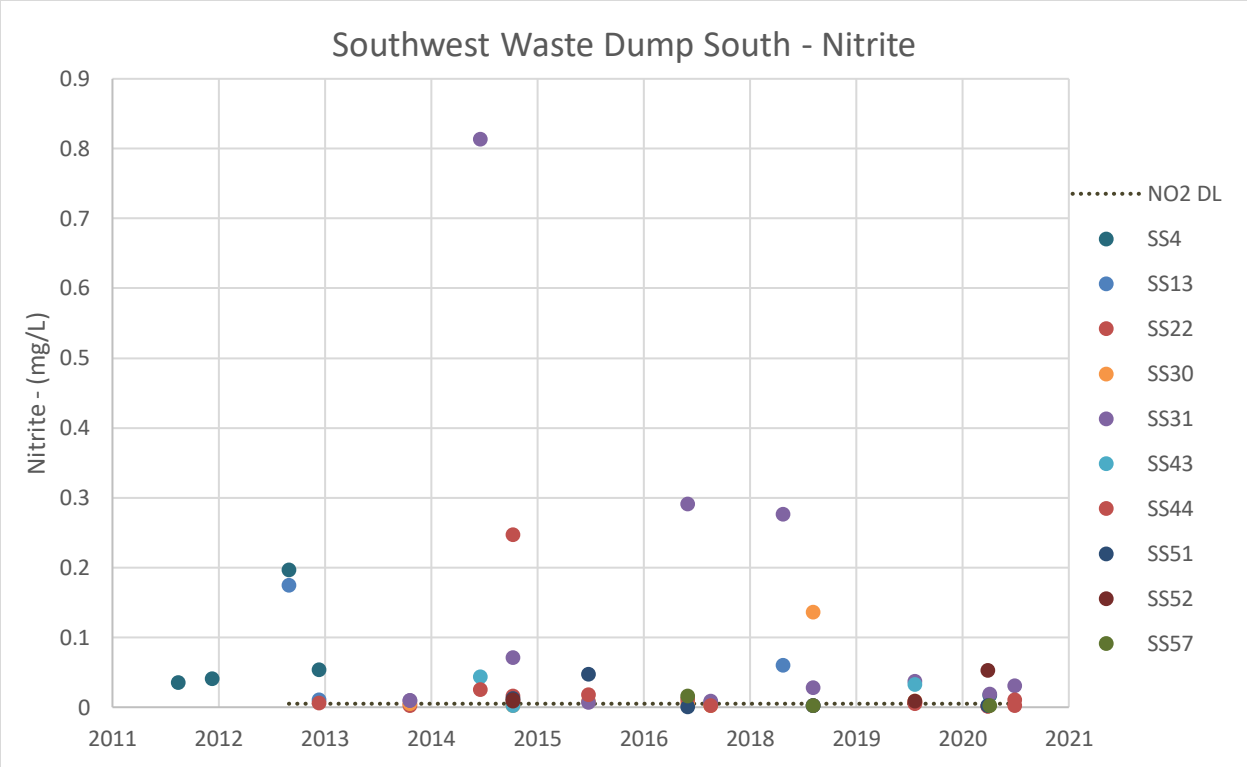


Figure 7-18: Southwest Waste Dump South Nitrite

DL is Analytical Detection Limit

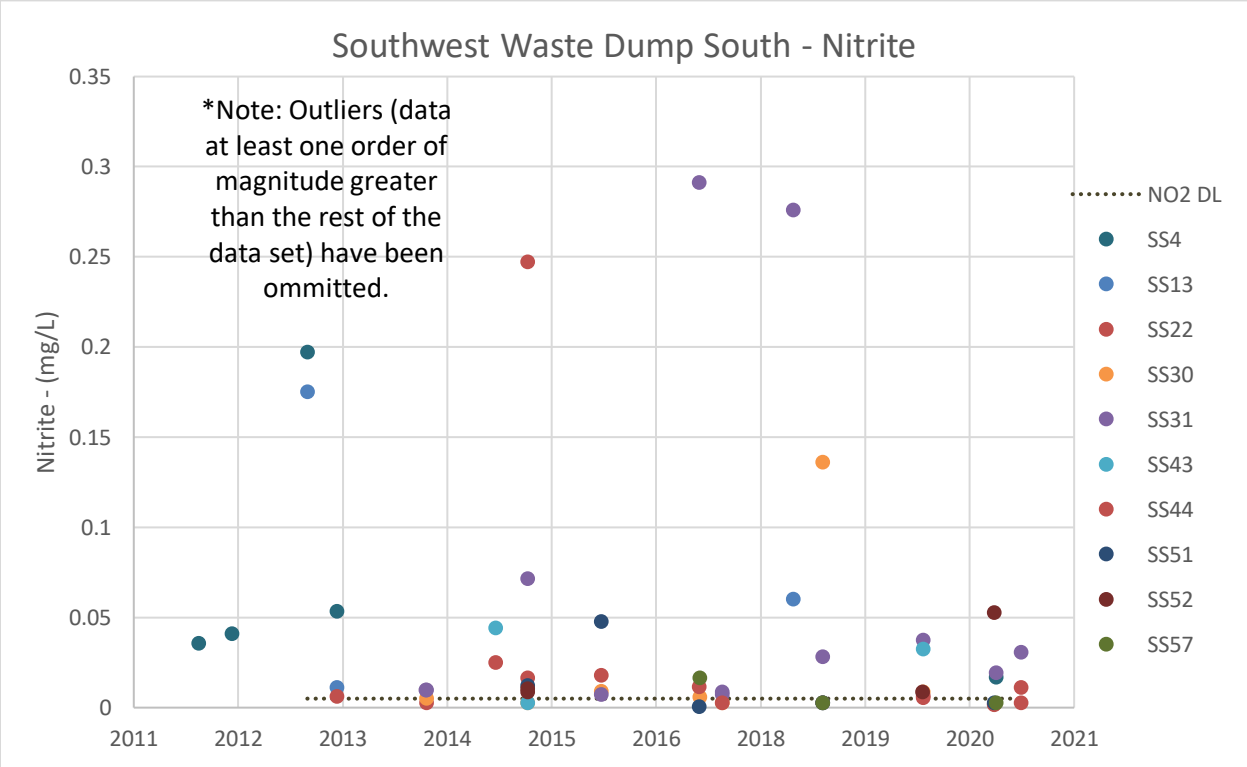


Figure 7-19: Southwest Waste Dump South Nitrite, Outliers Removed

DL is Analytical Detection Limit

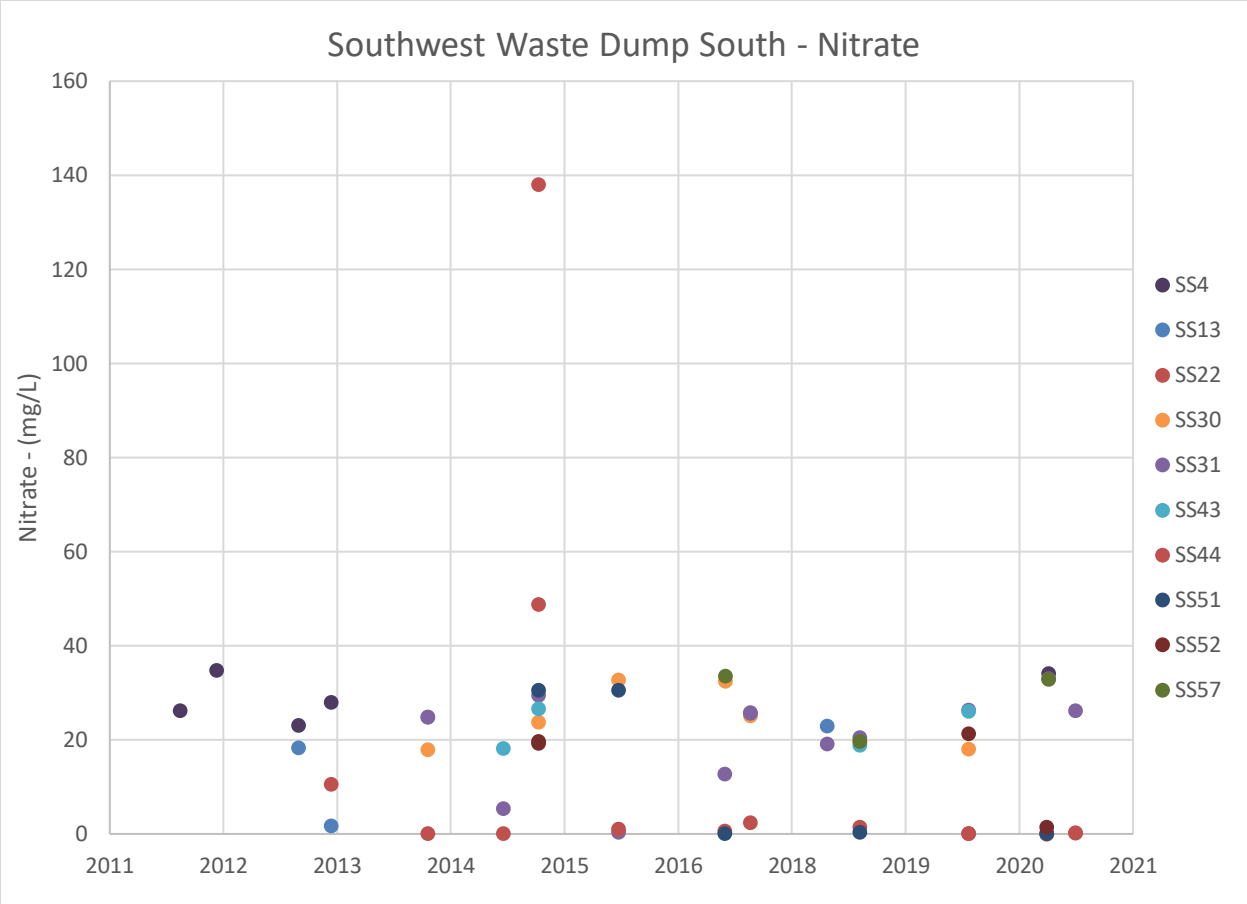


Figure 7-20: Southwest Waste Dump South Nitrate

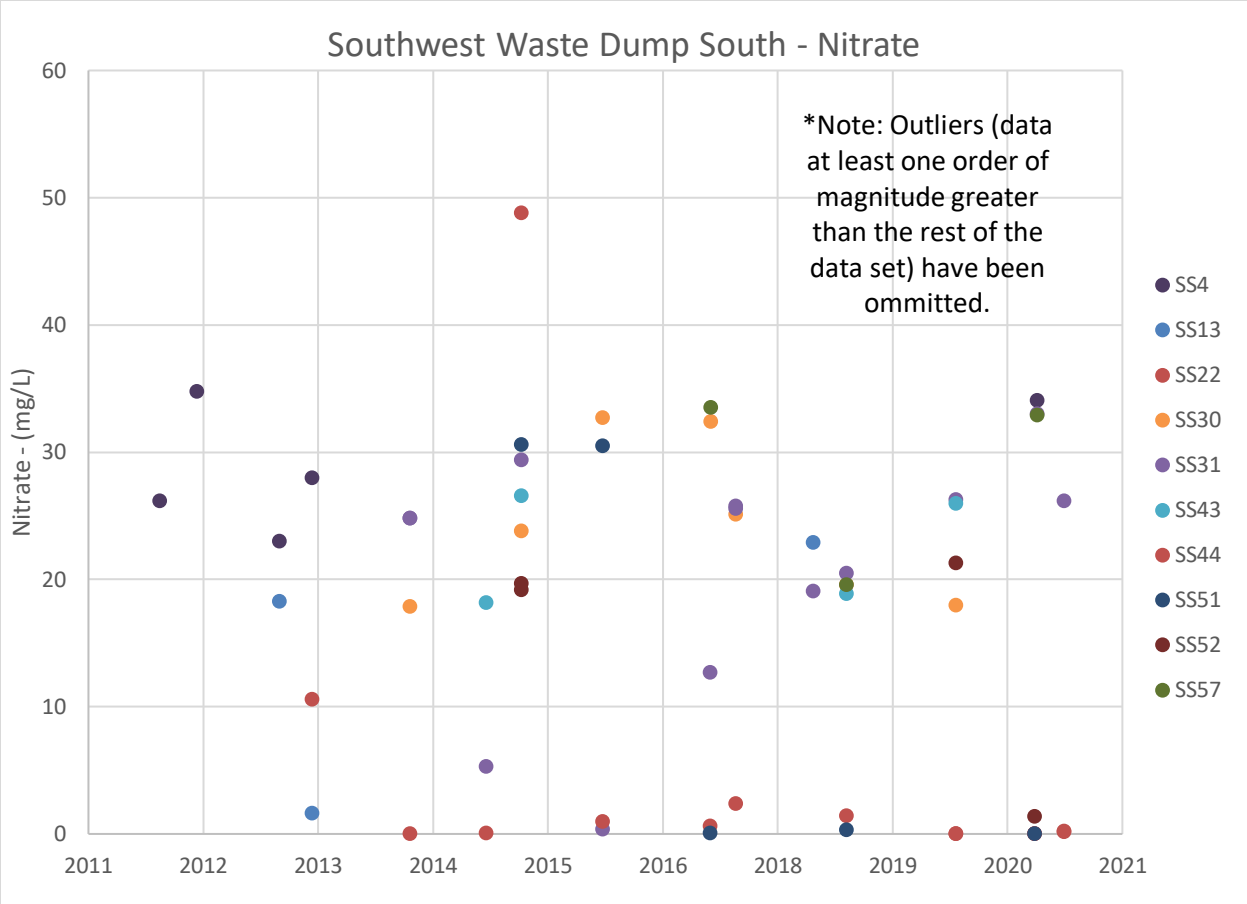


Figure 7-21: Southwest Waste Dump South Nitrate, Outliers Removed

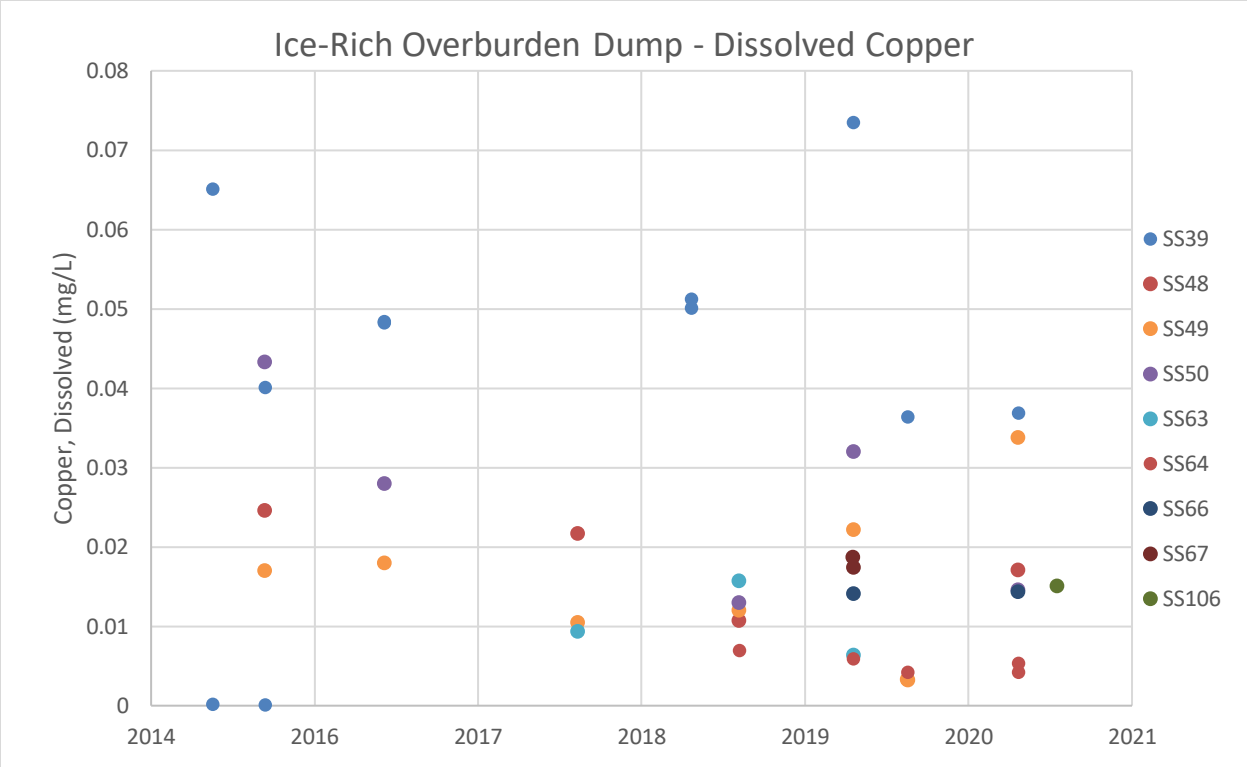


Figure 7-22: Ice-Rich Overburden Dump Dissolved Copper

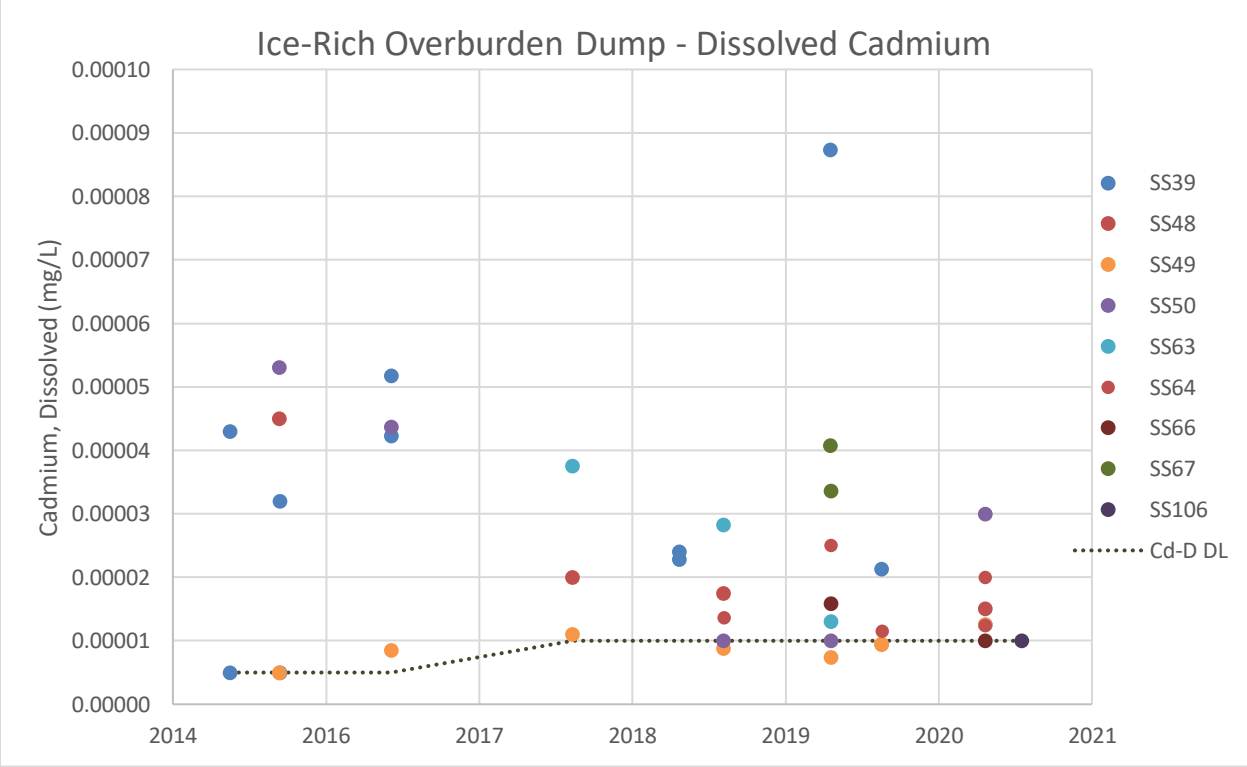


Figure 7-23: Ice-Rich Overburden Dump Dissolved Cadmium

DL is Analytical Detection Limit

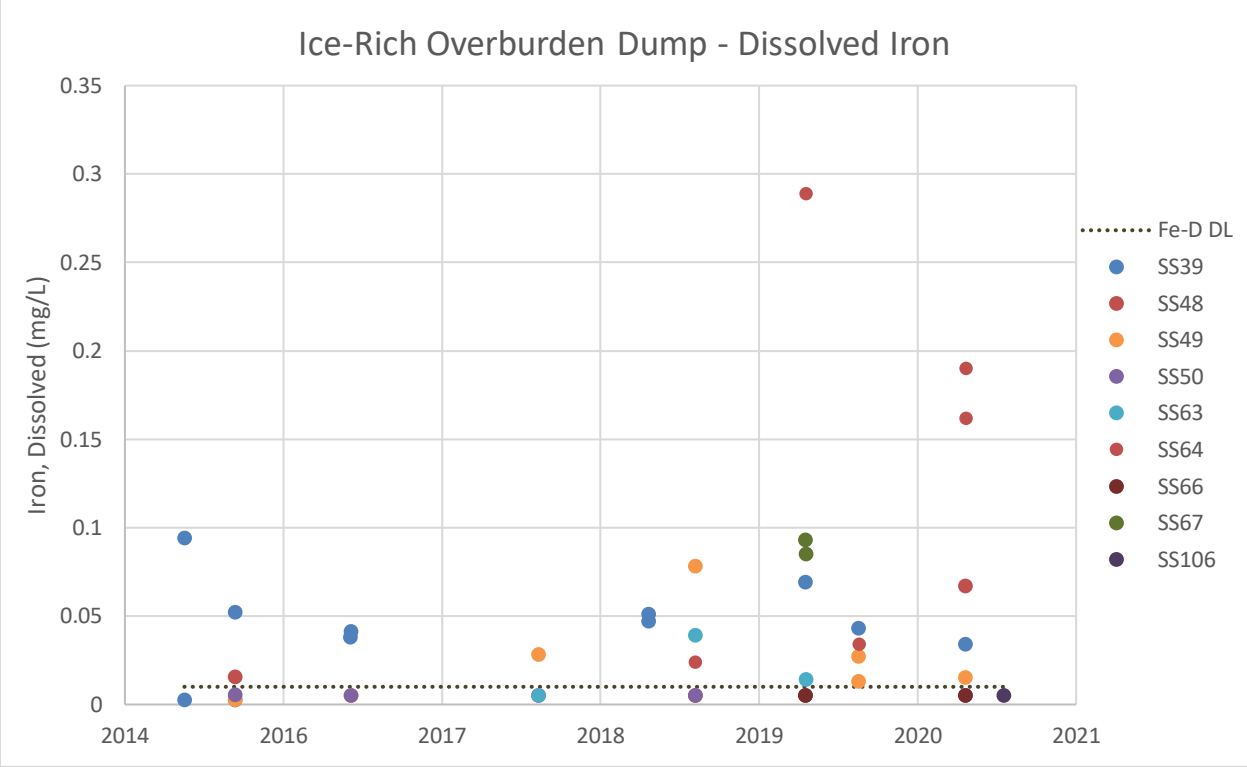


Figure 7-24: Ice-Rich Overburden Dump Dissolved Iron

DL is Analytical Detection Limit

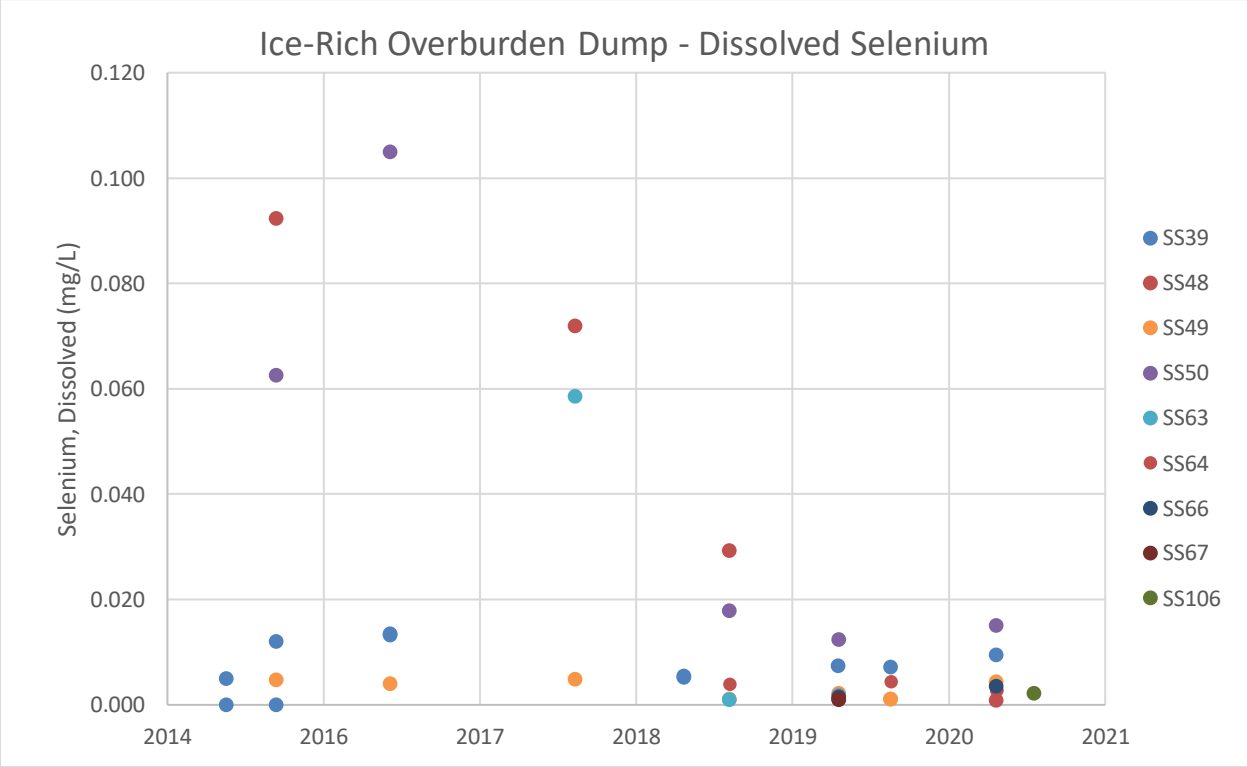


Figure 7-25: Ice-Rich Overburden Dump Dissolved Selenium

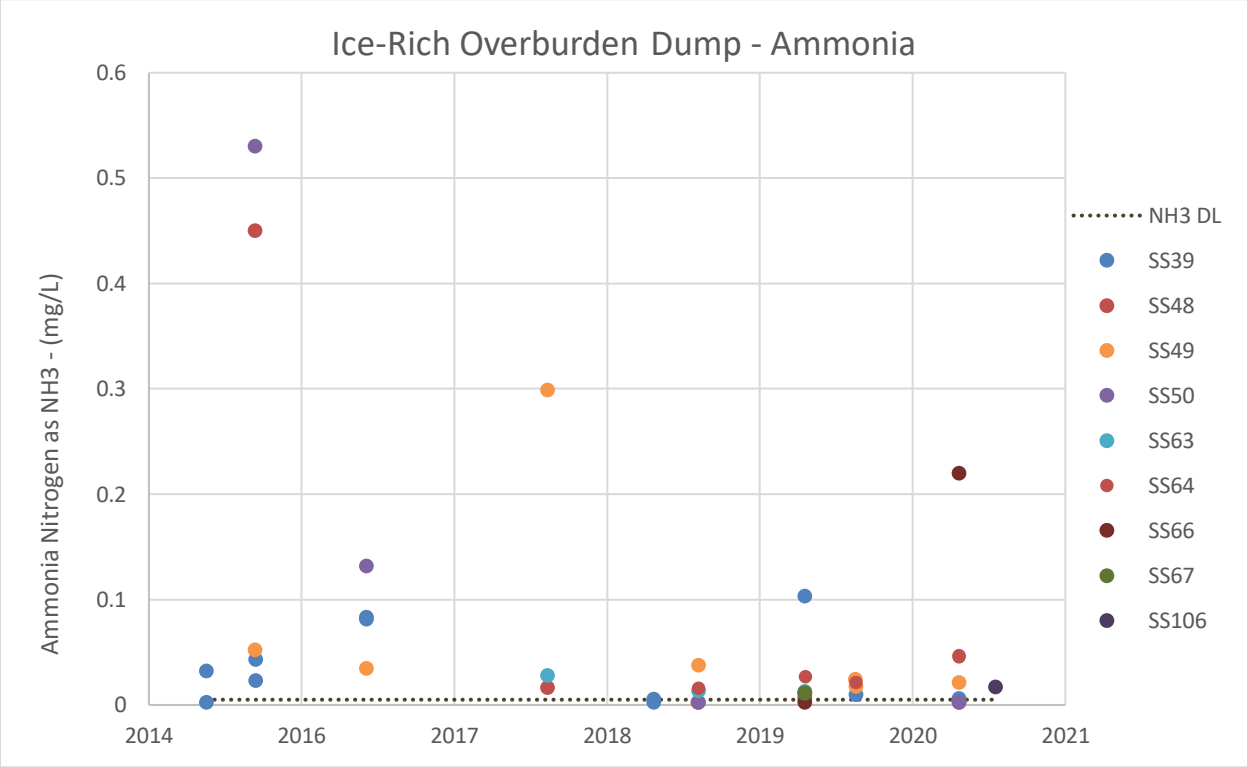


Figure 7-26: Ice-Rich Overburden Dump Dissolved Ammonia

DL is Analytical Detection Limit

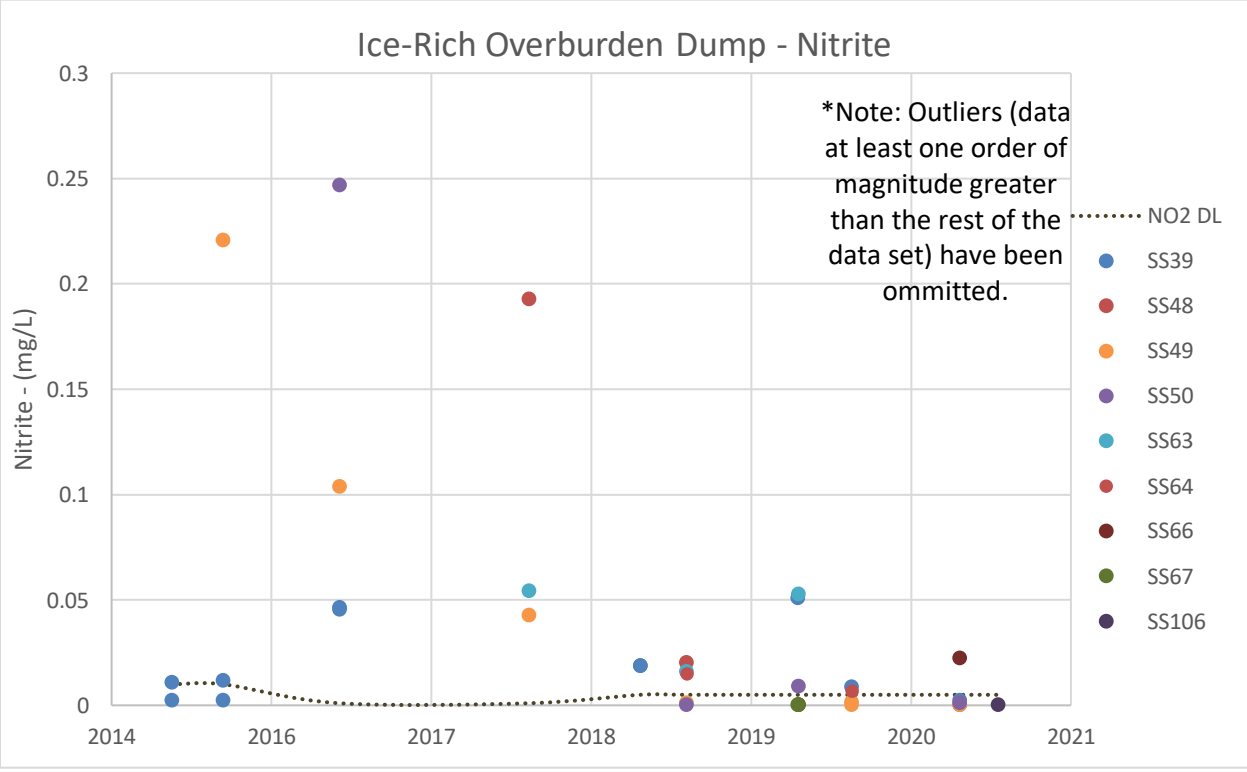


Figure 7-27: Ice-Rich Overburden Dump Dissolved Nitrite, Outliers Removed
DL is Analytical Detection Limit

7.2 Reclamation Overburden Dump (ROD)

In the 2017 Seepage Monitoring Survey, no water samples were collected from sites SS2, SS3, SS11, SS14, and SS15. All sites along the ROD were observed to be dry during the 2014, 2015, 2016 and 2017 surveys. The survey here was proposed to be canceled and therefore, in 2018 and 2019 the ROD was not surveyed.

The ROD was surveyed in the fall of 2020 to confirm the absence of seeps. No seeps were discovered, and this area will not be surveyed until further reclamation work is completed.

7.3 Main Waste Dump

No recurring seeps in the Main Waste Dump (MWD) area were observed during the 2020 seepage surveys. Only two seeps have been identified in this area since 2013. The first, SS12, was last recorded flowing in 2015 and the second, SS102, was sampled twice during September 2018 and once in September 2019. Due to the limited dataset, and the lack of any new seeps, historical data for the MWD will not be presented in this report. Minto staff will continue to monitor the area for seepage in future surveys.

7.4 Main Pit and SAT Dump

While no seeps in the Main Pit and SAT Dump (MPSD) area had been identified in previous seepage surveys, two new seeps were identified in 2020. SS107 is located along the south-facing toe of the southern end of the MPSD and was sampled in the spring, and SS109, sampled in the fall, is located mid-way up the western edge of the MPSD, seeping from the toe of an east-facing bench. As there is no historic data to compare, results for SS107 and SS109 are displayed in Table 7-1, below.

Table 7-1: Main Pit and SAT Dump Seeps, 2020

Station	SS107	SS109
Sample Date	12-Jun-20	8-Sep-20

Dissolved Metals (mg/L)		
Cu-D	0.0317	0.185
Cd-D	<0.000025	0.000248
Fe-D	<0.01	<0.01
Se-D	0.0124	0.0564
Nutrients (mg/L)		
N-NH3	0.0598	0.0312
N-NO2	0.413	0.0075
N-NO3	5.27	22.7

7.5 Minto North

Only one recurring seep, SS101, has been observed in the Minto North area. SS101 occurs along the northern edge of the Minto North haul road and was monitored frequently throughout the non-frozen months in order to better understand the potential relationship between seepage from the road and local groundwater. Although it was checked frequently, it was only discovered flowing on one occasion in May 2020. The results of this sample are presented with historic water quality results for dissolved copper, dissolved cadmium, dissolved iron, dissolved selenium, and nutrient levels for ammonia, nitrite, and nitrate in Table 7-2 below.

Table 7-2: Minto North Seepage, 2018-2020

Station	**SS101**			
Sample Date	19-May-18	24-May-19	24-May-19	25-May-20
Dissolved Metals (mg/L)				
Cu-D	0.00962	0.00674	0.00631	0.00883
Cd-D	<0.000005	<0.000005	<0.000005	<0.000005
Fe-D	0.047	<0.024	0.005	0.017
Se-D	0.000103	0.00025	0.000203	0.000157
Nutrients (mg/L)				
N-NH3	0.0128	0.0063	0.0064	0.0056
N-NO2	0.0085	0.0361	0.0276	0.04

N-NO3	0.205	4.08	4.45	1.88

7.6 Pit Walls

Seepage monitoring could not be conducted at the pit walls of the Main Pit, Area 2 Pit, and Minto North Pit; all pits were too unsafe to access during the 2020 surveys due to geotechnical instability. Records were taken for each pit where seeps were observable from a distance.

7.7 Ridgetop Road

A survey was conducted along the bottom toe of the Ridgetop Road, at the top of which is the ore transfer pad where ore is deposited from underground before being transported to the crusher pad. Seeps in this area are monitored to ensure that leachates from the ore are not impacting neighbouring stream which flows into a downstream collection point where it is directed to the Water Storage Pond if it meets effluent standards. No new seeps were identified in 2020, and only recurring site SS103 was found flowing during the spring survey. No seeps were found during the fall survey but the nearby WQS W33s was sampled monthly throughout the open-water season. The results for dissolved copper, dissolved cadmium, dissolved iron, dissolved selenium, and nutrient levels for ammonia, nitrite, and nitrate are displayed in Figure 7-28 through Figure 7-37 along with historical results of other sites within this area.

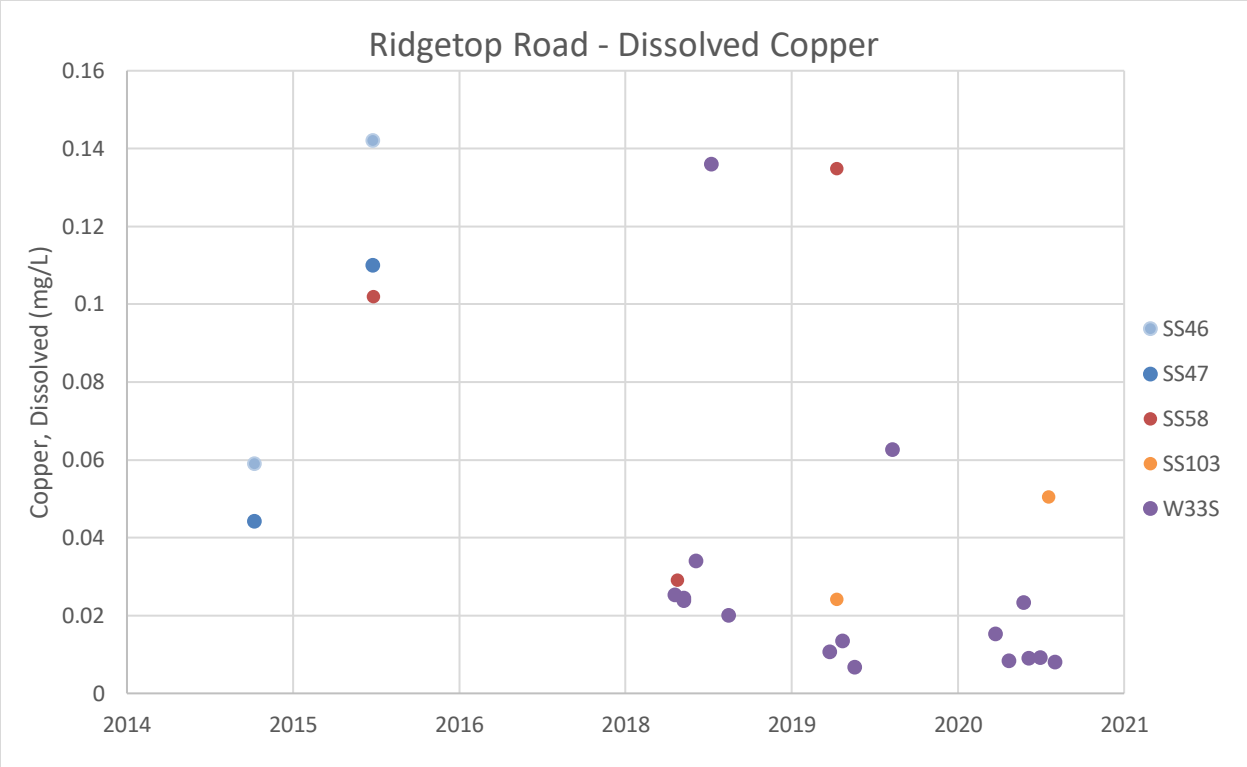


Figure 7-28: Ridgetop Road Sites - Dissolved Copper

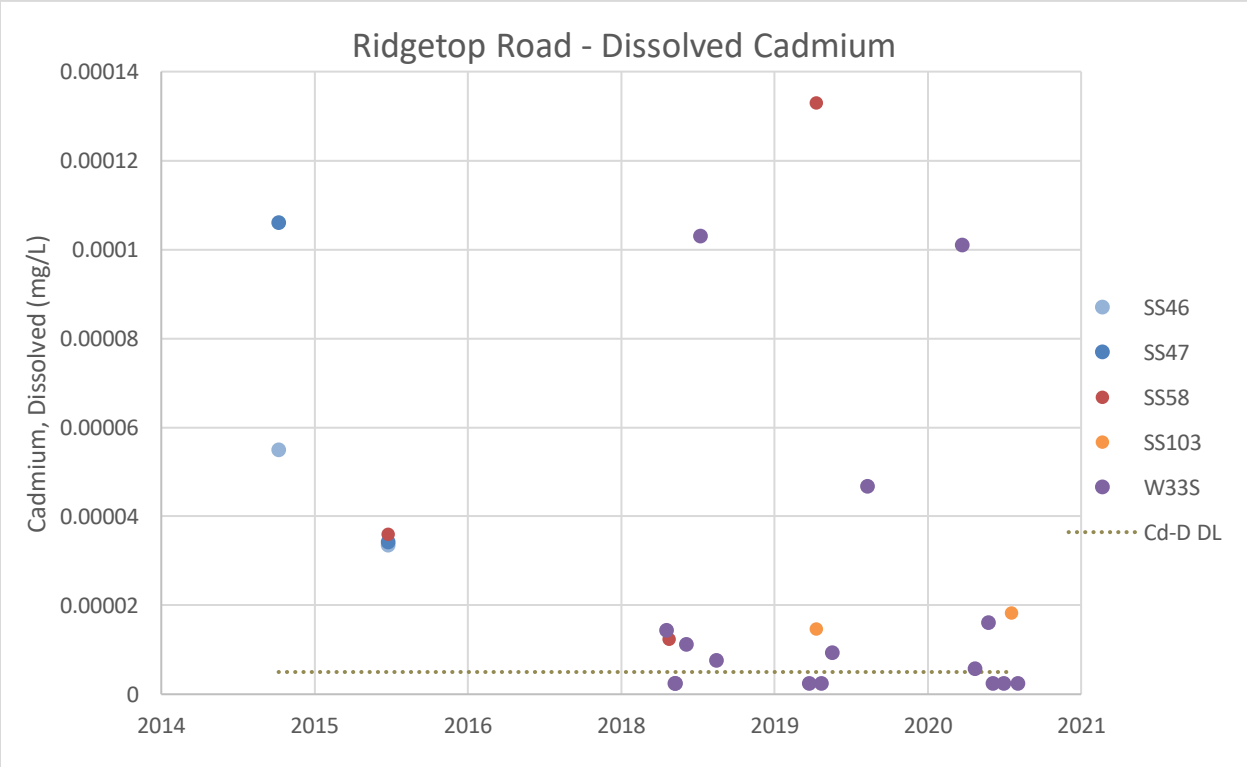


Figure 7-29: Ridgetop Road Sites - Dissolved Cadmium

DL is Analytical Detection Limit

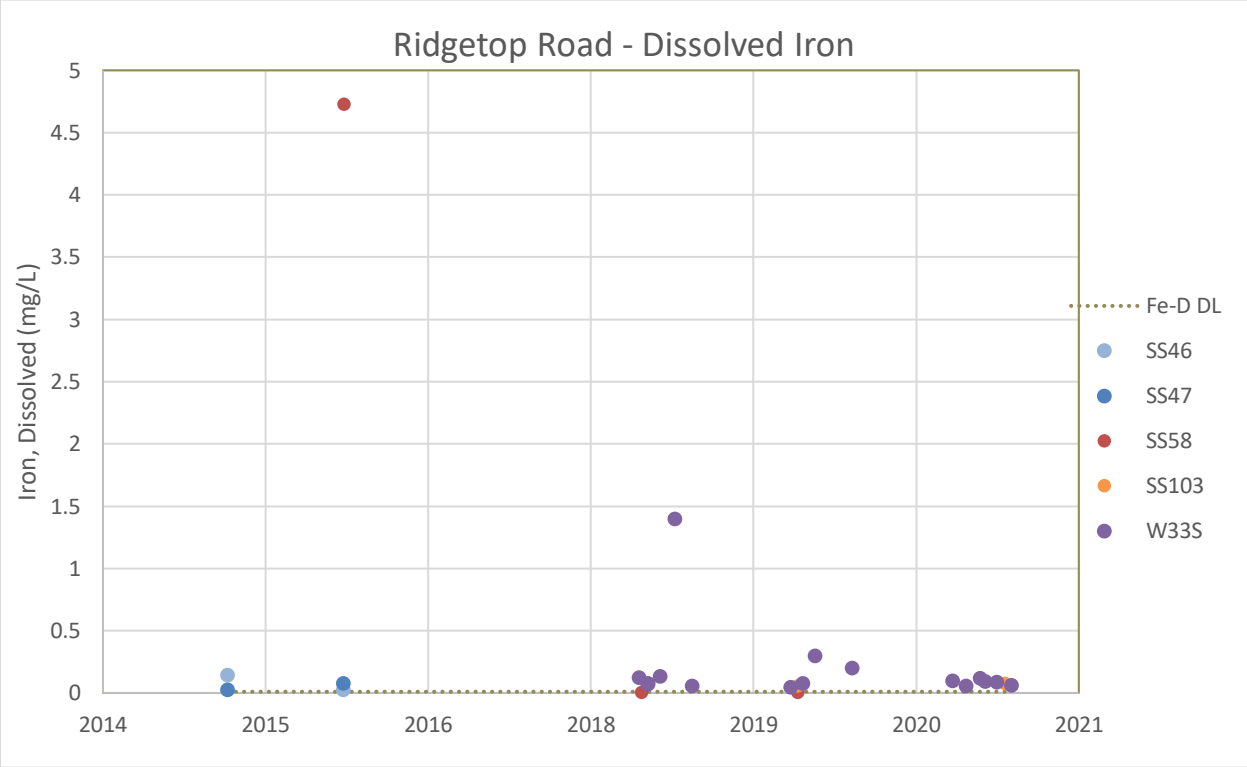


Figure 7-30: Ridgetop Road Sites - Dissolved Iron
DL is Analytical Detection Limit

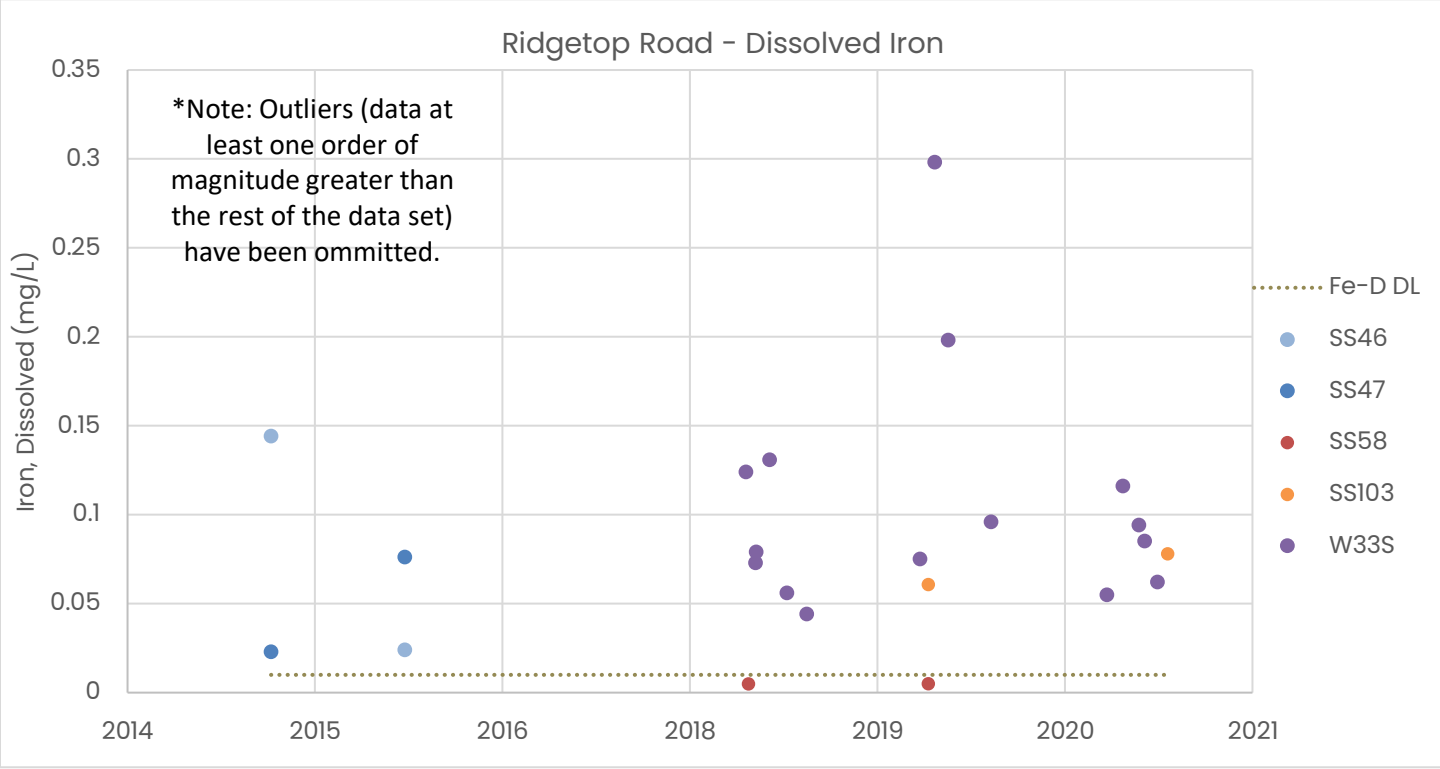


Figure 7-31: Ridgetop Road Sites - Dissolved Iron, Outliers Removed
DL is Analytical Detection Limit

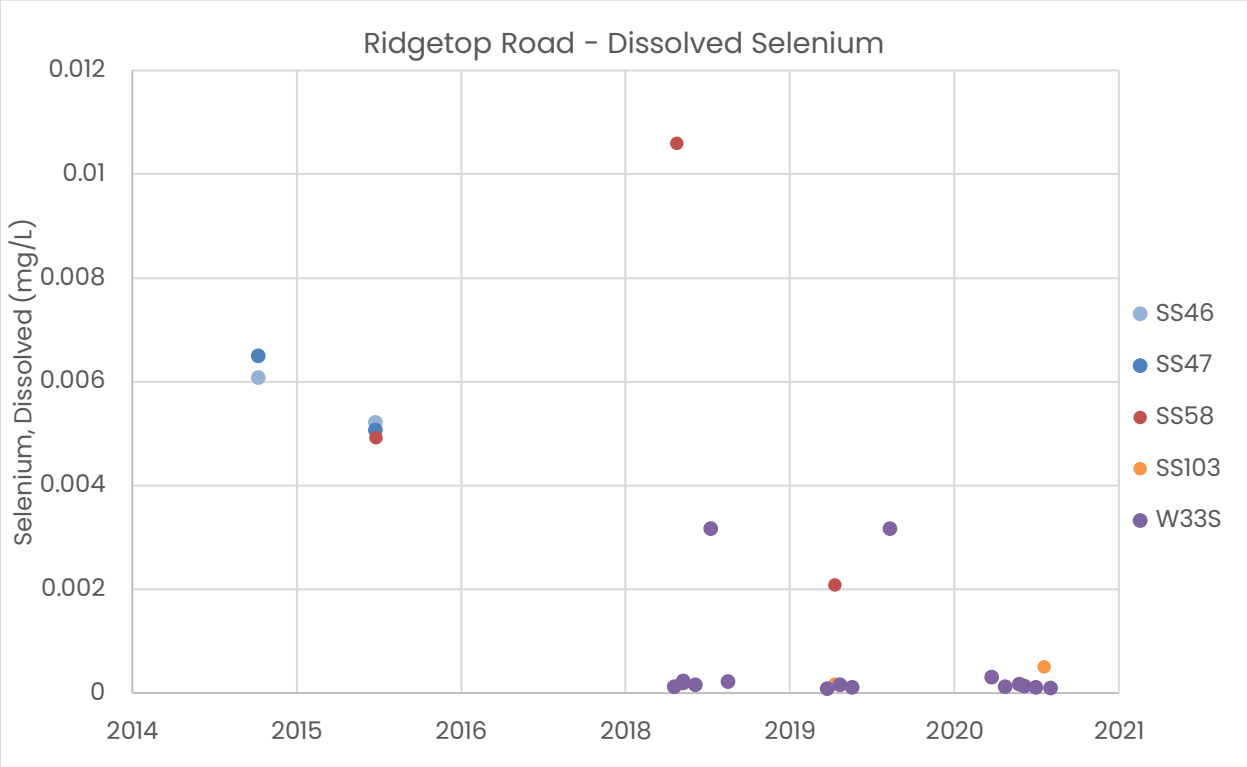


Figure 7-32: Ridgetop Road Sites - Dissolved Selenium

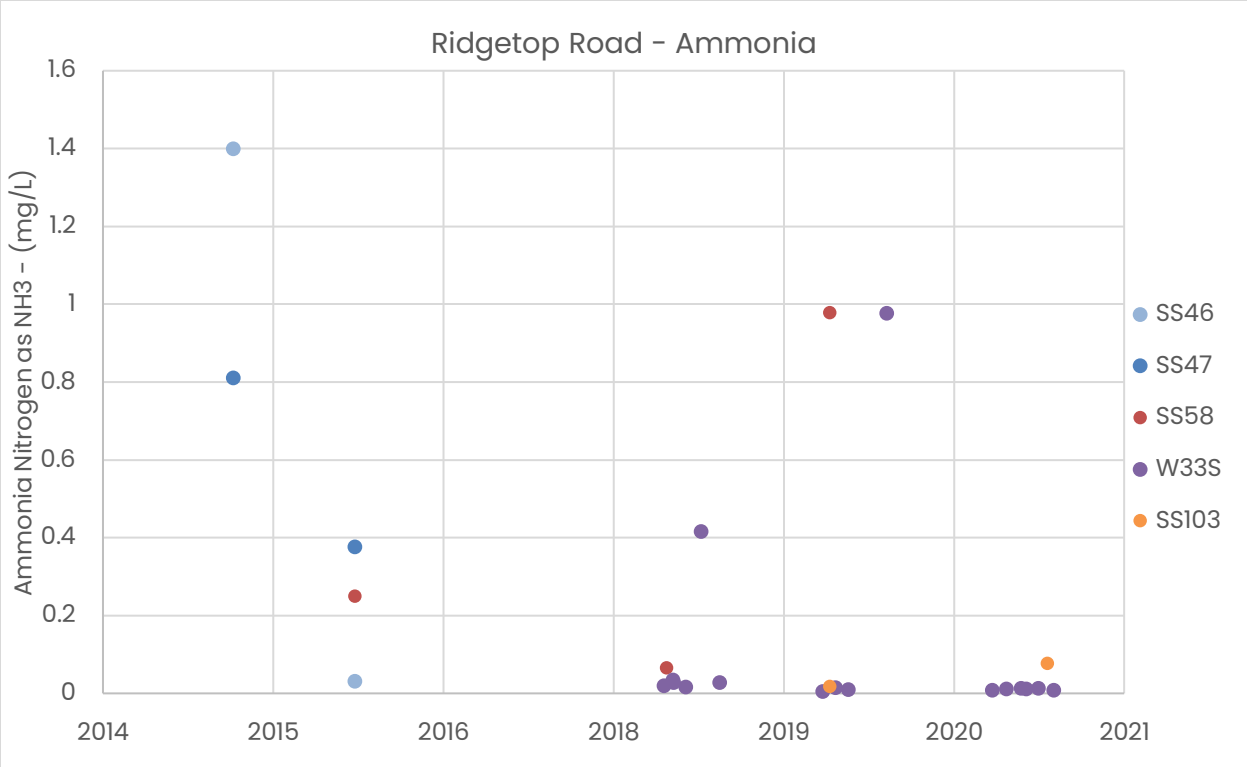


Figure 7-33: Ridgetop Road Sites – Ammonia

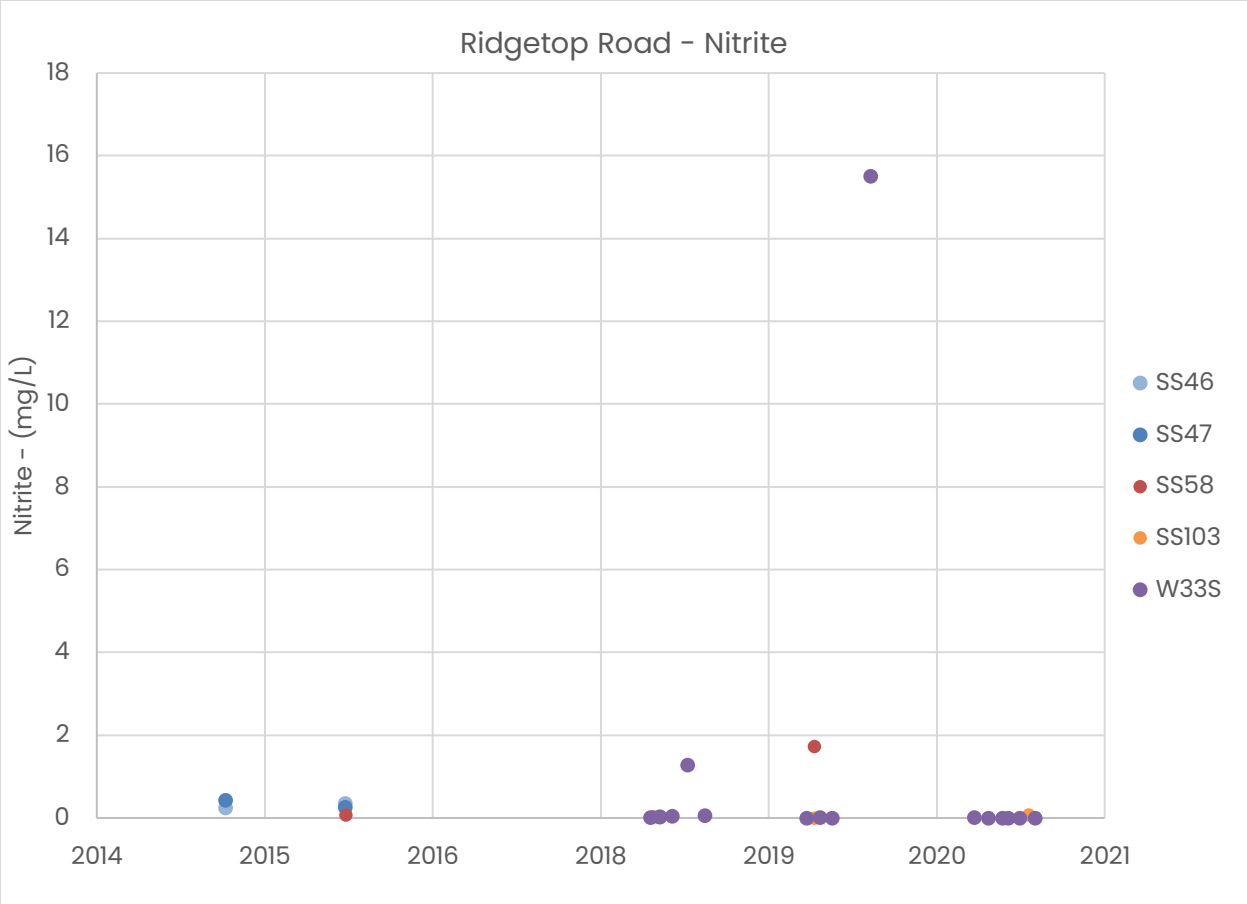


Figure 7-34: Ridgetop Road Site - Nitrite

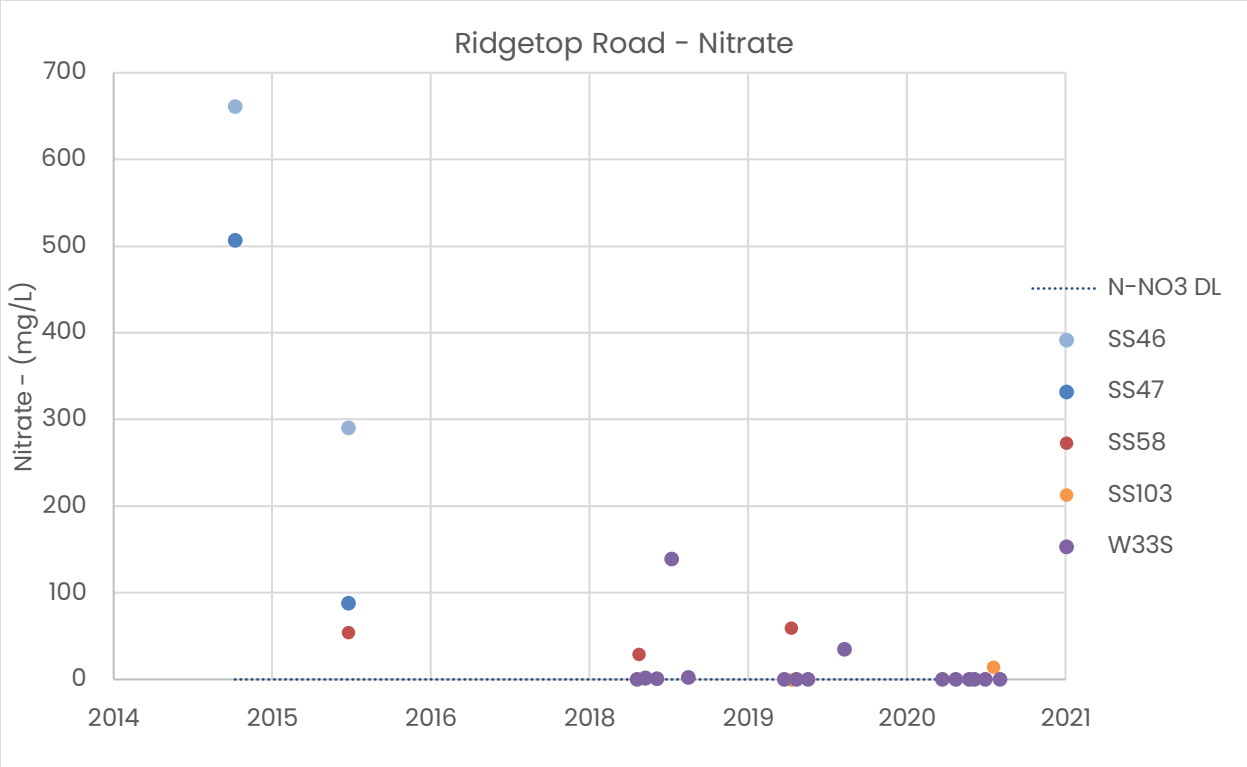


Figure 7-35: Ridgetop Road Sites - Nitrate

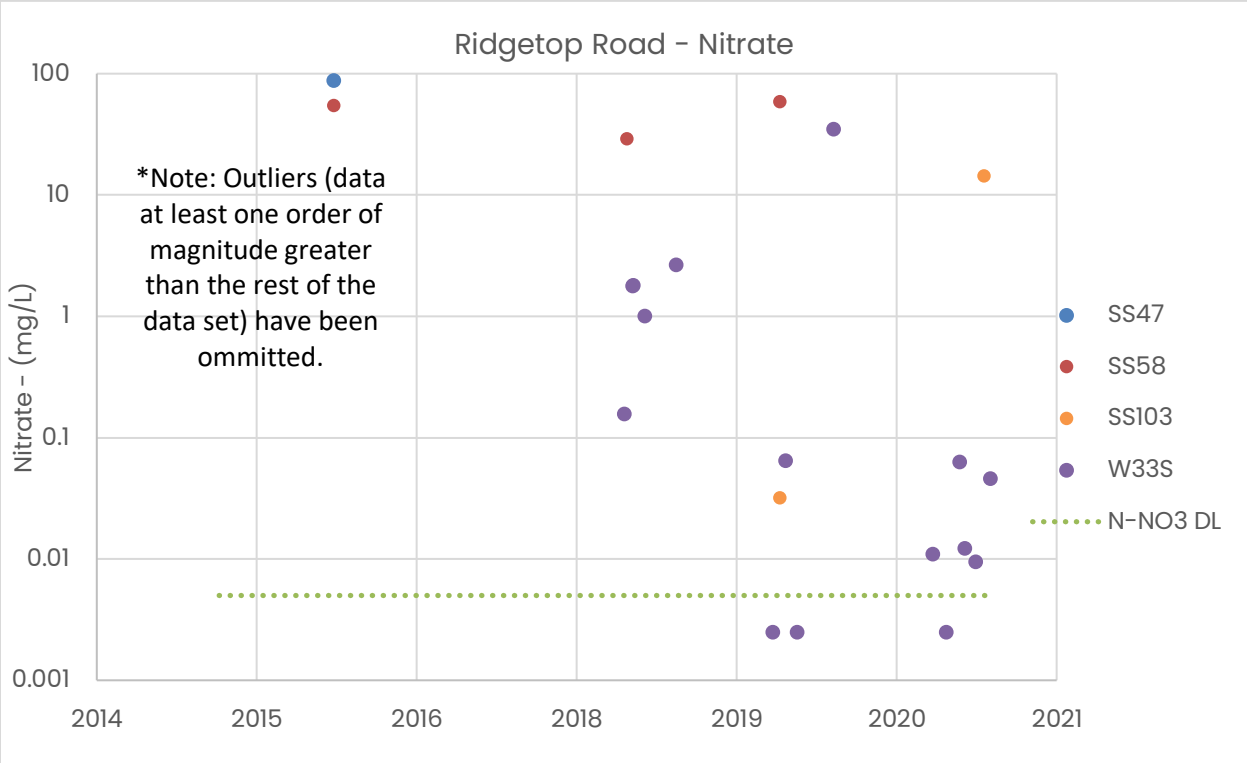


Figure 7-36: Ridgetop Road Sites – Nitrate, Outliers Removed

DL is Analytical Detection Limit

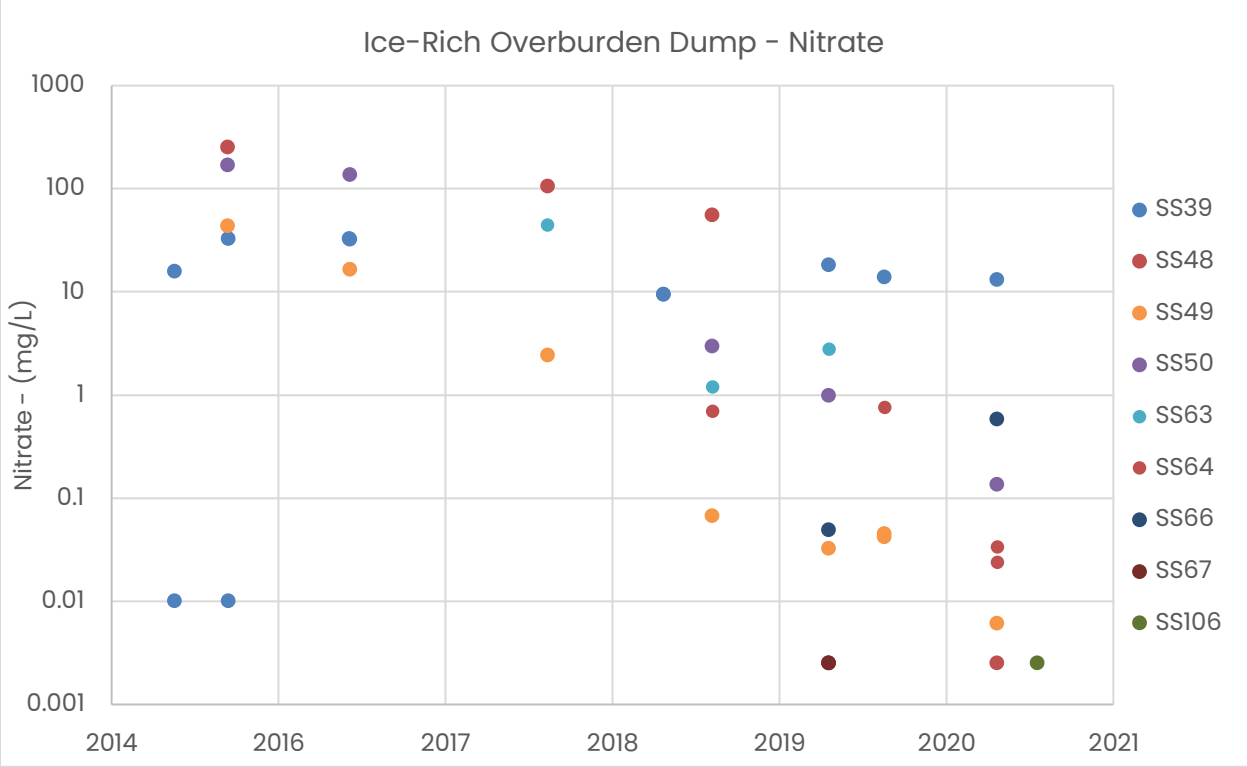


Figure 7-37: Ice-Rich Overburden Dump Dissolved Nitrate

7.8 Ore Stockpiles

Surface seepage runs along the toe of the west ore stockpile and into the ditch parallel to the heavy vehicle road. All seeps in this area drain into the west ore stockpile sump and are pumped to the Main pit. A new seep, SS105, was identified on the north-facing toe of the stockpile and work was completed to direct it into the existing sump. Recurring seeps at SS5, SS6, and SS7 were sampled in the spring and fall surveys, while SS8 and SS33 were only found flowing during the fall survey. Water quality results are outlined in Figure 7-38 through Figure 7-46 and include historic water quality results for dissolved copper, dissolved cadmium, dissolved iron, dissolved selenium, and nutrient levels for ammonia, nitrite, and nitrate.

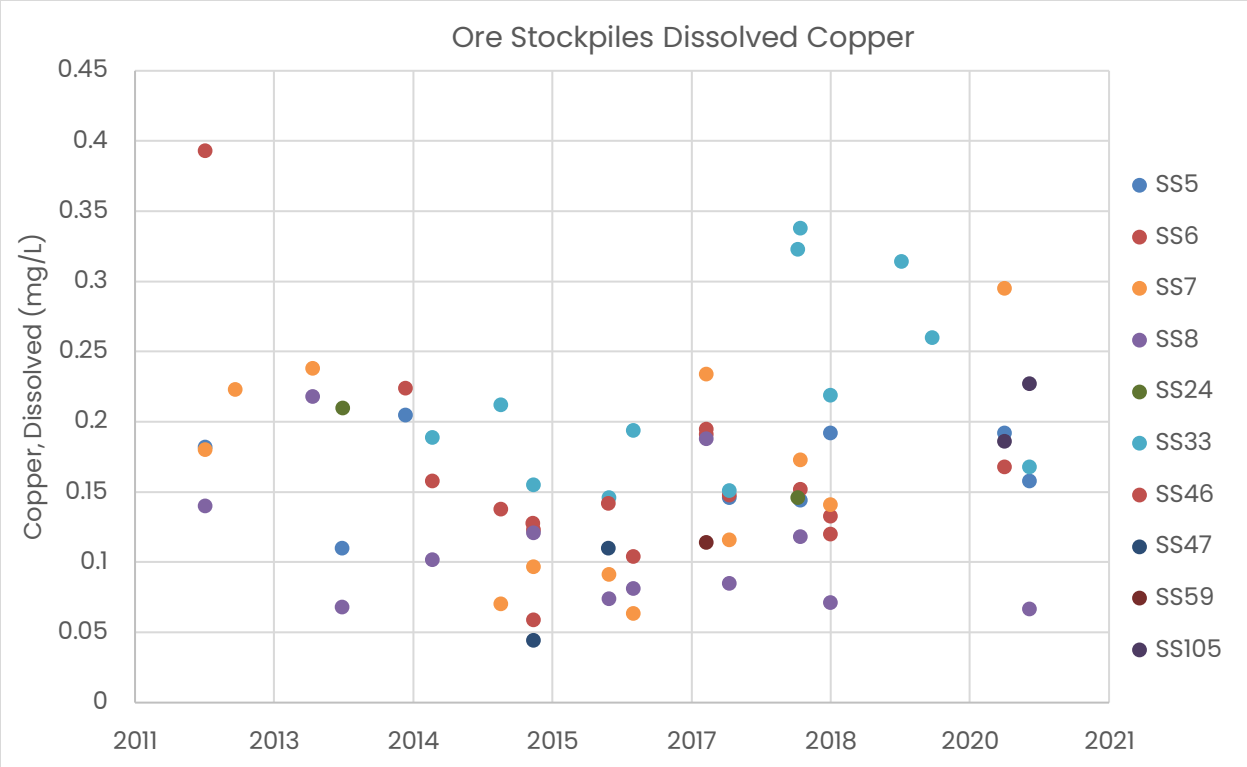


Figure 7-38: Ore Stockpile Sites - Dissolved Copper

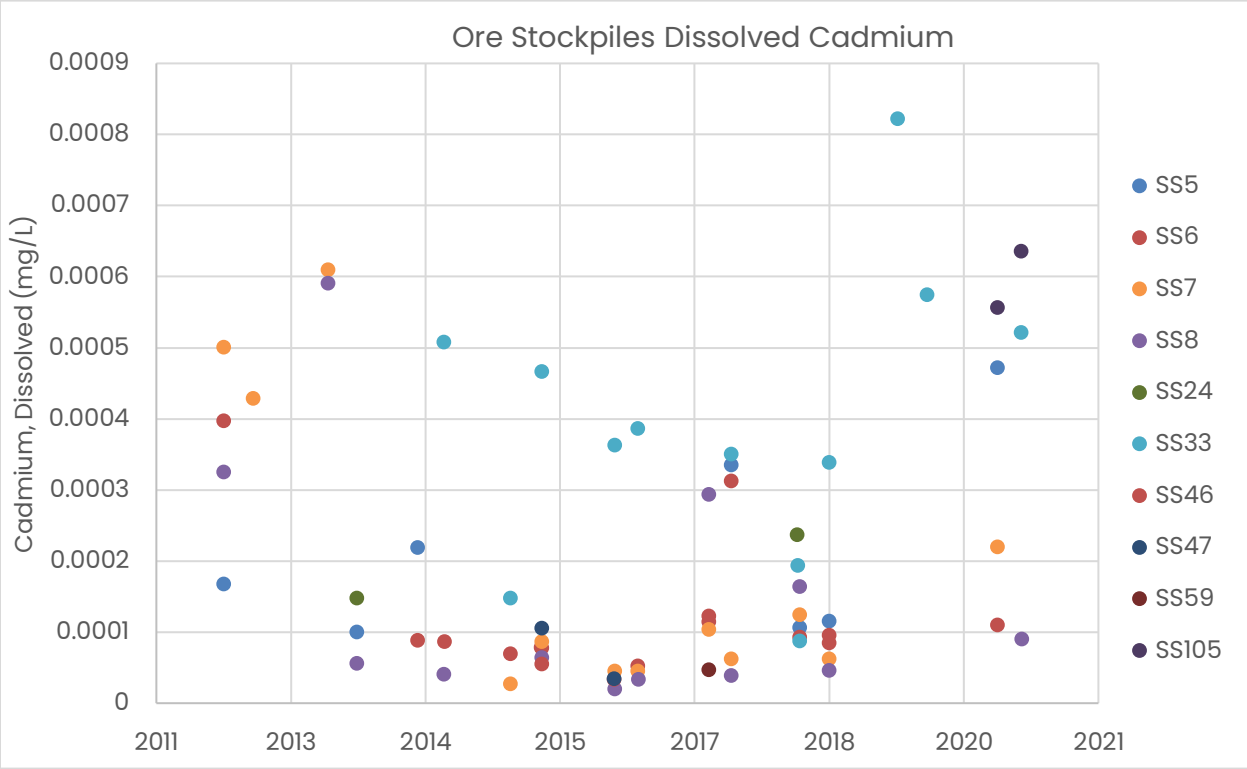


Figure 7-39: Ore Stockpile Sites - Dissolved Cadmium

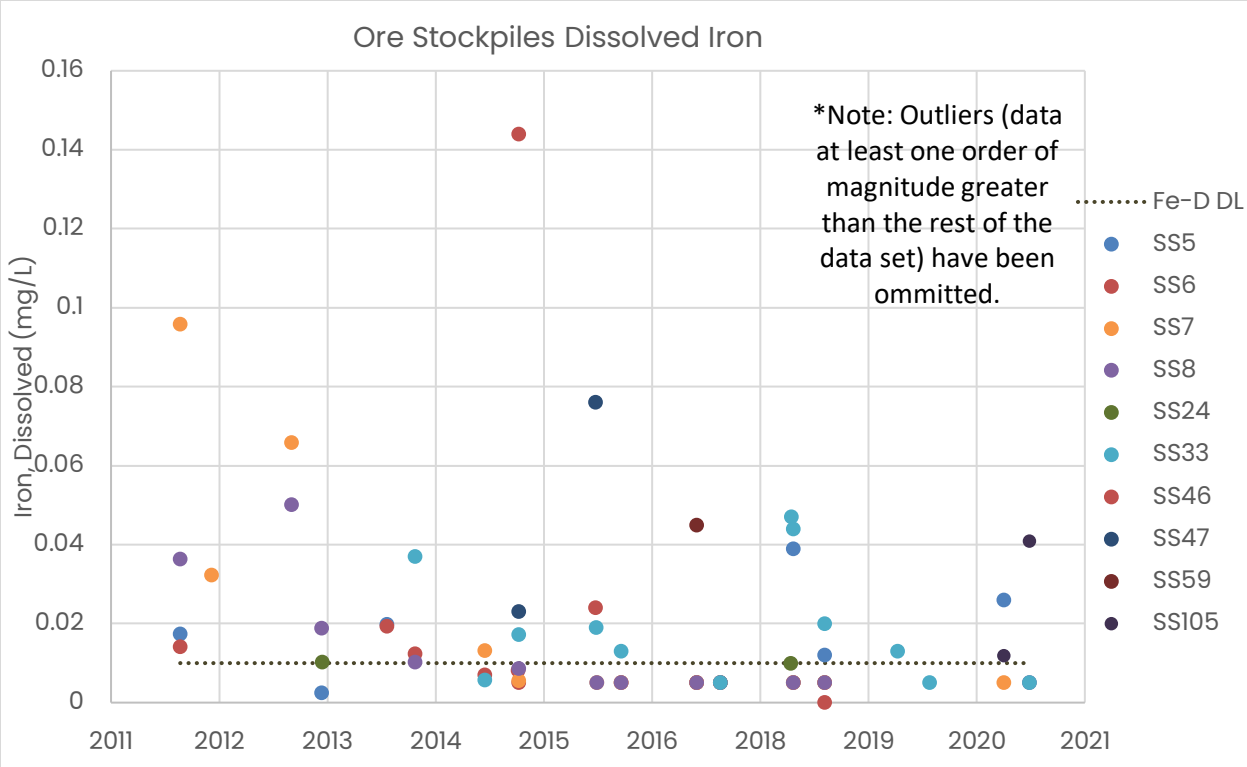


Figure 7-40: Ore Stockpile Sites - Dissolved Iron, Outliers Removed

DL is Analytical Detection Limit

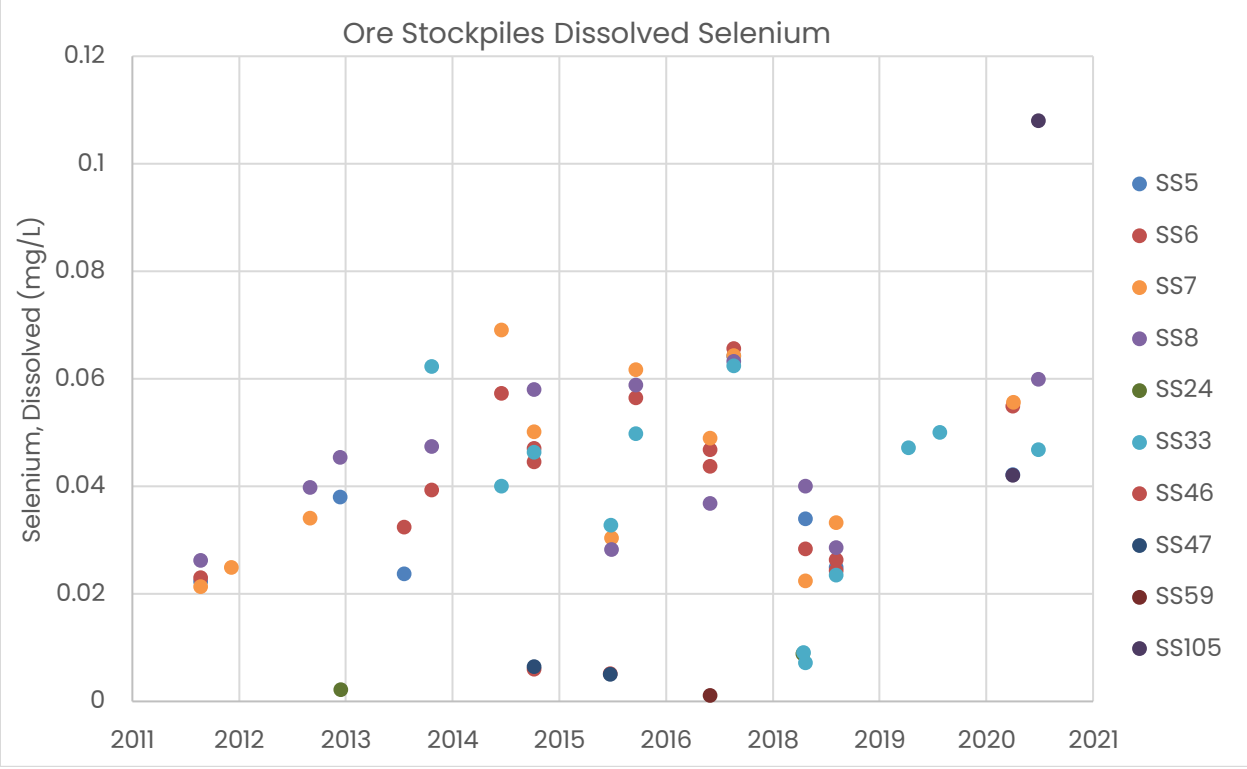


Figure 7-41: Ore Stockpile Sites - Dissolved Selenium

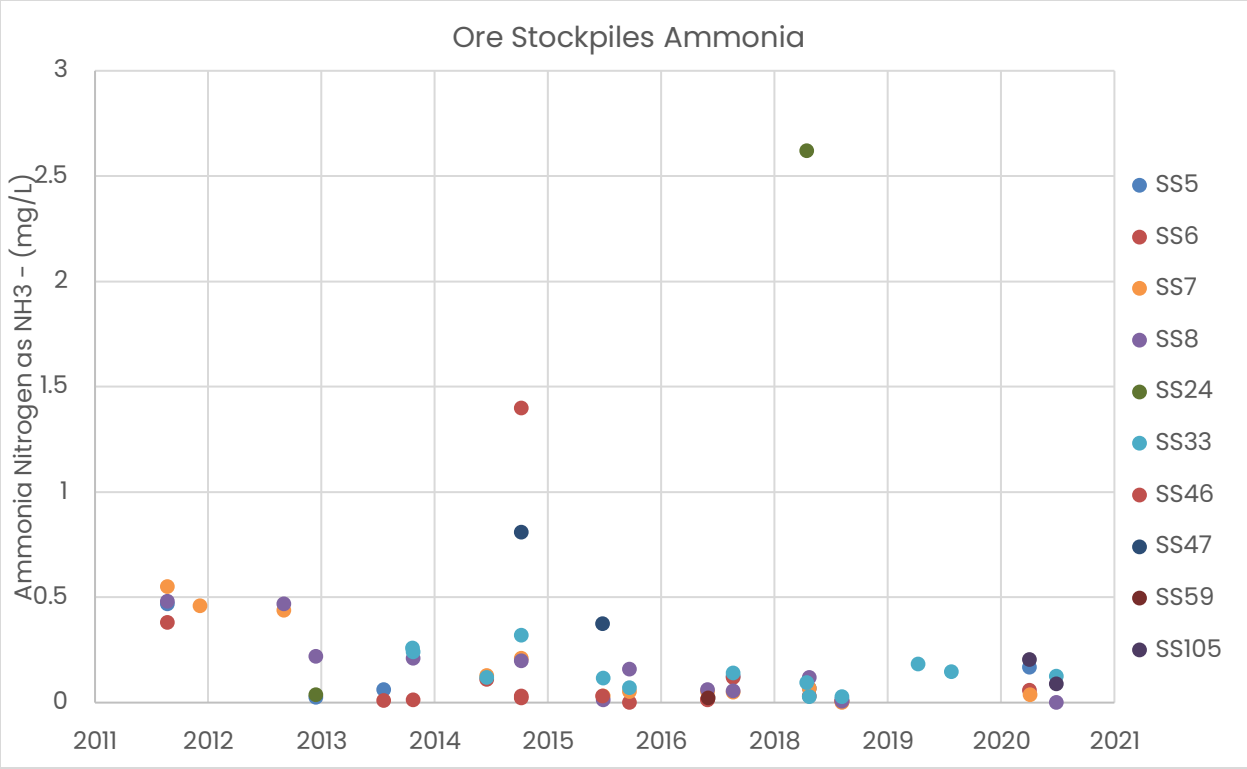


Figure 7-42: Ore Stockpile Sites - Dissolved Ammonia

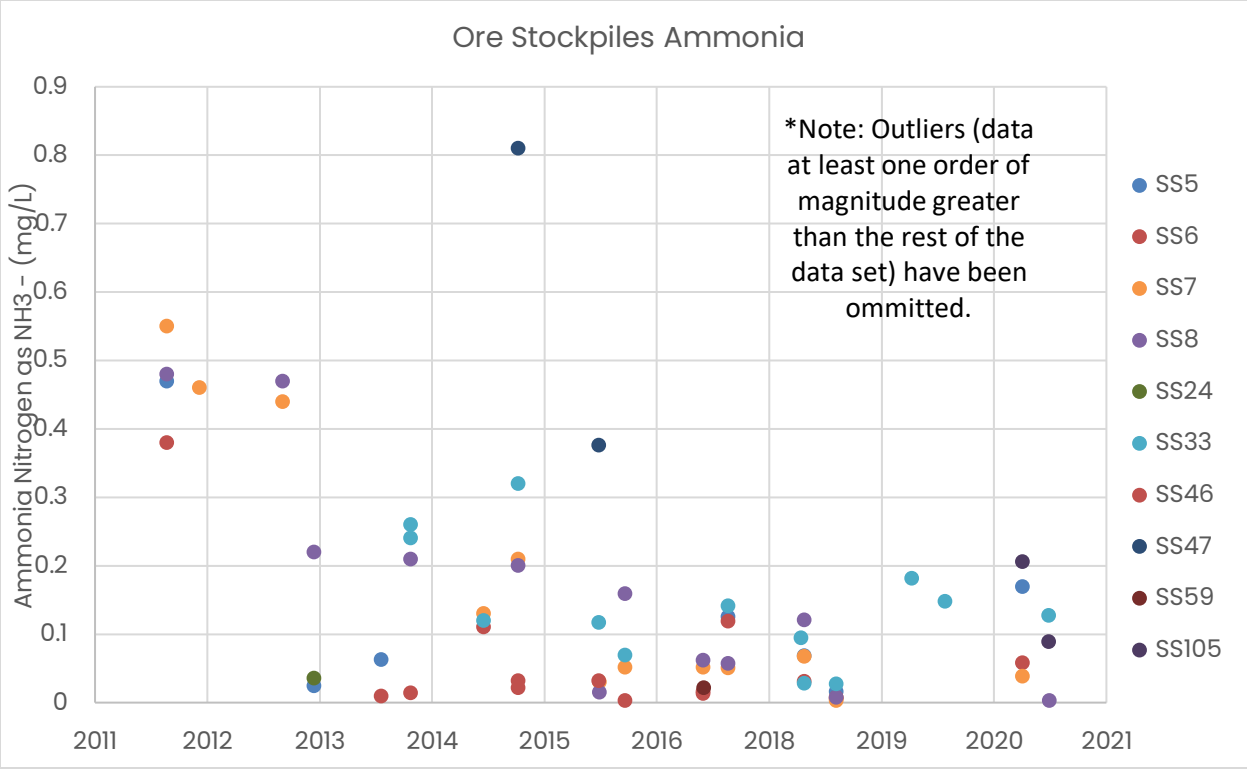


Figure 7-43: Ore Stockpile Sites – Dissolved Ammonia, Outliers Removed

DL is Analytical Detection Limit

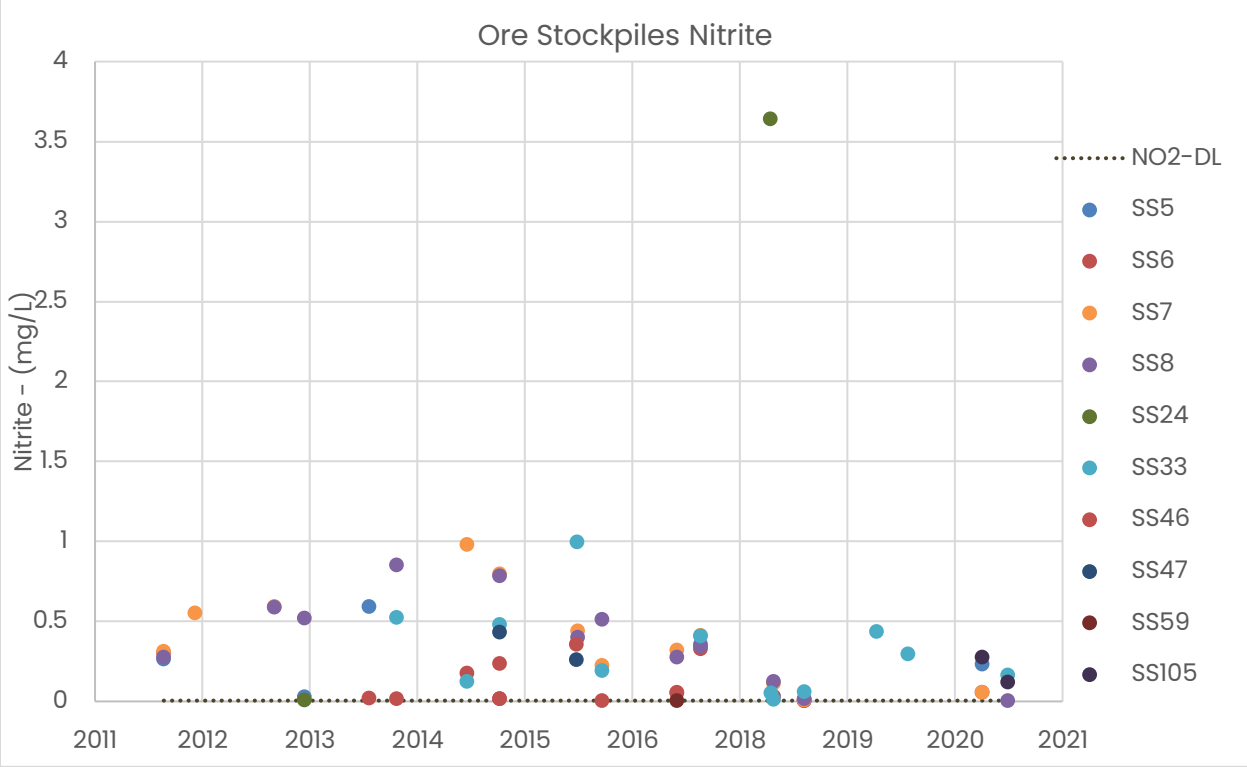


Figure 7-44: Ore Stockpile Sites - Dissolved Nitrite
DL is Analytical Detection Limit

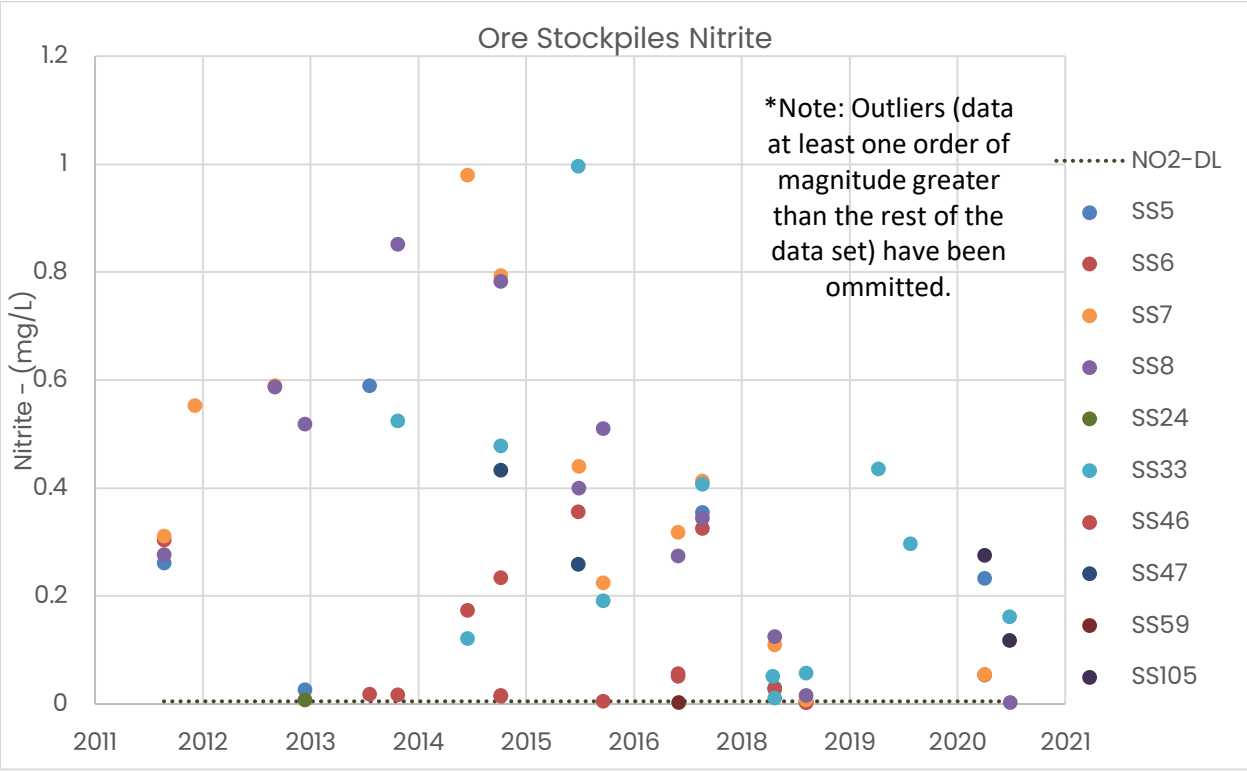


Figure 7-45: Ore Stockpile Sites - Dissolved Nitrite, Outliers Removed
DL is Analytical Detection Limit

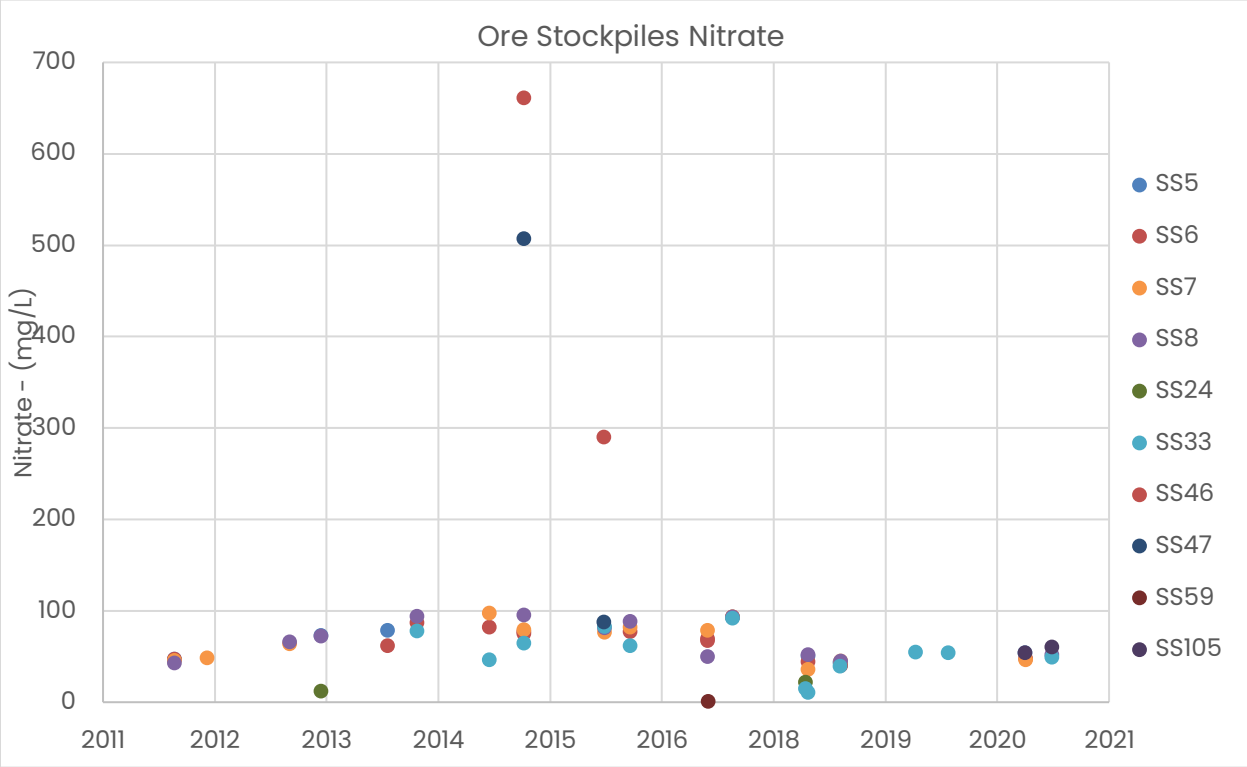


Figure 7-46: Ore Stockpile Sites - Dissolved Nitrate

7.9 Dry Stack Tailings Storage Facility (DSTSF)

Only one recurring site, SS53, was observed flowing at the Dry Stack Tailings Storage Facility (DSTSF) in 2020 during the spring survey. Although 2020 was a relatively wet year, increased precipitation does not necessarily correspond to an increase in seeps and can confound efforts to collect representative samples; that is, true seepage water from the ground that has not been diluted by surface run-off. Along the tailings diversion ditch road, at the southern edge of the DSTSF, flow was consolidated into a more or less continuous stream which made it difficult to identify individual seeps of groundwater. Historical water quality results and 2020 seepage surveys results for the DSTSF-associated seepage sites are outlined in Figure 7-47 through Figure 7-53 and include results for dissolved copper, dissolved cadmium, dissolved iron, dissolved selenium, and nutrient levels for ammonia, nitrite, and nitrate.

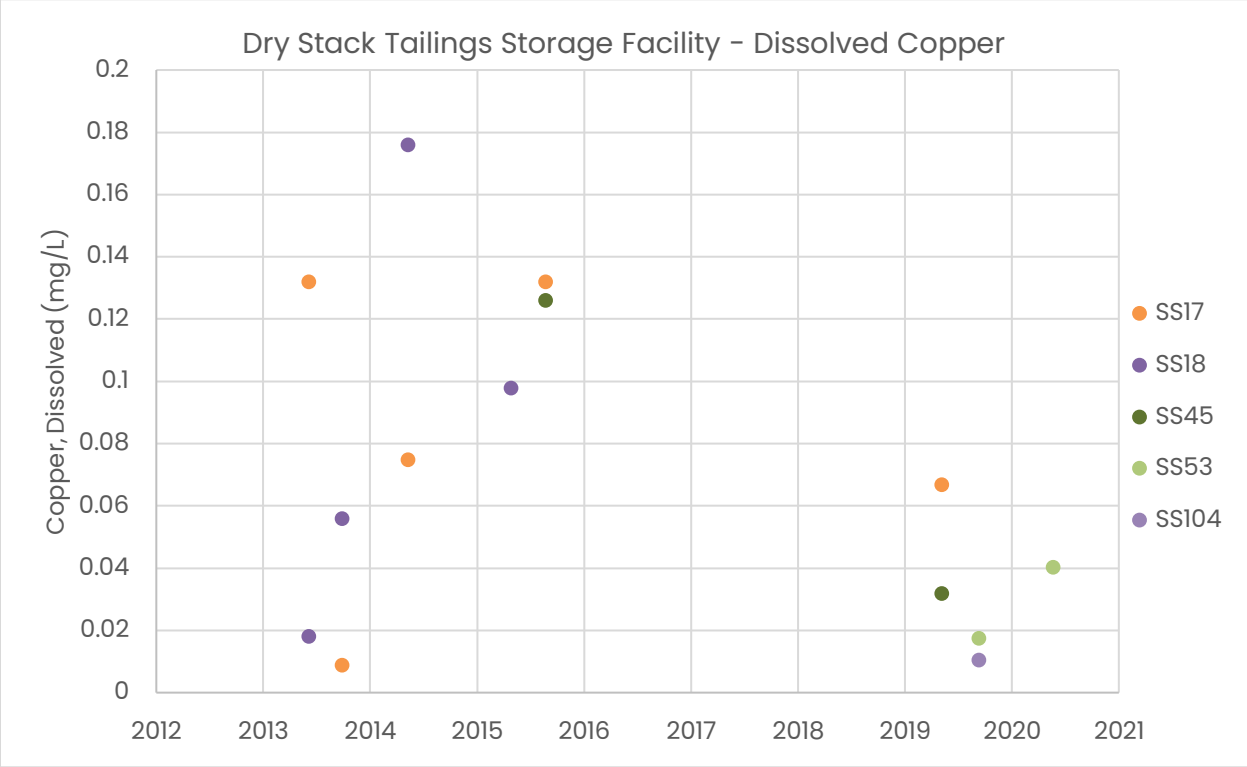


Figure 7-47: Dry Stack Tailings Storage Facility Seepage Sites - Dissolved Copper

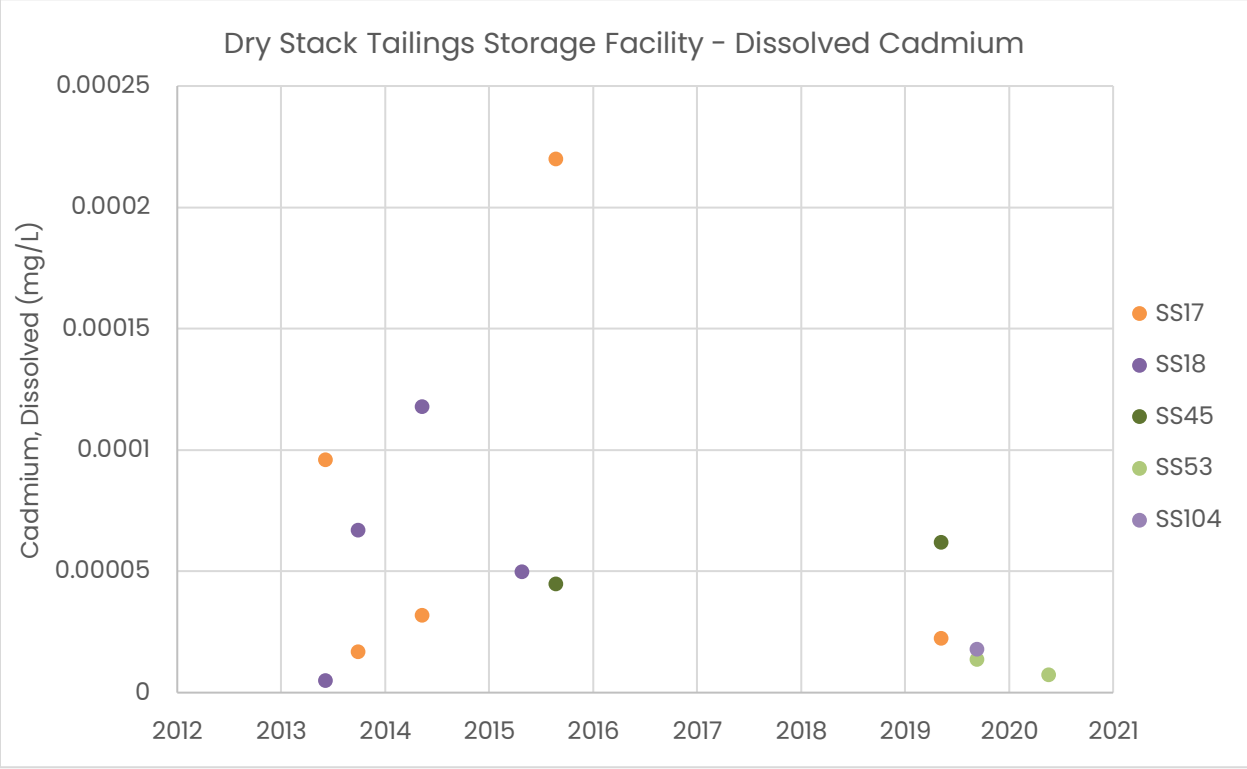


Figure 7-48: Dry Stack Tailings Storage Facility Seepage Sites - Dissolved Cadmium

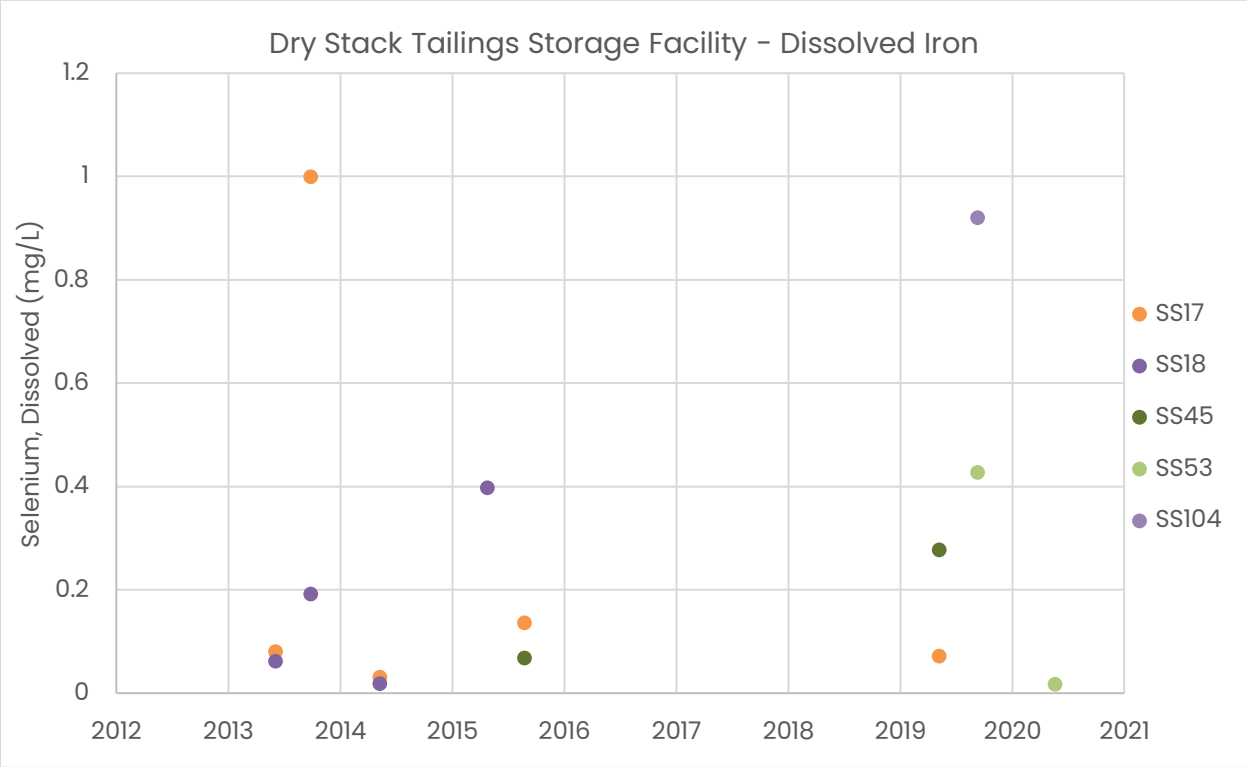


Figure 7-49: Dry Stack Tailings Storage Facility Seepage Sites - Dissolved Iron

DL is Analytical Detection Limit

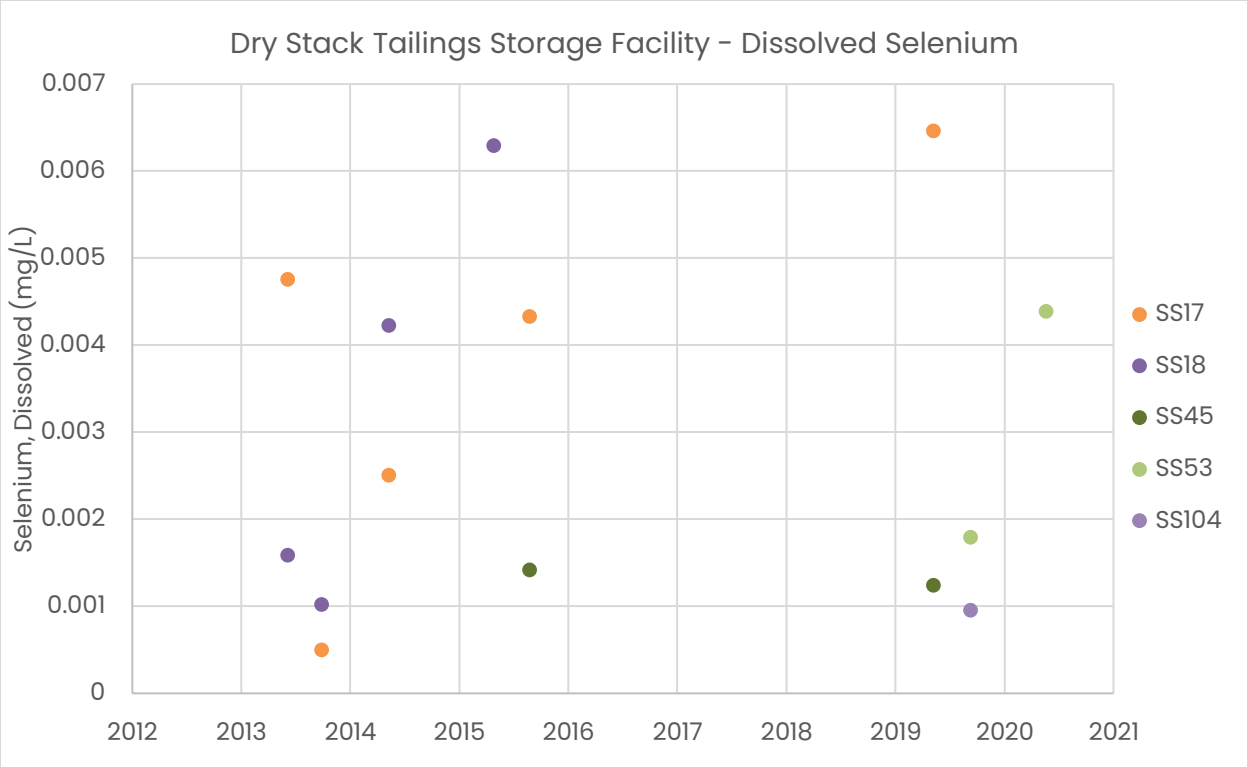


Figure 7-50: Dry Stack Tailings Storage Facility Seepage Sites – Dissolved Selenium

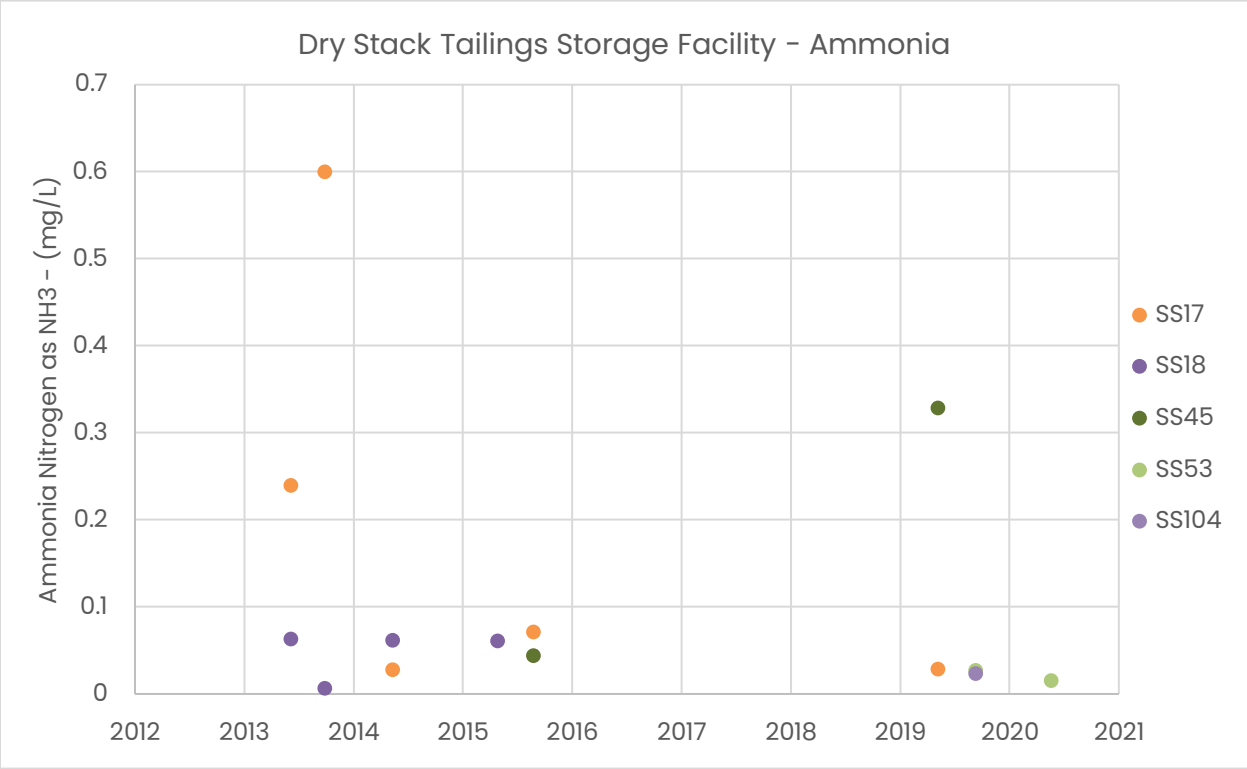


Figure 7-51: Dry Stack Tailings Storage Facility Seepage Sites – Ammonia

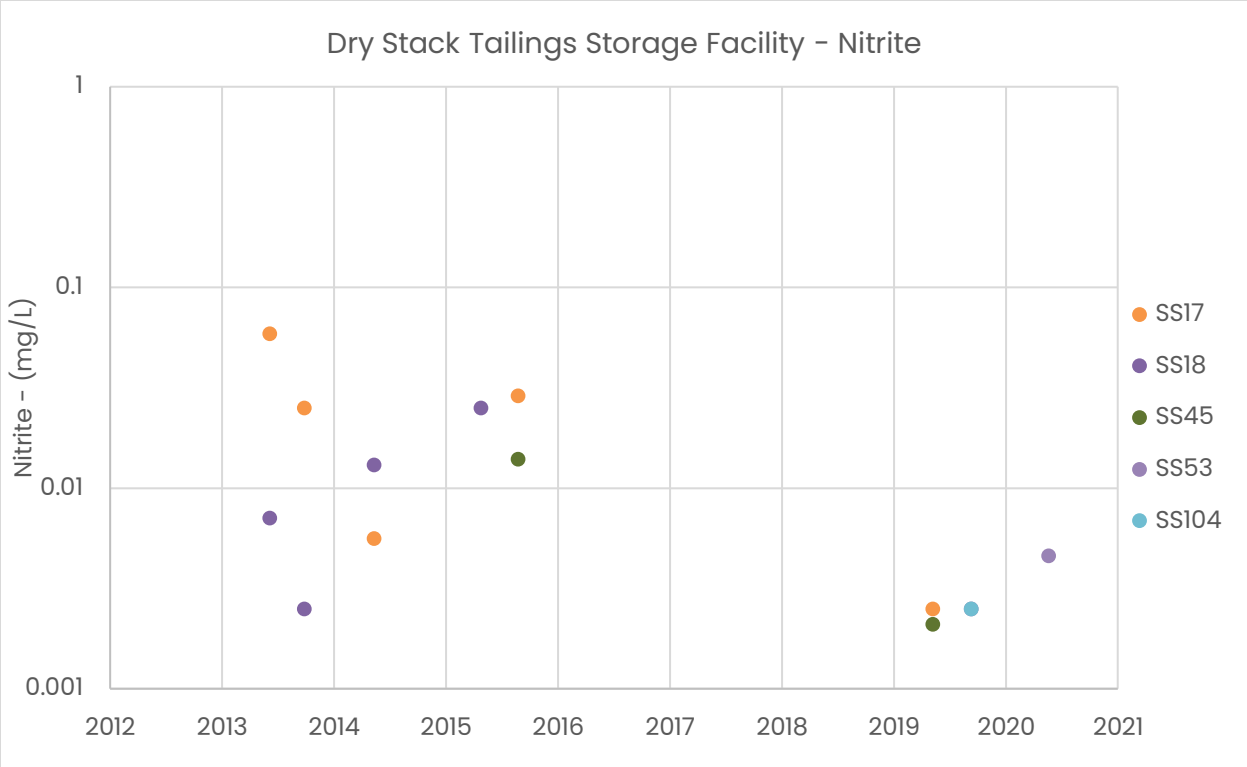


Figure 7-52: Dry Stack Tailings Storage Facility Seepage Sites – Nitrite

DL is Analytical Detection Limit

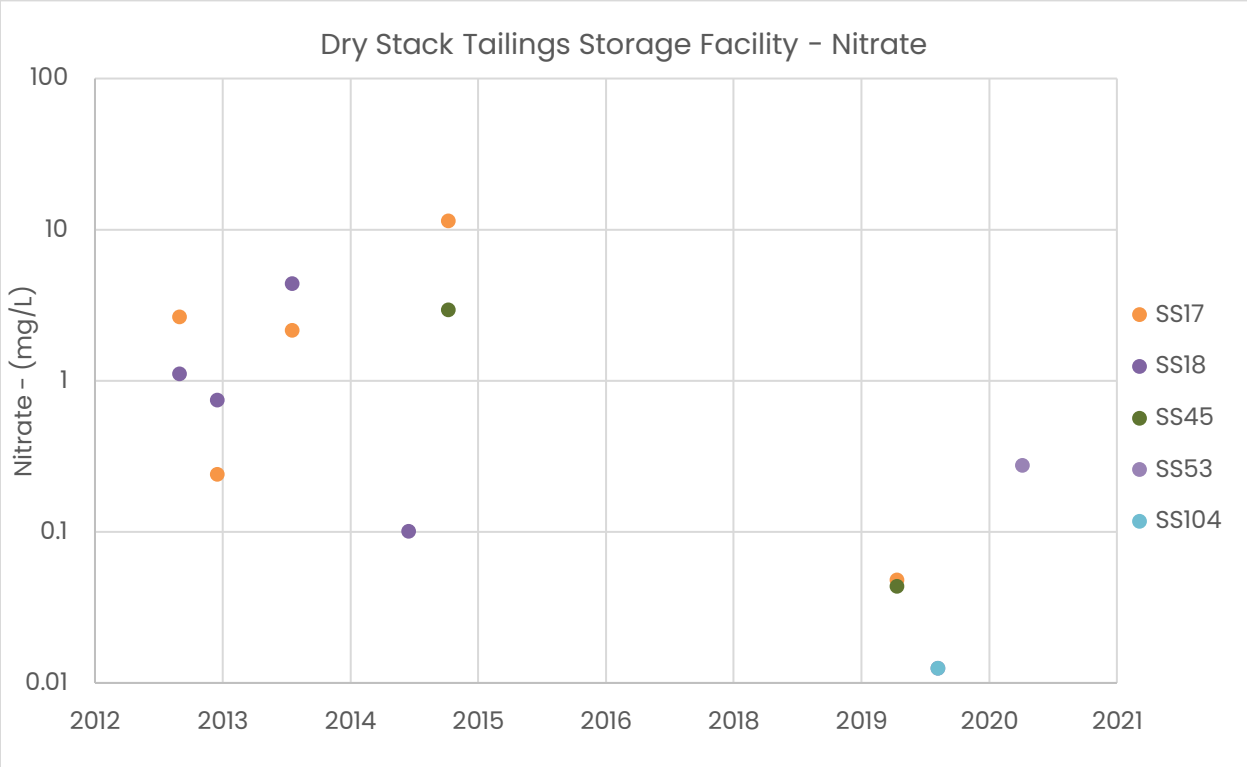


Figure 7-53: Dry Stack Tailings Storage Facility Seepage Sites – Nitrate

DL is Analytical Detection Limit

7.10 Mill Valley Fill

1.8.1 Mill Valley Fill Water Quality Monitoring Stations

The first phase of the Mill Valley Fill (MVF) was completed in 2012 and vertical culverts were installed at both W8 and W8A to enable water quality monitoring at these locations. Obtaining water samples at W8 has been sporadic since the installation of the vertical culvert. The last time this station produced water was in late 2013. The second phase of the Mill Valley Fill Extension was completed in early 2016. Additional extensions were added to the vertical culverts of W8 and W8A to preserve the sampling stations. In fall 2017, W8 culvert was covered during reclamation operations and could no longer be accessed. W8A was collected until March 2019 and has since been dry ever since.

The Mill Valley Fill Extension Stage 2 (MVFE2) collection sump (W62) was constructed during the period of November 9, 2015 to February 7, 2016 as a replacement for the Minto Creek Detention Structure (W37) used prior to 2016. W37 was decommissioned and buried in February 2016 as part of the MVFE2 construction. W62 is approximately 30m downslope from W37 and collects runoff and seepage from the Dry Stack Tailing Storage Facility and the Mill Valley Fill. W62 is collected on a monthly frequency as part of the WUL. Water collected at W62 is pumped to the Main Pit.

Water quality results for W8, W8A, W37 and W62 are outlined in Figure 7-54 through Figure 7-70 and include results for dissolved copper, dissolved cadmium, dissolved iron, dissolved selenium, and nutrient levels for ammonia, nitrite, and nitrate. For comparison, results for W62 are presented with the obsolete sites and separately, for trend analysis, as it is the final collection point for MVF seepage and run-off. In general, analyte concentration in the culverts show a decreasing trend; concentrations were highest during and after construction of the MVF and gradually decreased over time.

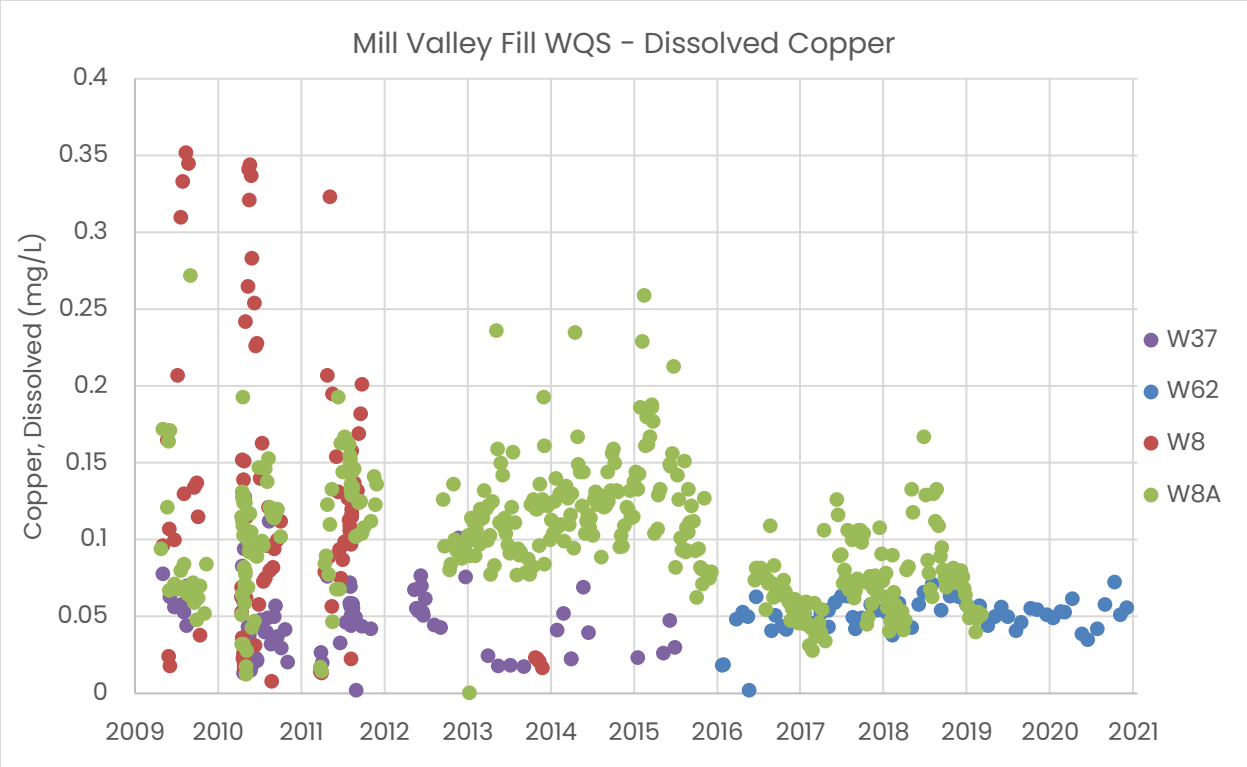


Figure 7-54: Mill Valley Fill WQS Dissolved Copper

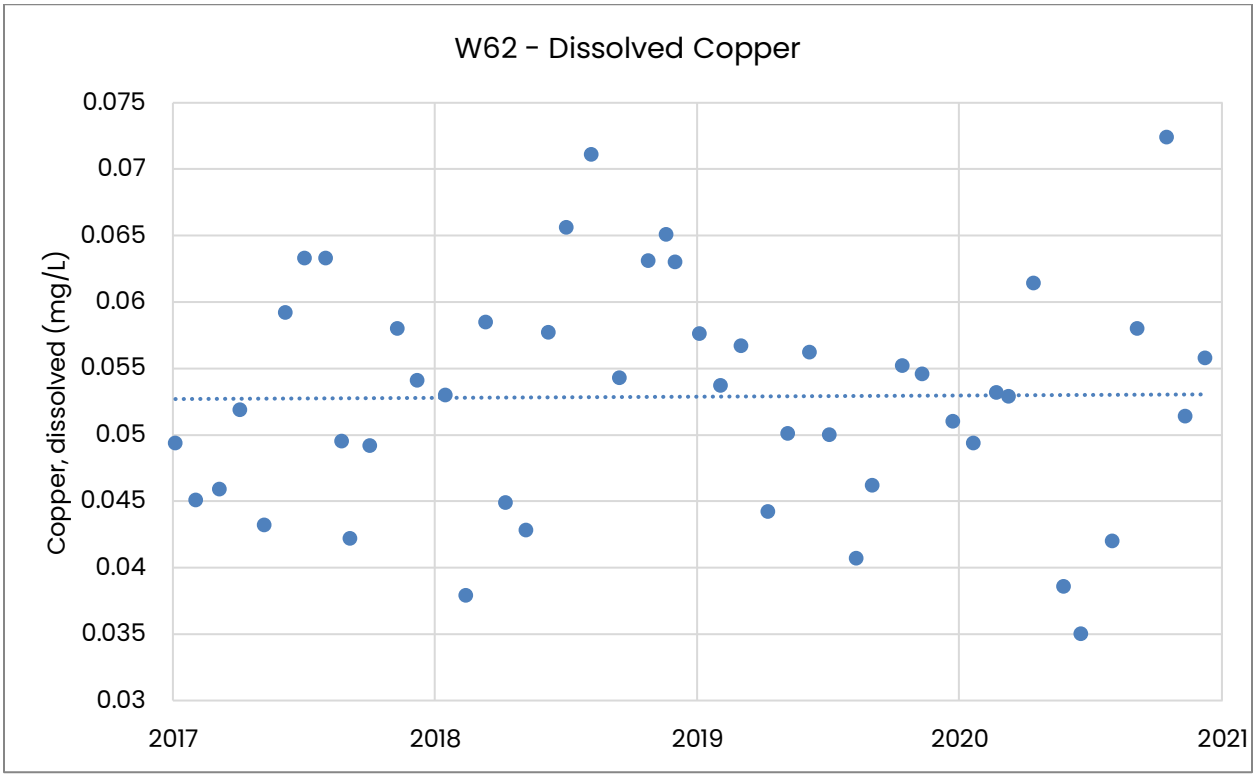


Figure 7-55: W62 Dissolved Copper

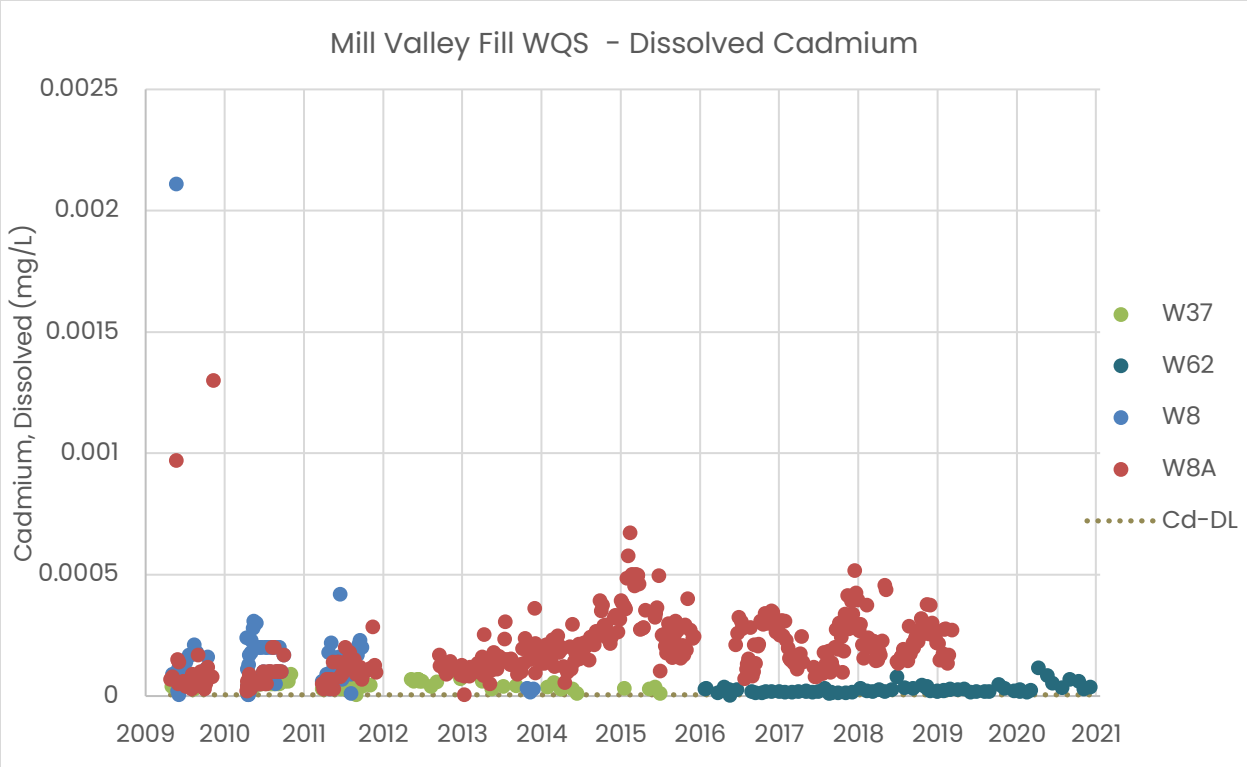


Figure 7-56: Mill Valley Fill WQS Dissolved Cadmium

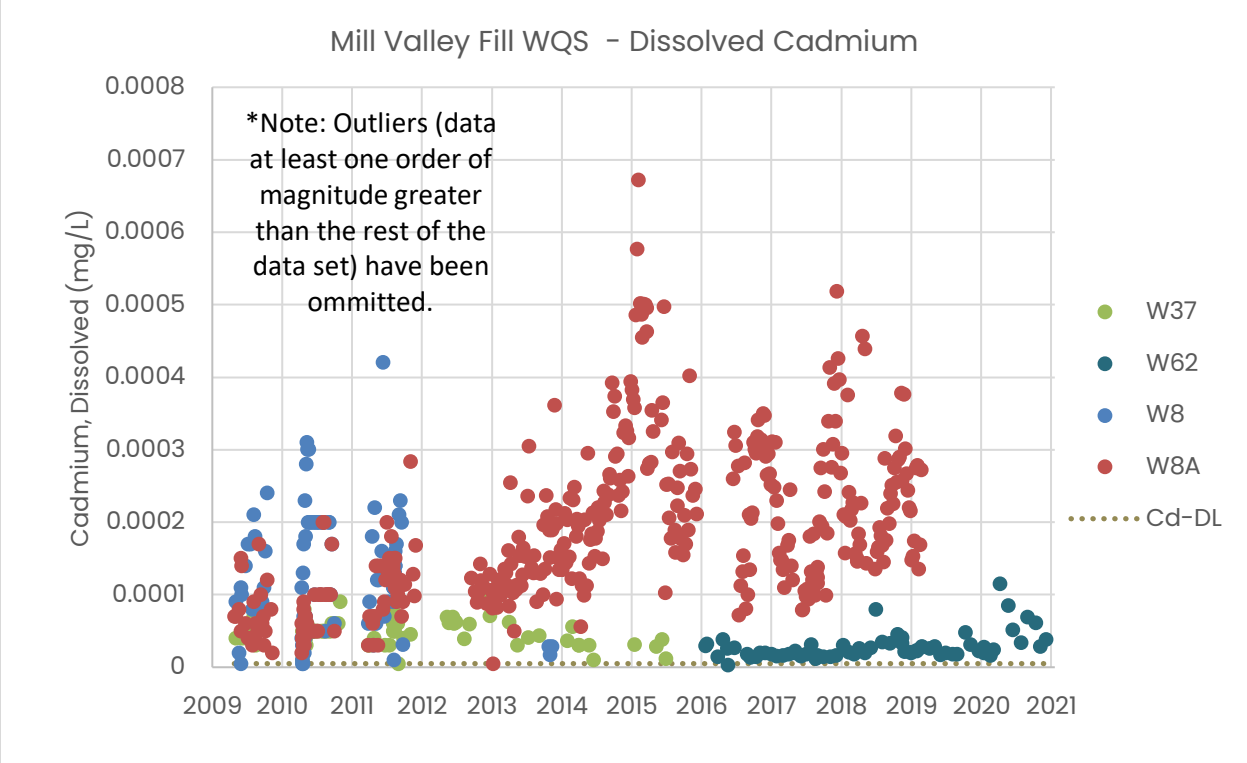


Figure 7-57: Mill Valley Fill WQS Dissolved Cadmium (Outliers Removed)

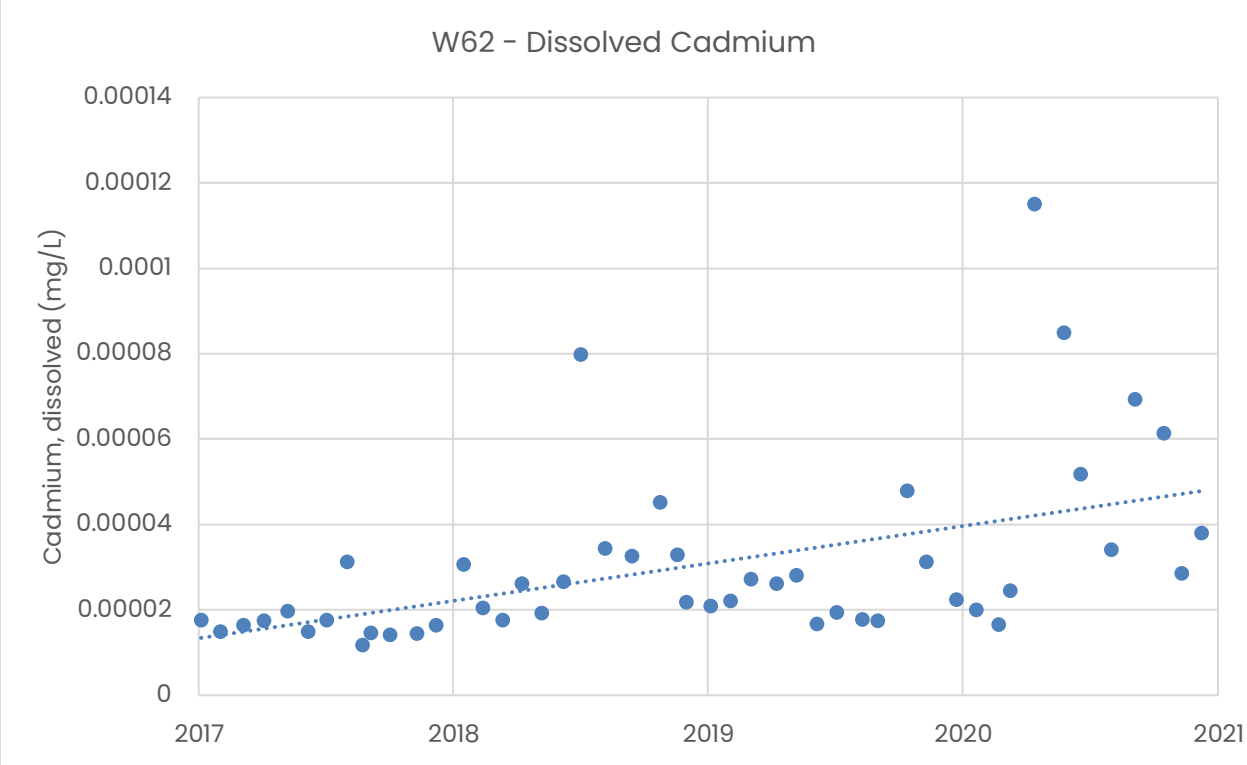


Figure 7-58: W62 Dissolved Cadmium

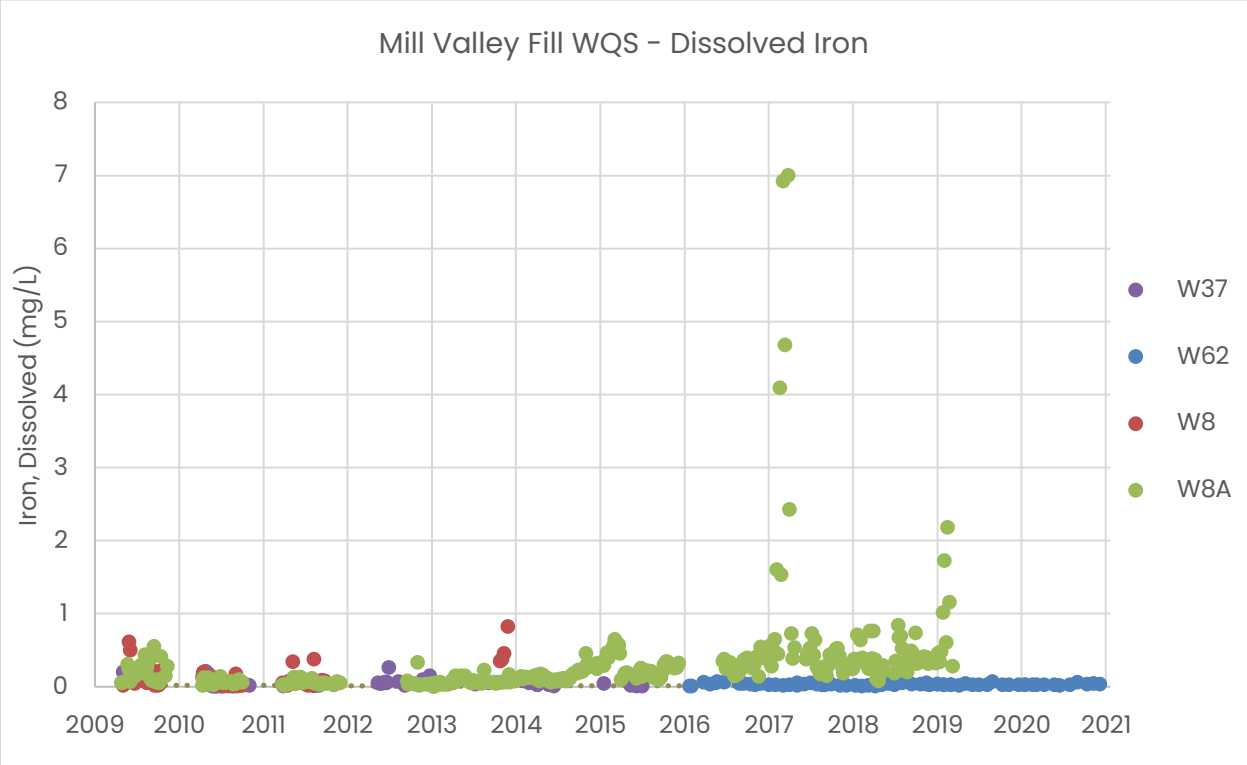


Figure 7-59: Mill Valley Fill WQS Dissolved Iron

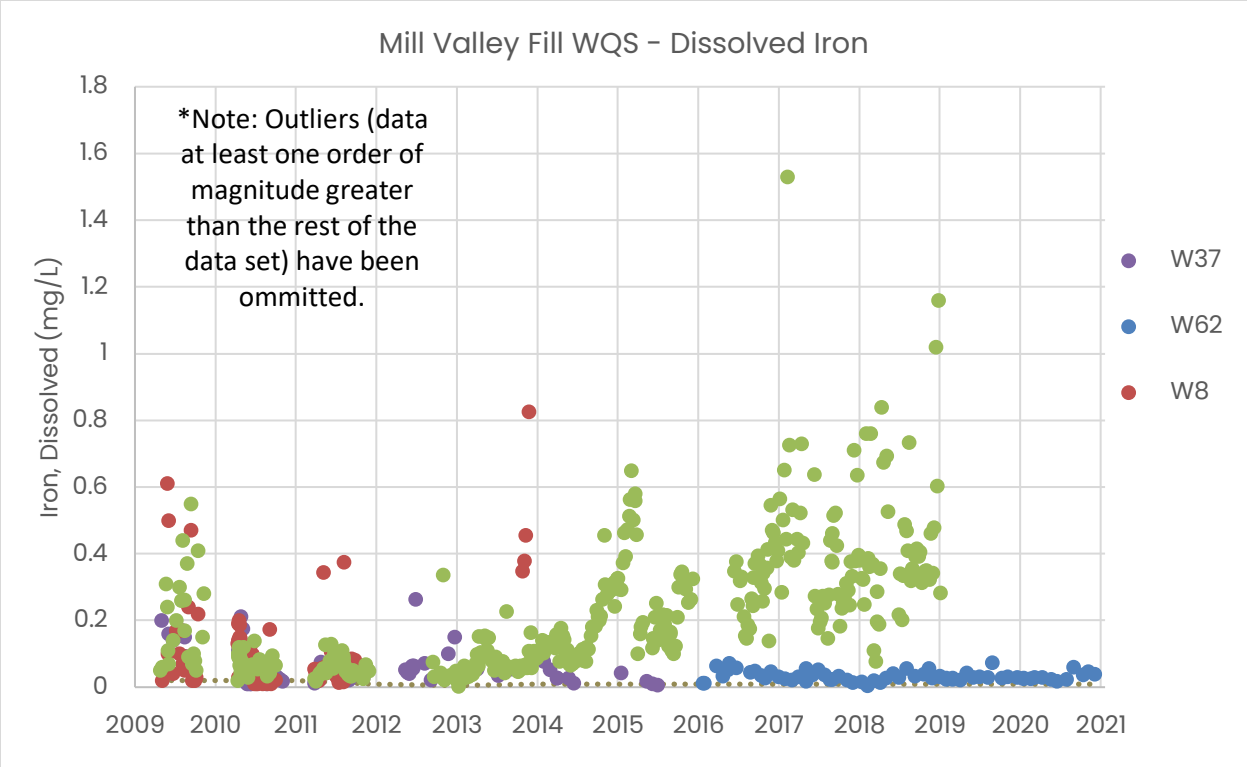


Figure 7-60: Mill Valley Fill WQS Dissolved Iron (Outliers Removed)

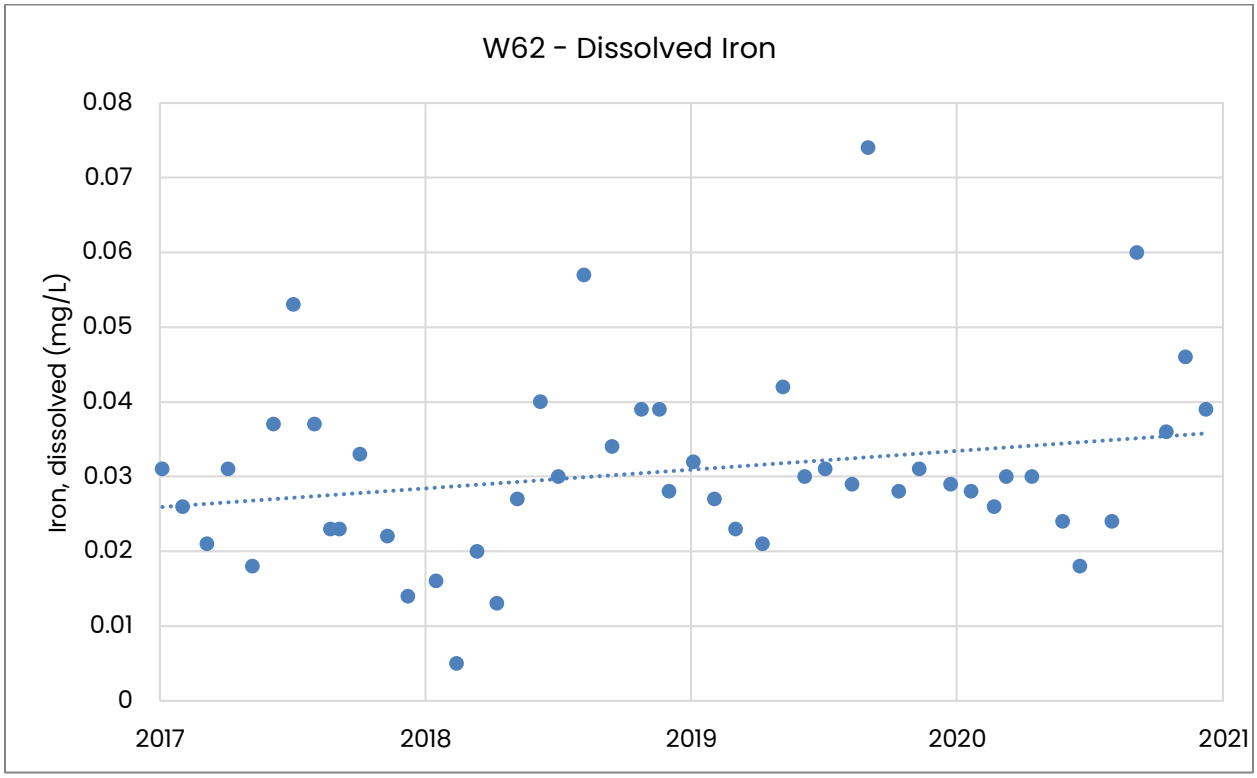


Figure 7-61: W62 Dissolved Iron

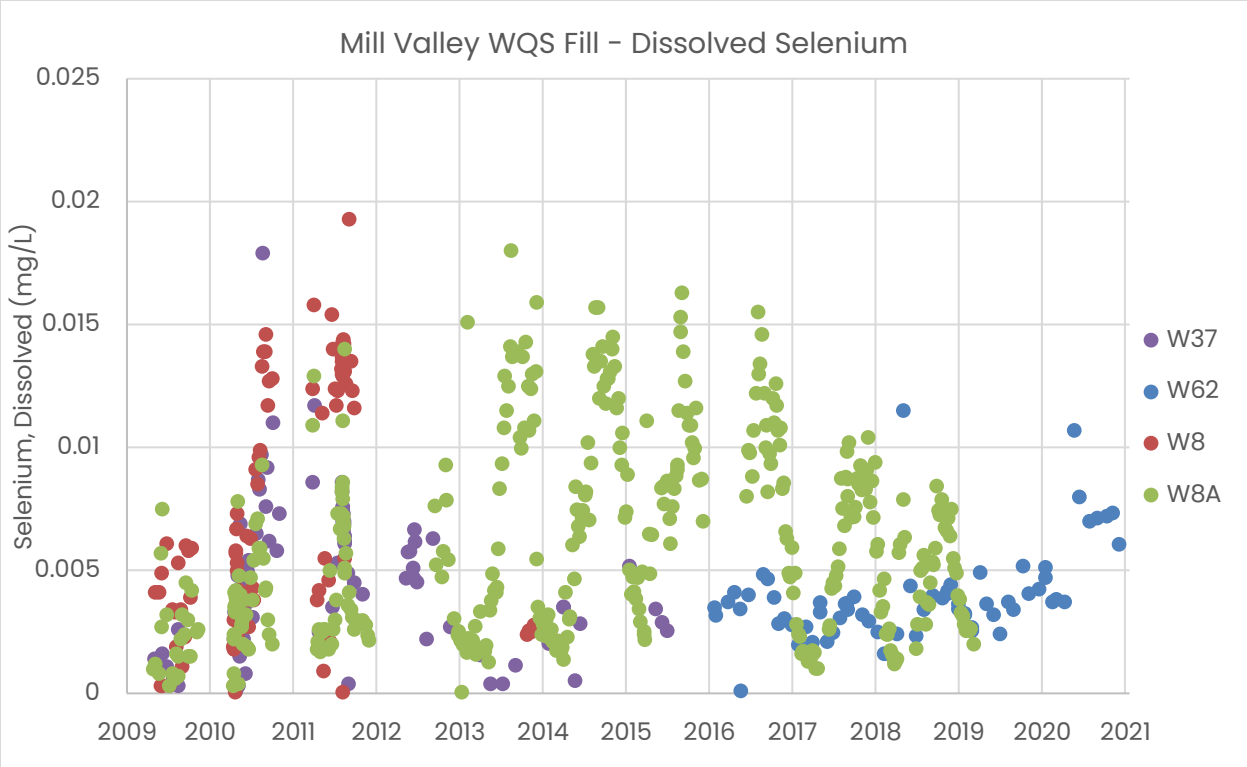


Figure 7-62: Mill Valley Fill WQS Dissolved Selenium

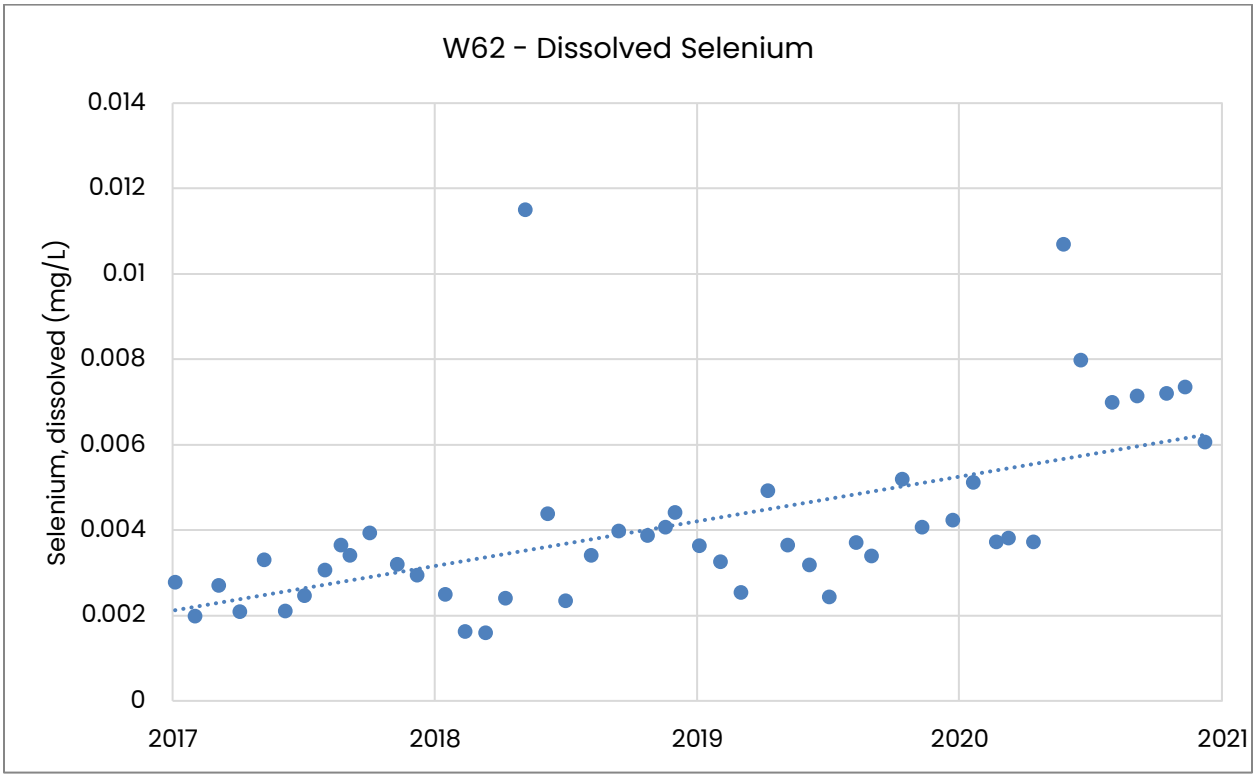


Figure 7-63: W62 Dissolved Selenium

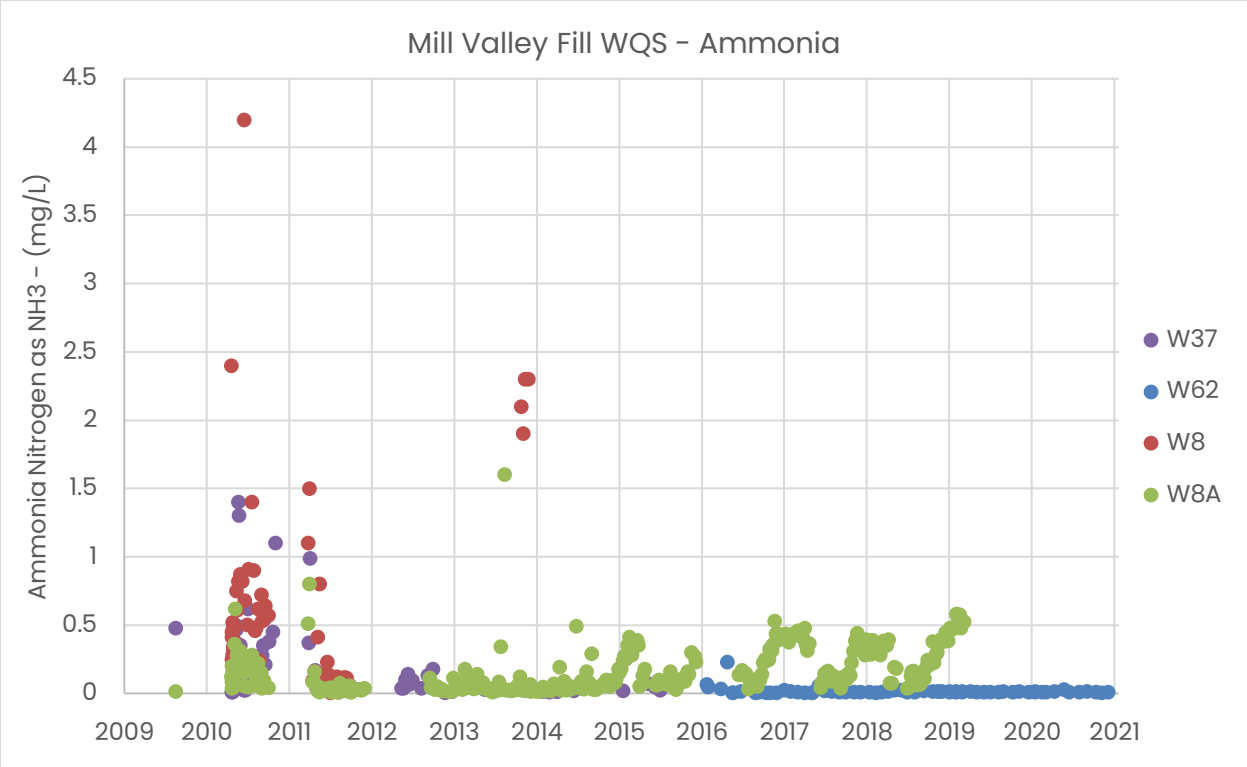


Figure 7-64: Mill Valley Fill Ammonia

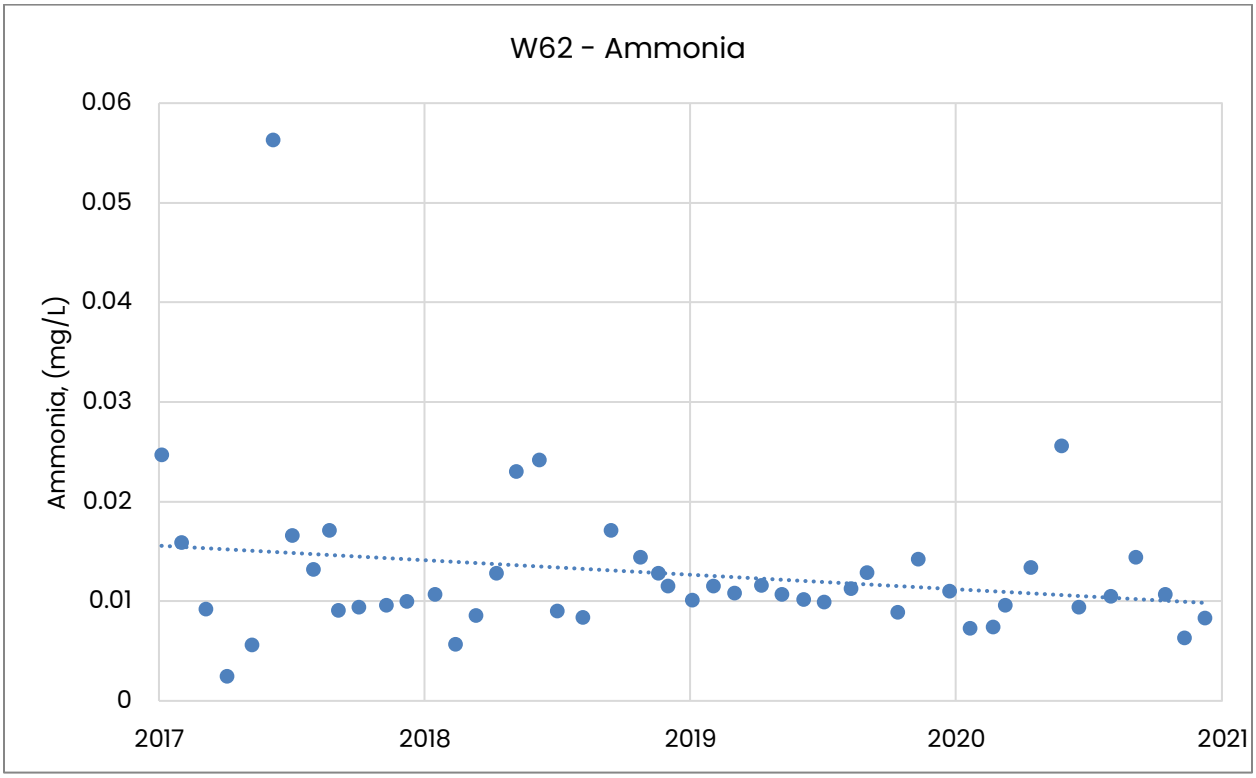


Figure 7-65: W62 Ammonia

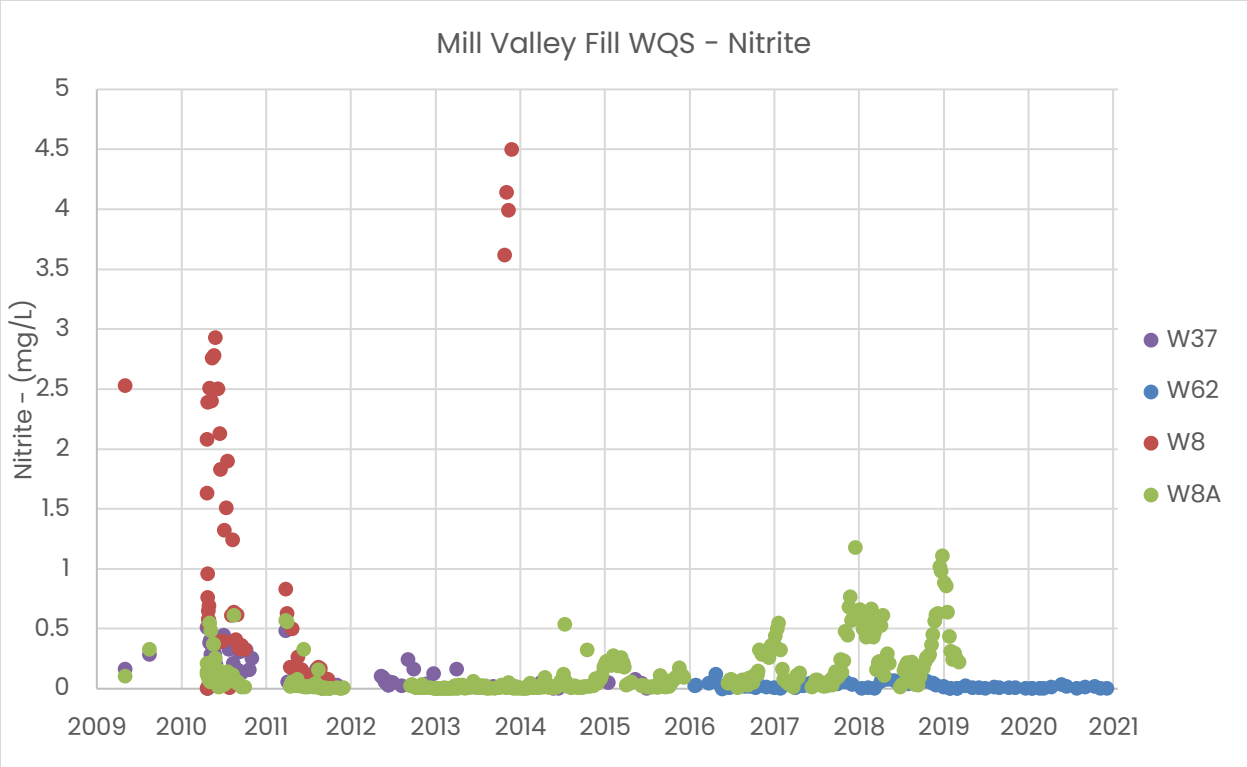


Figure 7-66: Mill Valley Fill WQS Nitrite

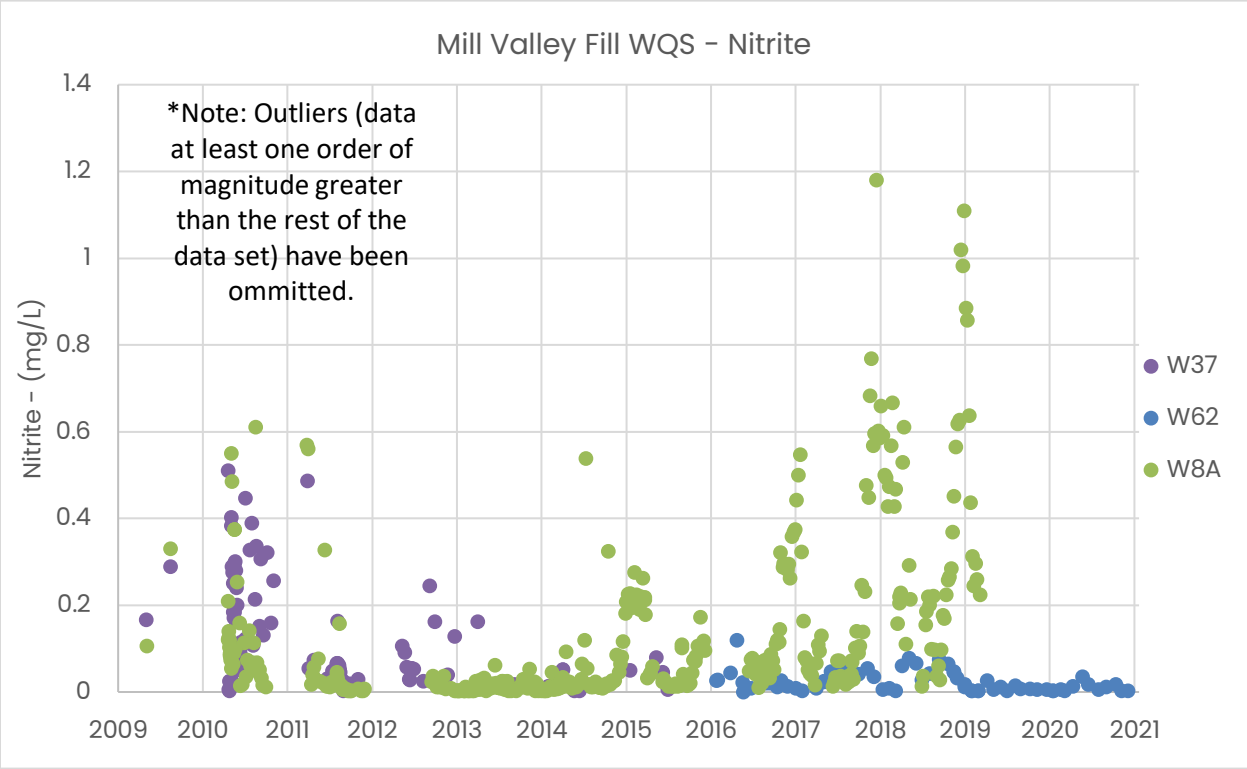


Figure 7-67: Mill Valley Fill WQS Nitrite (Reduced Concentration)

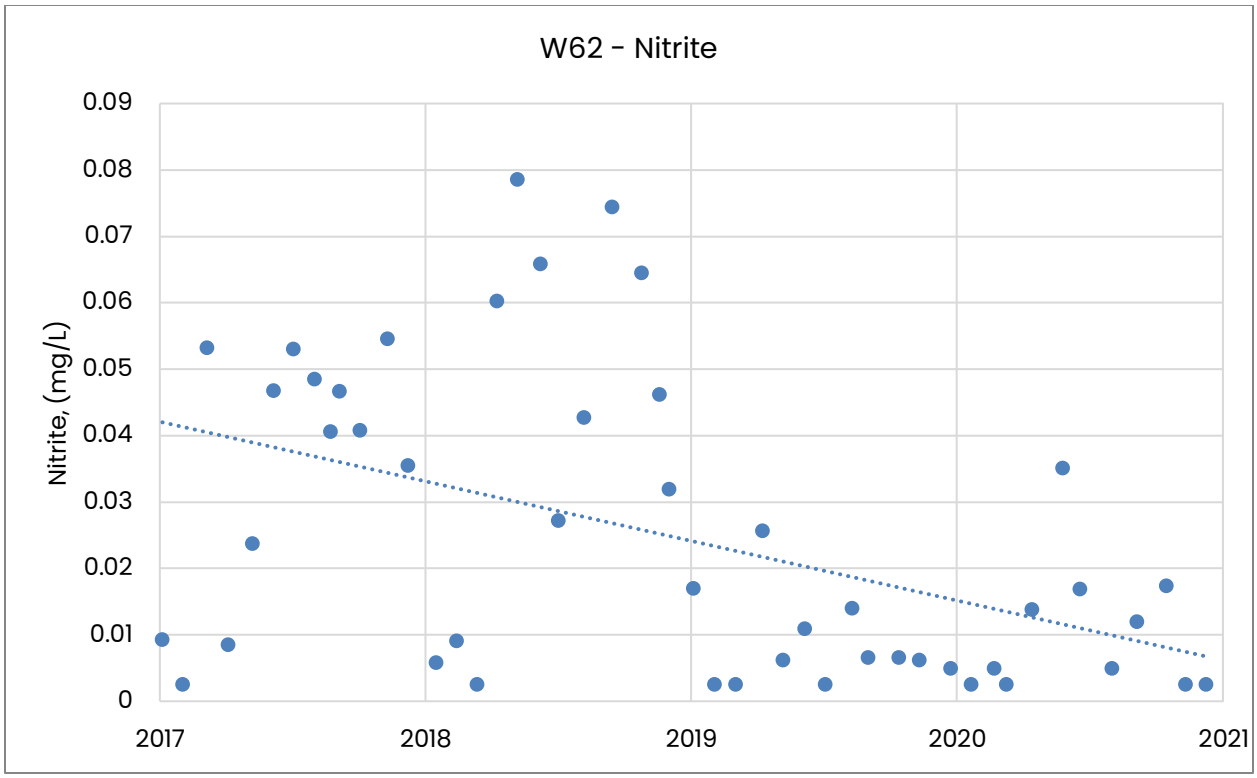


Figure 7-68: W62 Nitrite

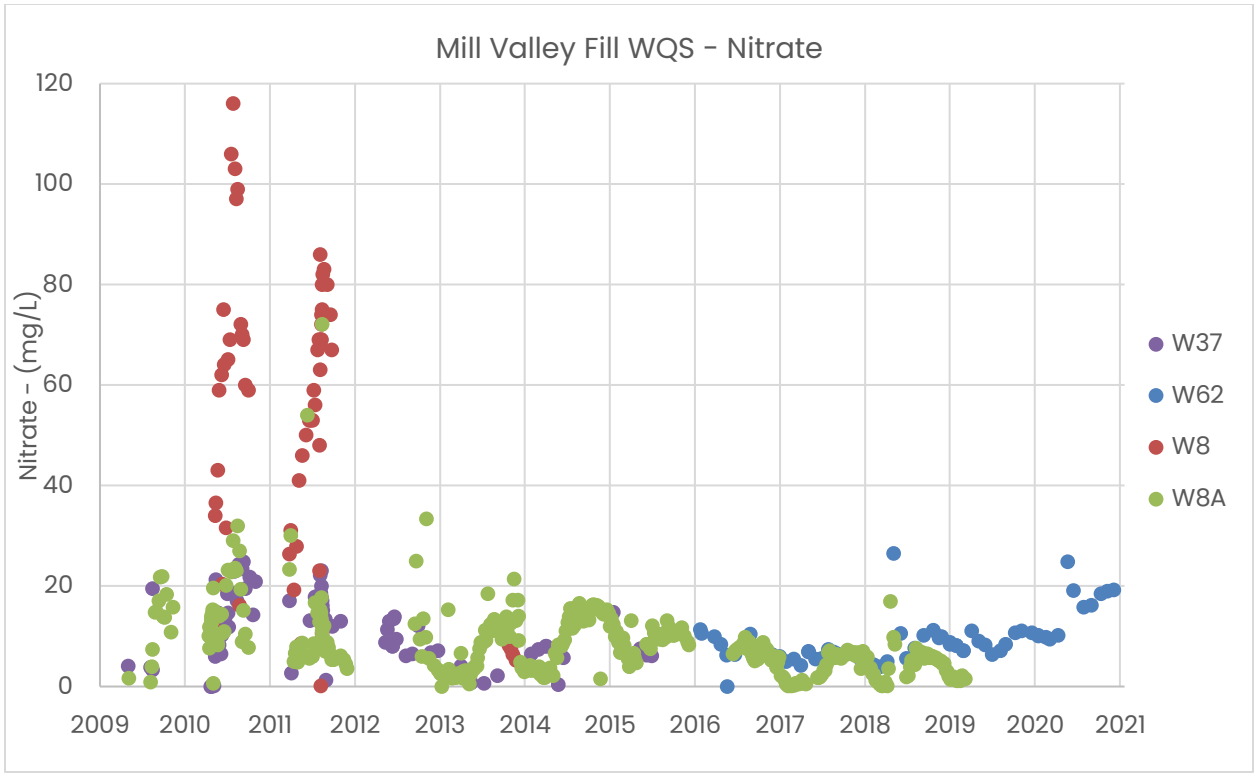


Figure 7-69: Mill Valley Fill WQS Nitrate

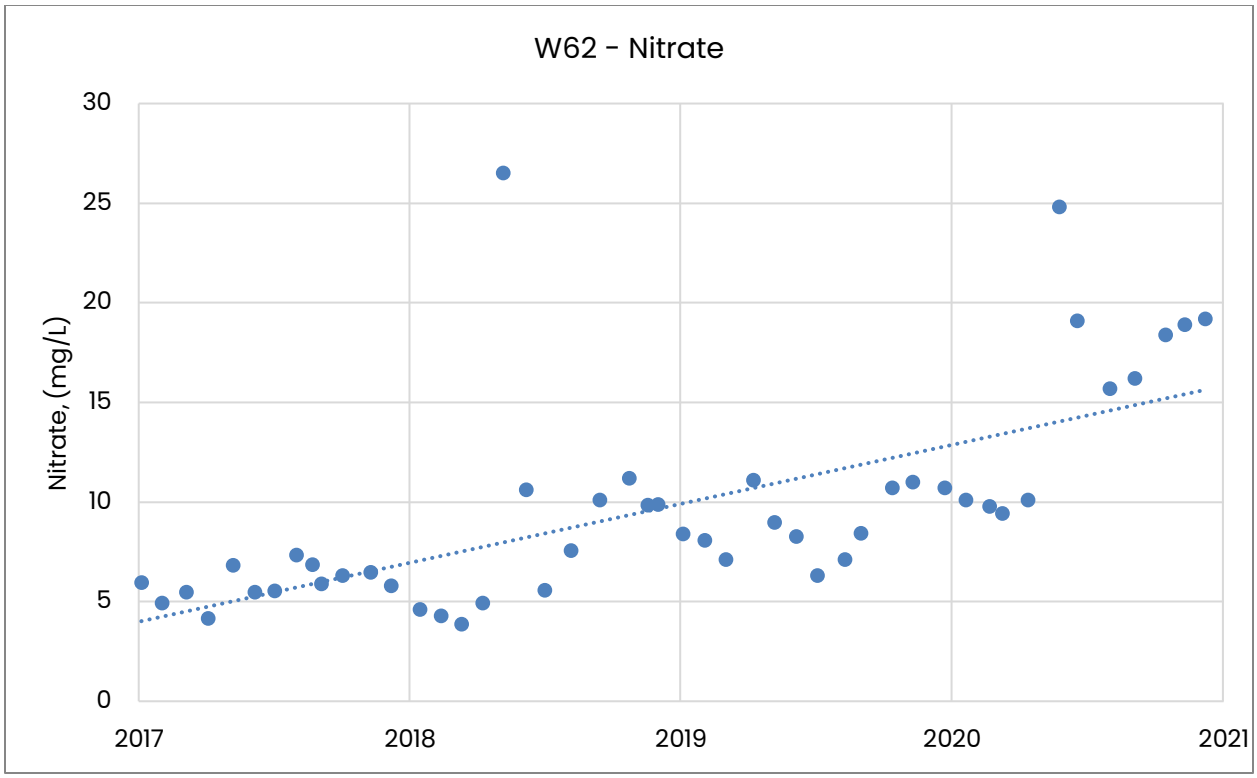


Figure 7-70: W62 Nitrate

1.8.2 Mill Valley Fill Seepage Monitoring Locations

In addition to permanent water quality monitoring stations, the MVF is surveyed in the spring and fall of each year for sporadic seeps. Nine recurring seeps have been identified in previous surveys, but none were found flowing during the surveys conducted in 2020 and no new seeps were discovered. Historical data for the MVF seeps is presented in Figure 7-71 to Figure 7-78 below.

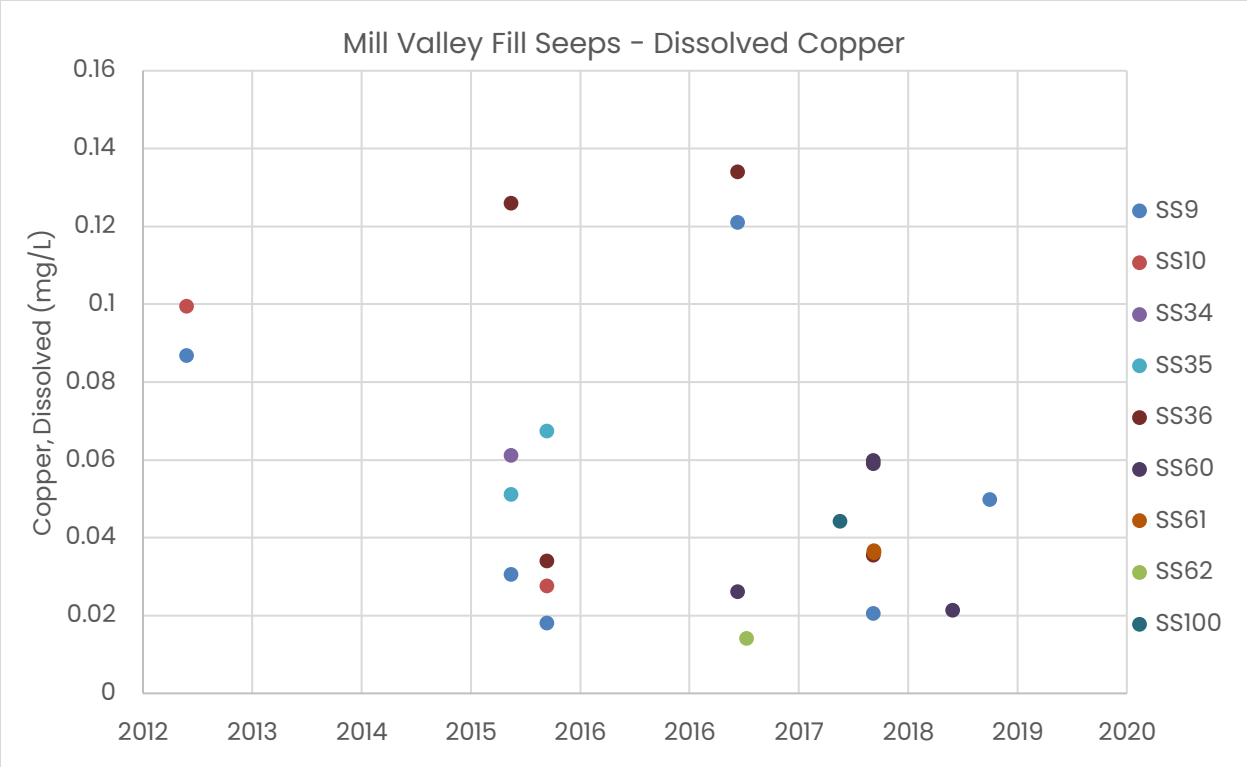


Figure 7-71: Mill Valley Fill Seeps Dissolved Cadmium

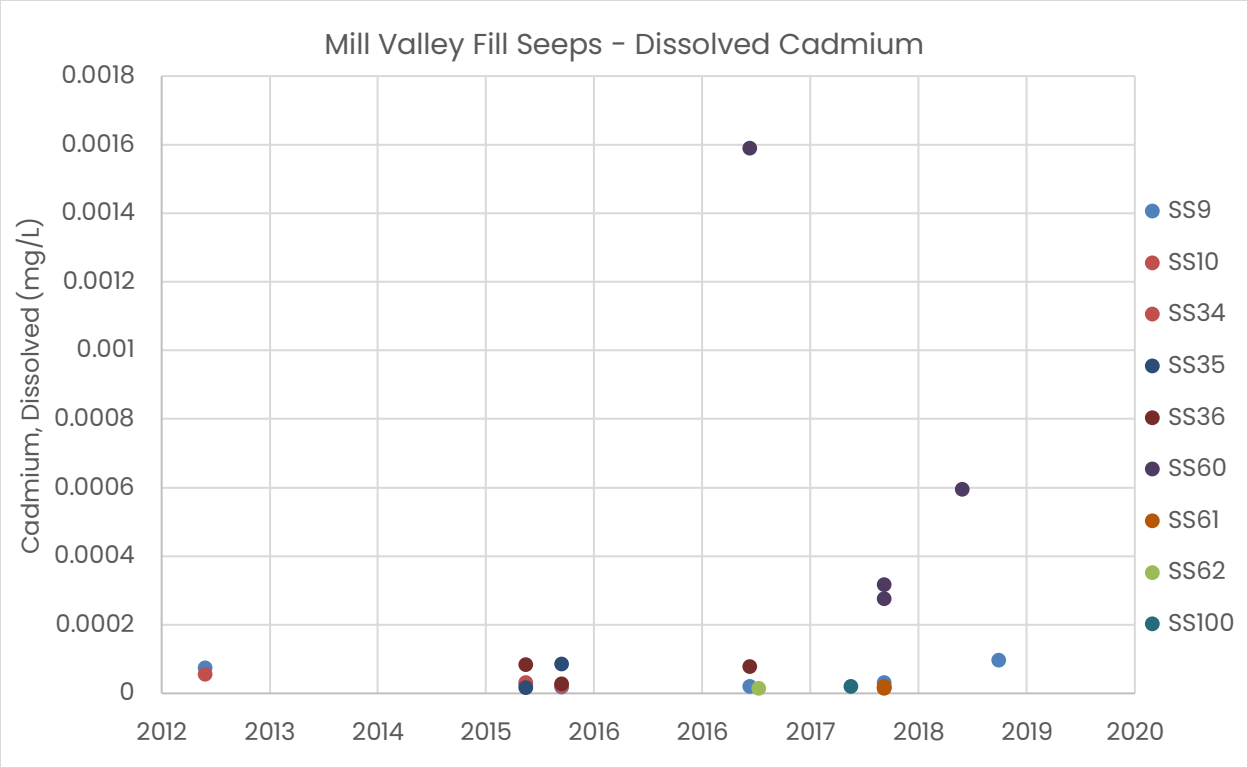


Figure 7-72: Mill Valley Fill Seeps Dissolved Cadmium

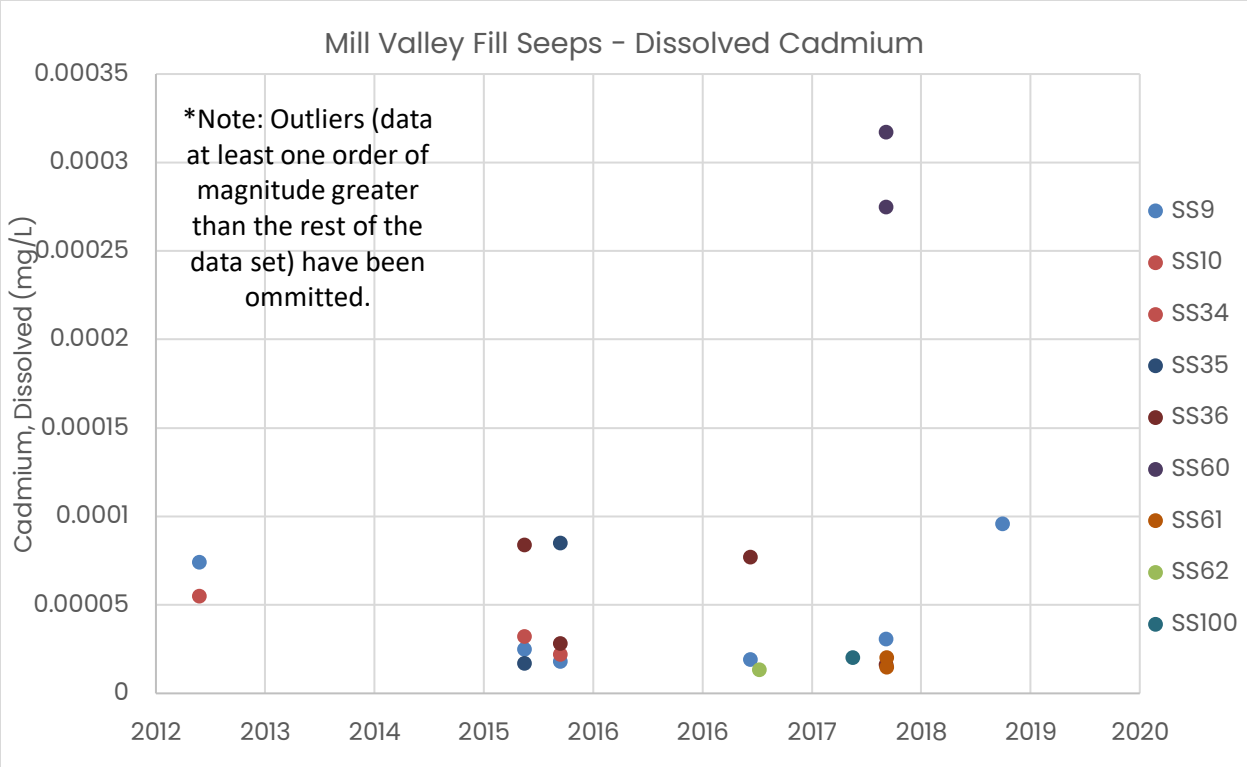


Figure 7-73: Mill Valley Fill Seeps Dissolved Cadmium (Outliers Removed)

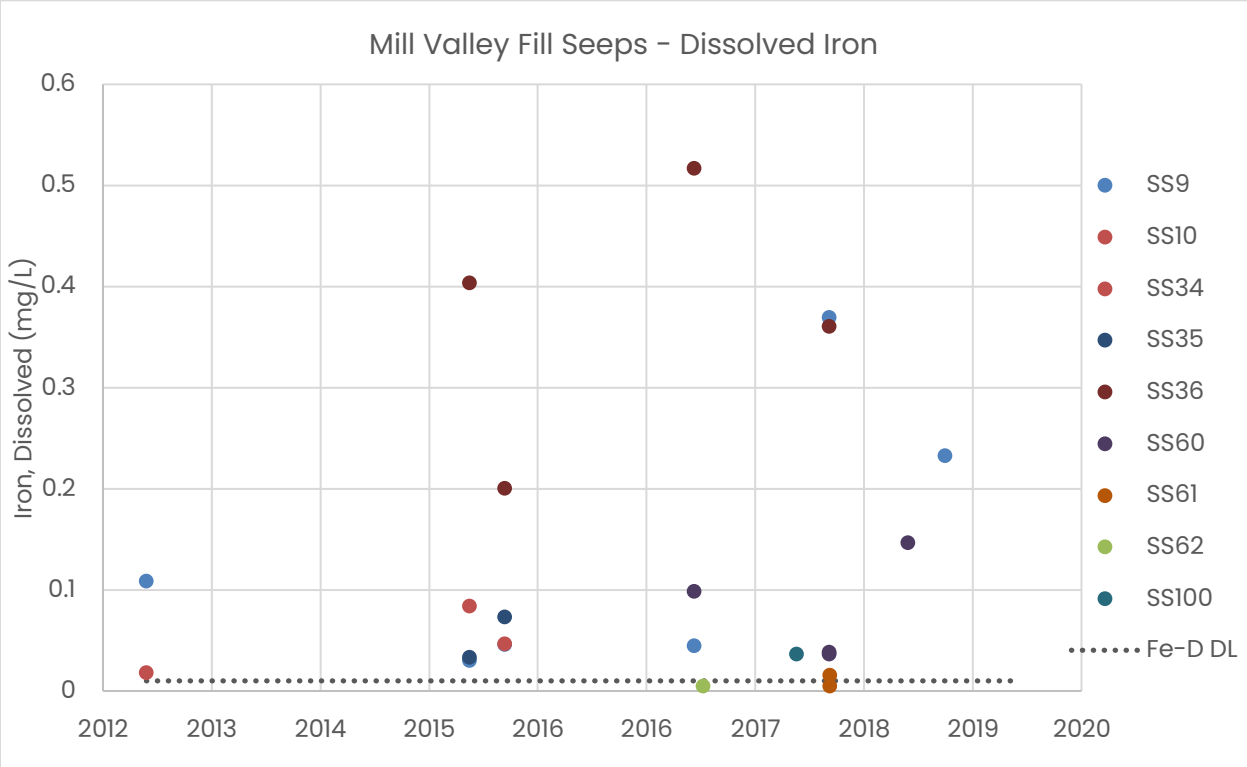


Figure 7-74: Mill Valley Fill Seeps Dissolved Iron

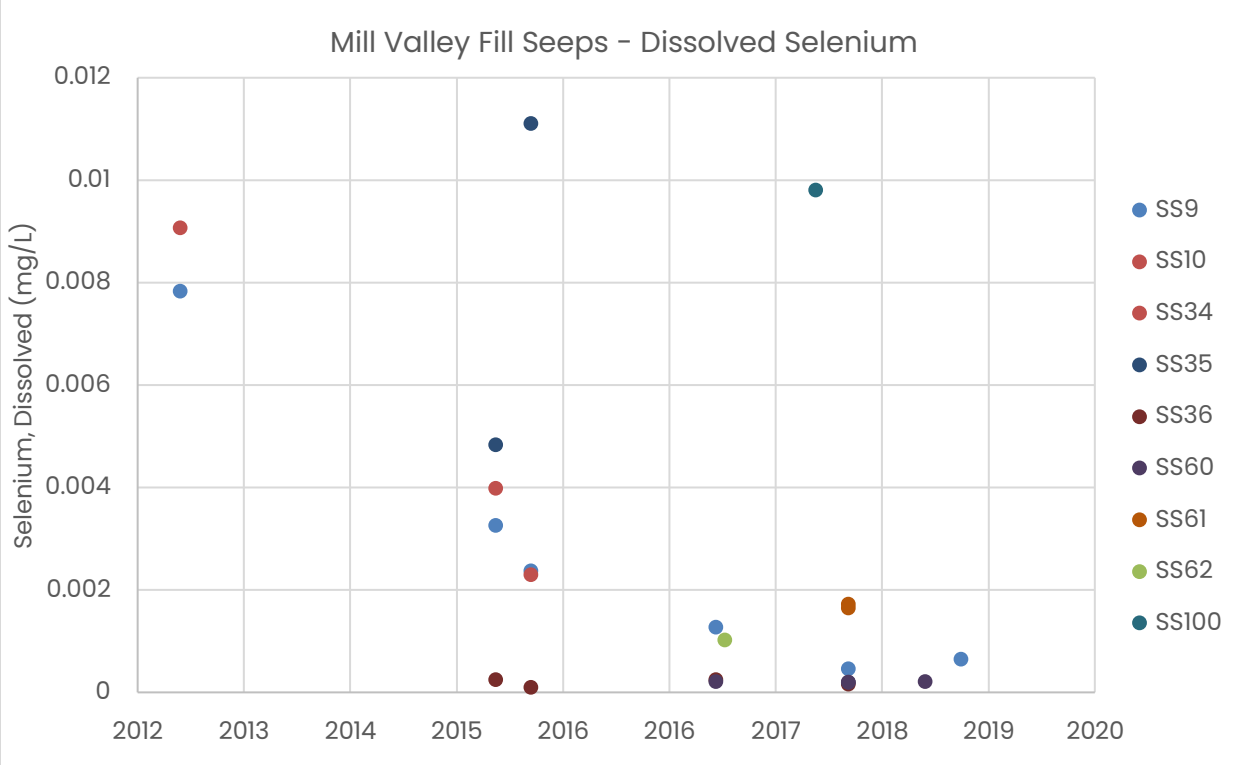


Figure 7-75: Mill Valley Fill Seeps Dissolved Selenium

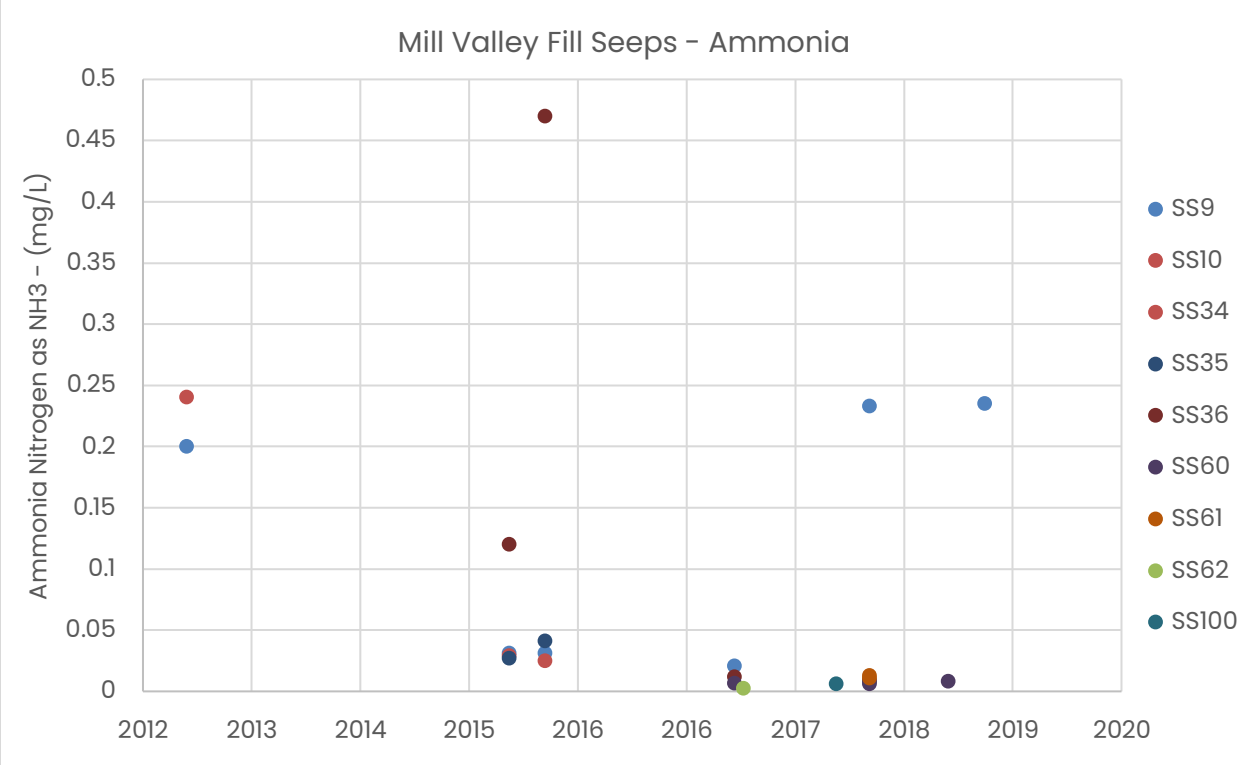


Figure 7-76: Mill Valley Fill Seeps Ammonia

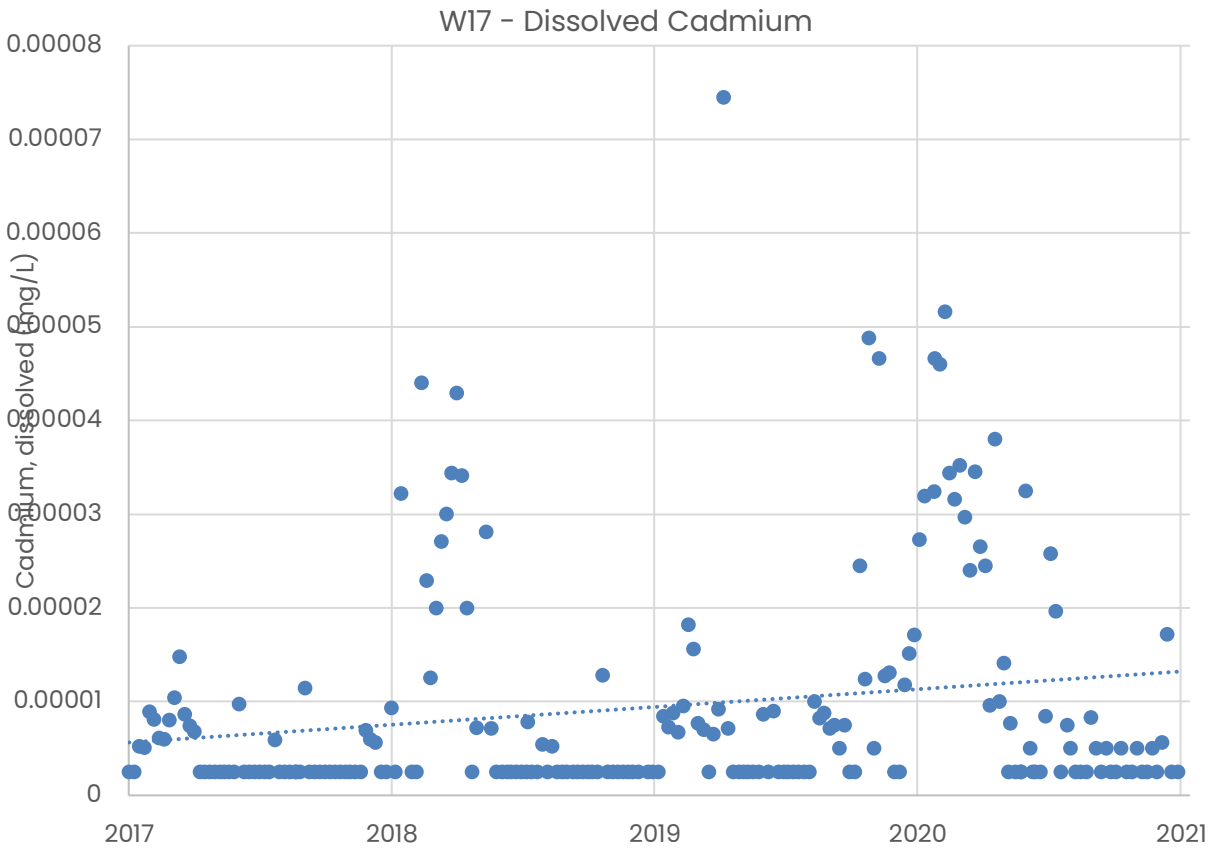


Figure 7-77: Mill Valley Fill Seeps Nitrite

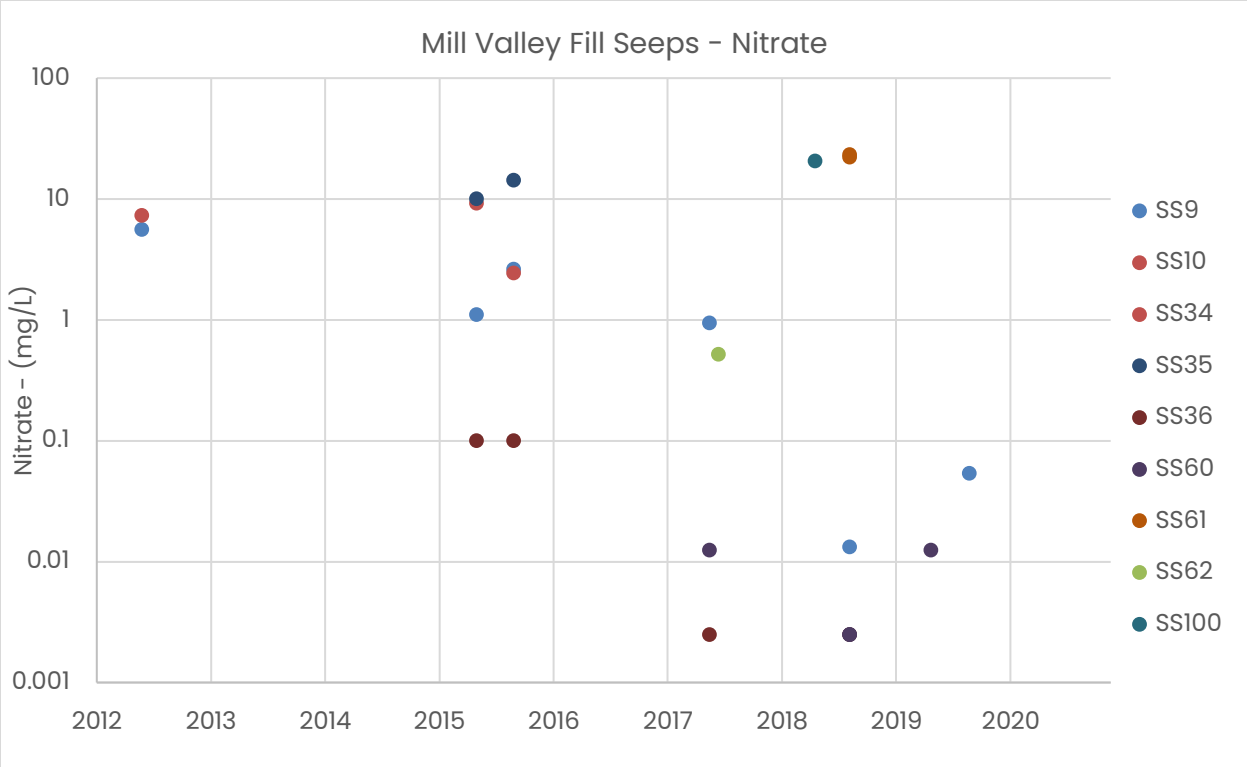


Figure 7-78: Mill Valley Fill Seeps Nitrate

7.11 Water Storage Pond Dam Seep

Seepage water quality at the Water Storage Pond Dam is represented by station W17. Water quality at station W17 is relatively consistent due to its being fed by a large stable body of water (Water Storage Pond). All dam seepage is collected in a vertical culvert and pumped back to the WSP via a 4" insulated heat traced pipe. Water quality statistics for station W17 from 2017 to 2019 are summarized below in Table 7-3. A total of 54 W17 samples were collected in the 2020 monitoring period. Water quality results for W17 are further outlined in Figure 7-79 through Figure 7-85 and include historic water quality results for dissolved copper, dissolved cadmium, dissolved iron, dissolved selenium, and nutrient levels for ammonia, nitrite, and nitrate.

Table 7-3: W17 Water Quality Results Summary (2017-2020)

W17	Effluent Quality Standards	2017 - 2019 Summary Statistics	2020 Summary Statistics

Parameters	(WUL Clause 9)	Mean	Min	Max	Mean	Min	Max
pH	6.0-9.0	8.28	7.83	8.59	8.09	7.53	8.46
TSS (mg/L)	15	4.63	<3.0	37.3	4.39	<3.0	33.1
Nutrients (mg/L)							
Ammonia	0.75	0.01047	<0.0050	0.0923	0.03298	<0.0050	0.208
Nitrite Nitrogen	0.18	0.00111	<0.0010	0.0107	0.00141	<0.0010	<0.0100
Nitrate Nitrogen	27.3	0.16095	<0.0050	1.9	0.11567	<0.0050	0.496
Dissolved Metals (mg/L)							
Aluminum	0.3	0.00242	<0.0010	0.0339	0.0035	0.0013	0.0162
Arsenic	0.015	0.0004	0.00025	0.00216	0.00056	0.00034	0.00165
Cadmium	0.004104*	0.00000907	<0.0000050	0.0000745	0.00001613	<0.0000050	0.0000516
Chromium	0.003	0.000117	<0.00010	<0.0010	0.000139	<0.00010	0.0003
Copper	0.039	0.00773	0.00472	0.0371	0.00927	0.00191	0.0219
Iron	3.3	0.0439	<0.010	0.556	0.2521	<0.010	1.73
Lead	0.012	0.0000548	<0.000050	0.000651	0.0002074	<0.000050	0.00325
Molybdenum	0.219	0.00586	0.00289	0.0103	0.00606	0.00309	0.00838
Nickel	0.33	0.00084	<0.00050	0.00727	0.001077	<0.00050	0.00225
Selenium	0.006	0.000372	0.000124	0.000722	0.00041	0.000079	0.00074
Zinc	0.09	0.00225	<0.0010	0.0209	0.00464	<0.0010	0.0534

Bold values indicate exceedances of the WUL standards

***Based on measured hardness**

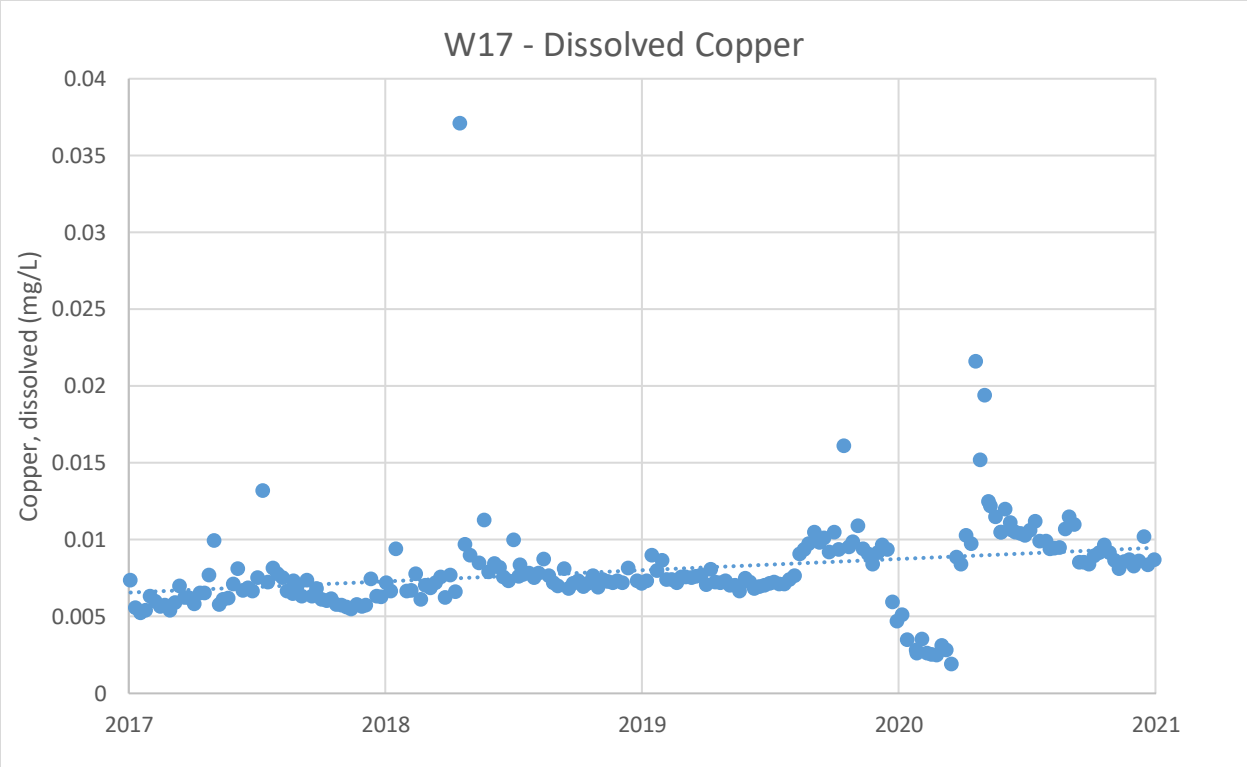


Figure 7-79: W17 Dissolved Copper

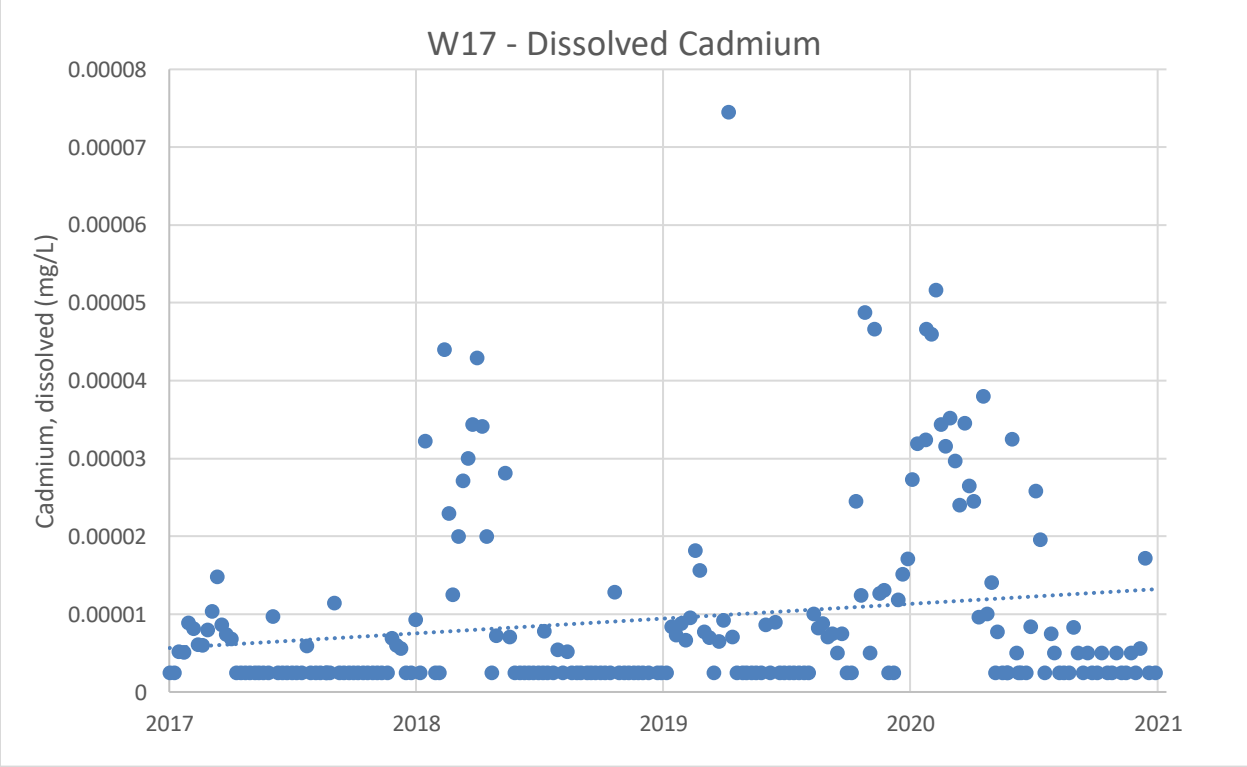


Figure 7-80: W17 Dissolved Cadmium

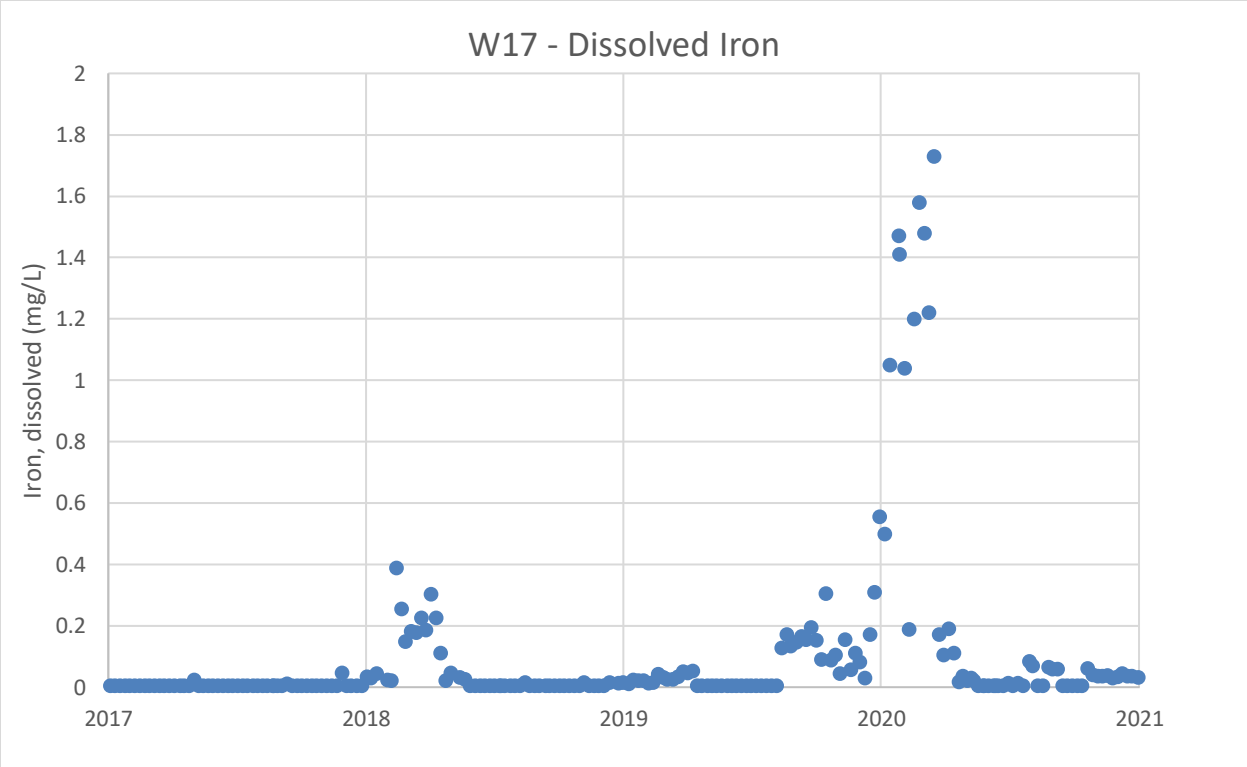


Figure 7-81: W17 Dissolved Iron

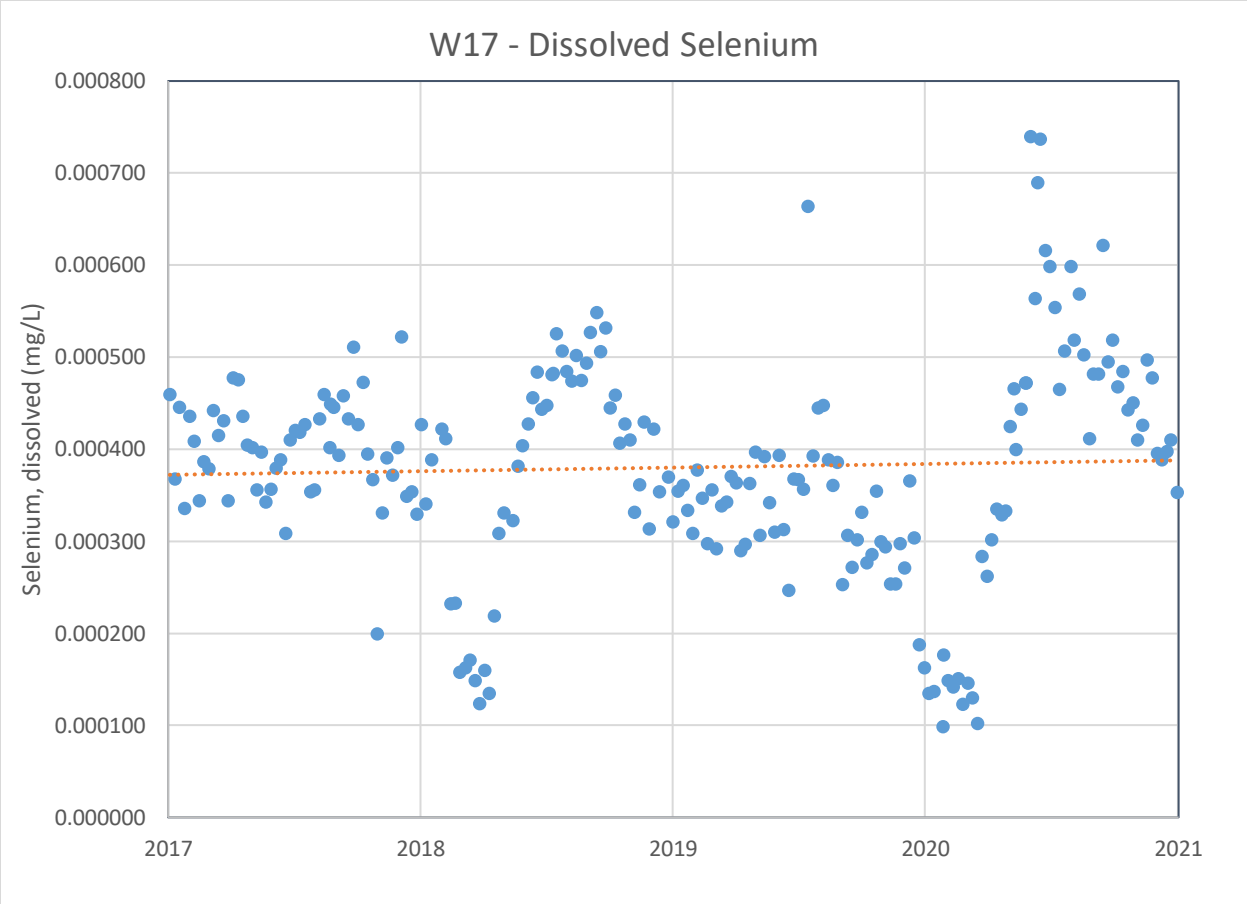


Figure 7-82: W17 Dissolved Selenium

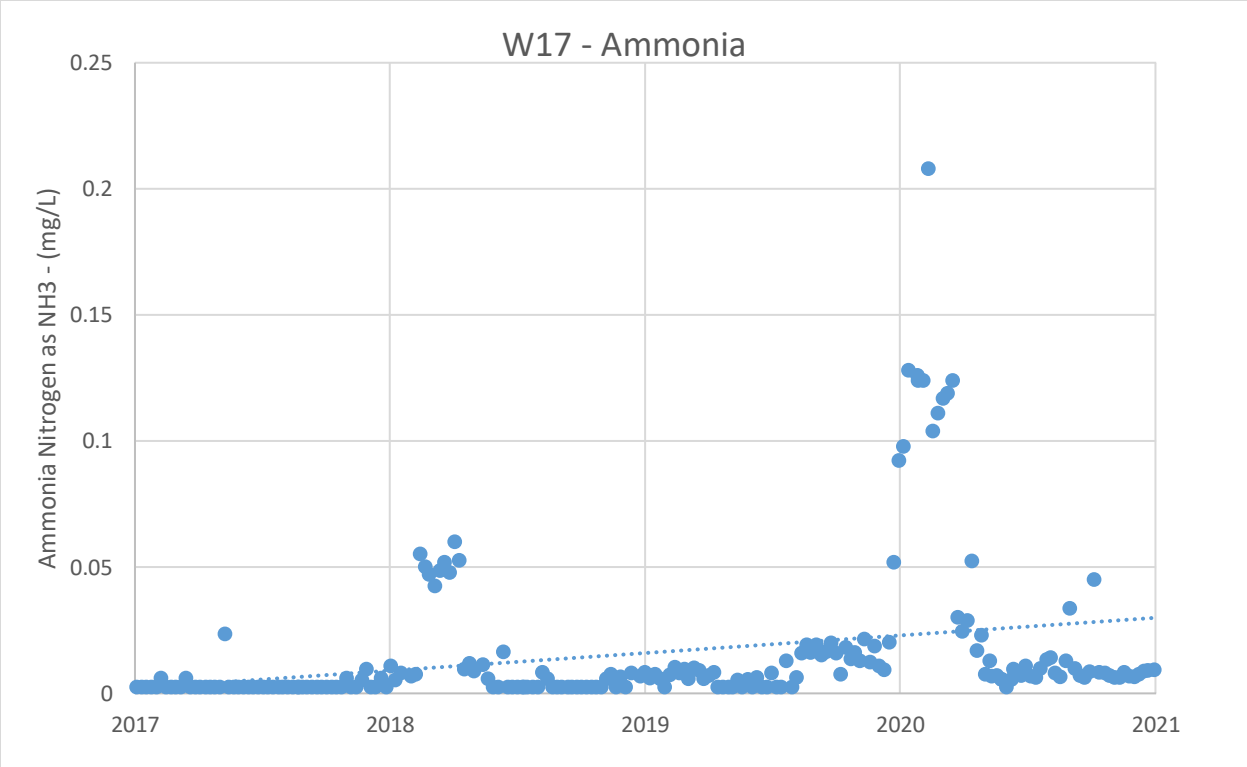


Figure 7-83: W17 Ammonia

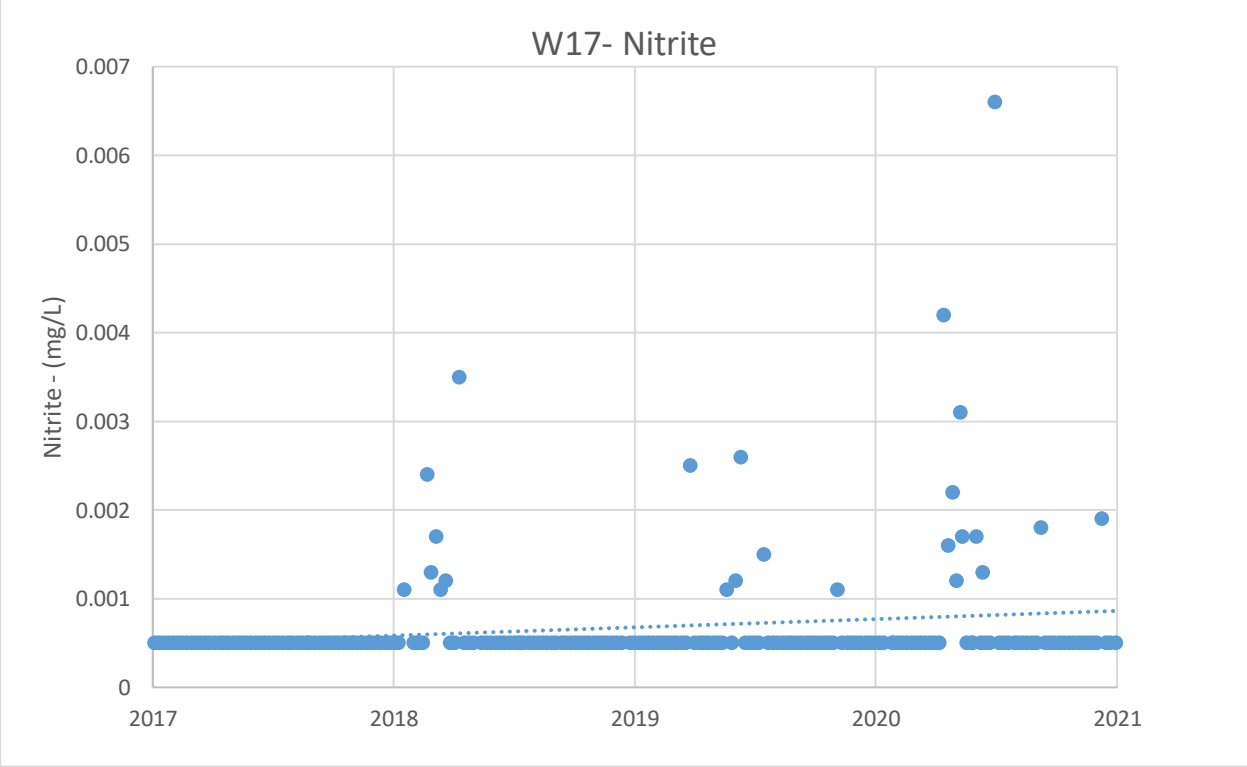


Figure 7-84: W17 Nitrite

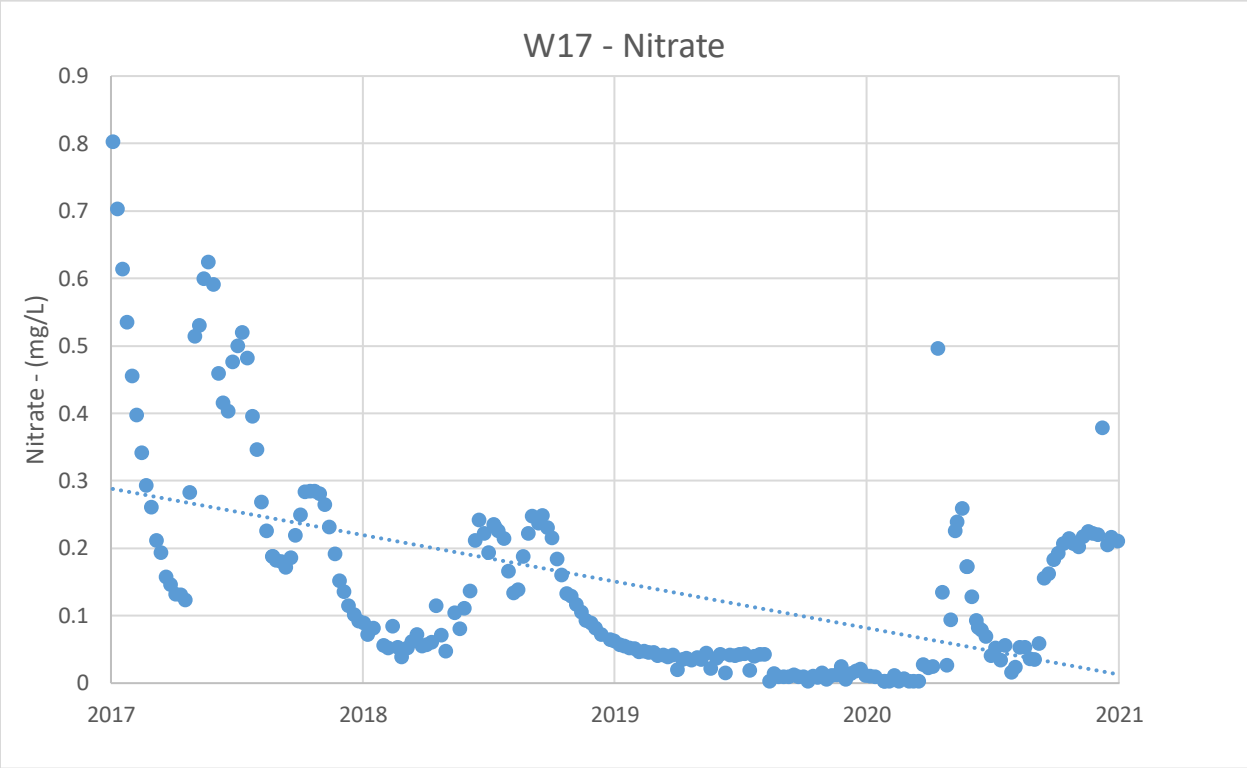


Figure 7-85: W17 Dissolved Nitrate

7.12 Camp Area

SS32 was discovered in 2014 behind the camp along the mill area survey route. SS32 was sampled in both the spring and fall of 2020 and the results for dissolved copper, dissolved cadmium, dissolved iron, dissolved selenium, and nutrient levels for ammonia, nitrite, and nitrate are displayed in Figure 7-86 through Figure 7-92 along with historical results. SS32 may be a useful reference as it originates in an area that is relatively undisturbed by mining activity. No other seeps were identified along the toe of the north ridge behind the camp and mill.

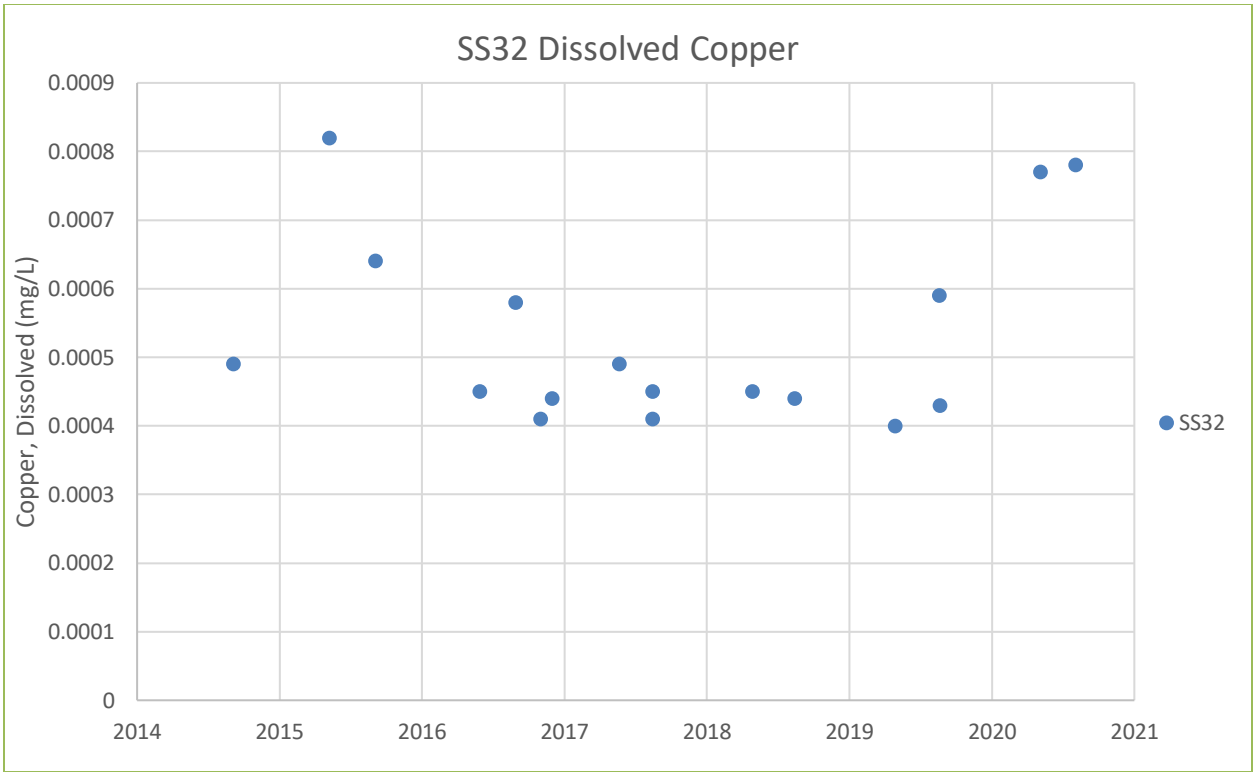


Figure 7-86: SS32 Dissolved Copper

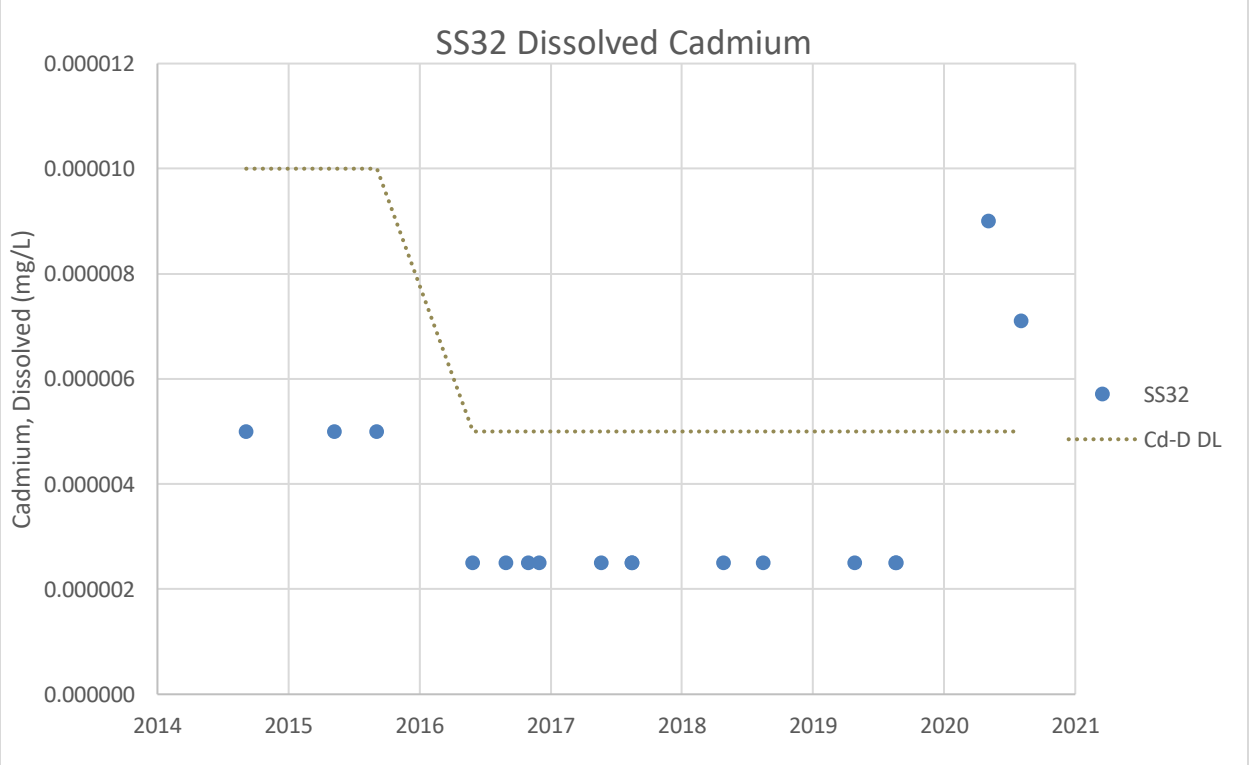


Figure 7-87: SS32 Dissolved Cadmium

DL is Analytical Detection Limit

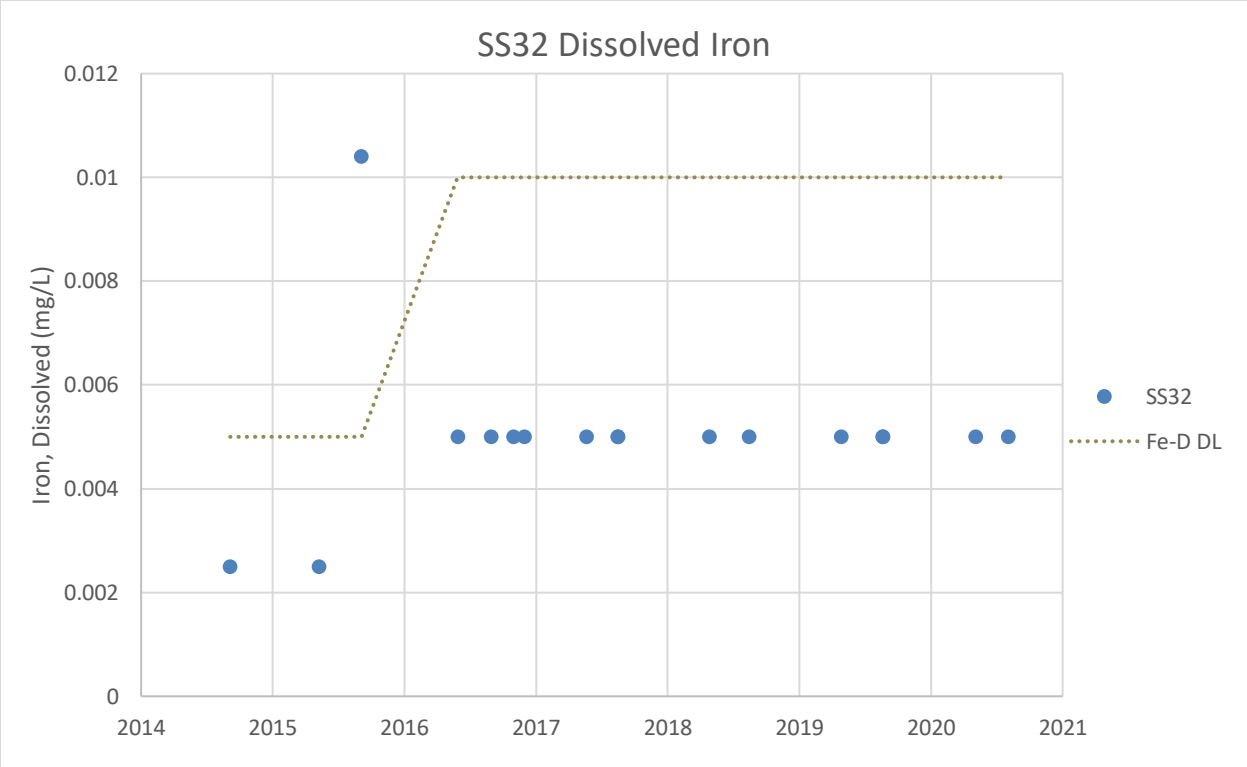


Figure 7-88: SS32 Dissolved Iron

DL is Analytical Detection Limit

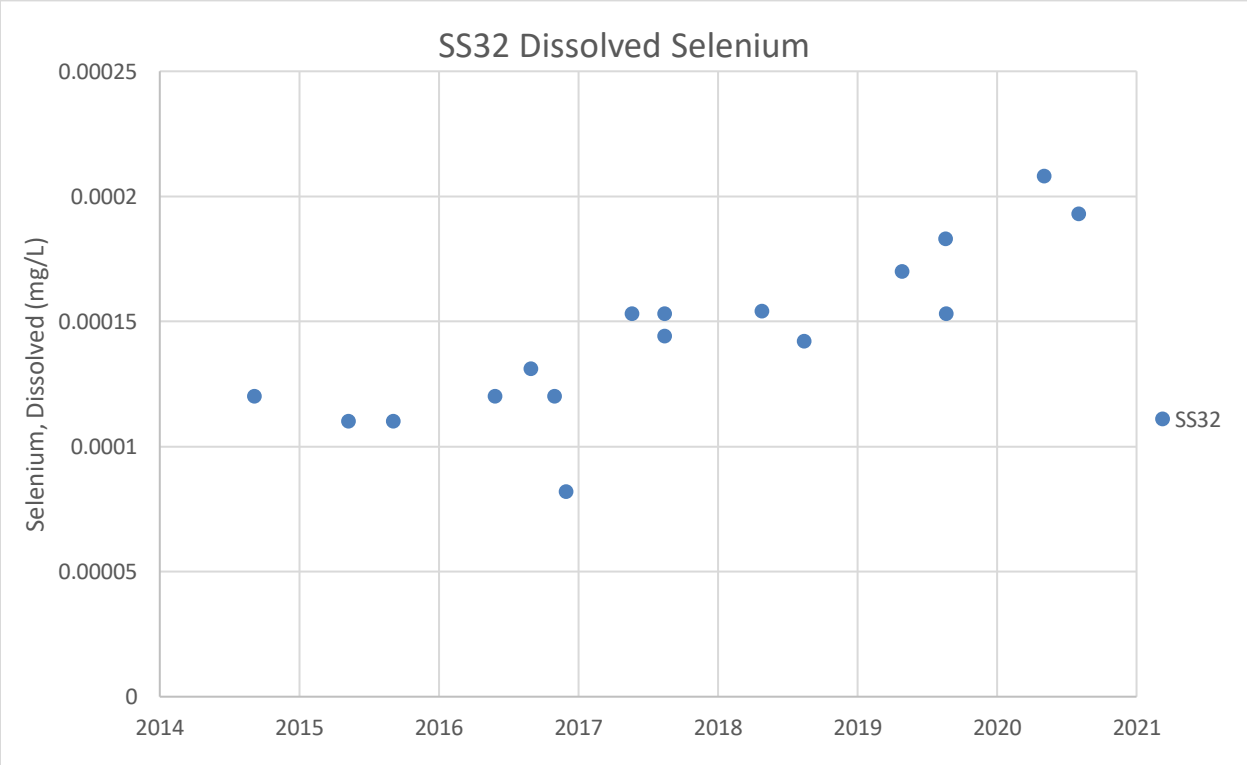


Figure 7-89: SS32 Dissolved Selenium

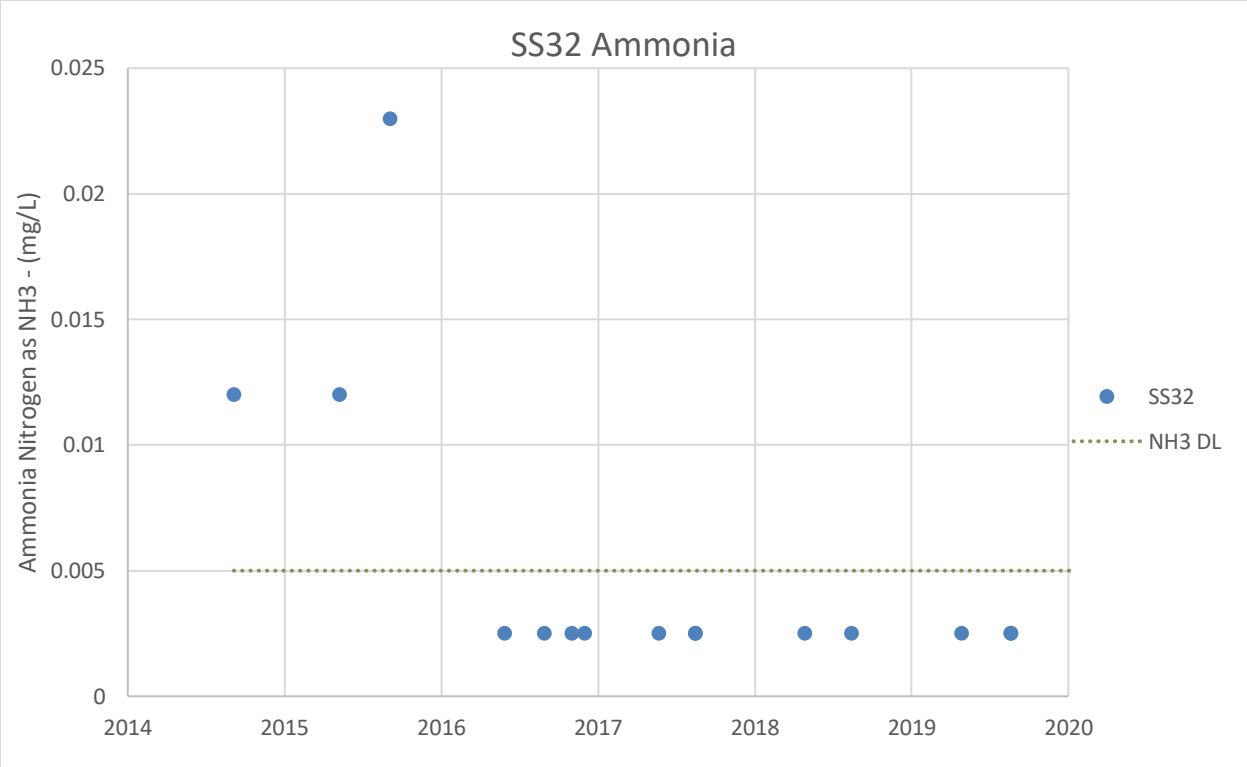


Figure 7-90: SS32 Ammonia

DL is Analytical Detection Limit

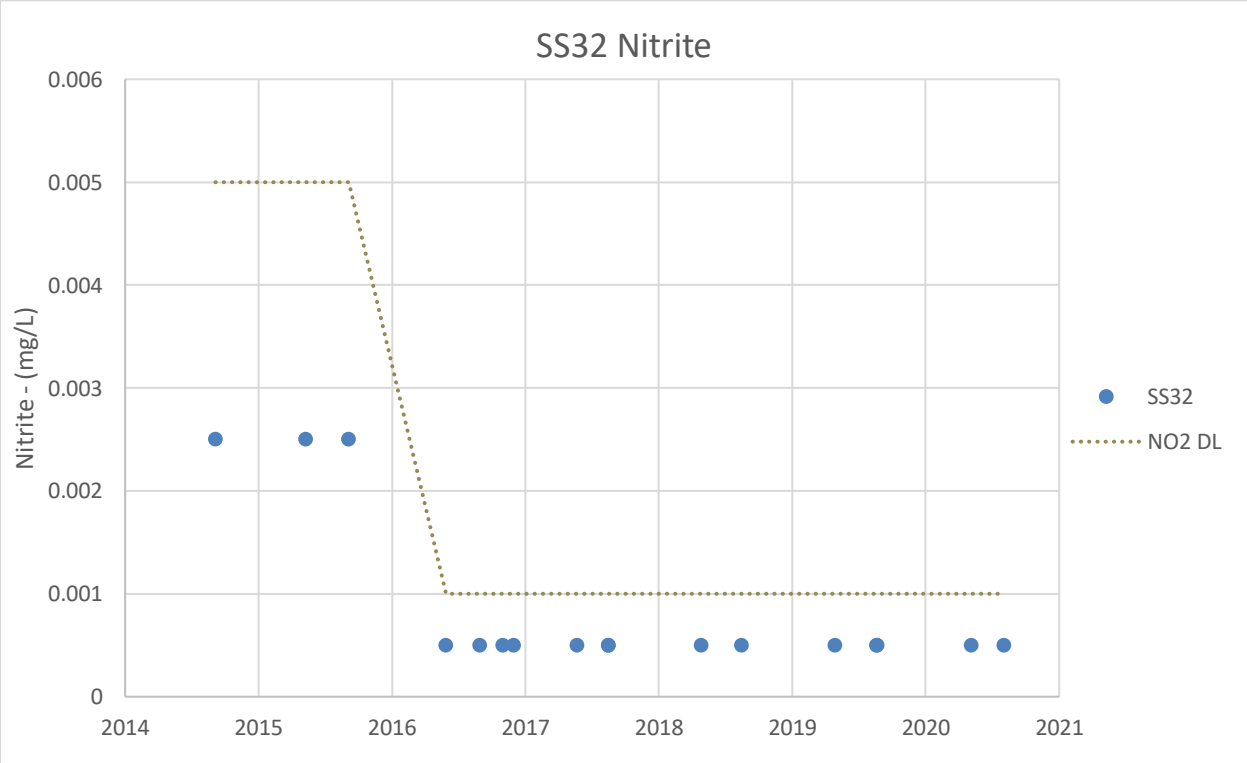


Figure 7-91: SS32 Nitrite

DL is Analytical Detection Limit

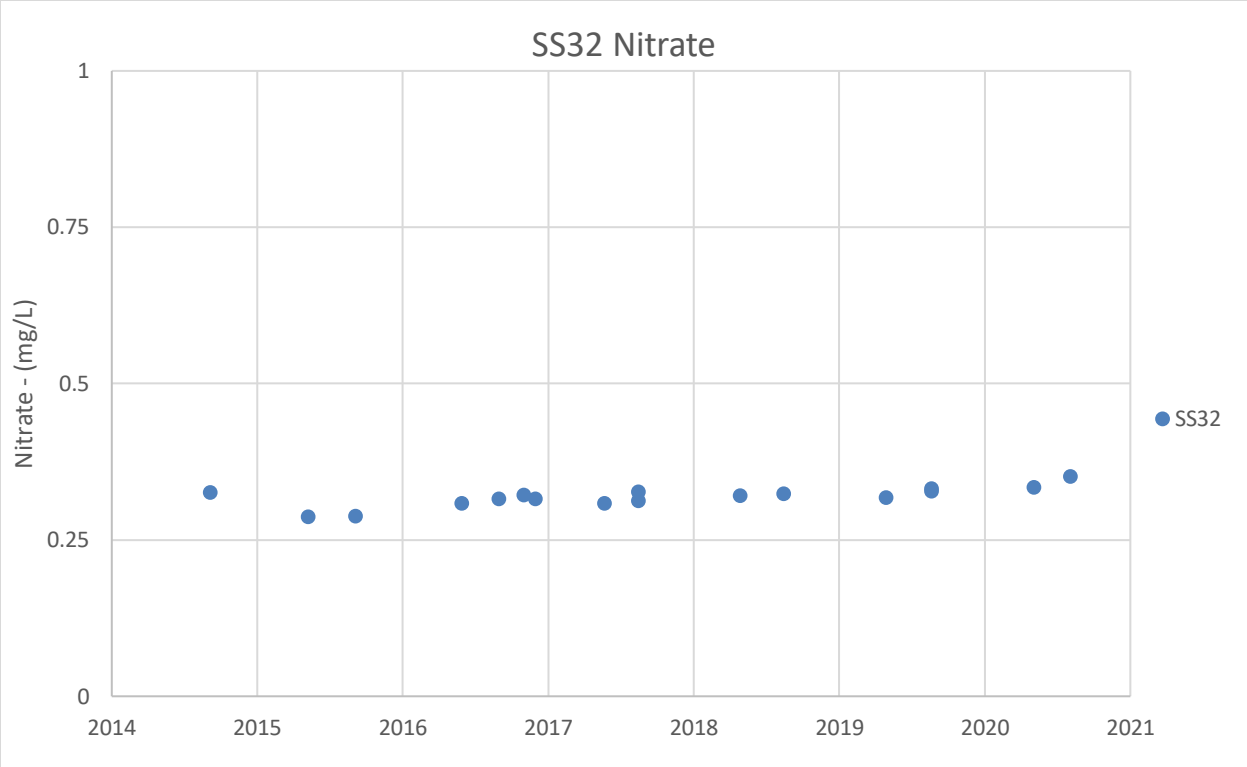


Figure 7-92: SS32 Nitrate

8 Water Management

The water balance for the Minto Mine forms the basis of the water management strategy at the site. The water management strategy at the site is for conveyance structures to either divert or release clean surface water or direct impacted water to the Main Pit and eventually treatment.

The Minto Mine generally has a positive water balance, meaning that the site-wide annual runoff is greater than the volume of water required to operate the mine. Therefore, it is necessary to release water to Minto Creek. In the event surface runoff does not meet the discharge limits stipulated in the WUL, Minto Mine has the ability to treat and release water using a combination of active treatment, conveyance structures and water storage features. The following sections will summarize water treatment, conveyance and storage during the reporting period.

8.1 Water Storage and Conveyance Network

There were no major changes to Minto's conveyance structures in 2020, however the Area 2 Stage 2 Pit and Area 2 Stage 3 Pit (previously separate reservoirs) have now merged. As planned, Area 2 Stage 2 was filled with tailings depositions to the level of the saddle separating the two pits, while Stage 3 collected surface run-off from W35 Sump, underground water from UG1, and any tailings water overflowing from Area 2. As of September 20th, 2020, the water level in Stage 3 breached the saddle, effectively combining the two storage facilities.

A permanent pump and flow meter were installed below the Yellow Ore Stockpile to collect persistent groundwater seepage and redirect to the Main Pit. Historically, this pump has only been operational during non-freezing months but, in recent years, glaciation over the winter has prevented the pump from becoming ice-free until late spring. The sump will now be functional year-round.

The strategy for managing the mine water inventory was unchanged in 2020, and the water conveyance network is illustrated in Figure 8-1. Compliant (clean) surface water was collected and diverted to the WSP. Runoff from developed mine areas (mine water) was collected and stored in the Main Pit and Area 2 Pit Complex, and once operations resumed in October, was used for ore processing, and deposition of

tailings. A planned discharge of effluent compliant water from the WSP took place from October 7th to 14th.

Water and tailings volume change over 2020 is presented in section 8.2.

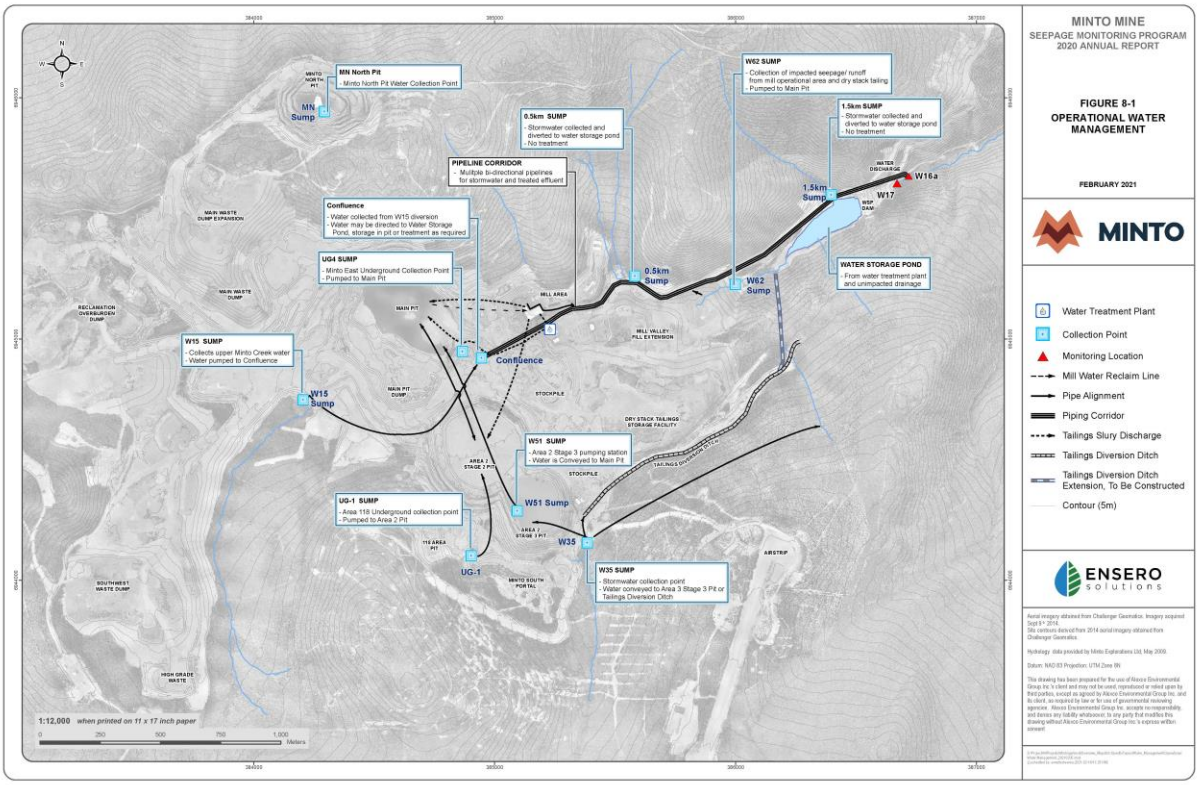


Figure 8-1: Minto Mine Water Conveyance Network (2020)

8.2 Water Storage Volumes Movement and Tracking

Water movement is tracked with flow meters on site, monitored and inspected on a weekly basis. Table 8-1 to 8-5 provide a summary of water volumes moved by conveyance structures around site in 2020. Please note that the total and net volume for each facility (WSP, MPTMF, A2PTMF) in the following tables only account for flow meter totals and do not account for evaporation and other losses/inputs. The Water Treatment Plant was not operational in 2020.

Table 8-1: Water Storage Pond (WSP) Conveyance for 2020

WSP		
Input Volume (m^3)		Total
W15	38,988	81,612

W35	0	
WTP	0	
W17	42,624	
Output Volume (m^3)		**Total**
WTP	0	48,006
Minto Creek (Environment)	5,381	
W17 seepage	42,624	
Net		33,606

Table 8-2: Main Pit Conveyance for 2020

Main Pit		
Input Volume (m^3)		**Total**
W62	107,989	1,299,547
Minto North	0	
Area 2 Pit	310,350	
W15	39,275	
UG4	412,437	
W35	0	
Mill	406,876	
Yellow Stock Pile	22,620	
Output Volume (m^3)		**Total**
Mill	1,300,351	1,300,351
Net		-804

Table 8-3: Area 2 Pit Conveyance for 2020

Area 2 Pit		
Input Volume (m^3)		**Total**
UG1	285,431	1,250,738
W35	73,696	
Mill	891,611	
W51	0	
Output Volume (m^3)		**Total**
Main Pit	310,350	310,350
Net		940,387

Table 8-4: Water Truck Deliveries on Site for 2020

Water Trucks		Total (m2)
Drills	4,930	5,044
Dust Suppression	114	

** The reported volumes are estimates only.*

Table 8-5: Well Usage in 2020

Wells		Total (m2)
Camp	7355	7,369
ERT	13	

8.2.1 Water Conveyance Tracking

Diversion of W35 water (TDD): Water was diverted from the south catchment (collected at station W35) to the Area 2 Stage 3 pit. An estimated total of 73,696 m^3

moved through the TDD to the A2S3 Pit in 2020 as measured by a Mace FloSeries® 3 open pipe flow measuring device.

Diversion of W15 water: The W15 sump collects surface runoff from adjacent undisturbed catchments, the SWD and part of the MWD. A total of 78,262 m^3 was conveyed through the W15 conveyance structure in 2020. 39,275 m^3 was directed to the Main Pit between April 22nd and June 8th. The water was redirected to the WSP when effluent standards were met at this time and a further 38,988 m^3 was deposited in the WSP between June 8th and October 20th. The W15 flows were measured and recorded using a Seametrics® mag flow meter with digital head relay module.

Pump Back of W62 water (MVFES2 Sump): Water collected downstream of the mill area, ore stockpiles and DSTSF is collected at the MVFES2 Sump (which replaced the MCDS in 2016) and pumped back to the Main Pit for treatment. A total of 107,989 m^3 was conveyed through this structure in 2020. The flow volumes were measured and recorded using a Seametrics® mag flow meter with digital head relay module.

Pump Back of Yellow Stockpile Sump: Surface runoff and groundwater seepage from the ditch between the main road(?) and the ore stockpile is collected at the Yellow Stockpile Sump and pumped back to the Main Pit for treatment. A total of 22,620 m^3 was conveyed through this structure in 2020. The flow volumes were measured and recorded using a Siemens® mag flow meter.

Pump Back of WSP Seepage (W17 Sump):

Underground De-watering (UG1 and UG4 Sumps): Groundwater in the underground workings is collected and pumped to surface via two main sumps, UG1 and UG4. UG1 collects water from the Area 118 Underground Sump and deposits it in the Area 2 Pit Complex. A total of 285,431 m^3 was conveyed from UG1 in 2020. UG4 collects water from the Minto East Underground Sump and pumps it to the Main Pit. 412,437 m^3 were conveyed through UG4 in 2020.

8.2.2 Water Storage Tracking

Water storage on site is monitored for Minto reservoirs which include the Main Pit, the Area 2 Pit, their respective tailings management facilities, the Water Storage Pond

(WSP), the Minto North Pit, and the Area 2 Stage 3. Appendix F provides a more comprehensive analysis of water movement, but presented below, Tables 8-6 to 8-10 provide a summary of their year-end storage volumes and the site-wide water yield.

In order to account for changes in reservoir capacity due to historic tailings and waste rock deposition, bathymetric surveys of the Main Pit and Area 2 pits were conducted in June 2020. New fill curves were developed based on that bathymetry to more accurately reflect the total water volume in each pit. Volume estimations based on the new fill curve were applied to the Main Pit beginning in June 2020. As noted in Section 8.1, the Area 2 and Area 2 Stage 3 pits merged in September. Water volume in these pits was tracked using the old fill curve until September; from that point, the new curve is used to track the total water volume for the combined pits in the Area 2 Pit Complex.

Main Pit: The Main Pit was used as a reservoir to support the following: water use for the Mill process; collection of impacted run-off; supply feed water to the water treatment plant; and receive water from Area 2 Pit and underground de-watering.

Table 8-6: Main Pit Storage Inventory, 2020

Date	MPTMF Volume Occupied (Water + Tailings)		Change in MPTMF Water Inventory	Tailings Solids Deposition in MPTMF
Month-Year	m^3		m^3	BCM/month
1-Jan-20	771,199		52,771	0
1-Feb-20	823,971		-84,289	0
1-Mar-20	739,682		-92,632	0
1-Apr-20	647,050		8,651	0
1-May-20	655,701		168,369*	0
18-Jun-20	**New Fill Curve**	**Old Fill Curve**	-21023**	0
	660,017	824,070		
1-Jul-20	638,994		79,123	0
1-Aug-20	718,117		33,529	0
1-Sep-20	751,646		-24,366	0
1-Oct-20	727,281		-33,962	0
1-Nov-20	693,318		-72,038	0
1-Dec-20	621,280		-68,337	0
1-Jan-21	552,943			0
	2020 Total Volume Change:		**11,457**	**0**
*May 1st to June 18th volume change from old fill curve **June 18th to July 1st volume change from new fill curve				

Area 2 Pit: The Area 2 Pit was used to support the following: supply water to the Mill via the Main Pit; collection of impacted site water; receiving water from underground de-watering; receiving water/tailings from the Mill.

As noted above, water/tailings levels in the Area 2 and Area 2 Stage 3 pits equalized in September. Table 8-7 displays storage inventory in Area 2 Stage 3 to September 1st, 2020, after which the total inventory for the combined pits is tracked in Area 2 (Table 8-8).

Table 8-7: Area 2 Pit Stage 3 Storage Inventory, January to September 2020

Date	A2S3PTMF Volume Occupied (Water + Tailings)	Change in A2S3PTMF Water Inventory
Month-Year	m^3	m^3/month
1-Jan-20	795,259	-83,667
1-Feb-20	711,592	52,055
1-Mar-20	763,648	71,408
1-Apr-20	835,056	206,305
1-May-20	1,041,361	53,674
1-Jun-20	1,095,035	10,794
1-Jul-20	1,105,830	-8,519
1-Aug-20	1,097,310	40,140
1-Sep-20	1,137,450	
YTD Total Volume Change		**342,191**

Table 8-8: Area 2 Pit Storage Inventory, 2020

Date	A2PTMF Volume Occupied (Water + Tailings)		Change in A2PTMF Water Inventory	Tailings Solids Deposition in A2PTMF
Month-Year	m^3		m^3/month	BCM/month
1-Jan-20	1,683,127		44,914	35,744
1-Feb-20	1,728,041		70,995	45,754
1-Mar-20	1,799,037		26,954	31,218
1-Apr-20	1,825,991		-59,922	55,404
1-May-20	1,766,069		3,528	78,560
1-Jun-20	1,769,596		13,822	28,527
1-Jul-20	1,783,419		3,722	57,937
1-Aug-20	1,787,141		24,161*	53,543
1-Sep-20	**New Fill Curve**	**Old Fill Curve**	119,480**	59,353
	1,007,104	1,811,302		
1-Oct-20	1,126,585		103,942	58,766
1-Nov-20	1,230,527		132,320	63,448
1-Dec-20	1,362,848		104,592	38,043
1-Jan-21	1,467,440			
	2020 Total Volume Change:		**588,511**	**606,297**

*August 1st to September 1st volume change calculated from old fill curve
**September 1st to October 1st volume change calculated from new fill curve

WSP: As 2020 was a relatively wet year, the WSP saw a significant increase in storage inventory. WSP water quality rose above the effluent quality standard for copper

following freshet in May but returned to below EQS concentration by mid-August. A brief active discharge period took place between October 7th and 14th.

Table 8-9: WSP Storage Inventory, 2020

Date	WSP Volume	Change in WSP Water Inventory
Month-Year	m^3	m^3/month
1-Jan-20	31,292	-5,031
1-Feb-20	26,261	-5,255
1-Mar-20	21,006	-2,972
1-Apr-20	18,035	35,222
1-May-20	53,257	15,704
1-Jun-20	68,961	-2,130
1-Jul-20	66,830	-960
1-Aug-20	65,871	17,125
1-Sep-20	82,996	13,672
1-Oct-20	96,668	2,040
1-Nov-20	98,708	-131
1-Dec-20	98,576	-5,726
1-Jan-21	92,850	
SUM		**61,558**

Table 8-10 summarizes the Minto Mine Site Water Balance for 2020. While the potential for variability between water volumes recorded with flow meters and volumes estimated by water elevation can be high, recorded and estimated changes in water inventories were very similar in 2020. Estimated volume change in the Main Pit was 2515 m^3 lower than change recorded by flowmeters, and 9686 m^3 lower in the Area 2 pit.

Table 8-10: Water Balance Summary for the Minto Mine Site 2020 (Jan to Dec)

	Units	Main Pit TMF	Area 2 Pit TMF	WSP
Volume Change 2020 (water + tailings)	m^3	11,457	930,702*	61,558
Tailings Deposited, total	BCM	0	**606,297**	0
Water Volume Change 2020	m^3	11,457	324,405	61,558
Estimated Groundwater Inflow	m^3	0	30,000	0
Total Water Inventory Change in 2020	**m^3**	**397,419**		
Total Water Discharged to Minto Creek	m^3	5,381		
Total Site-Wide Yield in 2020	**m^3**	402,801		

*Combined inventory change for Area 2 and Area 2 Stage 3

8.2.3 Water Conveyance Construction

Maintenance activities consisted of routine maintenance on water conveyance structures.

8.2.4 Water Balance and Water Quality Predictions Modeling

As per the WUL Clause 108, Minto is required to update the Water Balance and Water Quality Model. Minto retained SRK Consulting to complete a 2020 site water balance and water quality prediction model update. An updated 2020 Water Balance and Water Quality Model Summary for the Minto Mine is provided by SRK Consulting in Appendix F.

8.3 Water Treatment

All impacted surface runoff was directed to the Main Pit through the W15 Pipeline, via the W62 pump back pipeline, or to A2S3 Pit from the W35 Pipeline.

Minto has the option of treating for:

- Total suspended solids (TSS) only: clarification;
- TSS, copper and cadmium: clarification and chemical precipitation; or
- All water quality parameters present in the Main Pit: clarification and reverse osmosis (RO).

Water treatment by-products including TSS sludge and RO reject are pumped back to the Main Pit.

8.3.1 Operations Overview

The Water Treatment Plant did not operate in 2020 but is scheduled to be re-commissioned for use in Spring 2021.

8.4 Water Discharge

8.4.1 Discharge Volumes

Minto Mine discharged approximately 26,843 m^3 of water to Minto Creek from the WSP via W16A in 2018.

8.4.2 Compliance

As per WUL Clause 6 the rate of water discharge to Minto Creek is calculated based on daily creek flow measurements. The daily discharge volumes are presented below.

There were no exceedances of the maximum allowable daily discharge in 2020. The 2020 daily discharge values are presented in Table 8-11 and presented graphically in Figure 8-2 below.

Table 8-11: 2020 Discharge Data

Date	Daily flow rate in Minto Creek	Treated water from RO to Minto Creek, *day previous*	Daily water discharged WSP to Environment, *day previous*	Actual Daily Discharge	Qeff-c, Maximum Allowable Daily Discharge
No discharge					
8-Oct-20	0.058	0	0	762	1670
9-Oct-20	0.04	0	762	546.5	898
10-Oct-20	0.064	0	546.5	814	1661
11-Oct-20	0.059	0	814	876.9	1428
12-Oct-20	0.057	0	876.9	862.9	1349
13-Oct-20	0.053	0	862.9	901.9	1239
14-Oct-20	0.044	0	901.9	699.1	967
No discharge					

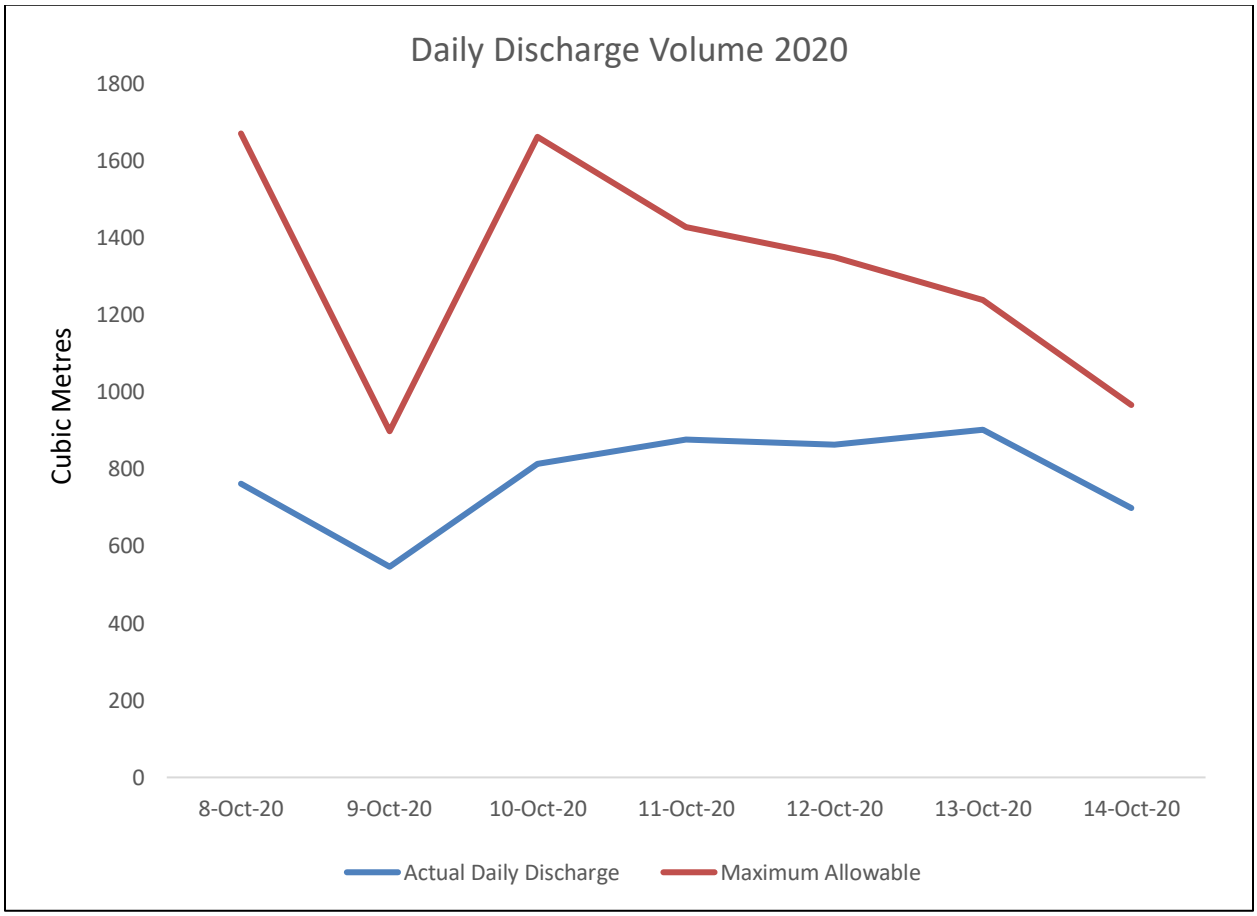


Figure 8-2: 2020 Discharge to Minto Creek

8.5 Hydrology

In 2020, as part of the EMSRP, Minto monitored hydrological conditions at water quality stations including the following: stations within the operational mine area; stations downstream from the mine operational area that are influenced by mine effluent discharge; and reference stations downstream from the mine operational area that are not exposed to effluent. Hydrological monitoring is performed using a variety of methods including manual discrete discharge measurements with combinations of flow meters, continuous stage measurements through the deployment of Solinst Level Loggers and Barometric Loggers and monitoring of an engineered flume.

The 2020 open water season was characterized by higher than average flows sustained by regular precipitation events. A brief period of active mine discharge, from the Water Storage Pond, occurred in October.

8.5.1 Minto Creek Hydrology

Hydrological monitoring on Minto Creek is conducted in accordance with the requirements outlined in the WUL. During the 2020 monitoring period, Minto Mine maintained and collected data from the following four hydrometric stations along Minto Creek.

- W3: Flume downstream of the Water Storage Pond (WSP);
- MC-1: Located in Minto Canyon – mid-catchment;
- W1: Located approximately 1 km upstream of Yukon River – lower catchment; and
- W7: Tributary on the south side of Minto Creek.

At the hydrometric stations, Solinst Level Loggers and Barometric Loggers were used in conjunction with staff gauge readings and manual flow measurements to produce volumetric flow rates.

For details on the 2020 results of Minto Creek hydrology see the *Summary of Minto and McGinty Creek 2020 Surface Hydrology Memo* in Appendix G.

8.5.2 McGinty Creek Hydrology

In 2020, hydrological monitoring on McGinty Creek was conducted as per the schedule outlined in the EMSRP. In 2018, Minto Mine added a hydrometric station at MN-1.5. During the 2020 monitoring period, Minto Mine maintained and collected data from the following four hydrometric stations along McGinty Creek.

- MN-0.5: West Tributary of McGinty Creek
- MN-1.5: Upper East arm of McGinty Creek
- MN-2.5: East Tributary of McGinty Creek
- MN-4.5: McGinty Creek near the Mouth

At the hydrometric stations, Solinst Level Loggers and Barometric Loggers were used in conjunction with staff gauge readings and manual flow measurements to produce volumetric flow rates.

For details on the 2020 results of McGinty Creek hydrology see the *Summary of Minto and McGinty Creek 2020 Surface Hydrology* in Appendix G.

8.5.3 Hydrology QA/QC

Detailed procedures for hydrology monitoring at the Minto Mine are detailed in the *Minto Mine Surface Water Hydrology* SOP. Few changes were made in the hydrology SOP, to ensure duplicate measurements were done on a 1:10 ratio as well as some changes to staff gauge measurements that would ensure consistency between users.

9 Physical Monitoring Program

Minto's physical monitoring program consists of a combination of instrumentation and visual inspections. Site wide inspections are carried out semi-annually - May/June post thaw and September pre- freeze-up. Normally, the Q2 inspection must be completed by an external geotechnical engineering consultant in accordance with Clause 13.2 of the QML. In 2020, due to COVID travel quarantine requirements in the Yukon in June, the Q2 inspection was completed by Minto and the external geotechnical inspection was completed in September. As specified in the WUL and *Minto Physical Monitoring Plan*, the following additional inspections are also performed:

- Static waste rock and overburden dumps – semi-annually
- Static open pits – semi-annually
- Diversion ditch – semi-annually (daily during water conveyance)
- Dry Stack Tailings Storage Facility, Mill Valley Fill Extension and Mill Valley Fill Extension 2 – quarterly
- Main Pit and Area 2 Pit tailings storage facilities – quarterly
- Water Storage Pond Dam – weekly (seepage), monthly (stability)

Deformation monitoring instrumentation includes survey hubs and borehole inclinometers, described in the following sections. A layout of physical monitoring instrumentation is provided in Figure 9-1, below. There were no changes to the *Physical Monitoring Program* (PMP) in 2020, however a review of the PMP was completed in early 2021 that revised the monitoring frequencies of some survey hubs. The current *Physical Monitoring Plan* can be found in Appendix H.

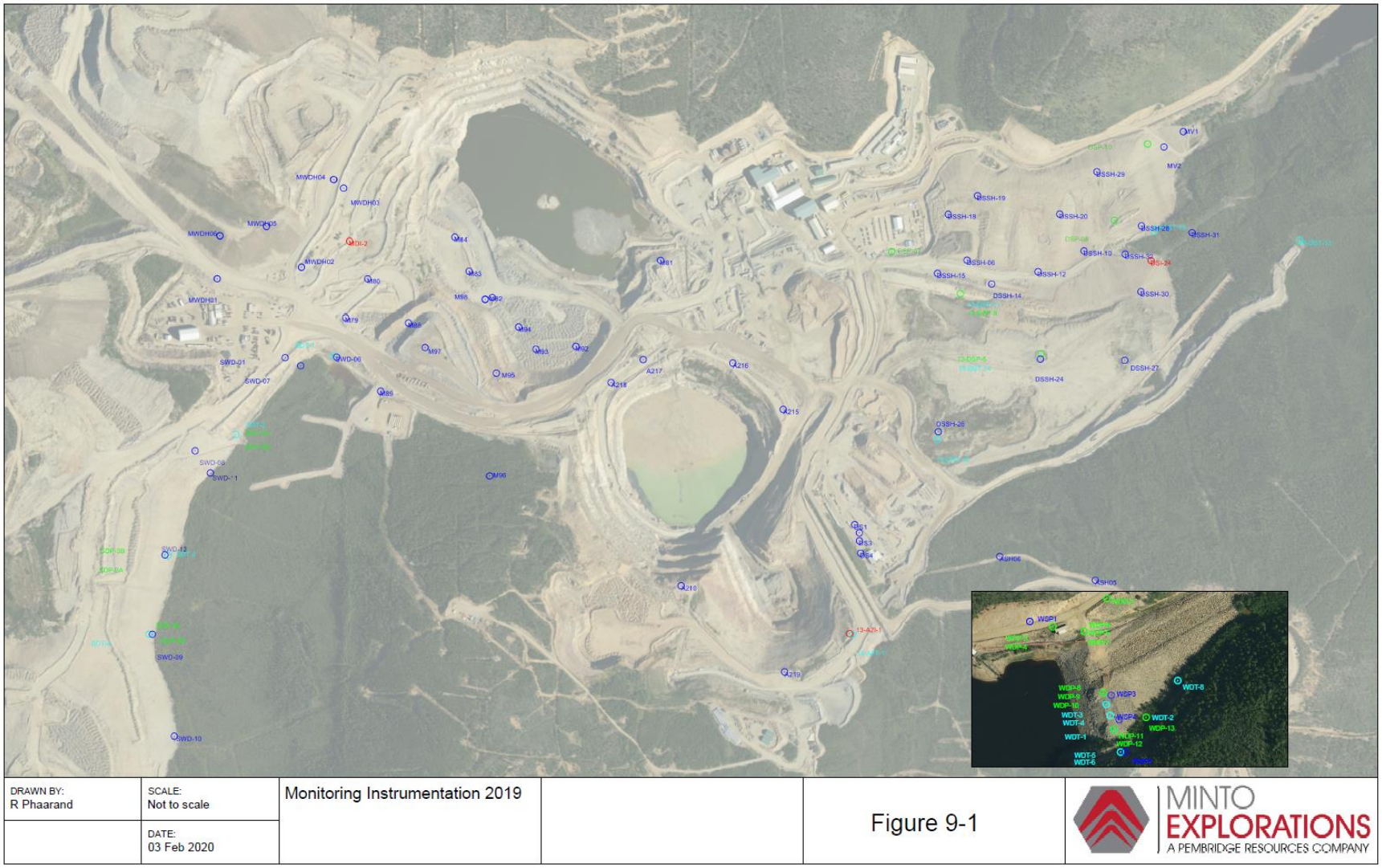


Figure 9-1: Physical Monitoring Program Installation (2020)

9.1 Physical Deformation Monitoring Instrumentation

9.1.1 Survey Hubs

Survey hubs are present at the Main Pit, Area 2 Pit, DSTSF, SWD, MWD Wrap, and WSP Dam to monitor physical deformation. Table 9-1 summarizes the data collection frequencies for each facility. The monitoring results are summarized in the following subsections.

Table 9-1: Survey Hub Data Collection Frequency (2020)

Facility	Reading Frequency	Survey Hub
Main Pit/South Wall Buttress	Monthly	M83, M88, M98
	Quarterly	M82, M84, M93, M94, M95, M97
	Annually	M79, M80, M92, M96
Area 2 Pit	Weekly (during operations)	DS01, DS02, DS03, DS04
	Quarterly	A210, A215, A216, A217, A218, A219
DSTSF	Monthly	DSSH06, DSSH12, DSSH28
	Quarterly	DSSH19, DSSH20, DSSH24, DSSH26, DSSH27, MV2
	Annually	DSSH10, DSSH14, DSSH15, DSSH18, DSSH29, DSSH31, DSSH32, MV1
SWD	Quarterly	SWD01, SWD06, SWD07, SWD08, SWD09, SWD10, SWD11, SWD12
MWD Wrap	Quarterly	MWDH01, MWDH02, MWDH03, MWDH04, MWDH05, MWDH06
WSP Dam	Monthly	WSP1, WSP3, WSP4, WSP5

Note: The data collection frequency was updated in 2021 with the annually read hubs now read quarterly.

9.1.1.1 Main Pit/South Wall Buttress Survey Hubs

There are currently 14 operating survey hubs on the Main Pit south wall buttress with the Data collected presented in Figure 9-2.

In 2017, M82 and M83 saw an increase in movement in May during construction of the Main Pit Dump (MPD), prompting the installation of additional hubs and review of the data by the SRK Consulting (the Engineer of Record). This movement was primarily associated with settlement of the in-pit dump, not part of the South Wall Buttress. In 2018, the M82, M83, M93, and M94 still show higher rates of movement with a decreasing trend. Four additional hubs were installed in May 2018 following completion

of the MPD (to monitor movement rates due to the construction of the Main Pit Dump. The readings from these new hubs show no movement or decreasing movement trends and are not considered to be a stability concern. Movement rates in 2020 showed slight increases in movement rates at M95, M97 and M98 in the spring, which subsequently slowed in the fall. The movement rates are significantly less than those observed in survey hubs prior to the south wall failure and are not considered to be a stability concern.

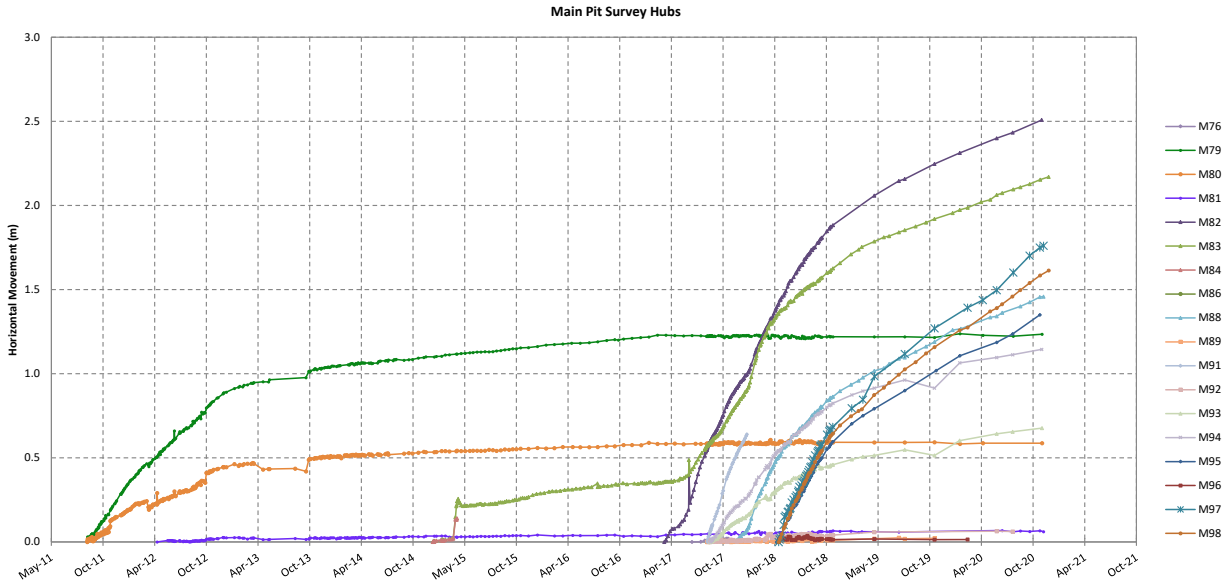


Figure 9-2: Main Pit/South Wall Buttress Survey Hub Data (2011-2020)

9.1.1.2 Area 2 Pit

There are currently 9 operating survey hubs located around the perimeter of the Area 2 Pit. Figure 9-3 presents the survey hub data for four of the hubs that are located on the east crest between the pit and the Underground Shop. The survey reading frequency of these hubs were increased to weekly since the resumption of mining due to their proximity to the shop. The 2020 results show a movement at DS04 at 0.4 mm/day and a movement rate of 0.2 mm/day at DS03, with no significant movement at the other hubs.

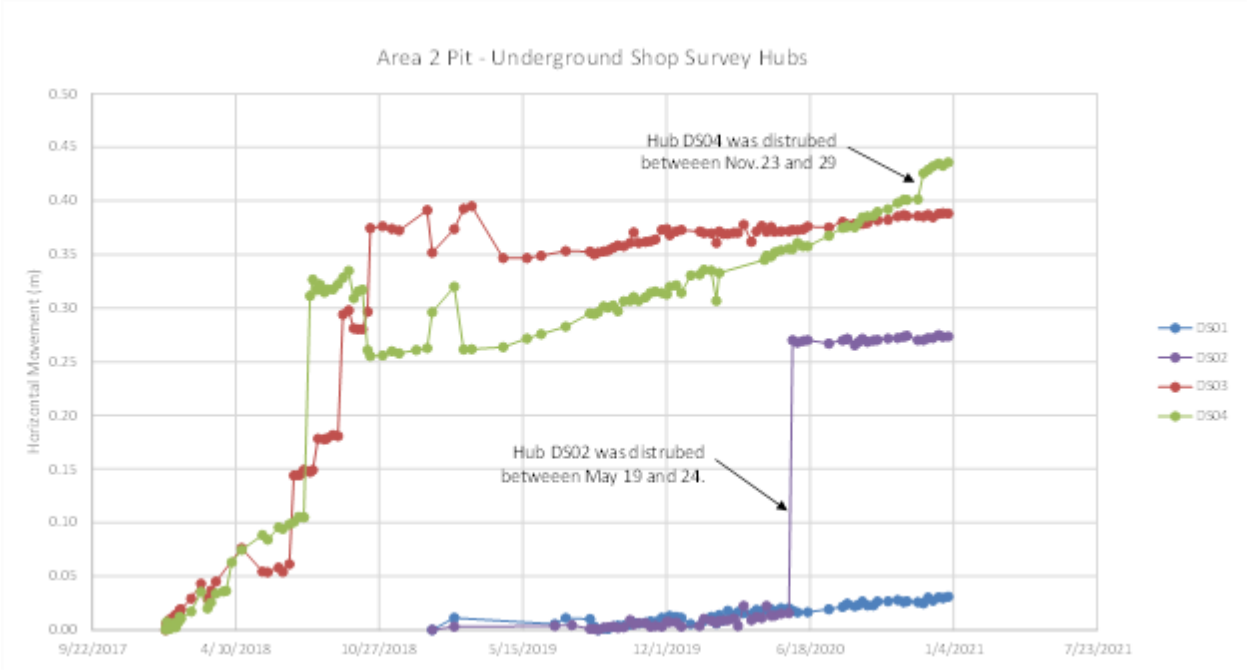


Figure 9-3: Area 2 Pit Survey Hub Data (2011-2020)

9.1.1.3 Dry Stack Tailings Storage Facility/Mill Valley Fill Survey Hubs

There are currently 17 operating survey hubs on the DSTSF and MVFE2. Data collected are presented in Figure 9-4. All hubs indicated a continued gradual decrease in movement rates in 2020, with some seasonal variation in movement rates observed at survey hubs installed over the DSTSF cover. Most hubs have shown a decrease in movement rate since the construction of the MVFE2 in summer 2016.

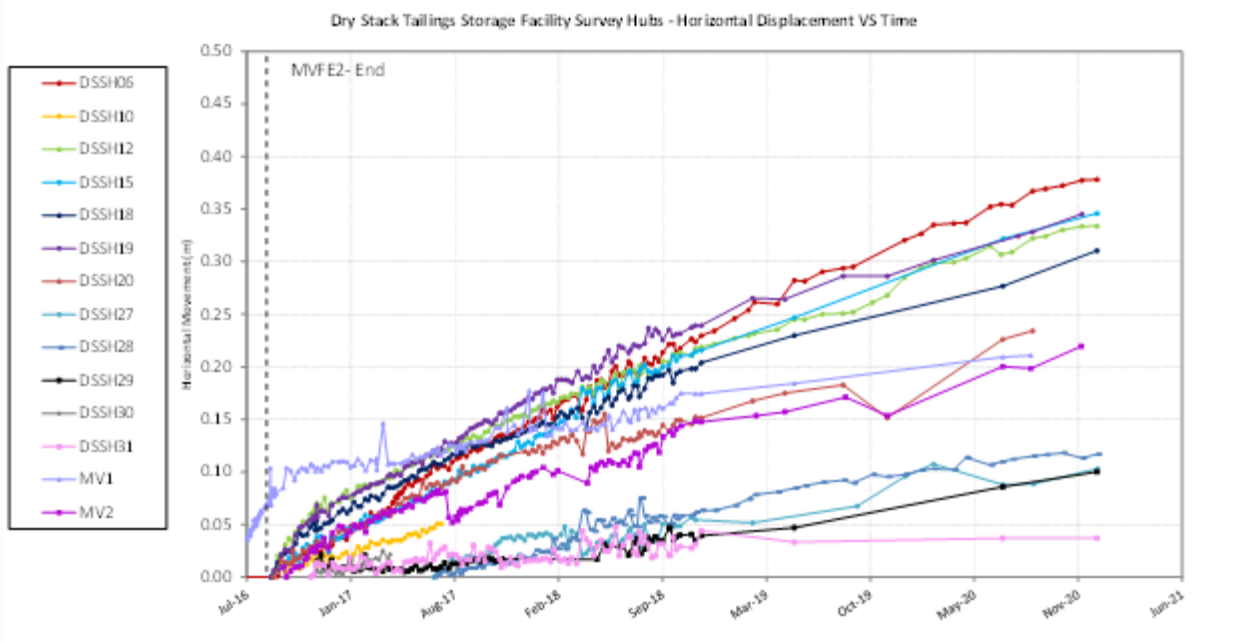


Figure 9-4: DSTSF Survey Hub Data (2016-2020)

9.1.1.4 Southwest Dump Survey Hubs

There are currently 8 operating survey hubs on the SWD. Data collected are presented in Figure 9-5. The hub indicated relatively consistent or decelerating movement rates in 2020.

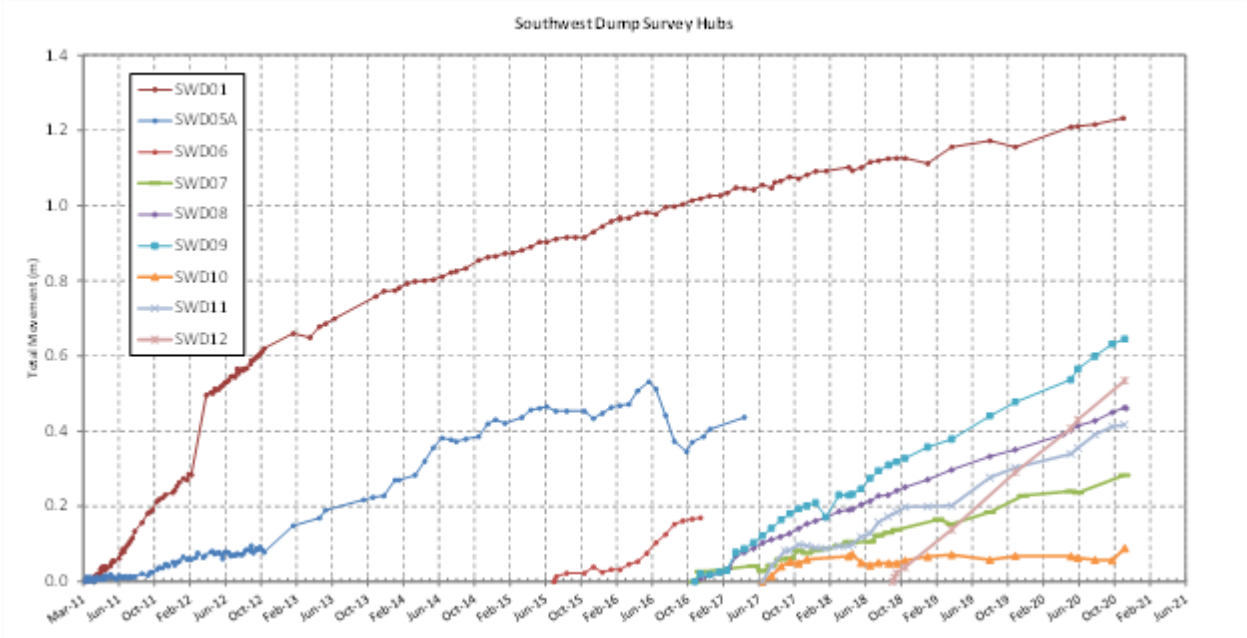


Figure 9-5: SWD Survey Hub Data (2011-2020)

9.1.1.5 Main Waste Dump Wrap Survey Hubs

Six survey hubs were installed on the Main Waste Dump Wrap in August 2018. Data collected are presented in Figure 9-6. Hubs MWDH05 and MWD06 were destroyed in 2020 because of re-sloping of the waste rock dump. The hubs have shown no movement, or a decrease in movement rate since the construction of the dump was completed.

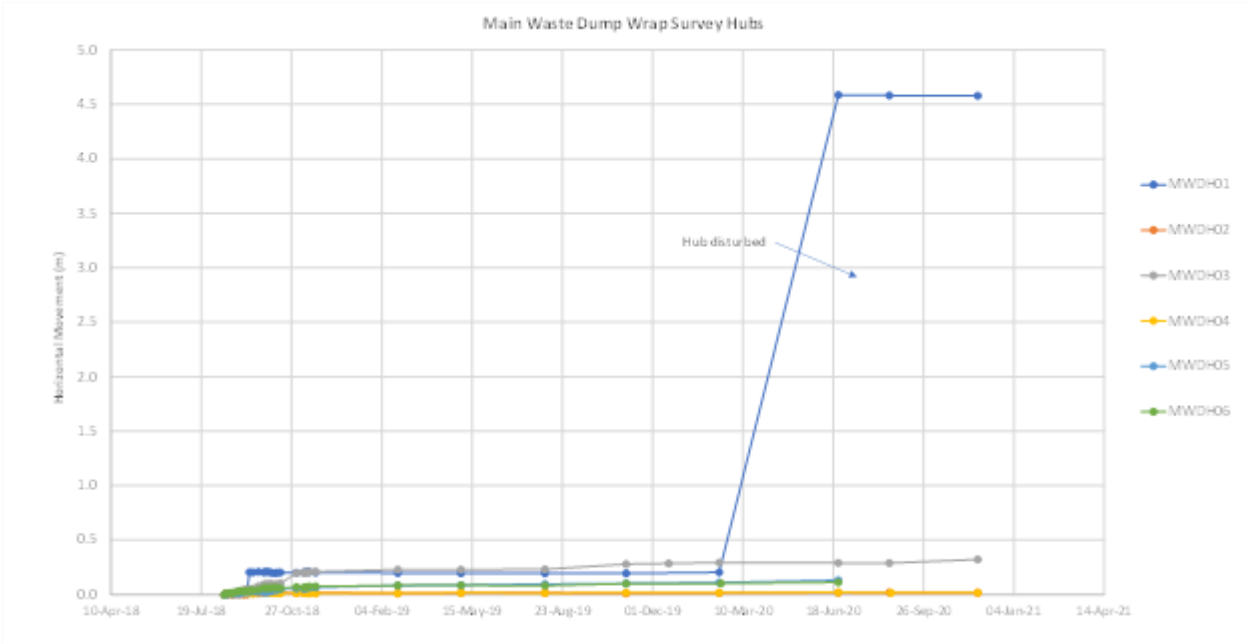


Figure 9-6: Main Waste Dump Survey Hub Data (2018-2020)

9.1.1.6 Water Storage Pond Dam Survey Hubs

There are currently four operating survey hubs on the WSP dam. There was no change to the operational status of any the hubs in 2020. Data collected are presented in Figure 9-7. Data continues to indicate no movement.

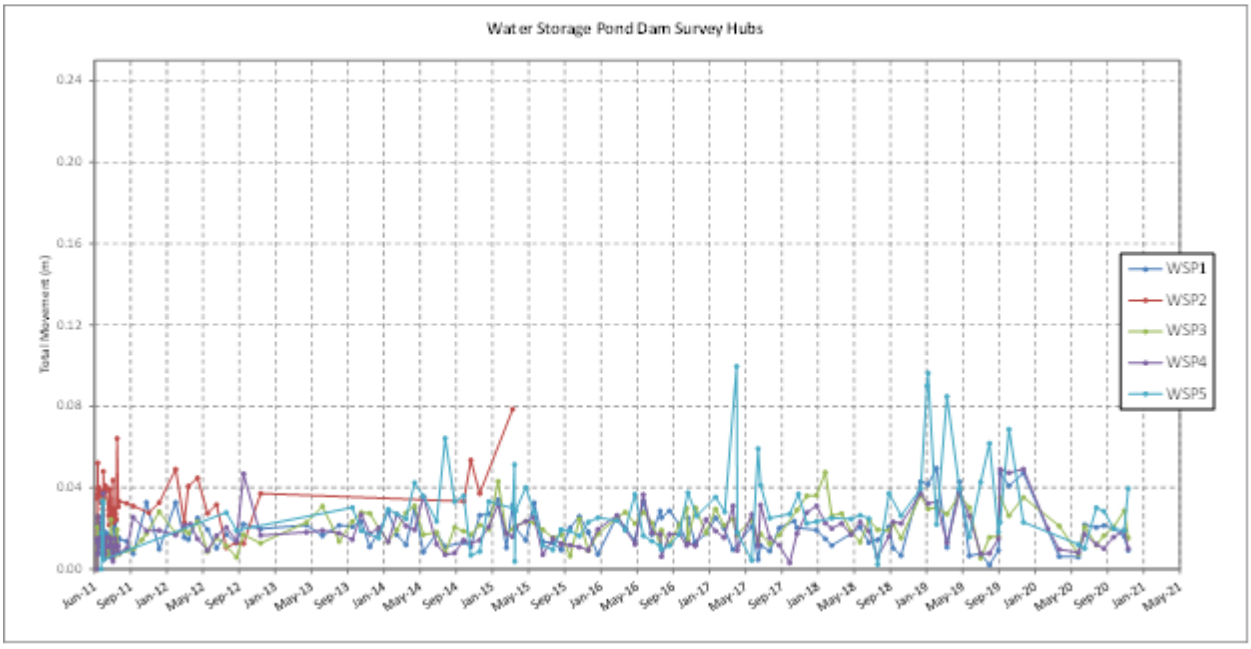


Figure 9-7: Water Storage Pond Dam Survey Hub Data (2011-2020)

9.1.2 Inclinometers

Physical deformation monitoring consists of monitoring of inclinometers at the DSTSF, Area 2 Stage 3 Pit and Main Pit. The monitoring results are summarized below.

9.1.2.1 DSTSF Inclinometer

There is one operating inclinometer (DSI-24) in the DSTSF area. DSI-24 is monitored monthly and the cumulative displacement data collected is presented in Figure 9-8. The profile plot indicates a main shear zone at a depth of 53 m, with the time plot data indicating a decelerating trend with a movement rate of approximately 0.07 mm/day in 2020. The displacement rate is similar to those observed at neighboring survey hubs.

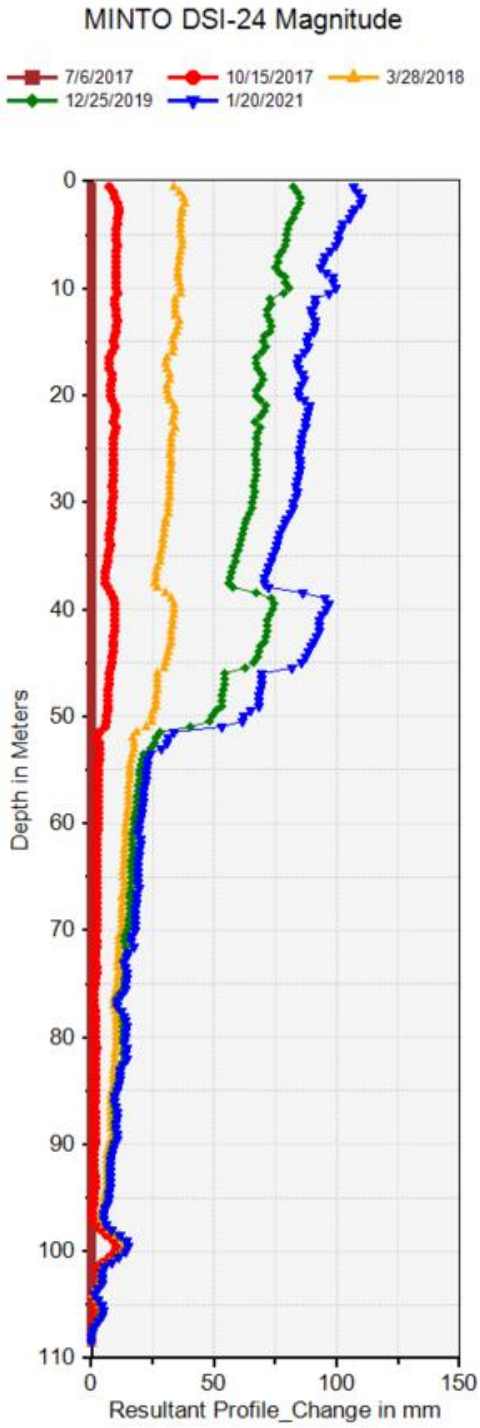


Figure 9-8: DSTSF Inclinometer DSI-24 (2017-2020)

9.1.2.2 Area 2 Stage 3 Inclinometer

There is one inclinometer (A2I-1) in the Area 2 Stage 3 Pit area that was installed in 2013 prior to development of the Area 2 Stage 3 Pit. A2I-1 is monitored quarterly with the cumulative displacement data presented in Figure 9-9. The displacement rate increased during mining of the pit in late 2017 and early 2018. Since completion of the pit, the movement rate has slowed and is not considered to be a stability concern.

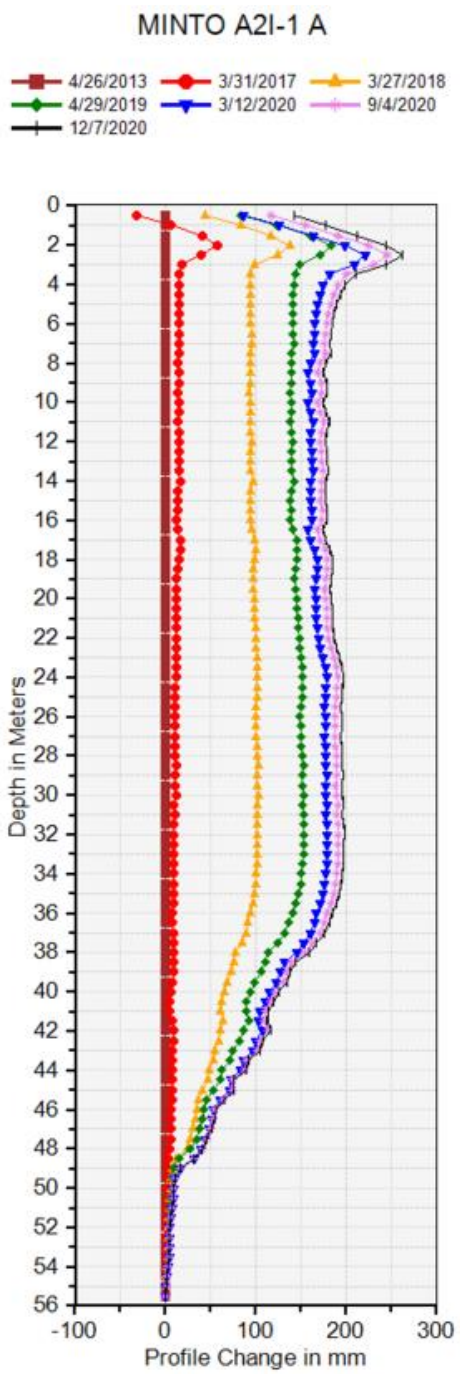


Figure 9-9: Area 2 Stage 3 Pit Inclinometer A2I-1 (2013-2020)

9.1.2.3 Main Pit Inclinometer

There is one operating inclinometer (MDI-2) in the Main Pit west wall area. Readings have been collected since 2010. Data are collected quarterly. Data collected are presented in Figure 9-10. Displacements in MDI-2 increased during the winter of 2017-18, with a movement rate of approximately 0.07 mm/day primarily occurring between the depths of 22 and 28 m below ground surface. The displacement is likely related to the construction of the MWD Wrap which occurred during the same time period. The movement rate has slowed since completion of the dump, with a rate <0.02 mm/day in 2020.

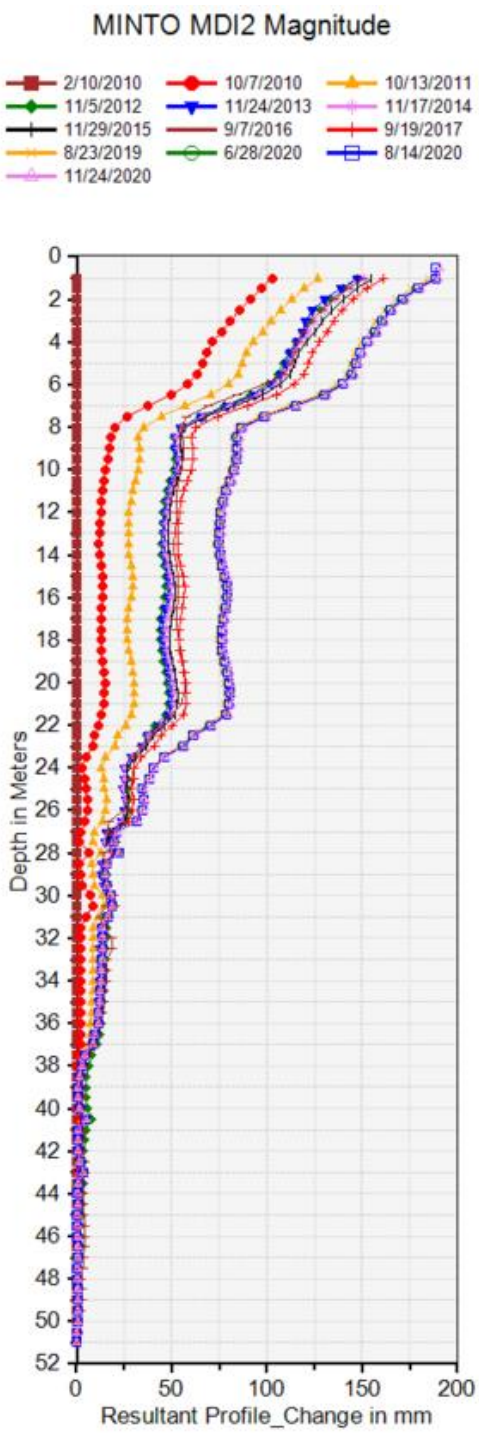


Figure 9-10: Main Pit Inclinometer MDI-2 (2010-2020)

9.2 Engineer's Annual Physical Inspection Reports

As required by the WUL and QML, the following structures are inspected semi-annually by Minto's geotechnical engineer and annually by an external geotechnical engineering consultant:

- Big Creek Bridge
- Mill and camp site
- Dry Stack Tailings Storage Facility and Mill Valley Fill Extension (Stage 1 and 2)
- Fuel containment facility
- Main Waste Dump
- Ore stockpiles
- Reclamation Overburden Dump
- Ice Rich Overburden Dump
- South Diversion Ditch
- Tailings Diversion Ditch
- Southwest Waste Dump
- Main Pit including South Wall Buttress and In-Pit Dumps
- Water Storage Dam
- Area 118 and Area 2 Pit
- Minto North Pit

Table 9-2 summarizes the recommendations from the most recent external inspection conducted September 10-11, 2020 and the associated planned actions.

Table 9-2: Annual Physical Inspection Report Summary (2020)

Area	Recommendation	Action
General	Updates are required to the sites OMS Manuals (DSTSF and WSP) due to high staff turnover in the past two years. The PMP also requires updates based on the monitoring frequency recommendations noted below.	PMP updated in early 2021, OMS Manual updates to be completed.
	An InSAR satellite survey study is recommended to be considered to increase the understanding of movement of the various waste facilities at site (DSTSF, SWD, and Main Pit Dump). The study may	Planned to be completed in 2021

Area	Recommendation	Action
	be useful to determine movement extents and if InSAR monitoring would be more an efficient long-term site monitoring method long-term (e.g. post-closure).	
DSTSF and MVFE	As part of the routine visual inspections, continue to monitor the following for any changes in condition: • the cracking present at the south end of the DSTSF, as well as • erosion gullies observed in the cover material on the northern and eastern slopes.	Ongoing Monitoring
	Survey hubs: Increase the survey hub monitoring frequency of the hubs currently monitored annually to quarterly (Hubs: DSSH-14, DSSH-15, DSSH-18, DSSH-29, DSSH-31, DSSH-32, and MV1).	Completed as part of the 2021 Physical Monitoring Plan Update (January 2021).
Tailings Diversion Ditch	Clear the sediments from the TDD Intake Structure prior to next freshet and complete construction of the TDD Intake Channel.	To Complete Spring 2021
	Construction of the Inlet Channel should be completed in a manner that meets all design requirements documented in the SRK design memo that include minimum channel dimensions, grades, rip-rap gradations and thicknesses. During construction, survey and visual inspections of the channel should be implemented to confirm adequate rip-rap gradations.	To complete summer 2021
SWD	Continue to monitor the cracking upslope of the cover soil stockpiles as part of the routine inspections specified in the PMP.	Ongoing
Camp Site	Earthworks are needed to mitigation the ongoing erosion in the erosion gulley at the north end of the camp pad to prevent damage to the utilidor. The gulley is recommended to be backfilled with coarse riprap and/or the upstream area regraded to direct runoff further to the north.	Completed

Area	Recommendation	Action
WSP Dam	Continue to monitor the identified potential sinkhole located 5 m NW of WDT-08 as part of the routine visual inspections for any change in condition. Photographs records should be maintained to aid in monitoring.	Ongoing
Main Pit, SAT Dump & In-Pit Dumps	Continue to monitor the extent of the long crack in the Main Pit Dump Ramp for any changes in condition as part of the routine visual inspections.	Ongoing
	Survey hubs: Increase the survey hub monitoring frequency of the hubs currently monitored annually to quarterly (Hubs: M79, M80, M81, M89, M92, M96).	Completed as part of the 2021 Physical Monitoring Plan Update (January 2021).
Area 2 Pit	Continue to monitor the crests and slopes as part of the monthly visual inspection for signs of worsening cracking to determine if any slope stabilization measures are required.	Ongoing

10 Adaptive Management Plan - Operations

The Operations Adaptive Management Plan has been in use since WUL QZ14-031 became active. Adaptive Management Plan 2017-01 (AMP 2017-01) is currently approved by Energy, Mines and Resources (EMR) under the current Quartz Mining License (QML-0001); while the Adaptive Management Plan 2017-02 (AMP 2017-02) is approved under by the Yukon Water Board under the current Water Use Licence (QZ41-031). This section includes the assessment to the AMP of 2017-02 specific thresholds.

The comparative tables and associated trigger levels for the adaptive management stations and the required trend analyses are included in the monthly WUL reports.

A summary of the AMP 2017-02 exceedances is included in the sections below. Not all threshold concentration exceedances result in the triggering of AMP responses, as determined by the AMP2017-02.

Quarterly Qualified Professional interpretations of AMP exceedances and their recommended responses are presented in Appendices I and J.

10.1 Surface Water Quality – Minto Creek

In 2020, AMP thresholds were triggered between April and October.

10.1.1 Minto Creek – W2

A summary of the W2 exceedances of the AMP are discussed below in Table 10-1. Trend analysis, evaluations and data has been presented in the monthly reports.

Table 10-1: Minto Creek Surface Water threshold exceedances, Station W2

Date	Parameter	Exceedance Threshold Triggered	Context
28-Apr-20	Al-D	SPT3	1 of 30 samples exceeded threshold concentration
28-Apr-20	Cd-D	SPT1	
28-Apr-20	Cu-D	SPT2	
5-May-20	Cu-D	SPT2	1 of 30 samples exceeded threshold concentration
8-Jun-20	Mo-D	SPT3	4 of 30 samples exceeded threshold concentration
11-Jun-20	Mo-D	SPT3	
15-Jun-20	Mo-D	SPT3	
22-Jun-20	Mo-D	SPT3	
8-Jul-20	Mo-D	SPT2	3 of 30 samples exceeded threshold concentration
13-Jul-20	Mo-D	SPT2	
20-Jul-20	Mo-D	SPT2	
17-Aug-20	Mo-D	SPT2	1 of 30 samples exceeded threshold concentration
8-Sep-20	Mo-D	SPT2	1 of 30 samples exceeded threshold concentration
13-Oct-20	Mo-D	SPT2	1 of 30 samples exceeded threshold concentration

Ongoing events are addressed specifically as follows:

The exceedances above expected or worst-case maximum predictions for dissolved aluminum, copper, and molybdenum were not mine-related. Instead, exceedances in dissolved aluminum and copper concentrations were more likely associated with elevated concentrations in tributaries that influence water quality at stations W2 and W3. The exceedances that occurred for dissolved molybdenum were also associated with reference concentrations, and it is likely that station W2 is influenced by

contributions from groundwater with naturally elevated dissolved molybdenum (Appendix J, *Technical Evaluation of Exceedances of Minto Mine AMP Specific Thresholds at Minto Creek Station W2*). Dissolved molybdenum did exceed the water criteria outlined in the AMP Level 3 trigger. However dissolved molybdenum concentrations were well below guidelines protective of aquatic life. Dissolved aluminum concentrations exceeded the guideline protective of aquatic life for one sampling event only, and this event was followed by a sharp decline to well below the guideline, however given that the aluminum exceedance was not mine-related no further action was recommended.

The exceedance observed for dissolved cadmium may have been mine-related, however the exceedance occurred over one sampling event only, and has since decreased. In addition, trend analyses showed that in general, cadmium concentrations at station W2 have been decreasing.

It is recommended that sampling continue as scheduled at stations W2 and W3 since concentrations are not expected to affect aquatic life. Increased monitoring frequency is not required at this time at stations W2 and W3.

10.1.2 Minto Creek – W50

Minto monitored the specific performance thresholds for surface water quality in Minto Creek at WQO station W50 until December 15th, 2020 there was no water and therefore no samples collected after this time. No adaptive management was required.

10.2 Surface Water Quality – McGinty Creek

Minto monitored the specific performance thresholds for surface water quality in McGinty Creek.

A summary of the MN-4.5 exceedances of the AMP are discussed below. Trend analysis and data has been presented in the monthly reports.

Not all threshold concentration exceedances result in the triggering of AMP responses.

Table 10-2: McGinty Creek Surface Water threshold exceedances, MN-4.5

Date	Parameter	Exceedance Threshold Triggered	Context
15-May-20	Al-D	SPT2	1 of 7 samples exceeded threshold concentration
15-May-20	Cu-D	SPT2	
15-May-20	Ni-D	SPT2	
15-May-20	Se-D	SPT2	
27-Jun-20	Se-D	SPT2	4 of 7 samples exceeded threshold concentration
21-Aug-20	Se-D	SPT2	
9-Sep-20	Se-D	SPT2	
10-Oct-20	Se-D	SPT2	

Ongoing events are addressed specifically as follows:

Dissolved aluminum, copper, nickel, and selenium exceeded the ST-2 objectives at MN-4.5, but the source was unrelated to the Minto Mine and consistent with historical concentrations before the Minto North Pit was operational. Dissolved aluminum, copper, nickel, and selenium were well below Minto's SSWQO, so effects to aquatic life would not be expected.

Three investigations show that dissolved selenium consistently triggers either the ST-2 or the ST-3 objective but that exceedances were unrelated to the mine. These consistent exceedances could be due to the appropriateness of using MN-4.5 as the station which thresholds are based on. Station MN-4.5 receives influence from a mix of the west and the east arms (Figure 1). Station MN-0.5 would be more appropriate to use as the basis for the thresholds as it is influenced by a greater proportion of the west arm (reference arm) and would serve as a good comparison to MN-2.5 which is influenced by most of the east arm (exposed arm; Figure 1). It is recommended that the development of Specific Thresholds using station MN-0.5 should be considered. Accordingly, draft thresholds were developed for MN-0.5 (for all analytes) using the same methodology as current thresholds and based on all available data from 2009 to 2018. Data for MN-0.5 was used to develop ST-1 (0.23 µg/L), ST-2 (0.26 µg/L), and ST-3 (0.21 µg/L) selenium thresholds. Draft selenium thresholds were evaluated against raw data and 12-month rolling average calculations. This interpretation is discussed in greater detail in *Evaluation of Dissolved Copper and Selenium AMP Threshold*

Exceedances in McGinty Creek – Minnow, which was submitted with the 2019 Annual Report.

It is recommended that sampling continue as scheduled since the exceedance of dissolved aluminum, copper, nickel, and selenium were unrelated to the mine. It is recommended that Minto Mine seek approval to use the draft thresholds. Increased monitoring frequency is not required at this time.

10.3 Groundwater Quality – Minto Creek

Various exceedances of AMP levels triggered a review of the groundwater data by the qualified professional. All groundwater data was forwarded to SRK Consulting for review and recommendations. See Appendix I , *2020 Minto Mine – 2020 Groundwater Review and Summary of OAMP SPT Exceedances - SRK,* for details. Groundwater quality results are presented in Appendix C.

10.4 Groundwater Quality - McGinty Creek

Minto monitored the specific performance thresholds for McGinty Creek groundwater. Various exceedances of AMP levels triggered a review of the groundwater data by the qualified professional. All groundwater data was forwarded to SRK Consulting for review and recommendations. See Appendices I and J, *2020 Minto Mine – 2020 Groundwater Review and Summary of OAMP SPT Exceedances - SRK,* for details. The Annual Review of AMP Exceedances for 2020 will include a comprehensive water and load balance for McGinty Creek and is expected later in the year, and will be submitted separately.

10.5 Water Management AMP

Water storage capacity in the Main Pit Tailings Management Facility and the Area 2 Pit Tailings Management Facility exceeded 1,000,000 m^3 during the operational period and as such, no responses from the adaptive management plan were applied.

10.6 Physical Monitoring Program AMP

The results of the Physical Monitoring Program are compared to the thresholds set out in the 2018 Adaptive Management Plan (AMP). Table 10-3 and 10-4 below, summarize the threshold statuses for the Category 1 and Category 2 facilities. Please note that the table also includes historical context for some Thresholds.

Category 1 facilities are those found in areas of ice-rich periglacial foundations that have previously experienced deep-seated foundation movement and include the Dry Stack Tailings Storage Facility, Mill Valley Fill Extension (Stages 1 and 2), Southwest Waste Dump, and South Wall Buttress/Main Pit Dump. Category 2 facilities are all other waste rock dumps, including the Main Waste Dump and Main Waste Dump Expansion, Reclamation Overburden Dump, and Ice-rich Overburden Dump.

Table 10-3: Category 1 Facilities – Threshold Status, December 2020

Specific Performance Thresholds	Thresholds Exceeded	Response
Specific Threshold 1 • Observation of unusual occurrence including: • tension cracks, settlement, or sloughing; • a seismic event that exceeds the 1:475 return period event[1]; • abnormal seepage from any area of the slopes; • increased turbidity from seepage; • Physical damage.	SWD Cracking	**Sept. 2020:** Increased cracking observed on the former main road of the dump just south of the former IROD. The crack is oriented parallel to the crest, is approximately 200 m long and has a maximum width of 35 cm. The cracking was observed in June 2019. Survey hub data below the cracking was reviewed (Hubs SWD09, 11, and 12) and hubs SWD09 and 11 show a slight acceleration trend, but movement rates are like those observed in 2018. The cracking is believed to be related to the long-term movement of the SWD. Area is to continue to be monitored for changes as part of routine inspections.

[1] This size of a seismic event would be felt by most people on site. It would shake buildings, and rattle or break dishes, hanging objects, etc. Earthquake information may also be found online at: http://www.earthquakescanada.nrcan.gc.ca/index-eng.php

Specific Performance Thresholds	Thresholds Exceeded	Response
		In response to the cracking, the survey hub frequency of hubs SWD 9, 10, 11, and 12 was increased to monthly. **Current Conditions:** Movement rates have since slowed with no indication of instability.
Specific Threshold 2 • One survey hub or inclinometer reading indicating an increase in the movement rate greater than the long-term trend and outside the range of instrumentation error.	DS04	**November 2020**: Apparent acceleration trend with a displacement of 2.3 cm between two weekly readings. The following reading resulted in a movement rate that was like the proceeding readings indicating potential hub disturbance. December 2020: Three readings collected in past month indicate no change in movement following the disturbance. Issue considered **CLOSED**.
	M95	**November 2020**: Apparent acceleration trend increasing from 0.7 mm/day to 1.1 mm/day. Retake reading to confirm trend. **December 2020:** Subsequent reading confirmed the 1.1 mm/day rate and no further acceleration noted. The 1.1mm/day rate is within the typical seasonal range observed in 2019-20 and will continue to be monitored.
Specific Threshold 3 • For DSTSF and MVFE piezometers 13-DSP-05a, 13-DSP-06, 15-DSP-07, and 15-DSP-08, an increase in piezometric pressures under	None	N/A

Specific Performance Thresholds	Thresholds Exceeded	Response
unfrozen or thawing conditions such that Ru[2] exceeds 0.40. • For MVFE2 piezometer 15-DSP-10, an increase in piezometric pressures under unfrozen or thawing conditions such that the equivalent water elevation is 3 m above the original ground surface. Or Temperature greater than zero at a depth of 2 m below original ground *(all SWD ground temperature cables, and DSTSF ground temperature cables DST-10, DST-11, and DST-14 only)*		
Specific Threshold 4 • For DSTSF and MVFE piezometers 13-DSP-05, 13-DSP-06, 15-DSP-07, and 15-DSP-08, an increase in piezometric pressures under unfrozen or thawing conditions such that Ru exceeds 0.6. • For MVFE2 piezometer 15-DSP-10, an increase in piezometric pressures under unfrozen or thawing conditions such that the equivalent water elevation is 10 m above the original ground surface.	None	N/A
Specific Threshold 5 • Three consecutive survey hub or inclinometer readings indicating an increase in the movement rate movement greater than the long-term trend. Or • Three consecutive survey hub readings indicating a change in	None	N/A

[2] Ru is the pore water pressure coefficient which is the ratio of piezometric pressure to the overburden pressure. A pore water pressure ratio of 0.5 would be similar to the effect of a groundwater table at surface. Conversions from Ru to equivalent water elevation are contained in Table 2-15 of the AMP.

Specific Performance Thresholds	Thresholds Exceeded	Response
horizontal direction of movement greater than 15 degrees from the long-term trend.		

Table 10-4: Category 2 Facilities – Threshold Status, December 2020

Specific Performance Thresholds	Thresholds Exceeded	Response
Specific Threshold 1 • Observation of unusual occurrence including: • tension cracks, settlement, or sloughing; • a seismic event that exceeds the 1:475 return period event; • abnormal seepage from any area of the slopes; • increased turbidity from seepage; • physical damage.	None	N/A
Specific Threshold 2 **WSP Dam:** • One survey hub reading indicating an increase of movement outside range of instrumentation error. **All other Category 2 Facilities:** • Survey hub cumulative displacements between 150 mm and 500 mm.	None	N/A
Specific Threshold 3 **WSP Dam:** • One piezometer reading outside of its long-term trend (in comparison to the reservoir pond elevation). **All other Category 2 Facilities:**	None	N/A

• Survey hub cumulative displacements greater than 500 mm.		
Specific Threshold 4 **WSP Dam:** • Three consecutive survey hub readings indicating increase in movement outside range of instrumentation error.	None	N/A

11 Aquatic Environmental Monitoring Program

The Aquatic Environmental Monitoring Program (AEMP) is composed of Minto's requirements under the MMER and biological monitoring of sediment, benthic invertebrates, fish and fish habitat. Monitoring under the MMER is presented in Section 11.1 and the biological monitoring of sediment, benthic invertebrates, fish and fish habitat is presented in Section 11.2.

11.1 Metal and Diamond Mining Effluent Regulations Monitoring Programs

The Metal and Diamond Mining Effluent Regulations (MDMER) outline requirements for monitoring and reporting of discharged effluent volume and quality under the MDMER to Environment Canada. Details of the Metal and Diamond Mining Effluent Program, including sampling station locations and monitoring frequency, are outlined in the EMSRP and the results are submitted on a quarterly and annual basis to Environment Canada.

11.1.1 Effluent Monitoring Program

The MDMER Program requires effluent monitoring and sampling at the final discharge point (FDP) station W3, downstream of the end of pipe discharge. The W3 sampling station is collected when there is a discharge of water at W3; testing occurs weekly for deleterious substances.

Weekly effluent monitoring samples are tested for the deleterious substances as described in the MDMER including total metals (arsenic, copper, lead, nickel and zinc), total suspended solids (TSS), and pH. Weekly samples are collected at least 24 hours apart and not more than 7 days apart. Minto is striving for consistency and has internally scheduled MDMER sampling to occur on Tuesdays.

Radium 226 and acute lethality tests are conducted quarterly due to the reduced frequency guidelines outlined in the MDMER.

The Effluent Monitoring Program results are submitted to Environment Canada quarterly and are presented in Appendix K.

11.1.2 Environmental Effects Monitoring Water Quality Monitoring

The EEM Water Quality Monitoring Program is designed to characterize water quality at the exposure area, the receiving environment and in reference (un-impacted) area. Water quality samples must be collected four times a year, not less than one month apart, while the mine is discharging effluent at the Final Discharge Point (FDP) of W3. Samples are collected at the exposure area (W3), receiving environment station (W2) and reference station (W7). Effluent toxicity testing is required annually using a total of four tests; one each of a fish, invertebrate, algae and plant species.

The EEM Water Quality Monitoring Program results submitted to Environment Canada annually, are presented in Appendix K.

11.1.3 Environmental Effects Monitoring Biological Monitoring

The EEM Biological Monitoring Program outlines fish population, fish tissue and benthic invertebrate tests conducted under Schedule 5, Part 2 of the MDMER. See Appendix L *Minto Creek Sediment, Periphyton and Benyhic Invertebrate Community Assessment – 2020 by Minnow,* for details.

11.2 Biological Monitoring Program

Clause 101 of the WUL requires an Annual Biological Monitoring Program that includes monitoring of sediment, periphyton, benthic invertebrates, fish, and fish habitat. The following sections summarize the monitoring programs while a more detailed report

can be found in Appendix L. Appendix M contains information relative to the fish monitoring program.

11.2.1 Sediment Monitoring Program

The objectives of the sediment monitoring program were to characterize particle size, total organic carbon content, and concentrations of metals, metalloids, and nutrients in sediments. A 10-day *Chironomus dilutus* and a 14-day *Hyalella azteca* sediment toxicity test were conducted in 2020 to evaluate survival and growth.

Surface water quality

In situ surface water quality measurements (meter measures) collected in September 2020 at the time of sediment sampling, indicated relatively good water quality in Minto Creek. The influence of the Minto Mine was primarily evident in higher specific conductance relative to the reference creek (Table 11-1).

Table 11-1: Statistical Comparison of In Situ Water Quality Taken with Sediment Samples, Upper Areas, 2020

Endpoint	Data Transformation	Test	Test P-Value	MCT[a]		MOD (%)[b]
				URC (Reference)	UMC (Exposed)	
Temperature (°C)	rank	M-W	0.093	0.700	3.10	343
Specific Conductance (µS/cm)	none	tequal	0.001	96.1	508	429
Dissolved Oxygen (mg/L)	none	tequal	0.003	10.9	10.1	-7.8
Dissolved Oxygen (%)	rank	M-W	0.056	77.9	72.1	-7.4
pH	none	tequal	0.173	7.45	7.35	-1.3

P-value < 0.0

P-value < 0.05 and MOD > 0

P-value < 0.05 and MOD < 0

Notes: URC = Upper McGinty Creek. UMC = Upper Minto Creek. M-W = Mann-Whitney test. tequal = t-test for equal variance. tunequal = t-test for unequal variance. ns = not significant.

[a] Measure of Central Tendency (MCT) is the mean for parameters where statistics were conducted on the raw scale, the geometric mean when statistics were log10 transformed to meet the assumptions of normality, and the median when rank transformed.

[b] MOD = magnitude of difference. MOD = MCT exp - MCTref/MCTref*100.

Supporting measures collected in September 2020 indicated good Minto Creek water quality. Influence of the Minto Mine was evident through higher specific conductance and pH in Minto Creek in comparison to in the reference creeks. However, water quality concentrations were lower than SSWQO. Total copper concentrations exceeded the

CWQG at all sites while dissolved copper concentrations were all below the SSWQO. Total copper concentrations exceeded the CWQG at all sites, including the reference, indicating that high copper concentrations might be natural (as observed in previous years).

Mean concentrations of chlorophyll-a were significantly different between areas and were below BCWQG. Temporal variability in chlorophyll-a concentrations was evident among samples taken from Minto Creek and the reference. Historically, chlorophyll-a values have been below the BCWQG of 100 mg/m2 and concentrations have been (generally) higher at Minto Creek than the reference. Concentrations at both areas were lower in 2020 than in 2018 but this was especially noticeable at lower Minto (55 mg/m2 to 16 mg/m2). It is difficult to determine the cause of the lowered concentrations, but it is possible that the dry conditions at lower Minto in 2019 contributed to lower concentrations. Production classification at the exposure and reference areas (lower Minto Creek as oligotrophic and lower Wolverine Creek as mesotrophic) were different from 2017 (when lower Minto Creek was mesotrophic and lower Wolverine Creek was oligotrophic) and 2018 (both Minto and Wolverine creeks were mesotrophic).

Sediment quality

Sediments collected in 2020 were largely composed of fine particles in the silt and sand size categories. Mean total organic carbon (TOC) content of sediment collected from upper McGinty Creek reference area (5.36%) was slightly higher (but not significantly) than at the upper Minto Creek (3.65%). Lower Wolverine Creek reference area had higher (but not significantly) TOC (4.92%) than the lower Minto Creek (4.39%). Arsenic and copper were the only analytes with mean concentrations greater than Interim Sediment Quality Guidelines (ISQG) for the protection of aquatic life (CCME 1999) in an effluent-exposed area. Arsenic concentration in upper Minto Creek exceeded the ISQG and was higher, though not significantly, than their upper McGinty Creek reference area. Whereas in lower areas, lower Minto Creek exceeded the ISQG and was significantly higher than lower Wolverine Creek.

Mean copper concentration in upper Minto Creek was above the Probable Effect Level (PEL) and lower Minto Creek was greater than the ISQG. Mean concentrations of

copper at upper McGinty Creek and lower Wolverine Creek reference areas remained below the ISQG. Both upper and lower Minto Creek had higher concentrations than their respective reference areas. With progression from upper to lower Minto Creek, sediment copper concentrations decreased from a mean of 213 to 53.5 mg/kg, respectively, indicating improvement with distance downstream. Due to the predominantly erosional habitat in upper Minto Creek, relatively few areas had deposited sediment and even this occurred only in small quantities that likely wash away each year during freshet. Therefore, elevated sediment copper in fine sediment in the upper reaches of Minto Creek may be of limited importance in terms of exposure and potential effects to biota. In lower Minto Creek, fine sediment deposits are somewhat more common than in upper Minto Creek and therefore more relevant to aquatic life. During the 2020 field campaign, sediment at lower Minto creek was less common than in previous years, potentially due to the lack of flow in 2019.

No effects on growth were observed in *C. dilutus* or *H. azteca* during the sediment toxicity testing. Survival of *C. dilutus* was significantly lower in sediment collected from lower Minto Creek than in laboratory control sediment (sand) but was not significantly different than field reference sediment (lower Wolverine Creek). Survival at lower Minto Creek was leveraged by one lab replicate that had a higher mortality rate (60%), while the remaining four replicates had mortality ≤ 20%. Survival of *H. azteca* for lower Minto sediment was significantly lower than both laboratory control and in field reference sediment (lower Wolverine Creek). Survival at lower Minto Creek was leveraged by two lab replicates that had mortalities > 50%. The remaining three replicates did not have any mortalities.

In previous years, growth for *C. dilutus* was only significantly different in 2017, whereas survival was significantly different between areas in 2017 and 2018 (Minnow 2019)[3]. Compared to 2018 results, the average mortality in 2020 was lower. No effects to *Hyalella azteca* were observed in 2018, which was similar to results from 2011, 2015 to 2017 (Minnow 2012, 2016, 2017, 2019). Temporal comparisons show differences in

[3] Sediment toxicity tests were not conducted in 2019 due to low flows.

responses despite similar sediment chemistry.

Table 11-2: Statistical Comparisons Between Upper McGinty Creek (Reference) and Upper Minto Creek (Mine-Exposed) Sediment Chemistry, 2020

Analyte	Data Transformation	Test	Test P-value	MCT[a]		MOD[b] (%)
				Upper McGinty Creek (Reference)	Upper Minto Creek (Exposed)	
Loss on Ignition (%)	none	tequal	0.182	11.6	7.68	-
ph 1:2 Soil:Water Ratio	none	tequal	0.001	6.64	7.92	19
Total Kjeldahl Nitrogen (%)	none	tequal	0.236	0.282	0.217	-
Total Inorganic Carbon (%)	none	tequal	0.121	0.128	0.184	-
Inorganic Carbon (as $CaCO_3$; %)	none	tequal	0.117	1.07	1.54	-
Total Carbon (%)	none	tequal	0.109	5.48	3.83	-
Total Organic Carbon (%)	none	tequal	0.091	5.36	3.65	-
Organic Matter (%)	none	tequal	0.091	9.22	6.28	-
Aluminum (mg/kg)	none	tequal	0.771	12,848	13,420	-
Antimony (mg/kg)	none	tequal	0.111	0.444	0.496	-
Arsenic (mg/kg)	none	tequal	0.089	5.32	6.45	-
Barium (mg/kg)	none	tequal	0.097	223	406	-
Beryllium (mg/kg)	none	tequal	0.064	0.356	0.460	-
Boron (mg/kg)	rank	M-W	0.424	5.00	5.00	-
Cadmium (mg/kg)	none	tunequal	0.086	0.170	0.317	-
Calcium (mg/kg)	none	tequal	0.102	8,114	10,170	-
Chromium (mg/kg)	none	tequal	0.261	24.9	27.9	-
Cobalt (mg/kg)	none	tequal	0.045	9.10	12.3	36
Copper (mg/kg)	none	tunequal	0.019	23.7	213	798
Iron (mg/kg)	none	tequal	0.091	21,140	25,300	-
Lead (mg/kg)	none	tequal	0.034	4.71	5.88	25
Lithium (mg/kg)	none	tequal	0.1	7.02	8.58	-
Magnesium (mg/kg)	none	tequal	0.001	4,426	7,226	63
Manganese (mg/kg)	none	tunequal	0.072	496	6321	-
Mercury (mg/kg)	rank	M-W	0.18	0.0500	0.0500	-
Molybdenum (mg/kg)	none	tunequal	0.081	0.590	3.50	-
Nickel (mg/kg)	none	tequal	0.001	18.1	31.3	73
Phosphorus (mg/kg)	none	tequal	0.015	817	1,016	24
Potassium (mg/kg)	none	tequal	0.001	700	1,422	103
Selenium (mg/kg)	none	tequal	0.141	0.516	0.814	-
Silver (mg/kg)	rank	M-W	0.072	0.100	0.140	-
Sodium (mg/kg)	none	tequal	0.001	203	313	54
Strontium (mg/kg)	none	tequal	0.006	64.8	135	109
Thallium (mg/kg)	rank	M-W	0.016	0.0710	0.0920	30
Titanium (mg/kg)	none	tequal	0.95	663	659	-
Uranium (mg/kg)	none	tequal	0.099	1.30	1.01	-
Vanadium (mg/kg)	none	tequal	0.207	49.0	54.4	-
Zinc (mg/kg)	none	tequal	0.009	45.3	69.2	53
Zirconium (mg/kg)	none	tequal	0.709	2.40	2.54	-

P-value < 0.05
Magnitude of Difference (MOD) > 0
Magnitude of Difference (MOD) < 0

Notes: "-" indicates not significant. M-W = Mann-Whitney test. tequal = t-test for equal variance. tunequal = t-test for unequal variance.

a Measure of Central Tendency (MCT) is the mean for parameters where statistics were conducted on the raw scale, the geometric mean when statistics were log10 transformed to meet the assumtions of normality, and the median when rank tranformed.

b MOD = magnitude of difference. MOD = MCTEXP - MCTREF/MCTREF*100.

11.2.2 Periphyton Monitoring

Evaluation of both periphyton community biomass (µg/cm^2) and density (cell/cm^2) indicated that three of five community metrics were not significantly different in lower Minto Creek relative to the lower Wolverine Creek reference. Density and the Bray-Curtis Index were the only metrics that differed between the two areas. It is possible that the lower density at lower Minto Creek and community dissimilarities between lower Minto Creek and lower Wolverine Creek can be partially explained by the dry conditions in 2019 (i.e., environmental stress). Apart from the dry conditions, substantial differences in periphyton community summary metrics and community composition were apparent over the years at both lower Minto and lower Wolverine creeks, indicating substantial temporal variability. The differences observed in the periphyton communities of lower Minto Creek and lower Wolverine Creek in 2020 were within natural temporal variability and do not suggest a mine influence.

11.2.3 Benthic Invertebrate Community Monitoring

The erosional benthic invertebrate community of lower Minto Creek differed from both reference (lower Wolverine Creek and lower Big Creek) communities for Bray-Curtis index and percent Ephemeroptera only. The benthic community differed from one of the two reference areas in percent EPT (LBC only), Trichoptera (LWC only), and Chironomids (LBC only). A potential decrease in number of taxa from 2012 to 2014 identified in previous reporting (Minnow 2015) appears to have been natural variability since number of taxa increased from 2014 to 2017, decreased in 2018, and increased again in 2020 (Minnow 2015, 2016, 2017, Minnow 2019a). Bray-Curtis index indicated that lower Minto Creek had a different community composition than the reference areas, and examination of taxon composition and CA results indicated that this difference was largely due to a higher proportion of chironomids and lower

proportion of EPT taxa. Although this difference is indicative of a potential influence on the benthic invertebrate community, it may not be mine related as the mine was not discharging for more than a year prior to sampling; rather it is likely at least partly related to creek drying in 2019.

High temporal variability in benthic invertebrate community density, richness, and composition has been observed at the exposure and reference areas, presumably due to inter-annual variability in environmental conditions (e.g., flow, ice scour, water levels). Densities in 2020 were the highest they have been over the 2012 to 2020 period. None of the primary community endpoints at lower Minto Creek differed significantly compared to both reference stations. There was a statistically significant upwards trend in chironomid proportion and downwards trend in EPT proportion at lower Minto Creek. This community shift could possibly be attributed to the dry conditions at lower Minto Creek in 2019. Since chironomids are more tolerant and EPT taxa are more sensitive, it would make sense to see more chironomids and fewer EPT taxa following a dry year (i.e., environmental stress).

11.2.4 Fisheries Monitoring Program

An evaluation of the Fisheries Monitoring Program was conducted by Minnow Environmental Ltd in 2020 (Appendix M), which recommended that fisheries monitoring in Minto Creek be conducted once every three years to coincide with Environmental Effects Monitoring, rather than annually, unless flows continuously exceed 0.1 m/s, temperatures exceed 10°C or there is emergency discharge. As none of these conditions occurred in 2020, no fisheries monitoring was conducted. The next EEM cycle study and concurrent fisheries monitoring program is scheduled for 2022.

12 Meteorological Monitoring Program

Meteorological monitoring at the Minto Mine consists of data collection for the following parameters: rainfall, snowfall, temperature, evaporation, wind speed and direction, barometric pressure, relative humidity, and solar radiation (incoming and reflected). The Meteorological Monitoring Program includes the Climate Monitoring Program (EMSRP Section 4.1) and the Snow Survey Program (EMSRP Section 4.2). Data collected under the Meteorological Monitoring Program, along with baseline climatic data, provides input for the following mine projects:

- Site water management.
- Prediction for yearly water events (e.g. freshet).
- Design of water storage, conveyance and discharge systems; and
- Design of flood control structures on the road network.

12.1 Climate Monitoring Program

The 2020 Climate Monitoring Program data are presented below in Figure 12-1 through Figure 12-7. During 2020, Minto Mine had one meteorological station located approximately 70 m northeast of the north end of the airstrip, in an area that allows ample meteorological exposure from all directions. Trees are cleared for a radius of

30 m from the meteorology station and beyond that radius is a sparse growth of 2 m tall conifers.

The meteorology station is a research grade Campbell Scientific station that records the following parameters: maximum wind speed, minimum wind speed, average wind speed, wind direction, precipitation (rain and snow), temperature, relative humidity, pan evaporation, barometric pressure, solar radiation, and calculated evapotranspiration. Data are averaged over the one-hour archiving period and then saved to the datalogger.

The evaporation pan was in operation from May 29th through to August 23rd.

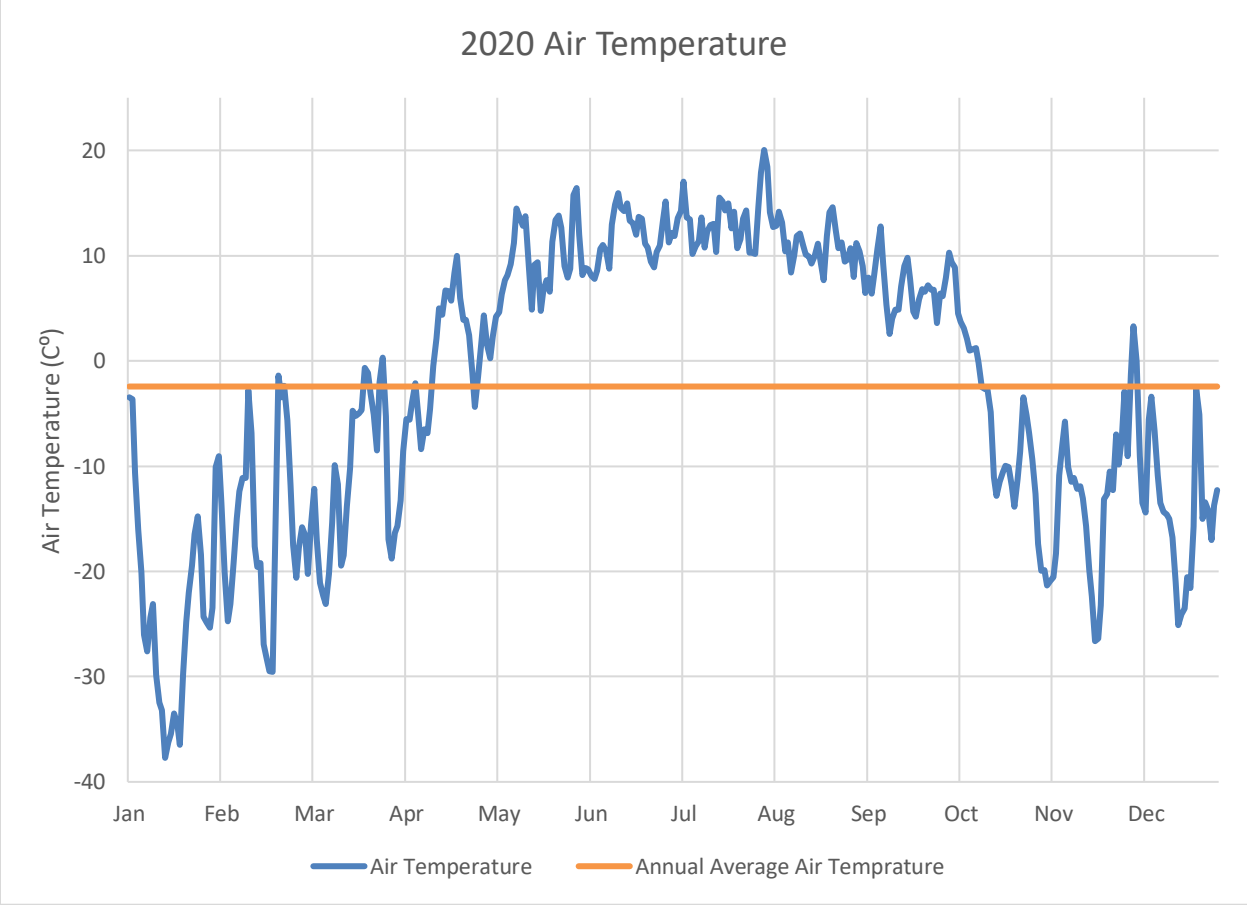


Figure 12-1: Annual Air Temperature (2020)

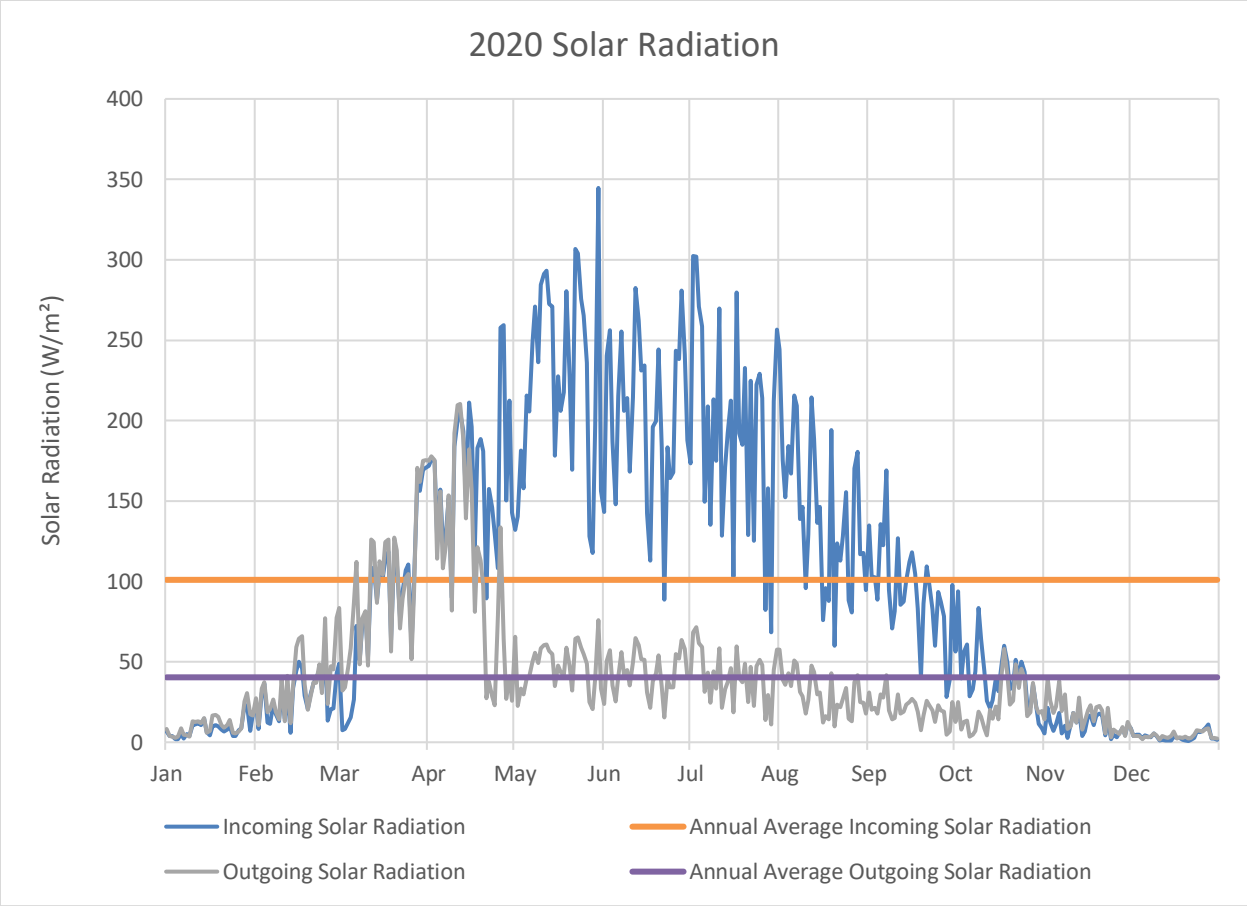


Figure 12-2: Annual Solar Radiation (2020)

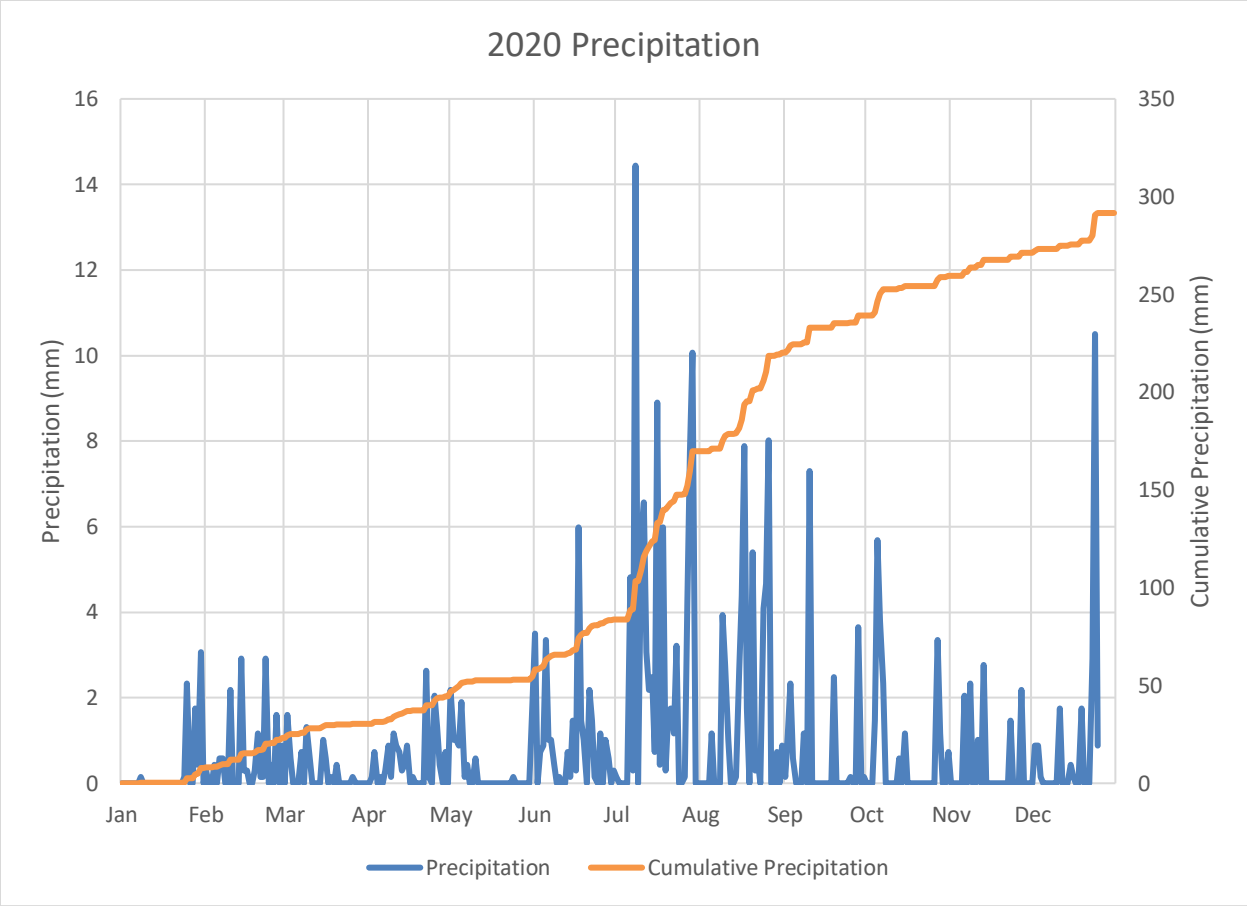


Figure 12-3: Annual Precipitation (2020)

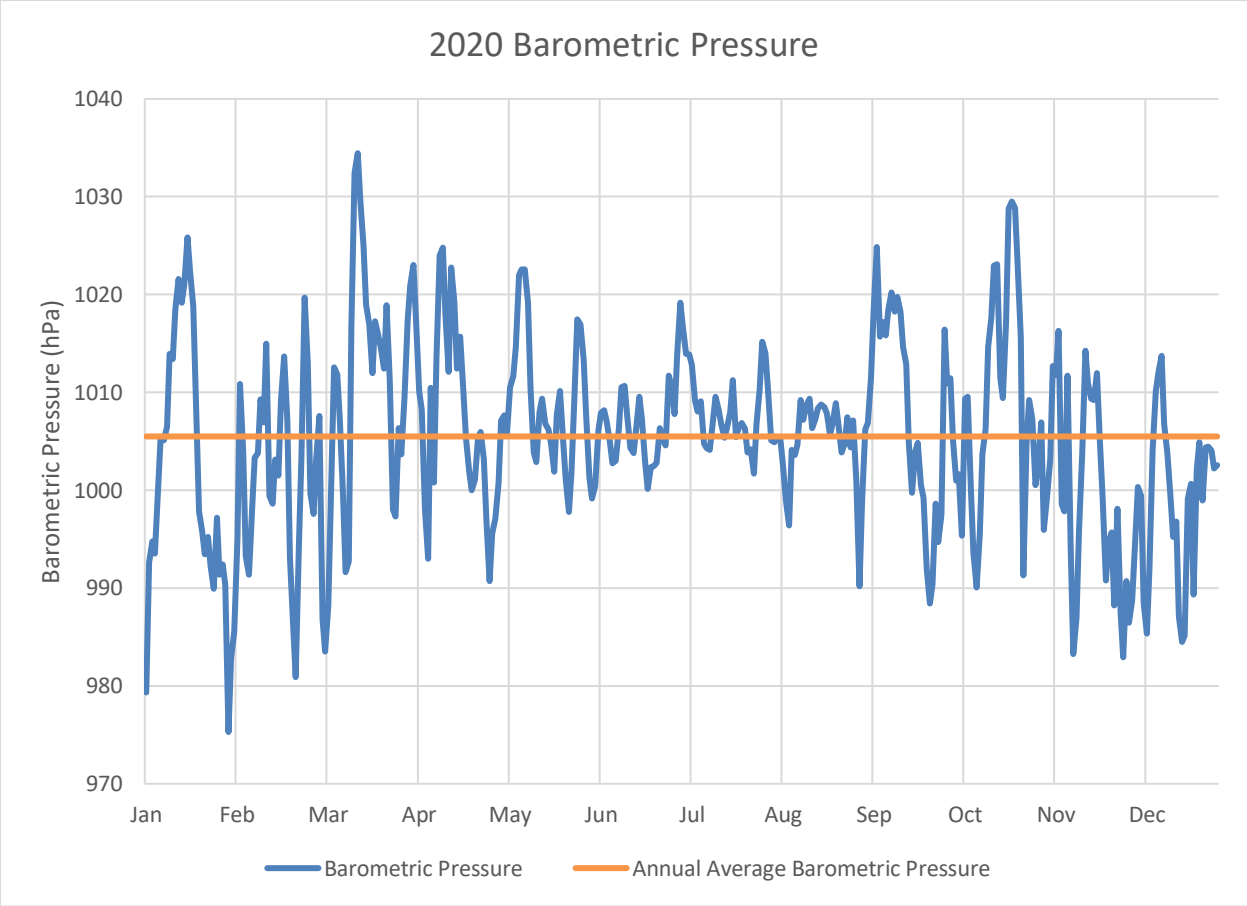


Figure 12-4: Annual Barometric Pressure (2020)

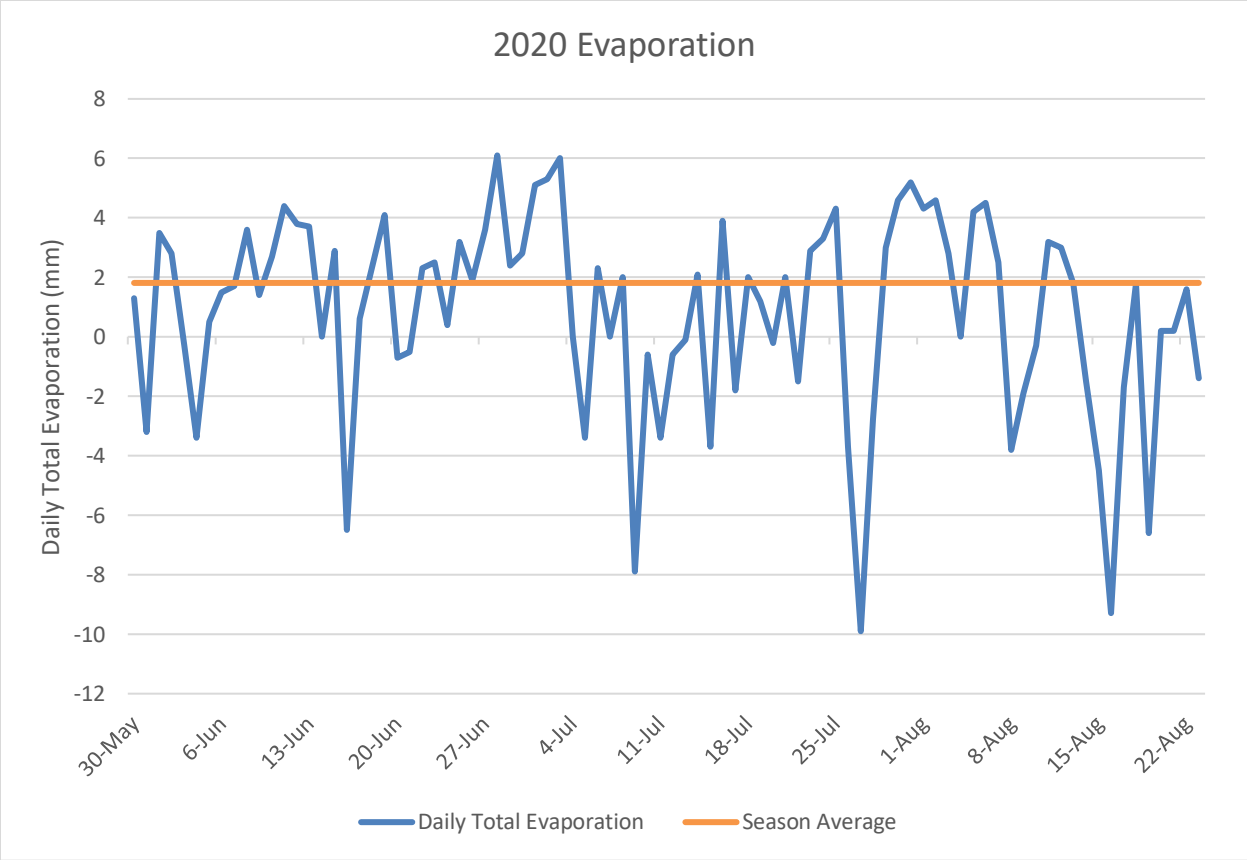


Figure 12-5: Evaporation (May 30th- August 23rd 2020)

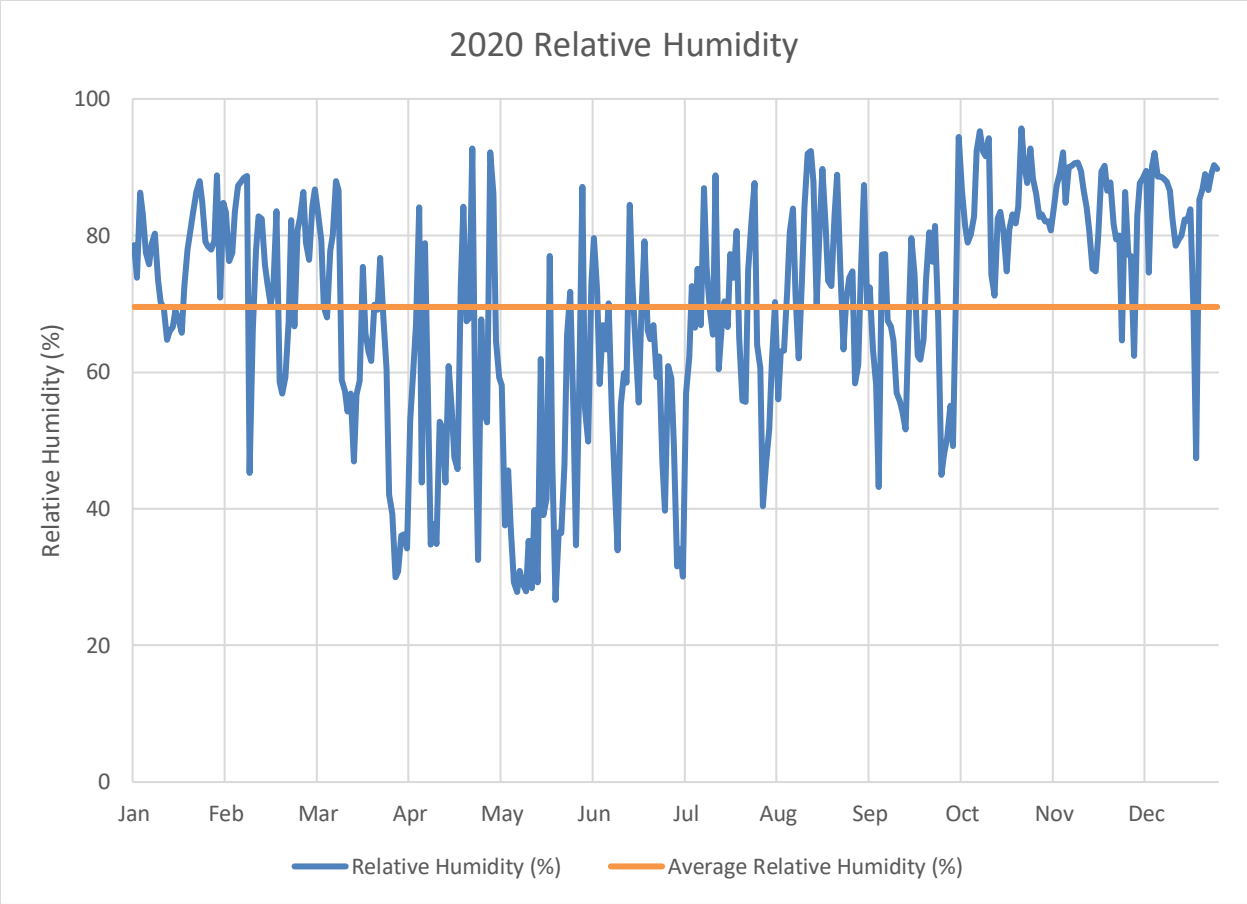


Figure 12-6: Relative Humidity (2020)

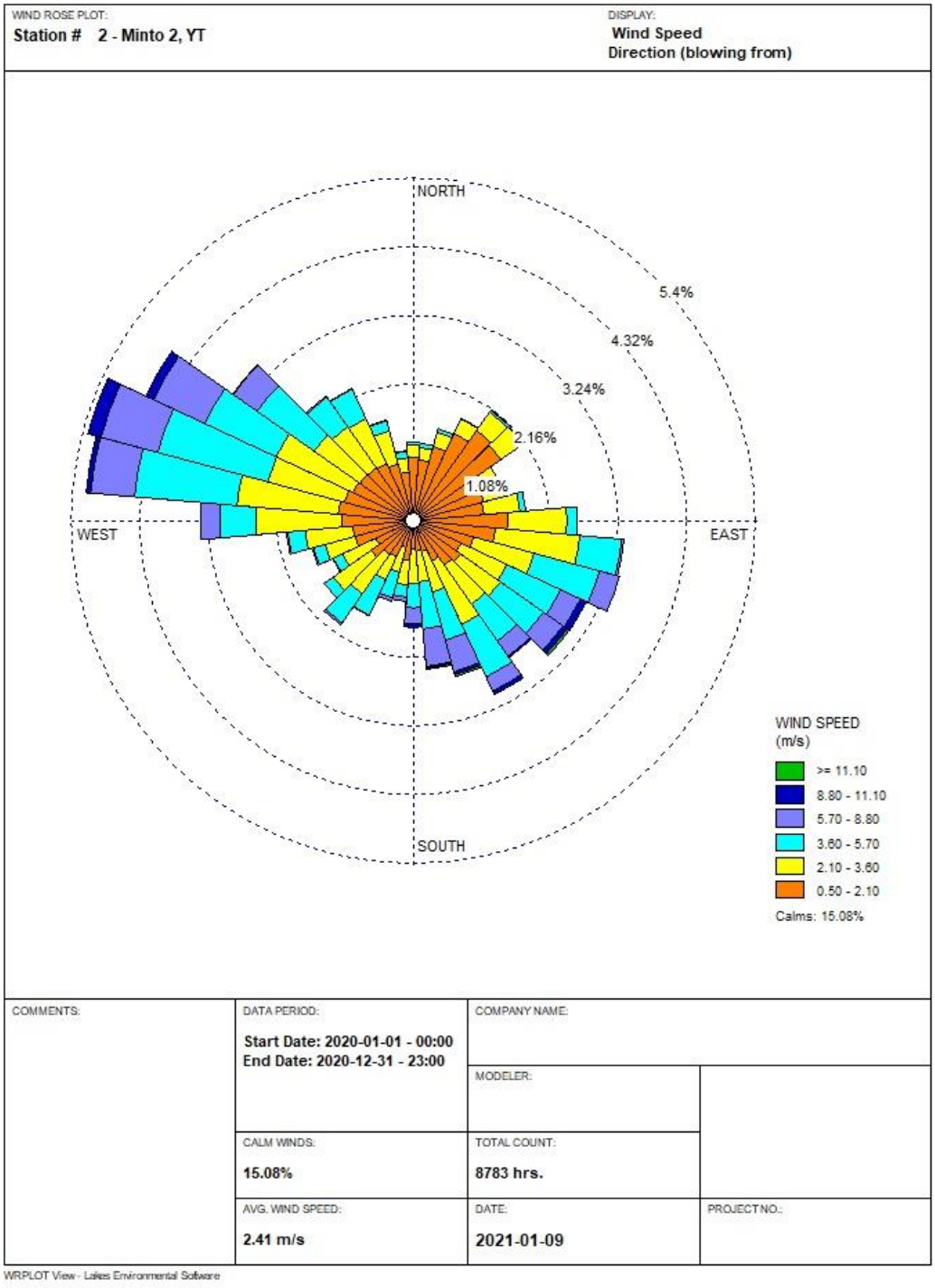


Figure 12-7: Wind Speed and Direction Events (2020) – WRPLOT View – Lake Environmental Software

12.2 Snow Survey Program

As required by the WUL Clause 96 and as part of the EMSRP, Minto collects snow data at the mine. The objective of the Snow Survey Program is to collect data used for calculating the snow water equivalent at the Minto Mine site. Snow water equivalents are inputs for the Minto Mine Site Water Balance models. Four courses are surveyed during the first week of February, March & April each year. If conditions permit, Minto will additionally survey the snow courses in May. These courses are East-facing (near the Dyno compound), North-facing (near the airstrip), South-facing (above the Tank Farm) and flat (Dry Stack Tailings), as detailed in Table 12-1. Along each course, ten stations are sampled using a machined core tube with cutting end and scale assembly. The parameters collected during the surveys include snow depth, core length, core weight, snow density, weather, site conditions, snowpack conditions, crust layers, and snow temperature. Multi-year results to 2020 (averaged across the four snow courses) are presented in Appendix F – 2020 Water Balance and Water Quality Model Summary for the Minto Mine.

Table 12-1: Snow Survey Course Locations

Course Location	Description	Aspect	UTM	
			Easting	Northing
Dyno	East of the Dyno compound on an east facing slope along a cut line surrounded by moderately densely tree area.	East Facing	8V 383 594	694 3377
Fuel Farm	North of the Minto Mine fuel farm on a south facing slope in a sparse to moderately densely treed area.	South Facing	8V 385 061	694 5318
Airstrip	Northeast of the Minto Mine airstrip on a north facing slope in a sparsely treed area.	North Facing	8V 386 255	694 4284
Dry Stack Tailings Facility	Directly on top of the Dry Stack Tailings Storage Facility.	Flat	8V 385 525	694 4786

12.3 Meteorology QA/QC

Procedures for meteorology monitoring at the Minto Mine are detailed in the Meteorology Station Standard Operating Procedures. Minto has installed a satellite connection to the Met Station 2 to enable real time viewing of the weather station data. The meteorology data is downloaded and reviewed twice monthly by Environmental Department staff and routine visual inspections of the monitoring stations occur on a weekly basis.

The Geonor precipitation gauge has not been functioning correctly since 2017. Numerous efforts to troubleshoot the problem with the manufacturer, Campbell Scientific, have failed. Minto Environment and Instrumentation staff are currently working to remedy the situation.

13 Geochemistry

13.1 Waste Rock Verification Program

The Waste Rock Verification Program was initiated in 2014 to support and monitor waste rock handling procedures at the Minto Mine. The program was developed to address Clause 95 of the WUL, with the results of the program to be included in the Annual Report. The program consists of detailed record keeping on the type and quantity of waste rock placed at each location and monitoring and verification of the characteristics of the waste rock stored at each location as per the Waste Rock and Overburden Management Plan.

Minto's Technical Services Department tracks all waste dispatched between the source and the destination using the mine's computer database system. The dispatch data are based on load count sheets compiled by the mining contractor.

Samples are taken by Minto geology personnel on dump crests that had been active in the 30 kT stockpile lifts as determined by the production tracking database. The grab sample consists of 5 kg sample collected along a 25 me transect with material being collected at one-meter intervals over the distance of the recently placed waste. Particles greater than a pebble (64-80 mm) in size are manually rejected, the sample is then labelled and delivered to Minto's onsite assay lab.

Each sample is analyzed for total copper (Cu (T)), total sulfur (S (T)), and total carbon (C (T)) content using an Eltra CS-800 induction furnace. S (T) and C (T) values are converted into equivalent Acid Potential (AP-S (T)) and Neutralization Potential (NP-C (T)) values, and NP-C (T): AP-S (T) ratios (NP/AP) are calculated for each sample. The resulting (NP-C (T)): (AP-C (T)) ratios are compared to the segregation criteria and assigned "pass" or "fail" designations, which is a 3:1 ratio at Minto.

All underground development during 2019 and June of 2020 was ore. After encountering SAT in the underground development, the material was deposited in the Main pit. Consequently during 2020; 21 samples were collected from the Main Waste Rock Dump.

Of the twenty- samples taken from the two lifts of the Main Pit Waste Dump – one sample on each lift failed in isolation. All passing samples contained less than 0.1% Cu, and 0.3% Sulphur, meeting clean construction material classifications and/or NPR NAG waste rock classifications. No resampling was conducted, since failures were considered isolated events. Table 13-1, below. For a complete summary of the sample results, please refer to Appendix N.

Table 13-1: Waste Rock Management Verification Program Summary (2020)

Average ABA Parameter Values: Month by Location								
Location	**Tonnes**	**Waste Type**	**Cu%**	**C% (Tot)**	**S% (Tot)**	**NP**	**AP**	**NP/AP**
Lift 1	17,810	WST	0.07	0.11	0.19	8.83	5.87	2.34
Lift 2	85, 540	WST	0.03 -	0.24 -	0.1 -	20.11 -	3.24 -	6.29 8 -

13.2 Acid-Base Accounting Program

The EMSRP commits to the submission of results of the ABA Program that was conducted during the reporting year. The ABA program determines the Neutralizing Potential Ratio ((defined as Neutralizing Potential divided by Acid Potential [NP/AP]) (NPR)) for overburden and waste rock to confirm that the NPR is greater than three. An NPR value of three or greater is generally considered indication of non-acid generating material. A separate, parallel program was initiated to determine the NPR of the tailings solids.

The following is a summary of results from the Underground mining ABA program for 2020.

A total of 37 samples were collected from the Copper Keel Underground (CK UG) and sent to an accredited laboratory (ALS Minerals) during the 2020 monitoring period. The samples were analyzed according to the MEND Modified NP Method as noted in the EMSRP.

The mean NP:mean AP results for waste rock samples was 7.84 for the duration of the monitoring period. 10 samples during the 2020 monitoring period were below the NPR threshold of 3 for waste rock. The mean paste pH values for all samples tested in 2020 was 8.18. The mean sulfide sulfur (S(S-2)) content for waste rock samples during the 2020 monitoring period was 0.21%. In 2020, 6 samples exceeded the S(S-2) content threshold of 0.30% for construction grade waste rock.

A full report containing lab results and analyses can be found in Appendix N.

13.3 Leach Pads

In 2017, two field scale leach pads were constructed and filled with Partially Oxidized Ore (POX – Leach Pad #1) and Low-Grade Sulfide Ore (Green sulfide ore – Leach Pad #2), as per the EMSRP. The Pads were constructed in October 2017, and the first leachate samples were collected in May 2018. In 2020, samples were collected monthly when water was available, resulting in 6 sampling events through the non-frozen months of 2020. Results from the leach pad samples are provided in the monthly

reports. A summary report is included in Appendix O; sampling methodology and sample results of the 2020 sampling season are included in Appendix P.

14 Terrestrial Monitoring Programs

14.1 Wildlife Monitoring Program

The *Minto Mine Wildlife Protection Plan* (a component of the EMSRP) establishes guidelines for minimizing wildlife disturbance at the Minto Mine site and along the development corridor and includes a monitoring program to yield information about wildlife use in the area. The 2020 activities under the Wildlife Monitoring Program including the area and frequency of monitoring, are summarized in Table 14-1, below. There were no notable Wildlife incidents in 2020 as previously outlined in Section 2.5.2.

Table 14-1: Wildlife Monitoring Activities (2019)

Area Monitored	Monitoring Activities	Frequency
Wildlife Monitoring	Wildlife monitoring consists of maintaining a wildlife observation log onsite and reporting wildlife encounters, as per the Wildlife Act. Environmental personnel on site will monitor project activities and modify operations to address wildlife concerns.	Ongoing
Migratory Birds	Monitoring to determine if waterfowl and shorebirds settle on impacted water bodies, such as the Main or Area 2 Pits. Environmental personnel on site will monitor project activities and modify operations to address wildlife concerns.	Seasonal, Daily during migratory periods
Species at risk/ of concern	Any caribou observations will be reported to the Conservation Officer in Carmacks. Bank swallows have been observed to nest in residuum piles in the summer months, in which case these piles are cordoned off and left undisturbed until after the late summer migration or re-sloped prior to nesting season to deter nesting.	As necessary

In addition to the Wildlife Monitoring Activities listed in Table 14-1, the Minto Environmental Department gathered observations from mine site staff with Wildlife Observation forms. These forms were posted at many accessible locations around site and employees were encouraged to record all wildlife observations. The forms were

collected periodically, and the sightings entered in a wildlife tracking sheet, which is included as Appendix Q.

In 2020, 62 wildlife sightings were recorded, with 48 sightings involving bears (45 Black Bear and 3 Grizzly), 6 foxes, 3 deer, 3 porcupines, 3 lynx, and one wolf. Other animals that have historically been observed on site include but are not limited to, hares, ermine, grouse, ptarmigan, sheep, dunlin, eagles, ducks, porcupine, coyote, cougar, sandhill cranes and geese.

The most active month of the year for wildlife observations was May, with 25 reportable sightings. Active hazing was most frequent in May as well.

Additional activities that took place on site included occasional information broadcasting known as Safety Flashes concerning the prevention of wildlife habituation to all staff working on site.

14.2 Erosion and Sedimentation Monitoring Program

As part of the EMSRP, Minto has developed and implemented a *Sediment and Erosion Control Plan* (SECP). The objective of the SECP is to minimize local site impacts from erosion and prevent sedimentation to the receiving environment of Minto Creek. The 2020 activities associated with the Erosion and Sedimentation Monitoring Program are identified in Table 14-2, below. Erosion on the revegetated Mill Valley Fill Extension was less severe in 2020, however more work is required to mitigate future erosion. These areas were treated with extra seed to establish root binding of the finer material in these designed run-off areas and will continue to be monitored as the reclaimed MVFE matures. There were no other significant issues in 2020.

Table 14-2: Erosion and Sedimentation Monitoring Activities (2019)

Activity	Location	Frequency
Visual inspections	Bottoms of slopes and depressions of large structures.	As needed following heavy rain events, and during freshet.
	Road routes: ditches and outlets of culverts and pipes.	As needed following heavy rain events, and during freshet.

Activity	Location	Frequency
Water quality monitoring for total suspended solids (TSS)	Water quality monitoring stations W2, W3, W50 and W17	Weekly and during heavy runoff periods.
Physical inspection of surface facilities by a Yukon registered Engineer.	Water Storage Pond Dam, Mill Water Pond, all waste rock and overburden dumps, all water diversion and conveyance structures and the dry stack tailings storage facility.	After the spring thaw period in May/June of each year and again prior to the on-set of winter in September of each year

14.3 Invasive Plant Species Monitoring Program

As part of the EMSRP, Minto developed an Invasive Species Monitoring Standard Operating Procedure in 2015. The Invasive Species Monitoring Plan, created in 2014, was the basis for the SOP. The SOP details how the monitoring program will be conducted.

The 2020 invasive species program took place on July 10 and August 15, 2020. The program consisted of surveys and long-term photo documentation in areas on site which are affected by high traffic such as the Waste Management Area, the Dry Stack Tailing Facility (by the haul road), the Fuel Farm, the road towards the Dyno plant and the Pelly Yard; areas with lower visitor traffic such as the Southwest Dump, the Minto North road, and the W15 wetland area; and, the length of the access road from the mine site to the barge landing. The survey focused on the high-risk species as listed by the Yukon Invasive Species Council (YISC) (Table 14-3) but also identified several lower risk non-native species. During the survey, high-risk species identified during the 2020 survey included narrowleaf hawksbeard, sweet clover (yellow and white) and smooth brome. As per the EMSRP, the observed high-risk species were reported to the Yukon Invasive Species Council (YISC) Spotter's Network.

In accordance with the EMSRP, invasive plant surveys will be continuing through 2021, particularly along invasive species pathways such as roads with high visitor traffic, recently exposed areas, and areas that have been recently reclaimed. Coordinated photos for long term photographic monitoring will be continued.

Table 14-3: High Priority Invasive Species as determined by the YISC, 2020

Common Name	Latin Name
Bird vetch	*Vicia cracca*
Dalmatica toadflax	*Linaria dalmatica*
Smooth brome	*Bromus inermis*
Crested sweetgrass	*Agropyron pectiniforme*
Quackgrass	*Elytrigia repens*
Altai wild rye	*Leymus angustus*
Reed canary grass	*Phalaris arundinacea*
Narrowleaf hawksbeard	*Crepis tectorum*
Common tansy	*Tanacetum vulgare*
Creeping thistle	*Cirsium arvense*
Hawkweeds	*Crepis tectorum*

Lucerne	*Medicago falcata*
Yellow & White sweetclover	*Melilotus*
Leafy spurge	*Euphorbia esula*
Oxeye daisy	*Leucanthemum vulgare*
Perennial sow-thistle	*Sonchus arvensis*
Scentless chamomile	*Tripleurospermum perforata*
Greater butter and eggs	*Linaria vulgaris*
Spotted knapweed	*Centaurea stoebe*

14.3.1 Meandering surveys

Meandering surveys are traversed on foot and instances of invasive species are documented. When an invasive species is identified, it is photographed, assigned a density code and its location is recorded using GPS. Density is an estimate of plants per square meter on a scale of 1 to 4, where 1 is one or fewer plants per square meter and 4 is more than ten. In addition to documenting each occurrence of invasive species, the coverage and distribution of invasive species at each meander survey location is documented and a long-term photo is taken at a recorded GPS position. Distribution refers to how plants are grouped in an area on a scale of 1 (a single plant) to 10 (continuous). For species identified in each area and distribution, see Table 14-4 below. 2020 survey routes, long-term photo sites and species' locations can be observed in Figure 14-1.

Table 14-4: Meandering Survey Results

Area	Invasive Species	Area (% coverage)	Distribution Code
Minto North	Narrowleaf Hawksbeard, Foxtail Barley	0-30	6
Camp Area	White Sweetclover	0-10	1
	Smooth Brome	0-10	1
Main Waste Dump	Narrowleaf Hawksbeard	0.10	1
Propane Farm	Perennial Sow Thistle	0-10	2

Waste Management Area	Smooth Brome	0-10	2
DSTF*	Narrowleaf Hawksbeard	0-10	2
	Smooth brome	0-10	2
Access Road (barge parking)	White Sweetclover	0-10	2
Access Road (barge parking)	Narrowleaf Hawksbeard	0-10	2

*Note: DSTF is the Dry Stack Tailing Facility

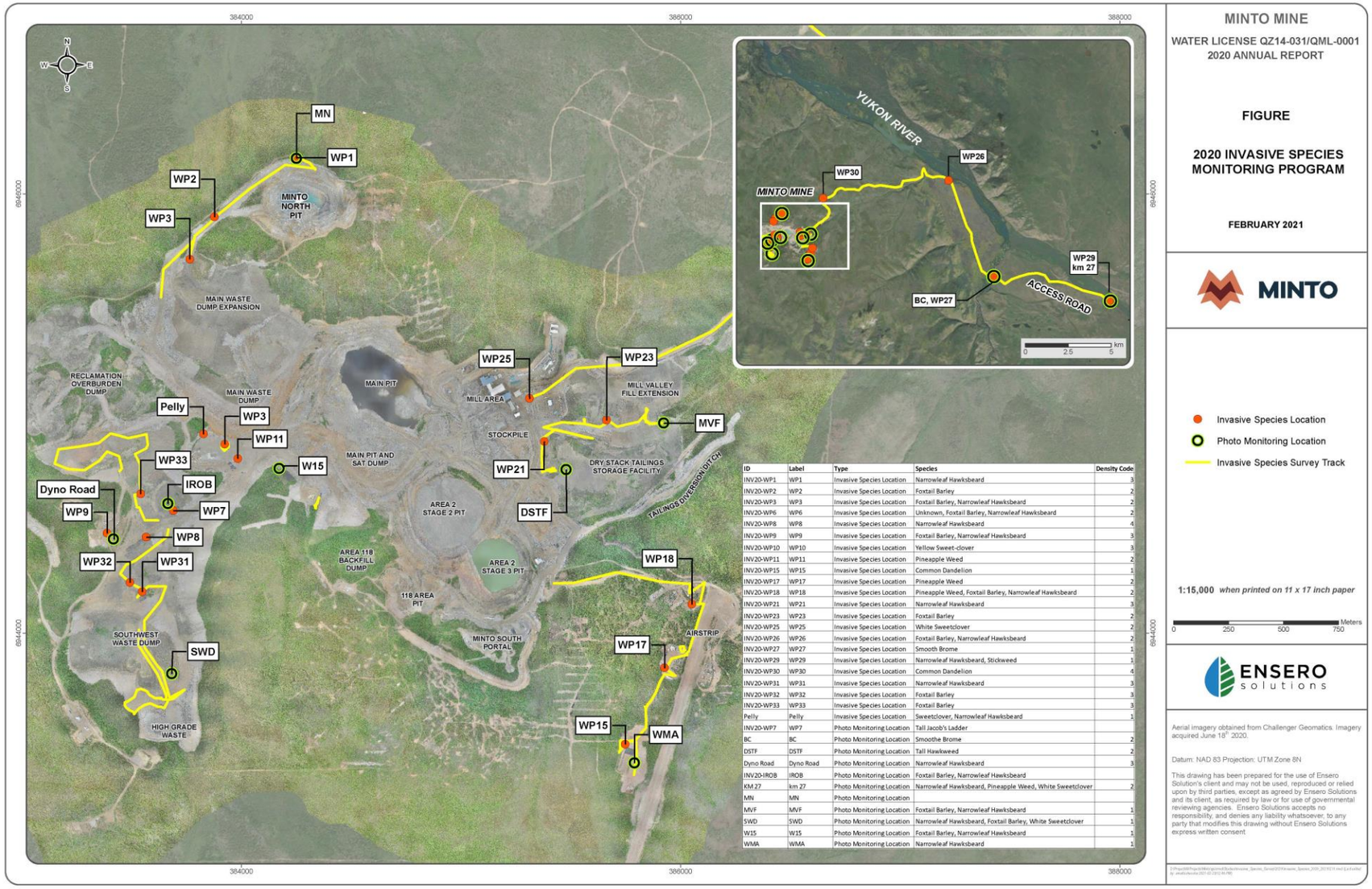

MINTO MINE
WATER LICENSE QZ14-031/QML-0001
2020 ANNUAL REPORT
FIGURE
2020 INVASIVE SPECIES MONITORING PROGRAM
FEBRUARY 2021
MINTO
Invasive Species Location
Photo Monitoring Location
Invasive Species Survey Track
1:15,000 when printed on 11 x 17 inch paper
0 250 500 750 Meters
ENSERO solutions
Aerial imagery obtained from Challenger Geomatics. Imagery acquired June 18th 2020.
Datum: NAD 83 Projection: UTM Zone 8N
This drawing has been prepared for the use of Ensero Solution's client and may not be used, reproduced or relied upon by third parties, except as agreed by Ensero Solutions and its client, as required by law or for use of governmental reviewing agencies. Ensero Solutions accepts no responsibility, and denies any liability whatsoever, to any party that modifies this drawing without Ensero Solutions express written consent
YUKON RIVER
MINTO MINE
WP30
WP26
WP29 km 27
BC, WP27
ACCESS ROAD
km 0 2.5 5
384000
386000
388000
6946000
6944000
N
W
E
S
MN
WP1
WP2
WP3
MINTO NORTH PIT
MAIN WASTE DUMP EXPANSION
RECLAMATION OVERBURDEN DUMP
MAIN WASTE DUMP
Pelly
WP3
WP11
WP33
W15
IROB
Dyno Road
WP9
WP7
WP8
WP32
WP31
SOUTHWEST WASTE DUMP
SWD
HIGH GRADE WASTE
MAIN PIT
MAIN PIT AND SAT DUMP
AREA 2 STAGE 2 PIT
AREA 118 BACKFILL DUMP
118 AREA PIT
AREA 2 STAGE 3 PIT
MINTO SOUTH PORTAL
MILL AREA
STOCKPILE
DRY STACK TAILINGS STORAGE FACILITY
TAILINGS DIVERSION DITCH
MILL VALLEY FILL EXTENSION
WP25
WP23
MVF
WP21
DSTF
WP18
AIRSTRIP
WP17
WP15
WMA
ID Label Type Species Density Code
INV20-WP1 WP1 Invasive Species Location Narrowleaf Hawksbeard 3
INV20-WP2 WP2 Invasive Species Location Foxtail Barley 2
INV20-WP3 WP3 Invasive Species Location Foxtail Barley, Narrowleaf Hawksbeard 2
INV20-WP6 WP6 Invasive Species Location Unknown, Foxtail Barley, Narrowleaf Hawksbeard 2
INV20-WP8 WP8 Invasive Species Location Narrowleaf Hawksbeard 4
INV20-WP9 WP9 Invasive Species Location Foxtail Barley, Narrowleaf Hawksbeard 3
INV20-WP10 WP10 Invasive Species Location Yellow Sweet-clover 3
INV20-WP11 WP11 Invasive Species Location Pineapple Weed 2
INV20-WP15 WP15 Invasive Species Location Common Dandelion 1
INV20-WP17 WP17 Invasive Species Location Pineapple Weed 2
INV20-WP18 WP18 Invasive Species Location Pineapple Weed, Foxtail Barley, Narrowleaf Hawksbeard 2
INV20-WP21 WP21 Invasive Species Location Narrowleaf Hawksbeard 3
INV20-WP23 WP23 Invasive Species Location Foxtail Barley 2
INV20-WP25 WP25 Invasive Species Location White Sweetclover 2
INV20-WP26 WP26 Invasive Species Location Foxtail Barley, Narrowleaf Hawksbeard 2
INV20-WP27 WP27 Invasive Species Location Smooth Brome 1
INV20-WP29 WP29 Invasive Species Location Narrowleaf Hawksbeard, Stickweed 1
INV20-WP30 WP30 Invasive Species Location Common Dandelion 4
INV20-WP31 WP31 Invasive Species Location Narrowleaf Hawksbeard 3
INV20-WP32 WP32 Invasive Species Location Foxtail Barley 3
INV20-WP33 WP33 Invasive Species Location Foxtail Barley 3
Pelly Pelly Invasive Species Location Sweetclover, Narrowleaf Hawksbeard 1
INV20-WP7 WP7 Photo Monitoring Location Tall Jacob's Ladder
BC BC Photo Monitoring Location Smoothe Brome 2
DSTF DSTF Photo Monitoring Location Tall Hawkweed 2
Dyno Road Dyno Road Photo Monitoring Location Narrowleaf Hawksbeard 3
INV20-IROB IROB Photo Monitoring Location Foxtail Barley, Narrowleaf Hawksbeard
KM 27 km 27 Photo Monitoring Location Narrowleaf Hawksbeard, Pineapple Weed, White Sweetclover 2
MN MN Photo Monitoring Location
MVF MVF Photo Monitoring Location Foxtail Barley, Narrowleaf Hawksbeard 1
SWD SWD Photo Monitoring Location Narrowleaf Hawksbeard, Foxtail Barley, White Sweetclover 1
W15 W15 Photo Monitoring Location Foxtail Barley, Narrowleaf Hawksbeard 1
WMA WMA Photo Monitoring Location Narrowleaf Hawksbeard 1

Figure 14-1: Invasive Plant Survey 2021

14.3.2 Access Road survey

For this survey, Minto Environment staff drove the length of the access road (27km) at low speed to observe any invasive species growing on the road.

Narrowleaf Hawksbeard was visible throughout the length of the road in single plants, and instances of Smooth Brome were found near Minto Creek and Big Creek. White Sweetclover was sporadic from kilometre 5 to 27, with continuous dense patches between kilometres 15 and 18.

The overall findings of all surveys continue to show the same types and general extent of invasive plants as seen in previous years. Additionally, it should be noted that all invasive plants found on the site are commonly found elsewhere in disturbed areas within the Yukon Territory.

14.3.3 Recommendations

In accordance with the EMSRP, invasive plant surveys will continue in 2021, particularly along invasive species pathways such as roads with high visitor traffic, recently exposed areas, and areas that have been recently reclaimed.

It is recommended that the invasive species surveys continue to be conducted earlier in the summer months, and that environmental staff track incidental observations of invasive species throughout the growing season. Previously, the study had been completed in August-September which caused difficulty identifying some species after they had gone to seed.

Control measures should be considered for areas with dense sweetclover infestations, such as the Access Road and DSTSF, to stop or slow the spread into more vulnerable areas where reclamation work is ongoing. If sweetclover becomes established in newly or sparsely revegetated areas, it could be detrimental to reclamation success.

14.4 Vegetation Metal Uptake Program

The VMU program was initiated in 2016, when sixteen exposure sites and five control sites were established. Samples were collected from key soil horizons and key plant species that could be vectors to humans or wildlife (blueberry, horsetail, Labrador tea, lichen, and willow). These monitoring sites were sampled again in 2019, and a comprehensive report was included in the 2019 Annual Report. The next iteration of this program will occur in 2021.

15 Site Characterization Report

The last Site Characterization Report was submitted to EMR in January 2018. As per Clause 13.1 of the QML, the report will be updated in three years from the effective date of the licence. The submission date for the update was December 2017. An extension was granted to January to ensure a comprehensive report was completed. This report was also submitted to the Yukon Water Board in January 2018. Due to the temporary closure period from October 2018 to October 2019, the next Site Characterization Report is due October 2021.

16 Reclamation

Minto Mine was under Temporary Closure and Care and Maintenance for part of 2019, until the sale of the mine in June, when activities started to ramp up to resume production. Production from underground and the mill resumed on September 2 and October 10, respectively.

Reclamation activities at Minto Mine that were planned for continuation in 2019 and 2020 were halted due to the sale of the mine in June 2019 and financial complications associated with large scale reclamation contracts required for both years. Activities for 2019 and 2020 were limited to monitoring of the vegetation growth on the final contoured Mill Valley Fill Extension Stage 2 (MVFES2) and Dry Stack Tailings Storage Facility (DSTSF), as well as planning for progressive reclamation activities in 2021.

Reclamation research regarding the use of constructed wetland treatment systems as a closure water treatment option continued throughout 2020. Also, bench scale trials of In-Pit treatment options were completed during the summer and fall of 2020. Details regarding both research programs for 2020 can be found in Section 16.2 or Appendix R.

16.1 Progressive Reclamation Activities on MVFE2 and DSTSF

As presented in Figure 16-1, the Cover and seeding of MVFES2 was completed in 2018. The final contouring, cover specifications and revegetation objectives of the Mill Valley Fill Extension 2 (MVFE2) and part of the Dry Stack Tailing Storage Facility (DSTSF) were met in 2018, both areas of concern are visible in Figure 16-3. In 2019-2020 some erosional channels were formed during spring runoff, but they are as designed, and have proven to be self-armouring with the larger cover materials remaining as finer material is washed away (see figure 16-2).

Figure 16-4 and 16-5 highlight those areas where contouring and overburden placement took place in 2017. For 2021, continuation of progressive reclamation and research with the development of significant revegetation plans focusing on MVFE/DSTSF to complete regrading, cover placement and start on revegetation. Figure 16-6 presents the site overview from the south of Minto Mine site.



Figure 16-1: Minto Mine – Mill Valley Fill Extension Stage 2 completed in 2016, final cover placed in 2018.



Figure 16-2: Minto Mine –MVFE self-armouring run-down channels.



Figure 16-3: Minto Mine - MVFE and DSTSF progressive reclamation: 2017 overburden placement highlighted in red, 2018 Seeded areas highlighted in green



Figure 16-4: Minto Mine – Southwest dump progressive reclamation, 2017 overburden placement and stockpiling (highlighted in red).



Figure 16-5: Minto Mine – MWDE and Low Grade Waste progressive reclamation, overburden cover placement 2017 (highlighted in red).



Figure 16-6: Minto Mine – Site overview, all facilities.

16.2 2020 Reclamation Research

Reclamation research in 2020 focused primarily on carryover research of passive treatment technologies which started in 2014 and carried through 2020.

16.2.1 Passive Water Treatment

The demonstration-scale CWTS was constructed at Minto in 2014, commissioned from 2015 through mid-2017 and transitioned into the operational period in August 2017. In 2018 the demonstration-scale CWTS was tested for its ability to recover and perform under the unintentionally imposed stresses of a winter/freshet drought and elevated nitrate concentrations in the inflow water. The CWTS demonstrated successful recovery and in 2019 the operational period had the primary objective of assessing performance under conditions that would be similar to the full-scale CWTS. This primary objective was developed as a response to lines of questioning in preliminary regulatory review of closure planning documents.

Various aspects of the system were measured in 2020 and have been detailed under a separate report including operating conditions, water treatment performance, fate and distribution of treated metals, detritus decomposition and accretion rates, carbon demand, extent of nitrate removal (concentration (mg/L) achieved at the outflow of the CWTS) and microbial community characterization, microbial community characterization (catalyzing treatment reactions), and pest control. The key findings of each phase of this research project are presented in table 16-1 below. A full detailed report can be found in Appendix R.

Table 16-1: Demonstration Scale Constructed Wetland 2019 Work Summary

Item	Date	Activites	Actual
Construction	2014	Identify potential location for demonstration scale CWTS (Contango site visit – 1 scientist)	Completed June 2014
		Engineering and geotechnical (Minto)	Completed July 2014
		Construction (Minto)	Completed July 2014
		Planting and bringing system online (Contango site visit – 1 scientist, 1 technologist), coordinate for local students to assist	Completed August 2014 (no students available, brought 2 technologists)
Commissioning	2014	Acclimation and maturation at constant flow rate, ~20 hr HRT	Completed
		September - Contango site visit/checkup (1 technologist, 1 scientist)	Did not occur because construction was last week of August
	2015	Continued commissioning. Operation at constant flow rate, ~20 hr HRT	Completed (at shorter HRT)
		Spring – Contango site visit/checkup (1 technologist, 1 scientist), includes micro sampling	Completed
		Summer - Increase depth from 10 cm to 20 cm (1 technologist), includes micro sampling	Completed (scientist)
		Fall – Contango site visit/checkup (1 technologist), includes micro sampling	Completed (scientist)
	2016	Minto to add sandbags prior to first site visit and begin W15 creek monitoring	Completed May/June 2016
		Spring – Contango site visit (1 scientist, 1 technologist), includes microbial sampling and tasks outlined in Table 5 of report. HRT tracer study completed, outlined in section 7 of report.	Completed June 2016
		Summer - Contango site visit/checkup (1 scientist, 1 technologist), includes microbial sampling and tasks outlined in	Completed July 2016

Item	Date	Activites	Actual
		Table 5 of report. Evapotranspiration study completed as outlined in section 9 of report. Organics were added to the CWTS as outlined in section 5.1 of report.	
		Fall - Contango site visit/checkup (1 technologist), includes microbial sampling and tasks outlined in Table 5 of report	Completed September 2016
	2017	Continued commissioning operations at constant flow rate.	Completed May 2017
		Two evapotranspiration studies were completed	Completed May/June 2017
		Spring – Contango site visit (1 scientist, 1 technologist), includes microbial sampling and tasks outlined in Appendix A of report. Completed HRT tracer study. Sample for AVS to assess if the added organics are having the desired effect.	Completed June 2017
		Summer - Contango site visit/checkup (1 scientist), includes microbial sampling and tasks outlined in Appendix A of report.	Completed July 2017. Seasonal water sampling was not completed due to flow interruptions. Seasonal water sampling was completed by Minto in August.
Commissioning		Minto added sandbags to outflows of CWTS cells to increase water depth	Completed August 2017
		Commissioning completed and beginning of operational period	Completed August 2017
Operations		Fall – Contango site visit/checkup (1 scientist), includes microbial sampling and tasks outlined in Table 5 of report.	Completed by Minto, after being taught microbial sampling by Contango. No site visit needed by Contango.
		Monitor soil redox. Determine when it consistently reaches targeted range.	Completed throughout 2017

Item	Date	Activites	Actual
Performance monitoring	2018	Develop a sampling plan, and aphid control and monitoring plan for 2018	Completed March, 2018
Drought recovery		Start water flow to CWTS; add sandbags to end and along perimeter of each CWTS cell to increase water depth by 1 to 5 cm; aphid control using more powerful insecticide on a routine schedule	Completed May 2018
		Assess recovery of CWTS from drought	Completed throughout 2018
		Summer – Contango site visit (1 scientist); conduct a vegetation plot harvest and assessment of biomass produced; collect one bag of *C. aquatilis* and one bag of polyester filter foam from each CWTS cell; replant *C. aquatilis* in areas with sparse vegetation	Completed July 2018
		Iron added to Series 1	Completed July 2018
		Two evapotranspiration studies were attempted (were not informative due to precipitation during trials)	Completed July/August 2018
Performance monitoring	2019	Fluctuate flow rates, based on expected amount of water for full-scale wetland (scaled to size). Evaluate performance of CWTS at different key periods. Fertilize plants (if necessary).	Completed throughout 2019. It was not necessary to fertilize plants.
Operations		Develop a flow rate schedule and sampling plan for 2019	Completed May 2019
		Provision of updated standard operating procedures for new staff responsible for monitoring and sampling CWTS	
		Start water flow to CWTS	Completed May 2019
		Continue aphid control using insecticide on a routine schedule	Completed May-September 2019

Item	Date	Activites	Actual
		Spring – Contango site visit; training of new staff responsible for monitoring and sampling CWTS, monitor for presence of aphids, add iron to Series 1, collect one bag of *C. aquatilis* and one bag of polyester filter foam from each CWTS cell	Completed May 2019. Iron addition to Series 1 was not completed due to prioritizing testing HRTs relevant to full-scale.
		Summer – Contango site visit; conduct a vegetation plot harvest and assessment of biomass produced; conduct evapotranspiration trial for warmer months	Completed July 2019. Vegetation plot harvest was not completed during the summer site visit as it was completed during the fall site visit. Evapotranspiration trial was not completed due to prioritizing testing HRTs relevant to full-scale.
		Fall – Contango site visit (if necessary), replanting if needed, soil harvesting for additional off-site stress tests, final sampling event.	Completed September 2019. Soil harvesting for additional off-site stress tests was not completed due to stress tests such as freezing occurring naturally each season. Replanting was not completed as it was not needed. Moss was added to the A cells during the spring site visit.
Maintenance and Operations	2020	Add tote to the inflow of the CWTS to simulate a forebay where a carbon source (straw) can be added. This will refine the full-scale design for early closure where higher nitrate loads may be present.	Completed May 2020.
		Test straw at the beginning and end of the operating season to evaluate depletion rates.	Completed May/September 2020
		Develop a sampling plan for monthly monitoring of the CWTS performance through 2020.	Completed
		Operate the CWTS at a hydraulic residence time (HRT) that mimics the full-scale system.	Completed throughout 2020
Reporting	Feb 2021	Memorandum to update on 2020 activities	Completed

16.3 In-Pit Treatment Bench Scale Trials

The in-situ pit lake treatment research was completed in phases. The first phase comprised an off-site bench- scale trial to determine the effectiveness of different organic carbon amendments (glycerol, ethanol, molasses) to treat contaminant of concern (COC) such as nitrite, nitrate, copper, selenium, and ammonia in the Main Pit water at the Minto Mine. These trials were intended to investigate the feasibility of in-situ pit lake treatment during closure and operations for the Site. The bench-scale pit lake data overall indicate that carbon amendment to the Main Pit would likely result in decreases in some COCs. Further details can be found in Appendix R.

16.4 Proposed Reclamation for 2020

Proposed reclamation for 2021 includes the following:

- Planting trees into suitably prepared areas (MVFE and DSTSF, potentially others).
- Finalize contouring work on soil cover on the Dry Stack Tailings Storage Facility.
- Finalize contouring work on soil cover on the Mill Valley Fill Expansion.
- Minor recontouring work and soil covers on SWD as required.
- Continuation of the Passive Water Treatment Research; and
- Field-scale in-situ pit lake treatment testing.

17 Socio-Economic Monitoring Program

The Minto Mine Socio-Economic Monitoring Program defines a framework for monitoring direct and indirect socio-economic effects from the Minto Mine. In 2020, Minto tracked and collected administrative data and other information relating to the mine's direct employment, training and procurement; worker safety; and Minto contributions to cultural well-being and community wellness. This information is presented in Appendix S, *2020 Minto Socio-Economic Report*.

18 Closure

Minto trusts this document fulfills the 2020 annual reporting requirements of Minto Mine's WUL and QML.

19 References

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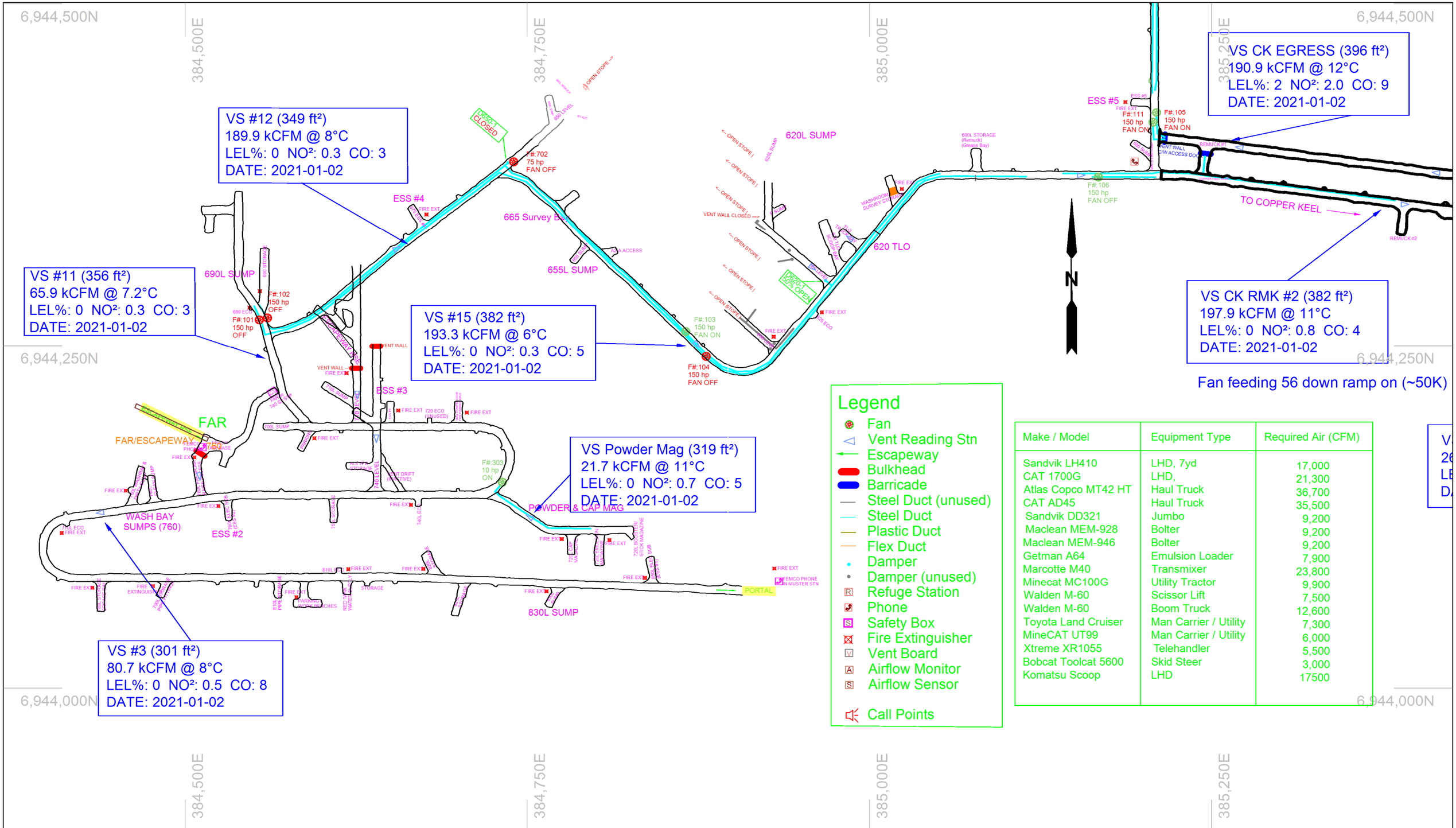
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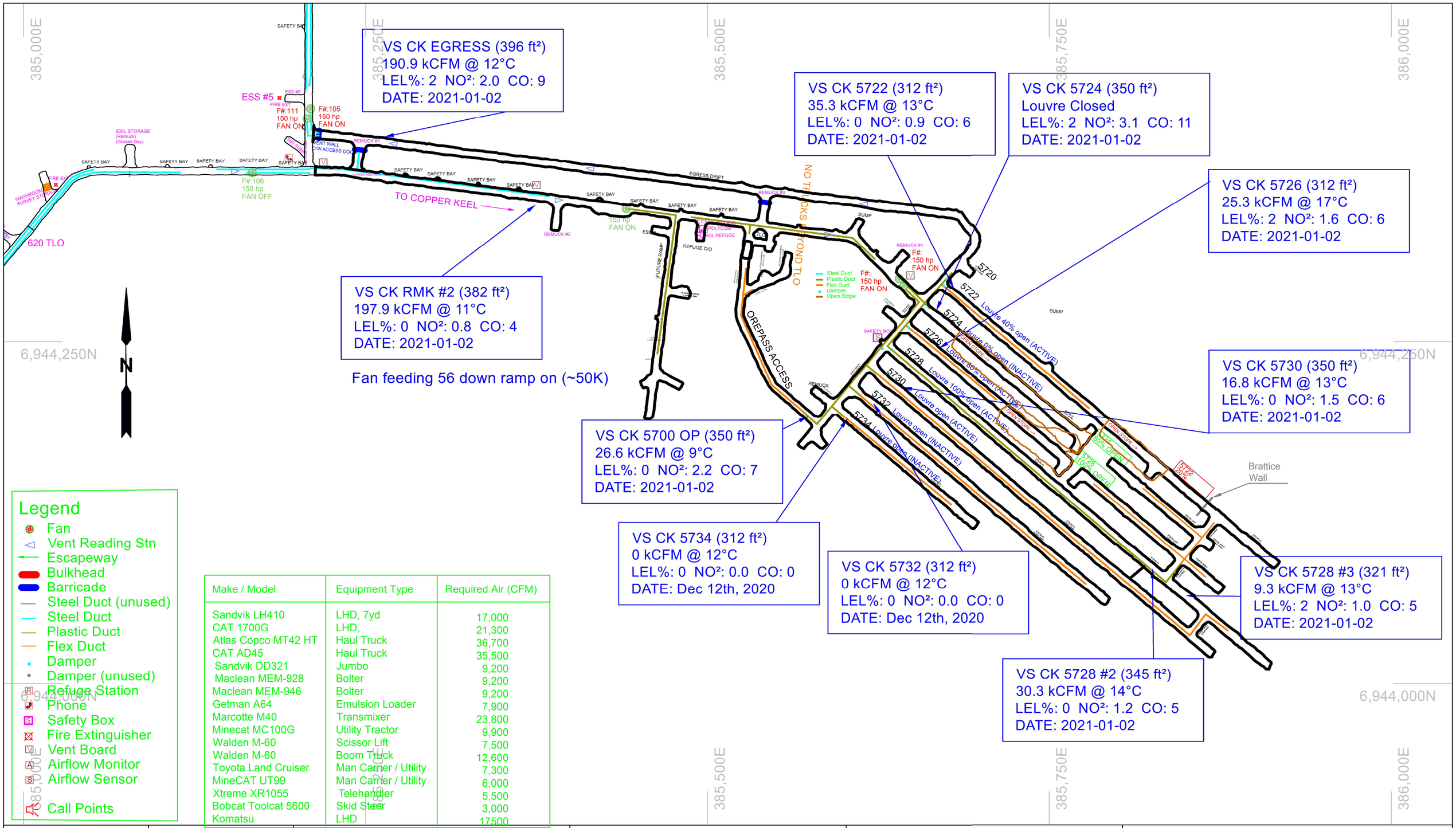
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- Plastic Duct
- Flex Duct
- Damper
- Damper (unused)
- Refuge Station
- Phone
- Safety Box
- Fire Extinguisher
- Vent Board
- Airflow Monitor
- Airflow Sensor
- Call Points

Make / Model	Equipment Type	Required Air (CFM)
Sandvik LH410	LHD, 7yd	17,000
CAT 1700G	LHD,	21,300
Atlas Copco MT42 HT	Haul Truck	36,700
CAT AD45	Haul Truck	35,500
Sandvik DD321	Jumbo	9,200
Maclean MEM-928	Bolter	9,200
Maclean MEM-946	Bolter	9,200
Getman A64	Emulsion Loader	7,900
Marcotte M40	Transmixer	23,800
Minecat MC100G	Utility Tractor	9,900
Walden M-60	Scissor Lift	7,500
Walden M-60	Boom Truck	12,600
Toyota Land Cruiser	Man Carrier / Utility	7,300
MineCAT UT99	Man Carrier / Utility	6,000
Xtreme XR1055	Telehandler	5,500
Bobcat Toolcat 5600	Skid Steer	3,000
Komatsu Scoop	LHD	17500

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Appendix A – Minto Mine Underground Development Map



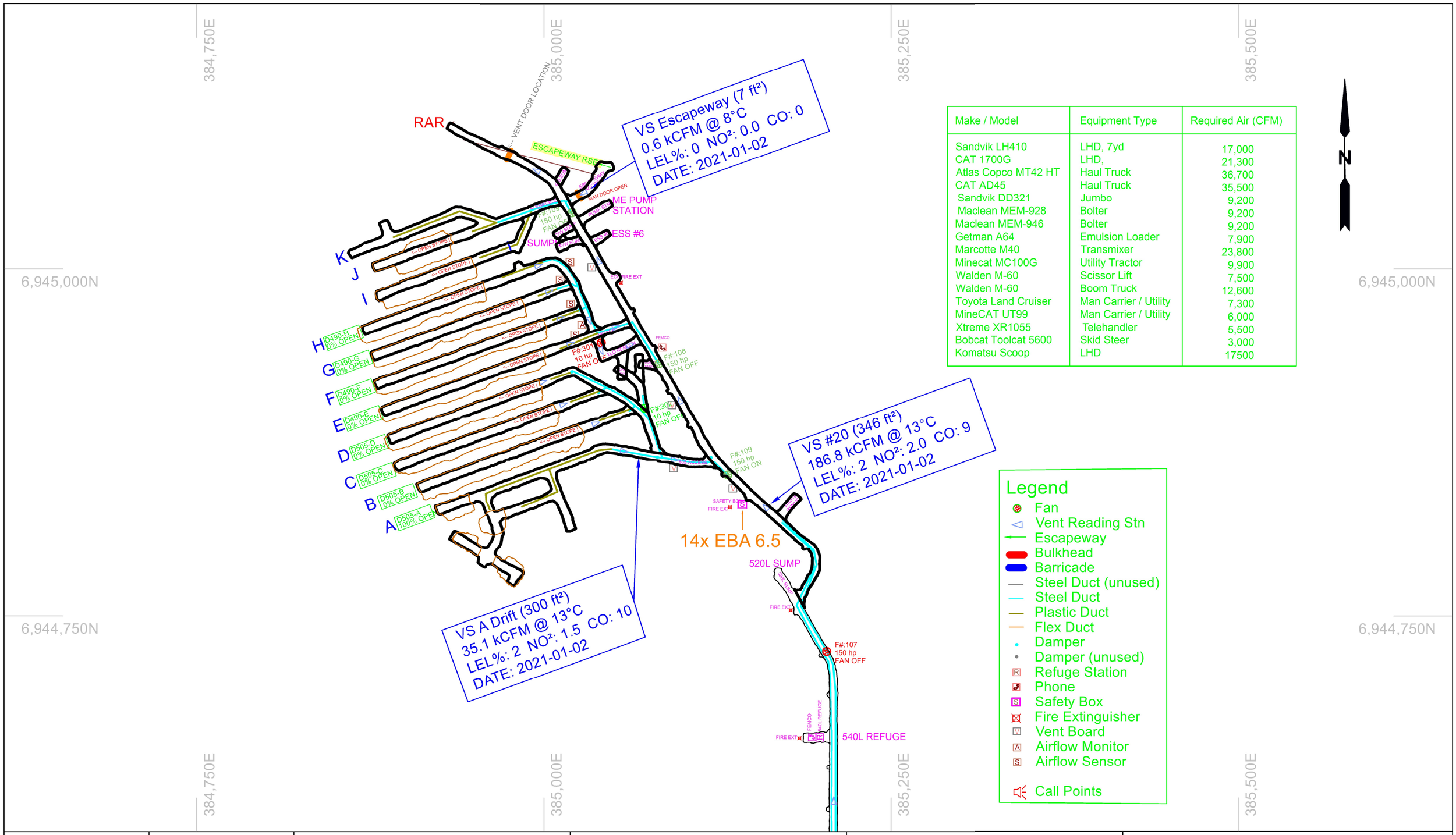
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Walden M-60	Boom Truck	12,600
Toyota Land Cruiser	Man Carrier / Utility	7,300
MineCAT UT99	Man Carrier / Utility	6,000
Xtreme XR1055	Telehandler	5,500
Bobcat Toolcat 5600	Skid Steer	3,000
Komatsu	LHD	17500

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	DATE PLOTTED: 03 Jan 2021		SURVEY DATE: 2021-01-02	GAS MONITOR: MT-002

MINTO



Make / Model	Equipment Type	Required Air (CFM)
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CAT 1700G	LHD,	21,300
Atlas Copco MT42 HT	Haul Truck	36,700
CAT AD45	Haul Truck	35,500
Sandvik DD321	Jumbo	9,200
Maclean MEM-928	Bolter	9,200
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MineCAT UT99	Man Carrier / Utility	6,000
Xtreme XR1055	Telehandler	5,500
Bobcat Toolcat 5600	Skid Steer	3,000
Komatsu Scoop	LHD	17500

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DRAWN BY: C. Bunston	SCALE: 1:2500	VENTILATION & EMERGENCY	SURVEY PERFORMED BY: C. Bunston	VENTILATION INSTRUMENT: Velocicalc 9535
	DATE PLOTTED: 03 Jan 2021		SURVEY DATE: 2021-01-02	GAS MONITOR: MT-002

MINTO

Appendix B – 2021 Spill Contingency Plan

Minto Mine

2021 Spill Contingency Plan

Prepared by:

Minto Explorations Ltd.

Minto Mine

January 2021

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1 Introduction

This Spill Contingency Plan (SCP) is an update to the previous SCP, drafted in March 2020. The content of this SCP is derived from the *Plan Requirement Guidance for Quartz Mining Projects* (Yukon Government, 2013). The SCP has been updated annually and submitted as part of Minto's Water Use Licence and Quartz Mining Licence annual reports.

The purpose of the SCP is to establish guidelines for staff, contractors, and suppliers working at the site with a formal framework of actions to be taken when responding to spills during mine operation. The SCP includes practices and planning of future efforts to further reduce the potential for environmental contamination and other spill-related impacts. The SCP describes the following:

- fuels, chemicals, and other materials used at the Minto Mine;
- reporting thresholds for those materials;
- a spill action plan for responding to unintentional spills of those materials;
- reporting sequences and forms;
- training requirements;
- spill prevention activities;
- routine monitoring and maintenance.

1.1 Project Description

Minto Explorations Ltd. (Minto), owns and operates the Minto Mine Project located 240 km (150 miles) northwest of Whitehorse, Yukon. Operations started in October 2007. The mineral deposits mined at the site were identified during exploration programs occurring in the area in the 1970's; exploration activities occurred sporadically since that time until construction of the mine and related facilities began in earnest in 2006.

The Project area encompasses the Minto Creek Valley which collects and drains in to the Yukon River (Figure 1-1). An overview of major infrastructure at the Minto Mine is shown on Figure 1-2 below.

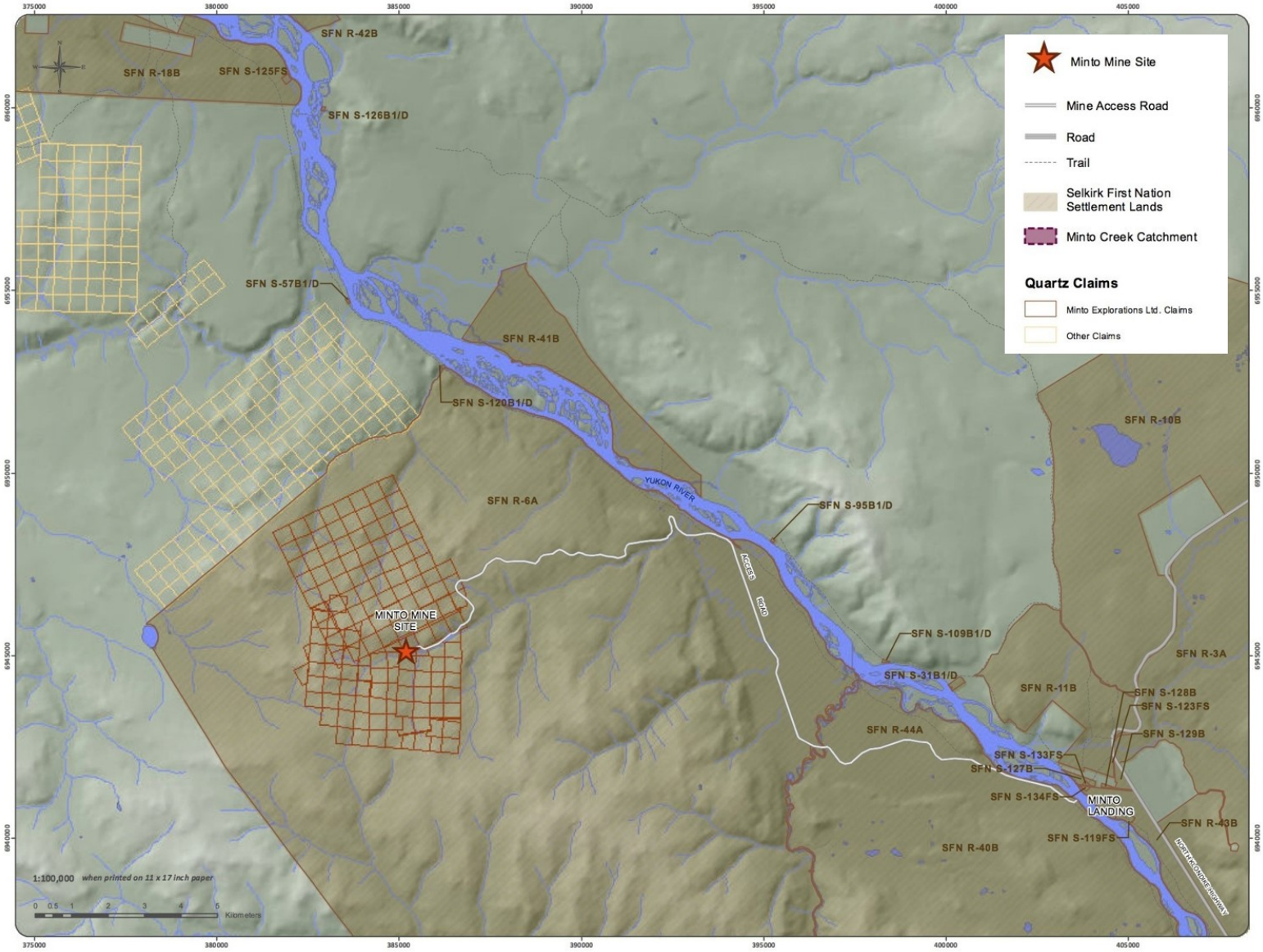


Figure 1-1: Minto Mine Area Overview



Figure 1-2: Minto Mine Area Overview – Existing Infrastructure

2 Definitions

The following definitions apply to the components of the SCP outlined herein.

Dangerous Good - A product, substance, or organism included by its nature or by the regulations in any of the classes listed in the schedule to the act (*Yukon Transportation of Dangerous Goods Act)*.

Deposit out of the normal course of events - A deposit that can reasonably be expected to occur at the mine and that can reasonably be expected to result in damage or danger to fish habitat or fish or the use by man of fish, and the identification of the damage or danger (*Metal Mining Effluent Regulations, Part 3, SOR/2002-222)*.

Discoverer - The person that discovers an incident that could possibly result in a spill or has resulted in a spill.

Spill - A release of a substance into the natural environment that is abnormal in quantity or quality in light of all circumstances of the release; or is in excess of an amount specified in the regulations (*Yukon Environment Act, Part 11*):

> **Emergency Spill -** A release of a hazardous product where there is potential for that product to enter a waterway or cause significant danger to life, health or environment.
>
> **Non-Emergency Spill -** All spills that do not meet criteria of an *emergency spill* and that the responsible party is competent to manage safely and efficiently in terms of assessment, prevention, containment and clean-up.

Substance - A hazardous substance, pesticide, contaminant or special waste often referred to as a "**deleterious substance".**

3 Purpose and Scope

Minto will ensure that all requirements related to Spill Response and reporting within these documents are implemented throughout the property for the life of the mine. If statutory and regulatory responsibilities change over time, the plan will be updated accordingly.

This SCP is prepared in support of:

- Minto's Type "A" Water Use License QZ14-031 (WUL) and Type "B" Water Use License MS15-094, which state that:

  "The Licensee shall apply the relevant procedures in the Spill Contingency Plan. The Licensee shall review the spill contingency plan annually and shall provide a summary of that review, including any revisions to the plan, as a component of the annual report."

- *Part 3 – Unauthorized Deposits*, Section 30 of the *Metal and Diamond Mining Effluent Regulations* (MDMER), which indicates that:

  "The owner or operator of a mine shall prepare an emergency response that describes the measures to be taken in respect of a deleterious substance within the meaning of subsection 34(1) of the Act to prevent any unauthorized deposits of such a substance or to mitigate the effects of such a deposit."

- *Part 7 – Emergency Response Assistance Plans and Security Plans of* the *Transportation of Dangerous Goods Act*:

  "*No person shall import, offer for transport, handle or transport dangerous goods in a quantity or concentration that is specified by regulation — or that is within a range of quantities or concentrations that is specified by regulation — unless the person has an emergency response assistance plan that is approved under this section."*

- Satisfying the requirements of the Quartz Mining License QML-0001 Schedule B, that requires:

  "A *plan that describes the measures designed to minimize the potential impact to the environment following a fuel or chemical spill."*

The SCP will apply to Minto Mine and the main access route for one year, whereby the owner or operator shall update and test the SCP to ensure it continues to meet the requirements of both the WUL, subsection 30(2) of the MDMER, and the QML.

3.1 Purpose

The purpose of the SCP is to outline a general set of procedures to be followed to assess, prevent, contain and clean-up a spill at the Minto Mine. For procedures to be effective, Minto must ensure that employees and contractors, through experience and training, possess the skills necessary to safely assess, prevent, contain and clean-up a spill or potential spill. These procedures are necessary to ensure continuity and develop the foundation for a robust and effective SCP. The SCP is also designed to establish clear reporting and clean-up procedures as they apply to emergency and non-emergency spills and incidents.

This document also addresses opportunities to improve spill preparedness, response, and mitigation for deposits out of the normal course of events that have the potential to impact the Yukon River and its tributaries within the project site.

All Minto employees and contract staff must be familiar with the general spill reporting procedures outlined in this document and will be introduced to them as part of their site orientation.

3.2 Scope

The objectives of the SCP are to:

- identify potentially hazardous materials located on site;
- identify spill prevention measures;
- establish a high order of preparedness if a spill occurs;
- ensure an orderly and timely decision-making, response and reporting process; and
- describe current and planned protective measures for all areas of the Mine Site

The *Minto Mine Emergency Response Plan* (Minto, 2020) contains other information that relates to Emergency spill procedures. The Emergency Response Team (ERT) and members of the Environmental Department have been trained on responding to Hazmat Spills. It is beyond the scope of this document to define the specific Spill Response Procedures and decision loops involved in an ERT response. Any details pertaining to a response from ERT to assess, prevent, contain and clean-up a spill at a spill incident

is the responsibility of the Site Safety Lead. General procedures for spill response procedures to emergency spills will be detailed herein.

3.2.1 Hardcopy Locations

Copies of the SCP are kept on-site in the following locations:

- Site Safety Office/ERT Building;
- Environmental Office
- Site Manager's Office
- Copper Queen Tug.

Contact information is provided in Table 4.2

4 Communication and Spill Reporting

Any spill that occurs at the Minto Mine site must be reported through the internal reporting chain of command and follow the procedures for assessment, prevention, containment and clean-up and reporting. Should a spill exceed the thresholds set by the Yukon Government (Table 4-1) then it must be reported to external authorities.

A spill that is in excess of the thresholds outlined in Table 4-1 or any spill that is abnormal in quality or quantity is considered a "reportable spill" under the *Yukon Spill Regulations* (O.I.C. 1996/193), pursuant to the *Environment Act*. Table 4-1: Reportable Spill Thresholds

Product	TDG[1.] Code	Threshold Quantity
Explosives	1	Any amount
Flammable gases	2.1	> 100 litres
Non-flammable gases	2.2	> 100 litres
Poisonous gases	2.3	Any amount
Corrosive gases	2.4	Any amount
Flammable liquids	3	> 200 litres
Flammable solids	4	> 25 kg
Spontaneously combustibles	4	> 25 kg
Dangerous when wet	4	> 25 kg
Oxidizers	5.1	> 50 kg or 50 litres
Organic peroxides	5.2	> 1 kg or 1 litre
Poisonous substances	6.1	> 5 kg or 5 litres
Corrosive materials	8	> 5 kg or 5 litres
Miscellaneous Dangerous Goods	9.1	> 50 kg or 50 litres
Special wastes	9.3	> 5 kg or 5 litres

1. TDG = *Transportation of Dangerous Goods Regulations* (Government of Canada, 1985)

4.1 Internal Reporting (All Spills)

All spills (whether externally reportable or not) must be reported by the discoverer to their immediate supervisor and then to the Environmental Department by radio or telephone following assessment of the scene. The supervisor of the responsible department will issue an Environmental Incident Notification, with assistance from the Environment department, to notify the site and its directors, including senior management. This typically occurs concurrently with spill response (prevention, containment, and clean-up) activities.

Following the spill response, responsible department supervisors are required to document the spill on an Environmental Incident Report, available through the Environmental Department, and provided in Appendix A. The report requires inclusion of photos, a description of clean-up activities, subsequent actions, and identifies the root cause and determines any necessary corrective actions.

4.2 External Reporting (Reportable Spills Only)

Under federal and territorial regulations, the environmental lead will call the 24-hour Yukon Spill Report line should a spill of a reportable quantity occur (Table 4-1). Although several government agencies at the federal, territorial and municipal levels may ultimately be informed, only the Yukon 24-Hour Spill Report line is required for reporting purposes. The environmental lead will ensure that the appropriate information is collected before reporting to the Spill Report line and the report will be filed within 24 hours.

Any spill of an amount greater than those listed in Table 4-1 or a spill of any amount that enters the Yukon River or a tributary of the river is a “reportable spill”.

The following information should be provided to the 24-Hour Spill Report line:

- Name
- Phone number
- Product spilled
- Quantity spilled
- Quality of product (thin, viscous etc.)
- Location of spill
- Distance to drinking water wells
- What happened
- Responsible party
- Actions to contain the spill
- Distance to water

When reporting the spill to the Spill Report Line, the environment lead will obtain the Environment Yukon Spill Reporting Number and first/last name of the person whom the report has been made to (in the event of a reporting discrepancy).

Minto will also contact: the Selkirk First Nation Lands Director; and Energy Mines and Resources Client Services and Inspections via email or phone after discovery of a reportable spill. Should the spill enter a waterway or be categorized as a major spill, Minto will also contact Environment Canada. A detailed written report will be submitted to the regulatory authorities within 10 days after the event. The contact

information for the various Minto employees, emergency response and external reporting personnel is provided in Table 4-2 below.

Table 4-2: Contact Information for Minto Personnel and External Agencies

Minto Mine Contact List		
Department Heads	**Email**	**Contact Number**
Director, HSE Kevin LeDrew	kevinl@mintomine.com	867-332-5527
Environment Coordinators Todd Swenson/Scott Morrison	todds@mintomine.com scottm@mintomine.com	604-759-4659
General Manager- Sebastien Tolgyesi	sebastient@mintomine.com	604-759-4639
Emergency Phone Contacts		
Yukon 24- Hour Spill Line		867 667-7244
CANUTEC-Dangerous Goods Help (Transport Canada)		1-888-CANUTEC or 613 996-6666
Fire Department – Pelly Crossing (Emergency)		867 537-3000
Police – Pelly Crossing		867 537-5555
Health Centre - Carmacks		867 863-4444
Hospital – Whitehorse		867 667-8700
Fire Department – Whitehorse		867 668-8699 or 668-2462
Police – Whitehorse		867 667-5555
YG Department of Environment, Water Resources Branch		867 667-3227
YG Environmental Protection Branch		867 667-3436
Selkirk First Nation, Betty Baptiste, Lands Manager		867 537-3331
YG EMR, Client Services and Inspections		867 667-3199
External Reporting and Contacts for Submission of Spill Reports		
YG EMR, Brett Isbister, NRO - Mining	Brett.Isbister@gov.yk.ca	867-334-9280
SFN, Betty Baptiste, Lands Manager	landsmgr@selkirkfn.com	867 537-3331 ext. 603
YG EHS, Craig Van Lankveld, Environmental Health Officer	craig.vanlankveld@gov.yk.ca	867 667-8316
Environment Canada, Travis Teel, Enforcement Officer	Travis.Teel@ec.gc.ca	867-393-6705

5 Spill Action Plan

Implementation of the spill action plan requires knowledge of spill response supplies and locations, spill response procedures (Sections 5.1 and 5.2) and clean-up protocols (Section 5.3). In addition to the internal and external reporting requirements, spills must further be categorized as “emergency” or “non-emergency” incidents as the action plans and reporting requirements will differ according to the type of spill.

5.1 Spill Response Procedures: Non-Emergency

The majority of spills that are likely to occur on the Minto Mine Site will include a simple stepwise process initiated by the discoverer. If the safety at the scene is in doubt, then it is imperative that the Site Safety Lead is notified immediately. A “non-emergency” spill is defined as a spill of any product that the discoverer, or other personnel within proximity of the incident can competently, safely, and efficiently manage in terms of assessment, prevention, containment, and clean-up. This typically includes fuels, blasting agents, oils, lubricants or coolants, and many of the reagents involved in mill operations. Once the scene is assessed for safety by the discoverer or supervisor and deemed a non-emergency, they will prevent, contain, and clean-up the spill, while also contacting the environmental team as soon as practical. If assistance is required to deal with the incident, the environmental team is to be notified by radio/telephone immediately. All small spills and drips discovered as part of vehicle pre-operation checks are to be cleaned up and reported for tracking purposes to the environment team. Specialized spill clean-up totes have been distributed around site in parking areas for this purpose. Specific instructions are located on the totes. Full totes are to be brought to the LTF for placement into the contaminated soils staging area.

A complete inventory of Dangerous Goods stored and used at the Minto Mine, including details on material handling and clean-up, reporting thresholds, special precautions, PPE requirements, and disposal methods is provided for reference during spill response activities (Appendix B).

5.2 Spill Response Procedures: Emergency

An “emergency spill” is a release of a hazardous product where there is potential for that product to enter a waterway or cause significant danger to life, health or environment. When a spill is discovered, the first

step is to assess the scene for safety and, **if safe to do so,** immediately control and contain the spill by any means necessary. If the discoverer or other personnel within close proximity of the incident do not have the required training, resources, or equipment to deal with the incident then the individual must report a "Code 1" callout. This protocol will initiate response of the Safety Lead, Environmental Lead, and the Emergency Response Team. The Emergency Spill Response Command Structure and General Spill Procedure are detailed in Figure 5-1 and Figure 5-2, respectively. If the scene is safe and the discoverer and the immediate supervisor have the means necessary to control, contain, and recover the spill then they should proceed as such.

Once called via a "Code 1" the Safety Lead will respond to the scene and conduct an initial assessment and assume command of the scene. If the Safety Lead/Medic is required to treat patients, command is transferred to the Emergency Response Team Captain. Unified Command Structure will be initiated once the Site Manager or Environmental Lead is on scene. The Unified Command Structure is a cooperative effort command between the Site Manager, Health and Safety Lead, and the Environmental Lead. Transfer of command includes a detailed verbal report of the incident and activities conducted and underway.

A "Code 1" Protocol initiated by an emergency spill will trigger the specific spill response procedure based on the product type, quantity and environmental and safety conditions.

Initial spill response will be conducted in accordance to *Transport Canada's 2016 Emergency Response Guidebook* (Transport Canada, 2016). This Guidebook will assist Incident Command with information to identify the material, use the guide to reference potential hazards, public safety and emergency response information. The *Table of Initial Isolation and Protective Action Distances* will be used to dictate isolation and protection for both large and small spills. However, this is not a comprehensive spill mitigation and response document and will only assist responders in making initial decisions upon arriving at the scene of a dangerous goods incident. It should not be considered as a substitute for emergency response training, knowledge, or sound judgment. The *Emergency Response Guidebook* does not address all possible circumstances that may be associated with a dangerous goods incident. The 2019 *Minto Mine Emergency Response Plan* has additional specific procedures for responding to the most commonly transported and hazardous materials including Nitric Acid, Gasoline, Diesel, Ammonium Nitrate, Sodium Sulfide, and Propane.

In addition to on-site response Minto, through its carriers of dangerous goods, has contracts in place with spill responders. These are full-service response agencies that have commitments to mobilize fully trained emergency response teams and equipment 24 hours a day, 7 days a week.

5.2.1 CANUTEC Transport Canada

In the event that a spill requires additional technical resources Minto is registered with CANUTEC, a division of Transport Canada, for 24-hour Spill Response support and information to deal with emergency situations. If a spill occurs beyond the boundaries of the Minto property, the owner of the transportation firm and the owner or consignor of the dangerous goods will communicate with the regulators. For incidents that occur on the Minto property, the Environmental Department will ensure reporting to regulators is performed accordingly.

5.2.2 Surrounding and Downstream Communities

Notification of downstream water users of a spill, if required, is the responsibility of the Yukon Government Environmental Protection Branch. Minto will additionally notify the authorities including police and fire departments and the Selkirk First Nation community of Pelly Crossing.

5.2.3 Public Relations

The Site Manager is the designated spokesperson for Minto. The Site Manager may delegate their responsibility for public relations if required to do so by the scale of the incident.

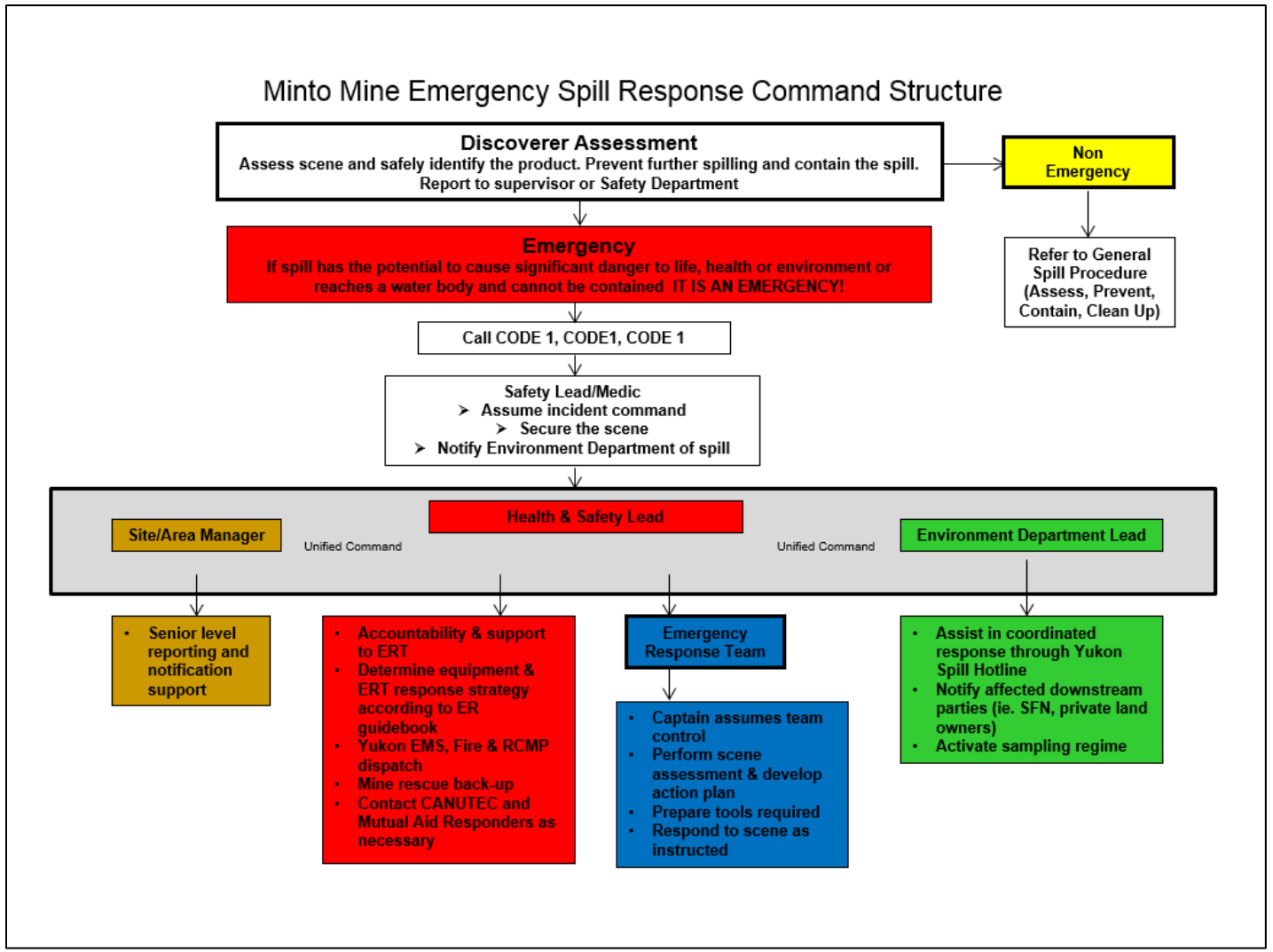


Figure 5-1: Minto Mine Emergency Spill Response Command Structure

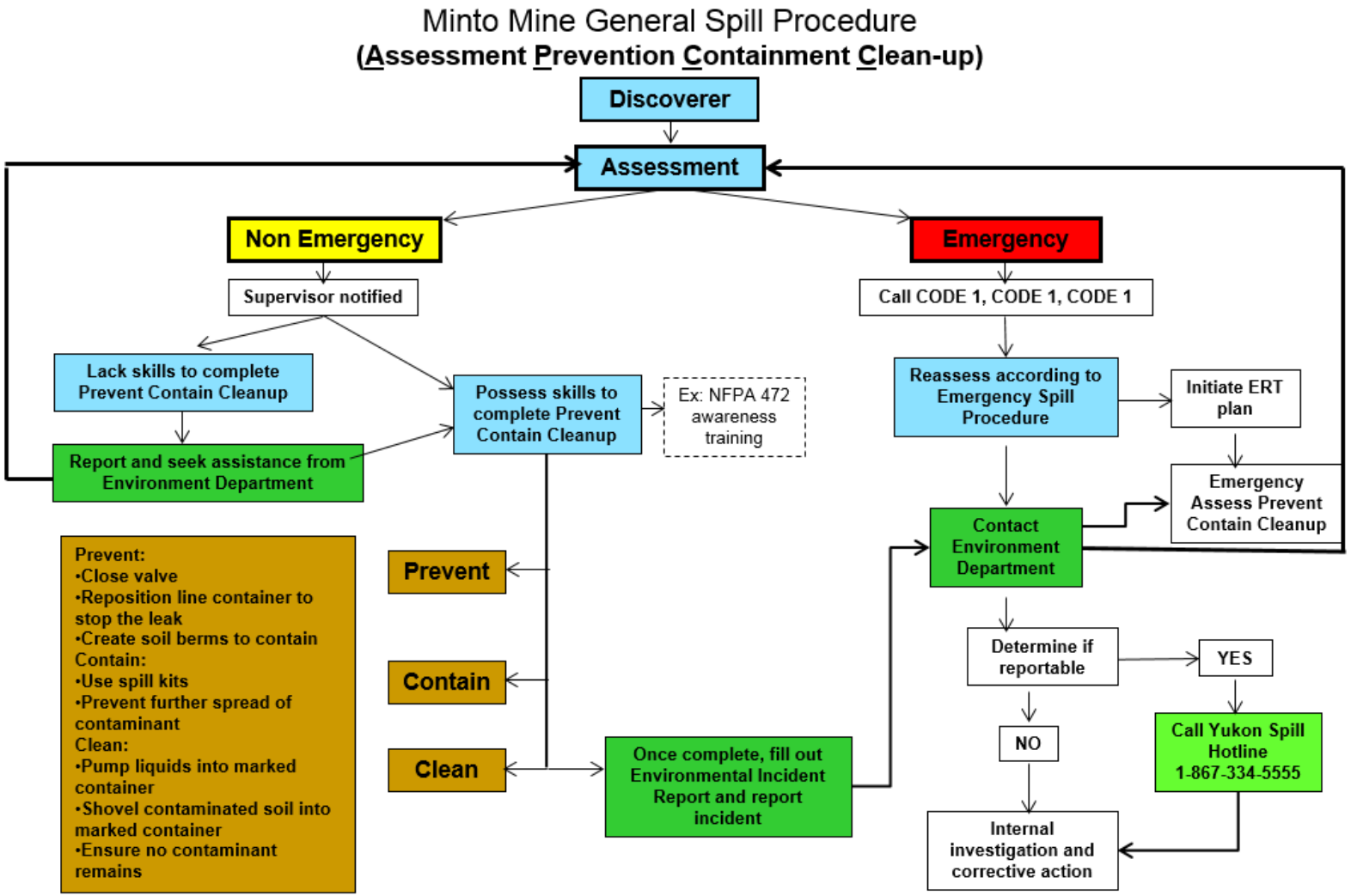


Figure 5-2: Minto Mine General Spill Procedure

5.3 Disposal and clean-up

Disposal and treatment methods of contaminated material are outlined below and are further detailed in the *Minto Mine Spill Response Procedure: Non-emergency spills on soil* and the *Minto Mine Land Treatment Facility Standard Operating Procedure* documents. The Minto Mine Site has a Land Treatment Facility to accept incoming contaminated material from petroleum hydrocarbon and ethylene glycol spills. Depending on the state and substrate of the surface material, the clean-up and disposal location will differ. Brief practical descriptions of the clean-up procedures are summarized in Table 5-1.

Table 5-1: Disposal and Movement of Contaminated Material from Spill Sites

WASTE TYPE	DESCRIPTION	MOVEMENT OF MATERIAL FROM SPILLS
Oil or Glycol Contaminated Soil	Soil, Organics, and granular material (avoid coarse rock) contaminated as a result of a hydrocarbon or glycol spill	Contaminated soil will be transferred to the Land Treatment Facility. Contaminated soil will first be placed in the staging cell and labelled to be later categorized and treated. Contact Environment dept. before dropping off material in the Land Treatment Facility. Small spills will be stored in a composite pile in the staging area. Larger spills will be stored separately in staging while waiting for lab results.
Oil or Glycol Contaminated Rock	Blasted rock and coarse material and/or bedrock, contaminated as result of a hydrocarbon spill or glycol spill	If blasted rock contains ore and has been cleared by Mill operations ore will be processed through the mill. Non-ore containing rock will be placed in the main pit and in-situ bioremediation will be applied to the pile.
Oil or Glycol Contaminated Snow/ Ice/Water	Snow, Ice, and/or Water that has been contaminated as a result of a hydrocarbon spill or glycol spill	Contaminated snow/water will be transferred to the Land Treatment Facility. The contaminated product will be placed in a separate pile in the cell.

**** Any amount of material that has more than 30,000 ppm oil or glycol is considered special waste and must be disposed of off-site to a Special Waste Facility**

6 Spill Response Supplies

Spill kits (yellow and blue drums) are located throughout the Minto Mine Property at locations indicated in Figure 6-1. Additionally, there are blue drums located at the km 12 gravel pit, Big Creek and at the east and west terminals of Minto Landing. The contents of the yellow and blue barrels are summarized in Table 6-1. Spill kits are also supplied for each heavy and light truck at the Minto Mine. Contractor supervisor trucks have spill kits permanently affixed to the truck body. All contract trucking agencies travelling to the mine are required to carry spill kits within or affixed to the truck. Spill kits are loaned to short term visitors if required.

Table 6-1: Spill Kit Contents

Spill Kit Item	Yellow Barrel	Blue Barrel	Yellow Truck Bag	Loaner Spill Kit (20 L Pail)
Tyvek splash suits	2	2		
Chemical master gloves	2	2	1	2
Garbage bags with ties	5	5	3	1
Oil only booms (5” x 10’)	2	4	1	
Oil only mats (16” x 20”)	50	50		10
Universal sorbent mat	20	20	10	5
Sorbent socks	10	10		1
Tarp	1	1		
Duct tape	1	1		
Utility knife	1	1		
Field notebook and pencil	1	1		
Instruction sheet (laminated)	1	1	1	1

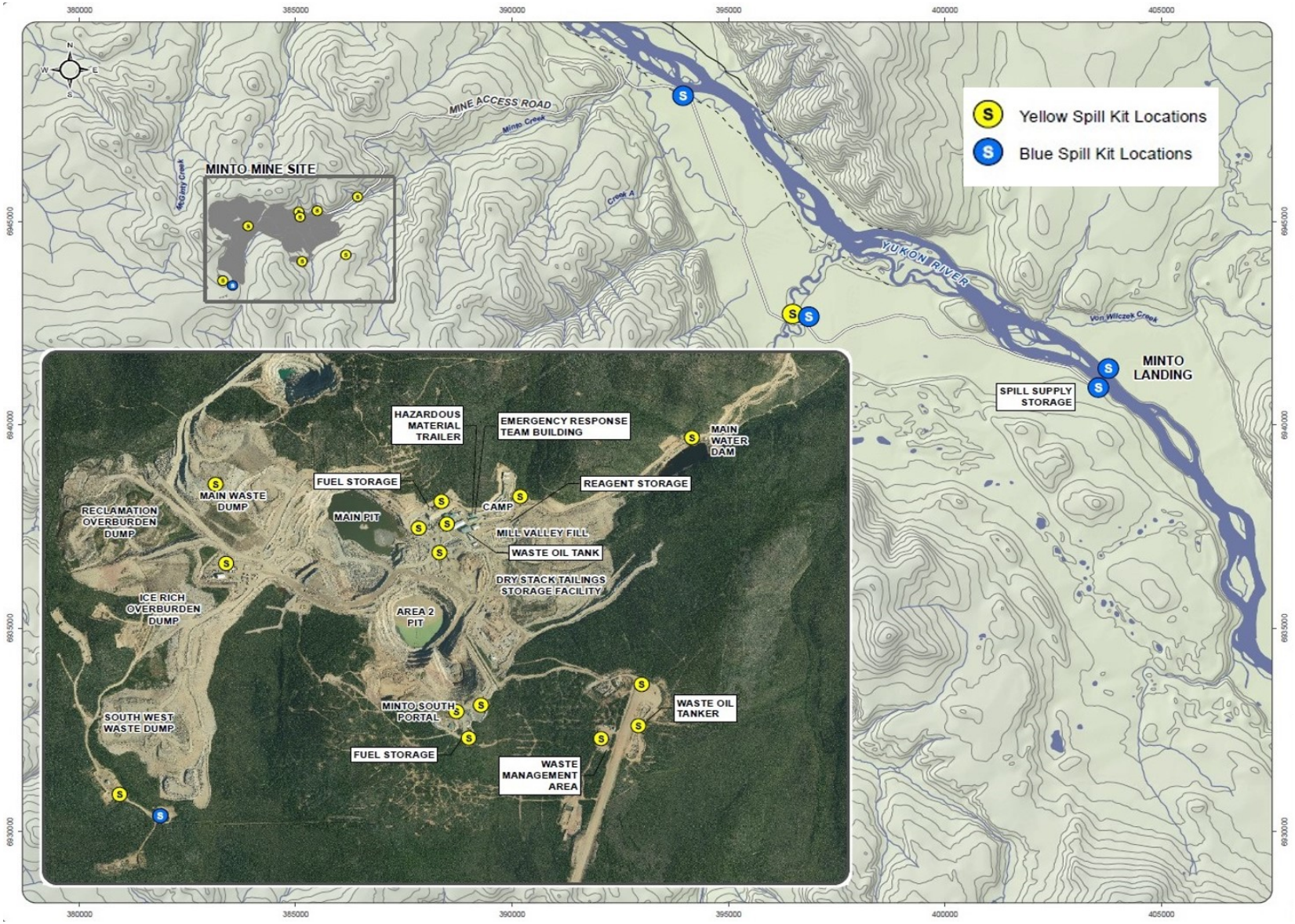


Figure 6-1: Minto Mine Area Overview – Hazmat Storage and Spill Supplies

Heavy machinery at the mine site is available for use in spill response and clean-up, as required under contract. Additionally, Minto has a 1991 Chevrolet Top Kick Fire truck with a 3200 litre/minute pump with a 3800-litre supply tank and a 3000-litre drop tank. This truck can support all spill response activities with SCBA, Class A and B foam capabilities, decontamination needs, as well as fire suppression/protection tools and equipment common to a truck of this nature. All ERT members are competent with the operation of this fire truck and related equipment.

In 2013, Minto, on advice from Emergency Response Action Plan providers, procured a 20-foot Hazmat trailer and a helicopter-portable In-Viro-Drum vacuum unit (Figure 6-2) capable of being transported to locations not reachable with a vacuum truck. It has a liquid cooled three-cylinder Kubota diesel engine and 250 CFM non-sparking blower, which makes it safe to vacuum flammable liquids and solids from water or dry land. It comes with a Double Port Vac Drum that allows for transfer of product from the drum to one of our 9500 litre bladders, while the drum continues to be filled. This system allows for quick, efficient and effective clean-up of hazardous products from hard to reach locations.

In 2016, Minto purchased a S.S. Alpha Adjustable Folding Weir Skimmer. Weir skimmers float on the surface of water and are designed to remove pollutants from the surface of calm or sheltered waters and shoreline areas. Connected to a shore-based portable pump (e.g. Honda), contaminants can be removed from the water surface and transferred to a drum or another container for proper disposal.

Figure 6-2: In-Viro Drum and vacuum unit, 24' Packman vessel, and Alpha Skimmer for spill response operations.



Minto Mine also acquired a 24-foot Packman man boat, which is described, further in the "Barge Emergency Contingency Plan" (Appendix D).

Spill contingency equipment and earth moving equipment located at Minto Mine are listed in Table 6-2. Contractor Reclamation and Revegetation equipment is available for use in spills and clean-up operations.

Table 6-2: Spill contingency equipment located at Minto Mine

Quantity of Units	Equipment		Quantity of Units	Equipment
1	430 Backhoe		1	Assorted Wooden Plugs
1	3800 Litre Vacuum Truck		1	Large Haul Truck
Various	Dozers, Excavator, Loaders		1	Hazmat trailer 20’
1	In-Viro Drum Portable Vacuum unit		1	Top Kick fire truck
2	9500 Litre bladders		500’	Sorbent Boom (various sizes)
1	24’ Packman Response Vessel		1	Storage Sea Can at Landing
1	Roll Over Kit		3	Trash pumps
1	Pipe Plug kit		1	S.S. Alpha Adjustable Folding Weir Skimmer Pump

7 Spill Prevention and Response Training

Education and training are critical to the success of any site-wide initiative, and the most important tool to ensuring the success of the SCP. Minto has comprehensive training initiatives that ensures all workers and supervisors are aware of their responsibilities and the practices that personnel and contractors must adhere to. Records are kept of the names of all employees or contractors that receive training, tracked though a centralized training matrix. Annual re-training will be scheduled for all Minto employees.

7.1 Existing Spill Prevention and Response Training

Employees are trained to understand the potentially hazardous situations that spills can create with respect to the health and safety of workers and the environment. They are trained to understand responsibilities as employees to Assess, Prevent, Contain, Clean-up, and Report any spills. The SCP is made available to all employees and employees will be advised of revisions or changes to the SCP.

7.1.1 Orientation

Employees and visitors are required to sign off on the environmental policy as part of the employee, contractor, and visitor orientations that include a summary of the response required when a spill has occurred. The orientation has a strong focus on ensuring proper reporting of spills, so that the appropriate response and clean-up can occur.

7.1.2 Onboarding Training

As part of the orientation, all Minto employees and major contractors receive training that is a computer-based PowerPoint presentation, followed by a written test. The onboarding package focuses on some of the most common safety training required for site, which includes WHMIS (Workplace Hazardous Material Information System), fall protection, confined spaces, lock out, hot work, Explosives awareness training, and Environmental Awareness. The Environmental Awareness portion of the training is comprised of four modules, with one module dedicated specifically to Spill Response, covering the reporting and basic steps for assessing, preventing, containing, and cleaning up of spills.

7.1.3 Targeted Practical Training

Training sessions are put on by the Environmental Department, and efforts are made to tailor the training to the attending group (i.e. underground miners, surface contractors, site services, etc.). Smaller groups are identified and targeted for specialised spill prevention training that is more job specific. These include but are not be limited to; maintenance personnel (mechanics), waste and water truck operators, fuelling personnel, and warehouse workers. Training in smaller groups focusses on specific spill prevention techniques.

7.1.4 Training for Fuel Handling Employees

Currently there are Safe Work Practices (SWP) designed for bulk fueling at the fuel farm and for fueling of equipment in the field. These SWPs include descriptions of the stepwise procedure for safely performing the task and includes steps to take for emergency shut-off. Both the procedure and the equipment are audited during Workplace Inspections and Planned Job Observations by immediate supervisors and the Environmental Department.

7.1.5 ERT Training

An Emergency Response Team (ERT) has been established to, among other duties, respond to emergency spills. The Emergency Response Team periodically receives training to the National Fire Protection Association (NFPA) 472 Hazardous Material awareness level, and are required to thoroughly understand this document in order to respond to spills or incidents of a specific nature. This training is required as a foundation to develop site specific contingency planning for response tactics in areas specific to the Minto Mine associated activities that present a risk to the Yukon River and its tributaries.

7.1.6 Emergency Spill Response Drills

Tabletop exercises and/or field drills will help to prepare the ERT and other mine staff to respond to a major spill safely by identifying any deficiencies in the equipment or processes in place.

On December 8, 2020 a tabletop exercise was conducted to assess the SCP's (and the overall MERP) response to a fuel spill on the haul road with potential to impact Minto Creek.

The scenario was as follows:

- A call comes over Channel 1: Site Services announces there is a Fuel truck that has lost visual of the haul road and tipped sideways at km 3.
- The tanker (30,000 L) was travelling "up" is at approximately 70 degrees from vertical and is leaking fuel on the northwest side of the road.
- The Driver is uninjured.
- Driver has deployed his spill kit, but the tanker is leaking from the top hatch beyond his capacity to hold it.
- Truck Appears to be undamaged.
- Temperature -17oC, Wind Brisk from northwest, Heavy Snowfall.

This tabletop exercise concluded with the following recommendations:

- Command Center resources be enhanced to ensure response consistency.
- Update MERP (MERM) and Pre-Plans.

On November 7, 2018, a tabletop exercise was conducted to assess the SCP's response to a large propane leak.

The scenario was as follows:

- A cloud of vapour was seen by employee conducting daily propane checks at the underground mine-heater propane farm.

The table-top exercise identified ready-made responses in keeping with the information from the Canutec Emergency Response Guidebook. Items for discussion and follow-up included:

- While the SCP/E2 plan calls for ground monitor water fog to dissipate a vapour cloud, there is insufficient water volume on the truck to effectively do so.
- There is an LEL alarm and nitrogen switch that will shut off gas supply in the event of a large gas leak, therefore it is important to ensure this switch is maintained and tested regularly (confirmed with propane supplier).

On October 26th, 2014, a combined field and tabletop exercise took place with the following objectives:

- Help individuals become more knowledgeable with the ERP and SCP;
- Identify gaps in the plan;
- Improve communication between stakeholders and departments; and
- Learn new ways and better ways to execute the plan.

The announced exercise was initiated to test part of the Emergency Response Plan as it applies to Spills and the SCP. It focused on the crisis, interaction and escalation of problems within:

- Administrative;
- Operational;
- Managerial; and
- Facilities.

The scenario was as follows:

- A tanker truck with pup and trailer of diesel overturns on Oct 26th on icy roads at 3:20pm at south end of Big Creek. It is still dark, and it is a Sunday and roads are icy and snowing lightly.

The exercise lasted approximately 2 hours and involved management staff onsite and offsite, the ERT, major contractors, The Yukon Spill Hotline, CANUTEC, Transnorth Helicopters, WCB, Parkland Fuel, and Quantum Murray. A post–incident debrief revealed both opportunities and successes at the field operations and management level.

8 Routine Maintenance and Monitoring

The Fuel Farm is visually inspected weekly for any leakages. An overfill protection system is installed on the two main diesel tanks using a visual indicator and a relay to the control room that will alarm on the HMI to alert maintenance personnel. The area also receives inspections by a qualified engineer and recommendations are recorded and deficiencies corrected as per the *CCME Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products* (Canadian Council of Ministers of the Environment, 2003).

The tug and barge receive frequent inventory inspections for spill equipment and have had major overhauls in the last few years to ensure that the operation is continually improving. Maintenance activities are also carried out regularly and systems are inspected as per Transport Canada Regulations. The daily start-up procedure includes checking for leaks and ensuring all systems are performing to specifications. Annual maintenance activities have included the following: propeller repairs, controls work, system checks and repairs. Substantive refits have included: cylinder heads, exhaust manifold seals, motor mounts, transmission mounts and replacement of water pumps. A new transmission, propulsion seals and propellers have been installed and aligned. Other improvements have included welding reinforcements on the bow of the barge for landings, electrical upgrades, and the installation of an anchor with hawser.

All fuel trucks receive a daily walk-around inspection to ensure emergency shutoffs and hatches and tank valves are operating properly and are free of leaks. These are recorded daily.

The Environment Department is directly responsible for the administration, compliance, and procedures associated with the management of waste. They are also responsible for providing education, support, and any necessary assistance required to prepare shipments for backhauling, and to ensure the Waste Management Area (WMA) is maintained in accordance with the Commercial Dump Permit (# 81-005).

The WMA is inspected weekly by Environment staff to ensure employees and contractors are following the site protocols for waste segregation, incineration, special waste handling, and landfilling. Any issues regarding these protocols are brought to the attention of all involved staff and/or contractors and the Environment Department has the right and ability to limit all access to the WMA if issues persist after they have been discussed.

9 References

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Appendix A: Spill Report and Environmental Incident Report Forms

MINTO

Environmental Incident Investigation Report		EIR-20-0XX	
Date of Incident:		Time of Incident:	
Date reported:		Time reported:	
Contaminant Type:		Volume of Spill (L):	
Location of Incident:		Equipment (Type/#)	
Responsible Dept.		Supervisor	

Incident Type

Non-Reportable Spill	**X**	Reportable Spill	
Non-Reportable Wildlife		Reportable Wildlife	
Non-Reportable Incident		Reportable Incident	

Detailed but brief description of *What, Where, When, Why*

What were they doing? **What was the cause?**

What was the initial response? **What is the current status?**

Make sure you have defined the "Direct Cause" of the incident in the statement below.

Photos

Photo 1:	***Photo 2:***

Non-Reportable Spill Report Form

Spill Name:	

General Report Information: (To be completed by the supervisor of responsible department or company)

EIR #:		**Location of Incident:**	
Date of Incident:		**Time of Incident:**	
Contaminant Type:		**Volume of Spill (L):**	
Equipment (Type):		**Equipment (#):**	
Company or Department:		**Supervisor**	
Hours since last PM:		**Proximity to nearest waterbody:**	
Previous indication of leak (i.e. Prior Drip) (Yes/No):		**Estimated cost of spill:**	

Failure of Mechanism: (Check one box below)

Blown Hose		Failed Hose Connection		Human Error	
Unforseen		Blown or Leaking Seal		Unknown	
Other					

Brief Description of Cause: (conditions at time of spill, what was happening at the time, specific direct cause of spill, etc.)

Clean Up Actions Undertaken:

Land Treatment Facility Information: (To be filled out by Environment Department)

Material Moved to LTF (Yes/No):		Material Sampled (Yes/No):		Quantity (m^3):	

Notes:	

Corrective Actions: (Must fill out for all reportable and preventable spills)

Action Item #	Responsible Department	Corrective Action	Due Date

Reporting Sequence:			
First Observer:			
Reported To:			
Reported To Environmental:			
Reported To General Manager:			
	Name	**Company**	**Date/Time**

Photos:	
Photo 1:	**Photo 2:**
Photo 3:	**Photo 4:**

Appendix B: Reporting Threshold, Special Precautions, PPE Requirements, and Cleanup and Disposal Methods

Minto Mine - Inventory of Dangerous Goods

Reporting Threshold, Special Precautions, PPE Requirements, and Cleanup and Disposal Methods

Common Name (Synonyms)	Chemical Name	Manufacture / Supplier	Phase	TDG Class	WHMIS Class	NFPA Rating	Reporting Threshold	Use	Special Precautions	PPE Required	Special Cleanup and Disposal Info
Acetone	2-Propanone	Anachemia	Liquid	3	B-2, D-2B	1, 3, 0	200 L	Solvent	Extremely Flammable	Goggles, gloves. SCBA if in confined space	Eliminate all sources of ignition. Ventilate area if required. Use absorbent. In case of fire, use dry chemical, CO2, Alcohol-resistant foam. Do not allow into waterway or drains. Contain spread of spill and soak up with absorb all, absorbant pads. Clear up using non-sparking tools. Place liquid and absorbents into tighly sealed container, label clearly and dispose of as hazardous waste offsite.
Acetylene	C_2H_2	AIRGAS INC	Pressurized gas dissolved	2.1	A, B-1, F	1, 4, 3	any if container larger than 100 L	Welding/cutting gas	Extremely flammable, pressurized gas dissolved in an extremely flammable liquid (Acetone)	Goggles, gloves. Respirator or SCBA if in confined space	Eliminate all sources of ignition, if possible without risk, shut off bottles. If bottle is ruptured after the gas has been expelled, the bottle will release the Acetone. At that point treat as an Acetone spill.
AERO 6493 Promoter	Alkyl hydroxamate	Cytec Canada	Liquid above 15C	9		2, 1, 2	5 L	Metal flotation in mill			Soak up with absorbent (do NOT use sawdust. Use PLASTIC tools). In case of fire, use dry chemical, CO2, Alcohol-resistant Foam or water spray. Place recovered spilt liquid in labelled drums for disposal as Special waste. Incinerate used absorbent pads.
AERO MX-5149	Modified Thionocarbamate 15-40%Xanthate esther 40-70%	Cytec Canada	Liquid	3	B3, D-1B, D-2B	3,2,0	200 L	Metal flotation in mill	Flammable	Closed system, safety glasses, gloves	Remove sources of ignition. Cover spills with some inert absorbent material; sweep up and place in a waste disposal container. Flush spill area with water.
Aerodri 100 Dewatering Agent		Cytec Canada	Liquid	3	B3, B-2, D-2A	2, 3, 0	200 L		Avoid contact with strong oxidizers or acids.	Safety Glasses, Gloves	Eliminate all sources of ignition. Ventilate area if required. Use absorbent. In case of fire, use dry chemical, CO2, Alcohol-resistant Foam or water spray. Incinerate waste. Soak up with absorbent materials and dispose of offsite in clearly labeled containers
Alconox		Anachemia	solid	not regulated	D-2B	1, 0, 0	50 kg			Safety Glasses, Gloves	Clean up uncontaminated material for reuse. Incinerate waste.
ALIQUAT 336	Methytrioctyl-ammonium Chloride	Sigma-Aldrich Canada	Liquid	6	D-2B	2, 1, 1	5 kg		Toxic if swallowed. Very corrosive. Will burn skin and eyes. Avoid contact with strong oxidizers. Hygroscopic: avoid contact with moist air.	Safety Glasses, Gloves	Eliminate all sources of ignition. Ventilate area if required. Use absorbent. In case of fire, use dry chemical, CO2, Alcohol-resistant Foam or water spray. Incinerate waste.
AlphaSolve II	>50% Sodium Hydroxide <50% Silicate	Alpha Resources	Solid						Avoid contact with strong oxidizers.	Safety Glasses, Impervious Gloves.	Highly caustic. Will produce heat and steam on contact with water. May boil and spatter. May generate hydrogen gas on contact with metals. Sweep or vaccum and, if not re-useable, send offsite as hazardous waste, in tightly closed, well labeled containers.
Aluminex 5	Aluminum Chloride Hydroxide Sulphate 15%	NALCO	Liquid	8	E		5 L	Coagulant		Safety Glasses, Gloves	Soak up with absorbent materials. These can be incinerated. Any remaining spilt liquid should be stored in closed container, labelled and disposed of off-site as Special Waste.
Aluminum Standard - AA		Anachemia	Liquid	8	E	4, 0, 0	5 L		Dilute Nitric Acid <5%	Safety Glasses, Gloves	Neutralize with soda ash or lime. Contain spill, **do not** allow un-neutralized acid to enter water systems. Neutralized spill can be pumped to the pit or tailings system.
AM28 Flotation Reagent	Mixture of Potassium Hydroxide Alkyl hydroxamate	Axis House (Pty) Ltd.	Liquid	not regulated	D-2B	2,1,0		Floatation Reagent	corrosive solid.	Safety Glasses, Gloves	Soak up with absorbent (do NOT use sawdust. Use PLASTIC tools). In case of fire, use dry chemical, CO2, Alcohol-resistant Foam or water spray. Place recovered spilt liquid in labelled drums for disposal as Special waste. Incinerate used absorbent pads.
Amco Clear Turbidity Standard		GFS Chemicals	Liquid	not regulated	not regulated					Safety Glasses, Gloves	Contain spill. Incinerate waste or place in landfill
Ammonia, Refrigerant	Ammonia, Anhydrous	GT&S, INC	Liquefied Gas	2.3, 8	does not appear classified??	3, 0, 0	any amount		Liquefied gas, will produce extreme cold when released. Death has occurred at 5000ppm exposure for 5 minutes. Evacuate release area upwind and avoid low areas.	Goggles, gloves. SCBA.	Toxic gas and will react with a large number of substances, many in a violent manner, Gas will dissipate quickly in air. Small spills can be dissolved in water at ratio of 1:10 Not very flammable. Do not attempt to neutralise.

Minto Mine - Inventory of Dangerous Goods

Reporting Threshold, Special Precautions, PPE Requirements, and Cleanup and Disposal Methods

Common Name (Synonyms)	Chemical Name	Manufacture / Supplier	Phase	TDG Class	WHMIS Class	NFPA Rating	Reporting Threshold	Use	Special Precautions	PPE Required	Special Cleanup and Disposal Info
Ammonium Nitrate prill	Ammonium Nitrate	Agrium	solid	5.1	C, D-2B	1.0.3	50 kg		Oxidizing material, does not burn but may contribute to combustion of materials that can burn	Safety Glasses, Gloves	In case of fire, cool containing vessels with water jet in order to prevent pressure build-up/explosion. Use flooding quantities of water. Evacuate surrounding area. If fumes or gases present, fire fighters should wear self-contained breathing apparatus. In event of spill, prevent from entering waterways. Will dissolve and disperse in water.
Ammonium Nitrate Emulsion	Ammonium Nitrate Emulsion	on-site	Liquid	5.1		2,0,3	50 kg	Explosive	Oxidizing material, does not burn but may contribute to combustion of materials that can burn	Safety Glasses, Gloves, chemical suits, SCBA may be required	In case of fire, cool containing vessels with water jet in order to prevent pressure build-up/explosion. Use flooding quantities of water. Evacuate surrounding area. If fumes or gases present, fire fighters should wear self-contained breathing apparatus. In event of spill, prevent from entering waterways. Use non-combustible material to soak up.
Arsenic Standard - AA		Anachemia	Liquid	8	D-2A, E	4, 0, 0	5 L		Dilute Nitric Acid <5%	Safety Glasses, Gloves	Neutralize with soda ash or lime. Contain spill, **do not** allow un-neutralized acid to enter water systems. Neutralized spill can be pumped to the pit or tailings system.
Ascorbic Acid	L-Ascorbic Acid (Vitamin C)	Anachemia	solid	not regulated	not regulated	1, 1, 1	5 kg		also known as Vitamin C	Safety Glasses, Gloves	Contain spill. Incinerate waste or place in landfill
Brake & Electrical Parts Kleen	CO_2 aerosol of Heptane and Isopropyl alcohol	Kleen-Flo Tumbler Industries	aerosol	Limited quantity	Consumer commodity; A, B5, D2-B	1, 3, 0			Highly flammable	Safety Glasses, Gloves	Eliminate all sources of ignition. Ventilate area if required. Use absorbent. In case of fire, use dry chemical, CO2, Alcohol-resistant Foam or water spray. Incinerate waste.
Buffer Solution pH 10		Anachemia	Liquid	not regulated	D-2A	1, 0, 0		Analytical Lab use	Dilute Sodium Hydroxide	Safety Glasses, Gloves	Contain spill. Absorb with sand, vermiculite or sorbal. Incinerate waste.
Buffer Solution pH 4		Anachemia	Liquid	not regulated	not regulated	1, 0, 0		Analytical Lab use		Safety Glasses, Gloves	Contain spill. Absorb with sand, vermiculite or sorbal. Incinerate waste.
Buffer Solution pH 7		Anachemia	Liquid	not regulated	not regulated	1, 0, 0		Analytical Lab use		Safety Glasses, Gloves	Contain spill. Absorb with sand, vermiculite or sorbal. Incinerate waste.
Cadmium Standard - AA		Anachemia	Liquid	8	D-2A, E	4, 0, 0	5 L		Dilute Nitric Acid <5%	Safety Glasses, Gloves	Eliminate all sources of ignition. Ventilate area if required. Use absorbent. In case of fire, use flooding quantities of water. Contributes to combustion of other materials. Neutralize with soda ash or lime. Contain spill, keep from entering ground water. Neutralized spill can be pumped to the pit or tailings system.
Calcium Chloride		J.T. Baker	solid	not regulated	D-2B	1, 0, 2, 3	any amount		Road Salt, will corrode metals	Safety Glasses, Gloves	Sweep up spilled material and it my be deposed of in dilute form to the pit or tailings system. In case of fire use appropriate measures for surrounding fire.
Carbon Dioxide in Argon		Mittler Supply Inc.	Pressurized gas	2.2	A, D-2B	1, 0, 0	any if container larger then 100 L		Non-Flammable but will replace the O_2 in confined space	Goggles, gloves. SCBA if in confined space	close valve if possible without risk, or allow the vent. In case of fire use any media suitable for surrounding fire. Use water spray to cool fire exposed containers.
Caustic Soda (solid)	Sodium Hydroxide	Fisher Scientific	solid	8	E	3, 0, 1	5 kg		very corrosive solid	Safety Glasses, Gloves	Sweep up spilled material for reuse. In case of fire use appropriate measures for the surrounding fire. Minimise direct water spray on material. This material melts and 318^{o}C and when molten reacts violently with water. Neutralize the residue with a dilute solution of acetic acid. Neutralized solution can be disposed of in the pit or tailings system.
Caustic Soda (solution)		DOW	Liquid	8	E	3, 0, 1	5 L		very corrosive liquid	Safety Glasses, Gloves	Contain spill and pump to plastic barrel for re-use. In case of fire use appropriate measures for the surrounding fire. Neutralize the residue with a dilute solution of acetic acid. Neutralized solution can be disposed of in the pit or tailings system.
Caustic Potash	Potassium Hydroxide	Brenntag Canada	Solid	8	D-1B, E	3,0,1	5 kg		water reactive, contact with metals may evolve flammable hydrogen gas.	Safety Glasses, Gloves, fume hood	Sweep up or vacuum spillage, collect in suitable container for disposal. Avoid dust formation.
Chevron 2-Cycle Oil		Chevron Lubricants Canada	Liquid	not regulated	B-3	1, 2, 0	100 L		flammable oil for 2-storke fuel	Safety Glasses, Gloves	contain spill and use absorbent and incinerate waste
Chevron ATF+3 Automatic Transmission Fluid		Chevron Lubricants Canada	Liquid	not regulated	not regulated	1, 1, 0	100 L			Safety Glasses, Gloves	contain spill. Small amounts can use absorbent and incinerate waste. Larger material pumped into plastic drums and used in a waste oil heating system.
Chevron Automatic Transmission Fluid MD-3		Chevron Lubricants Canada	Liquid	not regulated	not regulated	1, 1, 0	100 L			Safety Glasses, Gloves	contain spill. Small amounts can use absorbent and incinerate waste. Larger material pumped into plastic drums and used in a waste oil heating system.

Minto Mine - Inventory of Dangerous Goods

Reporting Threshold, Special Precautions, PPE Requirements, and Cleanup and Disposal Methods

Common Name (Synonyms)	Chemical Name	Manufacture / Supplier	Phase	TDG Class	WHMIS Class	NFPA Rating	Reporting Threshold	Use	Special Precautions	PPE Required	Special Cleanup and Disposal Info
Chevron Clarity Synthetic Machine Oil		Chevron Lubricants Canada	Liquid	not regulated	not regulated	1, 1, 0	100 L			Safety Glasses, Gloves	contain spill. Small amounts can use absorbent and incinerate waste. Larger material pumped into plastic drums and used in a waste oil heating system.
Chevron Compressor Oil 260		Chevron Lubricants Canada	Liquid	not regulated	not regulated	1, 1, 0	100 L			Safety Glasses, Gloves	contain spill. Small amounts can use absorbent and incinerate waste. Larger material pumped into plastic drums and used in a waste oil heating system.
Chevron Coupling Grease	Grease	Chevron Lubricants Canada	Semi-Solid	not regulated	not regulated	1, 1, 0	100 L or 100 kg			Safety Glasses, Gloves	contain spill. Small amounts can use absorbent and incinerate waste. Larger absorbent material in plastic drums and shipped off site for disposal.
Chevron Delo 300 Motor Oil		Chevron Lubricants Canada	Liquid	not regulated	not regulated	1, 1, 0	100 L			Safety Glasses, Gloves	contain spill. Small amounts can use absorbent and incinerate waste. Larger material pumped into plastic drums and used in a waste oil heating system.
Chevron Delo Grease EP	Grease	Chevron Lubricants Canada	Semi-Solid	not regulated	not regulated	1, 1, 0	100 L or 100 kg			Safety Glasses, Gloves	contain spill. Small amounts can use absorbent and incinerate waste. Larger absorbent material in plastic drums and shipped off site for disposal.
Chevron Diesel Engine Oil Delo 6170 CFO		Chevron Lubricants Canada	Liquid	not regulated	not regulated	1, 1, 0	100 L			Safety Glasses, Gloves	contain spill. Small amounts can use absorbent and incinerate waste. Larger material pumped into plastic drums and used in a waste oil heating system.
Chevron Drive Train Fluid HD		Chevron Lubricants Canada	Liquid	not regulated	not regulated	1, 1, 0	100 L			Safety Glasses, Gloves	contain spill. Small amounts can use absorbent and incinerate waste. Larger material pumped into plastic drums and used in a waste oil heating system.
Chevron ECO Hydraulic Oil AW		Chevron Lubricants Canada	Liquid	not regulated	not regulated	0, 1, 0	100 L			Safety Glasses, Gloves	contain spill. Small amounts can use absorbent and incinerate waste. Larger material pumped into plastic drums and used in a waste oil heating system.
Chevron Gas Engine Oil 930 and 940		Chevron Lubricants Canada	Liquid	not regulated	not regulated	0, 1, 0	100 L			Safety Glasses, Gloves	contain spill. Small amounts can use absorbent and incinerate waste. Larger material pumped into plastic drums and used in a waste oil heating system.
Chevron Mid-grade unleaded gasoline		Chevron Products	Liquid	3	B-2, D-2A, D-2B	2, 3, 0	200 L		Extremely Flammable, Vapours are harmful and they may be explosive. Non-sparking tools required. Vapours will collect in low areas and travel along the ground to an ignition source.	Goggles, gloves. Respirator or SCBA if in confined space	Eliminate all sources of ignition. Ventilate area if required. Dike the spill and pump to containers for recycling. Use absorbent. In case of fire, use dry chemical, CO2, Alcohol-resistant Foam or water spray. Allow waste absorbent to evaporate and then Incinerate waste.
Chevron NWS Manual Transmission Fluid 6044GR		Chevron Lubricants Canada	Liquid	not regulated	not regulated	1, 1, 0	100 L			Safety Glasses, Gloves	contain spill. Small amounts can use absorbent and incinerate waste. Larger material pumped into plastic drums and used in a waste oil heating system.
Chevron RPM Universal Gear Lubricant		Chevron Lubricants Canada	Liquid	not regulated	not regulated	1, 1, 0	100 L			Safety Glasses, Gloves	contain spill. Small amounts can use absorbent and incinerate waste. Larger material pumped into plastic drums and used in a waste oil heating system.
Chevron Supreme Antifreeze/Coolant	Ethylene Glycol	Chevron Lubricants Canada	Liquid	not regulated under 5000 lb.	D-2A	1, 1, 0	25 L		may be fatal by ingestion	Safety Glasses, Gloves	contain spill. Can be pumped, filtered and reused. Small amounts can use absorbent and incinerate waste. Larger absorbent material in plastic drums and shipped off site for disposal.
Chevron Ulti-Plex® Grease EP		Chevron Lubricants Canada	Semi-Solid	not regulated	not regulated	1, 1, 0	100 L			Safety Glasses, Gloves	contain spill. Small amounts can use absorbent and incinerate waste. Larger absorbent material in plastic drums and shipped off site for disposal.
Chloramine T	Chloramine-T trihydrate	Fisher	solid	8	D-2A, E	3, 1, 1	5 kg		Container may explode under fire conditions. Will release toxic fumes with fire or when mixed with strong oxidizers or acids	Goggles, gloves. SCBA if in confined space	Eliminate all sources of ignition. Ventilate area if required. In case of fire. Material by itself is non-flammable, may decompose violently >100^{o}C, use dry chemical, CO_2 foam or water spray. DISPOSAL mix with flammable solvent and incinerate.
Chromium Standard - AA		Anachemia	Liquid	8	D-2A, E	3, 0, 0	5 L		Dilute Nitric Acid <5%	Safety Glasses, Gloves	Neutralize with soda ash or lime. Contain spill, **do not** allow un-neutralized acid to enter water systems. Neutralized spill can be pumped to the pit or tailings system.
Citric Acid	Citric Acid, Monohydrate	Anachemia	solid	not regulated	E	2, 1, 0	5 L		Will cause severe eye damage. Avoid oxidizers, acids, bases and bleach.	Safety Glasses, Gloves	Eliminate all sources of ignition. Ventilate area if required. In case of fire, use flooding quantities of water. Will decompose at high temperatures and emit acrid smoke and fumes.
Copper Standard - AA		Anachemia	Liquid	8	E	4, 0, 0	5 L		Dilute Nitric Acid <5%	Safety Glasses, Gloves	Neutralize with soda ash or lime. Contain spill, **do not** allow un-neutralized acid to enter water systems. Neutralized spill can be pumped to the pit or tailings system.

Minto Mine - Inventory of Dangerous Goods

Reporting Threshold, Special Precautions, PPE Requirements, and Cleanup and Disposal Methods

Common Name (Synonyms)	Chemical Name	Manufacture / Supplier	Phase	TDG Class	WHMIS Class	NFPA Rating	Reporting Threshold	Use	Special Precautions	PPE Required	Special Cleanup and Disposal Info
Crystal 78	Sodium Silicate	Quadra Chemicals	Liquid	not regulated	D-2B		25 L		Caustic solution. Avoid mixing with strong acids. Contact with metals such as aluminum, tin, lead and zinc generates hydrogen gas.	Goggles, gloves. Respirator	solution can be pumped into plastic drum and possibly recycled in mill circuit, or shipped off site. In case of fire use appropriate measures for surrounding fire.
Cyquest DP-6	Sodium polyacrylate in water	Cytec Canada	Liquid	not regulated	not regulated	1,1,0		Mill reagent	Slippery	Goggles, Impervious gloves	Soak up with absorbent materials. These can be incinerated. Any remaining spilt liquid should be stored in closed container, labelled and disposed of off-site as Special Waste.
Delo Diesel Fuel System Cleaner		Chevron Lubricants Canada	Liquid	3	B-3, D-2A, D-2B		200 L			Safety Glasses, Gloves	Eliminate all sources of ignition. Ventilate area if required. Use absorbent. In case of fire, use dry chemical, CO2, Alcohol-resistant Foam or water spray. Incinerate waste.
Diesel Fuel No. 2		Chevron Products Company	Liquid	3	B-3, D-2A, D-2B	0, 2, 0	200 L			Safety Glasses, Gloves	contain spill. Small amounts can use absorbent and incinerate waste. Larger material pumped into plastic drums and used in a waste oil heating system.
DIISOBUTYL KETONE	2,6-Dimethyl-4-heptanone	J.T. Baker	Liquid	3	B-2, D-2A	2, 2, 0	200 L		Avoid contact with strong oxidizers or acids.	Safety Glasses, Gloves	Eliminate all sources of ignition. Ventilate area if required. Use absorbent. In case of fire, use dry chemical, CO2, Alcohol-resistant Foam or water spray. Incinerate waste.
Drierite, indicating		Anachemia	solid	not regulated	D-2A	1, 0, 1				Safety Glasses, Gloves	Eliminate all sources of ignition. In case of fire use measures dictated by surrounding fire. Will decompose at 1450^{o}C liberating Cl_2 and SO_2. This product can be dried and reused, recycled.
Envirobind KFZ		Power Chemicals Ltd.	Liquid	not regulated	not regulated	1, 0, 0		Dust Suppression	Avoid contact with oxidizing agents or strong acids.	Goggles, Gloves	Do not use absorbents. Contain spill using noncombustible materials such as vermiculite, earth or sand.
Envirobind KTF		Power Chemicals Ltd.	Liquid	not regulated	not regulated	1, 0, 0		Dust Suppression	Avoid contact with oxidizing agents or strong acids.	Goggles/Glasses, Gloves	Do not use absorbents. Contain spill using noncombustible materials such as vermiculite, earth or sand.
Envirobind PCW		Power Chemicals Ltd.	Liquid	not regulated	not regulated	1, 0, 0		Dust Suppression	Avoid contact with strong oxidizing materials.	Goggles/Glasses, Gloves	Dike or contain. Absorb irrecoverable material onto inert oil absorbent medium, package, and label for legal disposal. Wash hard surfaces with water. Contaminated absorbent material may be disposed of in an approved landfill
FLEET CHARGE 50/50 Antifreeze	Ethylene Glycol	OLD WORLD INDUSTRIES	Liquid	9	D-2A	1, 1, 0	25 L		may be fatal by ingestion	Safety Glasses, Gloves	contain spill. Can be pumped, filtered and reused. Small amounts can use absorbent and incinerate waste. Larger absorbent material in plastic drums and shipped off site for disposal.
Fleet Charge PG Antifreeze/Coolant	Propylene Glycol	OLD WORLD INDUSTRIES	Liquid	not regulated	not regulated	0, 1, 0	25 L			Safety Glasses, Gloves	contain spill. Can be pumped, filtered and reused. Small amounts can use absorbent and incinerate waste. Larger absorbent material in plastic drums and shipped off site for disposal.
Flomin C 3505 Collector	Potassium amyl xanthate (PAX)	Flomin Inc.	solid	4	not regulated	2, 2, 1	25 kg		Product is spontaneously combustible. Avoid contact with heat, moist air, and water.	Safety Glasses, Gloves	Sweep up spilled material and place in closed container for reuse. Solutions of product my be deposed of on the pit or tailings system. In case of fire use appropriate measures for surrounding fire.
Flomin F 500 Frother	4-METHYL-2-PENTANOL (Methyl isobutyl carbinol - MIBC)	Flomin Inc.	Liquid	3	B-2, D-2B	2, 2, 0	200 L		Acids, acid chlorides, alkalis, oxidizing agents. Will attack some forms of plastics, rubber and coatings	Goggles, gloves. Respirator or SCBA if in confined space	Eliminate all sources of ignition. Ventilate area if required. Use absorbent. In case of fire, use dry chemical, CO2, Alcohol-resistant Foam or water spray. Incinerate waste.
Floran Catalyst	Proprietary Inorganic Peroxide Blend	Floran Technologies	Liquid	5	C, D-2B	2, 0, 1, OX	50 L		Non-Flammable but will aid combustion of other materials	Safety Glasses, Gloves	Eliminate all sources of ignition. Ventilate area if required. Use absorbent. In case of fire, use flooding quantities of water. Contributes to combustion of other materials. Contain spill, keep from entering ground water. Absorbed pill can be disposed in the pit or tailings system.
Frost Killer (Tannergas)	Methyl alcohol	TANNER SYSTEMS, INC.	Liquid	3, 6.1	B-2, D-1B, D-2A,D-2B	1, 3, 0	200 L		Extremely Flammable, Vapours are harmful and solution is poisonous	Goggles, gloves. Respirator or SCBA if in confined space	Eliminate all sources of ignition. Ventilate area if required. Use absorbent. In case of fire, use dry chemical, CO2, Alcohol-resistant Foam or water spray. Incinerate waste.
FUEL INJECTOR CLEANER		Radiator Specialty Co	Liquid	3	B-3, D-2A, D-2B		200 L			Safety Glasses, Gloves	Eliminate all sources of ignition. Ventilate area if required. Use absorbent. In case of fire, use dry chemical, CO2, Alcohol-resistant Foam or water spray. Incinerate waste.
Gasoline, Unleaded		Petro-Canada	Liquid	3	B-2, D-2A, D-2B	2, 3, 0	200 L		Extremely Flammable, Vapours are harmful and they may be explosive. Non-sparking tools required. Vapours will collect in low areas and travel along the ground to an ignition source.	Goggles, gloves. Respirator or SCBA if in confined space	Eliminate all sources of ignition. Ventilate area if required. Dike the spill and pump to containers for recycling. Use absorbent. In case of fire, use dry chemical, CO2, Alcohol-resistant Foam or water spray. Allow waste absorbent to evaporate and then Incinerate waste.

Minto Mine - Inventory of Dangerous Goods

Reporting Threshold, Special Precautions, PPE Requirements, and Cleanup and Disposal Methods

Common Name (Synonyms)	Chemical Name	Manufacture / Supplier	Phase	TDG Class	WHMIS Class	NFPA Rating	Reporting Threshold	Use	Special Precautions	PPE Required	Special Cleanup and Disposal Info
Glycerin	IPAC	Power Chemicals Ltd.	Liquid	Not regulated	Not regulated				Avoid contact with reducing agents and oxidizing agents.	Goggles, gloves.	Dike spilled product to prevent runoff
Havoline DEX-COOL Extended Life 50/50 Anti-Freeze/Coolant	Ethylene Glycol	Chevron Lubricants Canada	Liquid	not regulated	D-1b, D-2A	2, 0, 0	25 L		may be fatal by ingestion	Safety Glasses, Gloves	contain spill. Can be pumped, filtered and reused. Small amounts can use absorbent and incinerate waste. Larger absorbent material in plastic drums and shipped off site for disposal.
HAVOLINE DEX-COOL extended life anti-freeze/coolant-B	Ethylene Glycol	Chevron Lubricants Canada	Liquid	not regulated	D-1b, D-2A	2, 1, 0	25 L		may be fatal by ingestion	Safety Glasses, Gloves	contain spill. Can be pumped, filtered and reused. Small amounts can use absorbent and incinerate waste. Larger absorbent material in plastic drums and shipped off site for disposal.
Havoline Power Steering Fluid		Chevron Products	Liquid	not regulated	not regulated	0, 1, 0				Safety Glasses, Gloves	contain spill. Small amounts can use absorbent and incinerate waste. Larger material pumped into plastic drums and used in a waste oil heating system.
Hot 4-in-1 Heating Oil Treatment	Proprietary Blend	FPPF Chemical Company, Inc.	Liquid	3	B-3, D-1A, D-2A, D-2B	3, 2, 0	200 L		Fuel Additive, fumes will collect in low area's.	Safety Glasses, Gloves	Eliminate all sources of ignition. Ventilate area if required. Use absorbent. In case of fire, use dry chemical, CO2, Alcohol-resistant Foam or water spray. Incinerate waste.
Hydrated Lime	$Ca(OH)_2$	Chemical Lime Company of Canada Inc.	Solid	not regulated	D-2A, E				Will cause severe caustic burns. Avoid strong acids, and aluminum	Safety Glasses, Gloves	sweep up uncontaminated material for reuse. Neutralize with dilute acid and may be disposed of in pit or tailings system.
Hydraulic Oil SAE 10W		EXXON MOBIL	Liquid	not regulated	not regulated	0, 1, 0	200 L			Safety Glasses, Gloves	Eliminate all sources of ignition. Ventilate area if required. Use absorbent. In case of fire, use dry chemical, CO2, Alcohol-resistant Foam or water spray. Incinerate waste.
Hydrex 3223		Veolia	Liquid	8	E	1, 0, 0	5kg or 5L	Coagulant in the WTP		Safety glasses with side shields or goggles, face shield, chemical resistant gloves. Suitable respiratory equipment in poorly ventilated areas.	Contain spill. Ventilate area if required. Use absorbent. Place contaminated materials in sealed container for disposal and dispose of via a licensed waste disposal contractor.
Hydrex 6186		Veolia	Solid	not regulated	not regulated	0, 1, 0		Flocculant in the WTP		Safety glasses with side shields or goggles.	Sweep or vacuum spilled material. Do not get water on spilled material. Flush area with water after product recovery. Place recovered material in sealed container and dispose of via a licensed waste disposal contractor.
Hydrochloric Acid		Anachemia	Liquid	8	D-1A, E	3, 0, 1	5 L		Concentrated acid, Extremely corrosive. Ventilate or stay upwind	Goggles, gloves. Respirator or SCBA if in confined space	Neutralize with soda ash or lime. Contain spill, **do not** allow un-neutralized acid to enter water systems. Neutralized spill can be pumped to the pit or tailings system.
Hydrofluoric acid, 47 - 51%		Fisher	Liquid	8, 6.1	D-1A, D-2A, E	4, 0, 1	5 L		**Extremely corrosive and Toxic acid. Causes very severe acid burns with symptoms being delayed. Skin contact of <10% can be fatal from cardio-pulmonary problems. IMMEDIATE medical attention is required for all exposures.**	**Goggles, gloves. Respirator or SCBA if in confined space (Actually SCBA should be used anywhere unless spill is in a fumehood)**	Neutralize with soda ash. Contain spill, **do not** allow un-neutralized acid to enter water systems. Neutralized spill can be pumped to a plastic barrel and then disposed of in the pit or tailings system.
IPAC 6832		Quadra Chemicals	Liquid	not regulated	not regulated				water soluble	Safety Glasses, Gloves	No special clean up procedures,
Iron Standard - AA		Anachemia	Liquid	8	E	1, 0, 0	5 L		Dilute Nitric Acid <5%	Safety Glasses, Gloves	Neutralize with soda ash or lime. Contain spill, **do not** allow un-neutralized acid to enter water systems. Neutralized spill can be pumped to the pit or tailings system.
Isopropylxanthic acid sodium salt (SIPX)		Quadra Chemicals Ltd.	Solid	4.2	B-6, D-1B, D-2B		25 kg	Collector in Mill	Keep away from water - contact with water liberates extremely flammable gases. Keep away from heat, sparks and flame - fine dust clouds may form explosive mixtures with air. Use only with adequate ventilation.	Goggles, Gloves, Respirator (air-purifying or air-fed)	Move containers from spill area. Avoid allowing the spilled material to get wet or using water to clean up spillages or residues, unless the quantity remaining is very small. Vacuum or sweep up material and place in a designated, labeled waste container. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.
Javex Liquid Bleach	NaOCl	Colgate Palmolive	Liquid	not regulated	E, D-2B, C				Self heating and may catch fire.	Safety Glasses, Gloves, SCBA	Ventilate area and allow qualified personnel to stop/control spill. Small spills: flush area with plenty of water and mop up. Large spills: dike the ingredient and transfer to appropiate containers. Consult Federal, Provincial and Municipal regulations for disposal. May be neutralized with sodium bisulphite or dilute hydrogen preoxide.

Minto Mine - Inventory of Dangerous Goods

Reporting Threshold, Special Precautions, PPE Requirements, and Cleanup and Disposal Methods

Common Name (Synonyms)	Chemical Name	Manufacture / Supplier	Phase	TDG Class	WHMIS Class	NFPA Rating	Reporting Threshold	Use	Special Precautions	PPE Required	Special Cleanup and Disposal Info
KAX 51	Proprietary Blend (mix of isoamyl alohol, potassium amyl xanthate, and potassium hydroxide)	Prospec Chemicals	Solid	4.2	B-6, D-1B, E		25 kg	Collector in Mill		Safety Glasses. Face Shield, Gloves, SCBA	If in the liquid state: Stop spill at source. Contain any spilled material to prevent discharge into the environment. Eliminate all sources of ignition. Persons not wearing protective equipment should be excluded from the area. Absorb with inert dry material. Put into an approved metal salvage drum for disposal. If in the solid state: Eliminate all sources of ignition. Restrict access to area until completion of clean-up. Ensure clean-up is conducted by trained personnel only. Do not touch spilled material. Do not use water on spilled material as heat will be generated. Put spilled material into approved salvage drums for disposal. Flush cleaned area with water, making sure no water enters xanthate containers.
KOPR-KOTE	Graphite, Cu & MoS_2 mixture	Jet-Lube of Canada	paste	not regulated	not regulated	1,1,1				Safety Glasses, Gloves	Wipe up spill with rages and incinerate waste.
Lead Standard - AA		Anachemia	Liquid	8	D-2A, E	4, 0, 0	5 L		Dilute Nitric Acid <5%	Safety Glasses, Gloves	Neutralize with soda ash or lime. Contain spill, **do not** allow un-neutralized acid to enter water systems. Neutralized spill can be pumped to the pit or tailings system.
Lime		Chemical Lime Company of Canada Inc.	powder	not regulated	E	3, 0, 1			Will cause severe caustic burns. Avoid strong acids, and aluminum	Safety Glasses, Gloves	sweep up uncontaminated material for reuse. Neutralize with dilute acid and may be disposed of in pit or tailings system.
Liquid Nitrogen	Nitrogen	Praxair Canada Inc.	Liquefied Gas	2.2 Non-flammable gas	A	3, 0, 2	any if container larger then 100 L		Use air supplied respirator when working in confined space, Loose-fitting cryogenic gloves, Metatarsal shoes for cylinder handling. Protective clothing where needed. Cuff less trousers should be worn outside of shoes	Extremely cold liquefied gas, Will cause severe frost bite Use SCBA when working in confined space,	Evacuate all personnel from danger area. Allow spilled liquid to evaporate. Use self-contained breathing apparatus where needed. Shut off flow if you can do so without risk. Ventilate area or move cylinder to a well-ventilated area. Test for sufficient oxygen, especially in confined spaces, before allowing re-entry
LIQUID WRENCH SUPER LUBRICANT (AEROSOL)	Proprietary Blend	Radiator Specialty Co	aerosol	2.1	A, B5, D-1A, D2-B		any if container larger then 100 L		containers may rupture if exposed to high temperatures.	Safety Glasses, Gloves	Allow container to completely discharge while eliminating ignitions sources. Wipe up spill with rages and incinerate waste.
Loctite Belt Dressing	Proprietary Blend t	Henkel Canada, Inc.	aerosol	2.2	A, D-2A, D-2B		any if container larger then 100 L		containers may rupture if exposed to high temperatures.	Safety Glasses, Gloves	Allow container to completely discharge Wipe up spill with rags and incinerate waste.
LPS 2 Spray Lubricant	Proprietary Blend	LPS Laboratories	aerosol	2.2	A, D-2A, D-2B		any if container larger then 100 L		containers may rupture if exposed to high temperatures.	Safety Glasses, Gloves	Allow container to completely discharge Wipe up spill with rages and incinerate waste.
Magnesium Nitrate Matrix Modifier		Spex CertiPrep	Liquid	8	D-2A, E	3, 0, 0	5 L		Dilute Nitric Acid <5%	Safety Glasses, Gloves	Neutralize with soda ash or lime. Contain spill, **do not** allow un-neutralized acid to enter water systems. Neutralized spill can be pumped to the pit or tailings system.
MAXGOLD™ 900 Promoter	Proprietary Blend	Cytec Canada	Liquid	3	B-3, D-2A	3, 2, 0	200 L		slightly yellow liquid that has a slight sulphur smell. In confined space use respirator with organic vapour cartridges	Goggles, gloves. Respirator or SCBA if in confined space	eliminate ignition sources, use absorbent on small spills, for large spill pump to plastic drum for shipment off site. In case of fire use dry chemical extinguisher, CO_2 or foam. Water likely not effective.
MERCSORB Mercury Amalgamation Powder		NPS Corporation	solid	4		0, 1, 1	25 kg		Dry zinc dust will not ignite spontaneously, but once ignited, it may burn readily in air	Safety Glasses, Gloves	Sweep up spilled material and place in closed container for reuse. In case of fire use appropriate measures for surrounding fire.
Mercury Indicator Powder	Proprietary Blend	NPS Corporation	solid	not regulated		2, 1, 0			Odorless, yellowish-tan to gray powder. Dust may form a flammable or explosive mixture in air. When heated to decomposition, toxic fumes of sulfur oxides are produced	Safety Glasses, Gloves	Sweep up spilled material and place in closed container for reuse. In case of fire use appropriate measures for surrounding fire. This product in itself is considered to be non-hazardous.
Mercury Standard - AA		Anachemia	Liquid	8	D-2A, E	3, 0, 0	5 L		Dilute Nitric Acid <5%	Safety Glasses, Gloves	Neutralize with soda ash or lime. Contain spill, **do not** allow un-neutralized acid to enter water systems. Neutralized spill can be pumped to the pit or tailings system.
Mercury Vapor Suppressor	Proprietary Blend	NPS Corporation	solid	not regulated		2, 1, 0			Odorless, black, irregular, dry granular solid. Wet activated carbon removes oxygen from the air causing a severe hazard to workers in confined space.	Safety Glasses, Gloves	Sweep up spilled material and place in closed container for reuse. Contaminated waste can be incinerated. In case of fire use appropriate measures for surrounding fire. This product in itself is considered to be non-hazardous.
Methanol		Anachemia	Liquid	3, 6.1	B-2, D-1B, D-2A,D-2B	1, 3, 0	200 L		Extremely Flammable, Vapours are harmful and solution is poisonous	Goggles, gloves. Respirator or SCBA if in confined space	Eliminate all sources of ignition. Ventilate area if required. Use absorbent. In case of fire, use dry chemical, CO2, Alcohol-resistant Foam or water spray. Incinerate waste.

Minto Mine - Inventory of Dangerous Goods

Reporting Threshold, Special Precautions, PPE Requirements, and Cleanup and Disposal Methods

Common Name (Synonyms)	Chemical Name	Manufacture / Supplier	Phase	TDG Class	WHMIS Class	NFPA Rating	Reporting Threshold	Use	Special Precautions	PPE Required	Special Cleanup and Disposal Info
MIBC	Methyl Isobutyl Carbinol	Flomin Inc.	Liquid	3		2, 2, 0	200 L	Frother in Mill	Product liquid and vapor are flammable. Keep away from heat and sources of ignition. Product vapors or mist may be irritating to eyes and respiratory system. Product liquid may cause eye and skin burns. Harmful if swallowed.	Googles or Face Shield, Gloves, Respirator (NIOSH/MSA)	Dike spill and collect for disposal or reuse. Use adsorbents on residual material. Flush spill area with water. Keep flush material out of waterways. Dispose of cleanup material in an approved manner.
MIBK	4-Methyl-2-pentanone	Fisher Scientific	Liquid	3	B-2	2, 3, 0	200 L		clear liquid that has a slightly sweet smell. In confined space use respirator with organic vapour cartridges	Safety Glasses, Gloves	Clear liquid that is immiscible with water. Use absorbent for small spills and incinerate waste. Large spills, eliminate ignitions sources and pump to plastic drum for shipment off site.
Molybdenum Standard - AA		Anachemia	Liquid	not regulated	not regulated	0, 0, 0				Safety Glasses, Gloves	Contain spill. Incinerate waste or place in landfill
Mucasol universal detergent		Sigma-Aldrich Canada	Liquid	not regulated	D-2B	2, 0, 0				Safety Glasses, Gloves	
Nickel Standard - AA		Anachemia	Liquid	8	D-2A, E	1, 0, 0	5 L		Dilute Nitric Acid <5%	Safety Glasses, Gloves	Neutralize with soda ash or lime. Contain spill, **do not** allow un-neutralized acid to enter water systems. Neutralized spill can be pumped to the pit or tailings system.
Nitric Acid		Anachemia	Liquid	8	C, D-1A, E	4, 0, 0, OX	5 L		Concentrated acid, Extremely corrosive. Ventilate or stay upwind. **Strong Oxidizer**	Goggles, gloves. Respirator or SCBA if in confined space	Neutralize with soda ash or lime. Contain spill, **do not** allow un-neutralized acid to enter water systems. Neutralized spill can be pumped to the pit or tailings system.
Nitric Acid 40%		Quadra Chemicals	Liquid	8	C, D-1A, E	4, 0, 0, OX	5 L		Concentrated acid, Extremely corrosive. Ventilate or stay upwind. **Strong Oxidizer**	Goggles, gloves. Respirator or SCBA if in confined space	Neutralize with soda ash or lime. Contain spill, **do not** allow un-neutralized acid to enter water systems. Neutralized spill can be pumped to the pit or tailings system.
Oxygen		BOC Canada Limited (Linde)	Pressurized gas	2.2	A, C	0, 3, 0, OX	any if container larger then 100 L		Strong Oxidizer will Contribute to combustion of other materials.	Safety Glasses, Gloves	close valve if possible without risk, or allow the vent. In case of fire use any media suitable for surrounding fire. Use water spray to cool fire exposed containers.
Oxygen Refrigerant		Air Liquide Canada	Liquefied Gas	2.2	A, C	0, 3, 0, OX	any if container larger then 100 L		Strong Oxidizer will Contribute to combustion of other materials. Liquefied gas, will produce extreme cold when released.	Safety Glasses, Gloves	close valve if possible without risk, or allow the vent. In case of fire use any media suitable for surrounding fire. Use water spray to cool fire exposed containers.
Palladium Nitrate Matrix Modifier		Spex CertiPrep	Liquid	8	D-2A, E	3, 0, 0	5 L		Dilute Nitric Acid <5%	Safety Glasses, Gloves	Neutralize with soda ash or lime. Contain spill, **do not** allow un-neutralized acid to enter water systems. Neutralized spill can be pumped to the pit or tailings system.
Phosphoric acid		Sigma-Aldrich Canada	Liquid	8	D-1A, D-2B, E		5 L		Concentrated acid, Extremely corrosive. Ventilate or stay upwind.	Goggles, gloves. Respirator	Neutralize with soda ash or lime. Contain spill, **do not** allow un-neutralized acid to enter water systems. Neutralized spill can be pumped to the pit or tailings system.
Pine Oil (Terpene SW Blend)		Quadra Chemicals Ltd.	Liquid	not regulated	B-3, D-2B			Frother in Mill	Combustible liquid and vapor. Causes respiratory tract, eye and skin irritation. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling. Avoid oxidizing materials.	Goggles, Gloves, Respirator (air-purifying or air-fed)	Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble or absorb with an inert dry material and place in an appropriate waste disposal container. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.
PAX	Potassium Amyl Xanthate	Quadra Chemicals Ltd.	Solid	4.2	B-6, D-2B		25 kg	Collector in Mill	Keep away from water - contact with water liberates extremely flammable gases. Keep away from heat, sparks and flame - fine dust clouds may form explosive mixtures with air. Use only with adequate ventilation.	Goggles, Gloves, Respirator (air-purifying or air-fed)	Move containers from spill area. Avoid allowing the spilled material to get wet or using water to clean up spillages or residues, unless the quantity remaining is very small. Vacuum or sweep up material and place in a designated, labeled waste container. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.
Polyclear A2501		Quadra Chemicals Ltd.	Solid	not regulated	not regulated			Tailings thickener flocculant	Keep away from heat, sparks and flame - fine dust clouds may form explosive mixtures with air. Take precautionary measures against electrostatic discharges.Use only with adequate ventilation. Avoid oxidizing materials.	Safety Glasses, Gloves	Move containers from spill area. Vacuum or sweep up material and place in a designated, labeled waste container. Use spark-proof tools and explosion-proof equipment. In case of fire use appropriate measures for surrounding fire. Place in sealed container and dispose of via a licensed waste disposal contractor.
Polyclear 2528	Polyclear Floc	Quadra Chemicals Ltd.	solid	not regulated	not regulated				concentrated solution is extremely slippery, use caution	Safety Glasses, Gloves, respiratory equipment if risk assesment deems necesarry	Sweep up spilled material and it my be deposed of in dilute form to the pit or tailings system. In case of fire use appropriate measures for surrounding fire.
Polyclear 31080C		Quadra Chemicals Ltd.	Liquid	9	D-2B			Dewatering Aid in Mill	Use only with adequate ventilation. Avoid contact with strong oxidizers or halogens	Goggles, Gloves, Respirator (air-purifying or air-fed)	Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble or absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Minto Mine - Inventory of Dangerous Goods

Reporting Threshold, Special Precautions, PPE Requirements, and Cleanup and Disposal Methods

Common Name (Synonyms)	Chemical Name	Manufacture / Supplier	Phase	TDG Class	WHMIS Class	NFPA Rating	Reporting Threshold	Use	Special Precautions	PPE Required	Special Cleanup and Disposal Info
Polyfroth W31		Quadra Chemicals Ltd.	Liquid	not regulated	not regulated			Frother in Mill	Harmful or fatal if swallowed. Can enter lungs and cause damage. May cause target organ damage	Goggles, Gloves, Respirator (air-purifying or air-fed)	Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble or absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.
Potassium hydroxide	KOH	Science lab	Solid	8	D-1B	3, 0, 1	5 kg		very corrosive solid	Safety Glasses, Gloves	Use appropriate tools to put the spilled solid in a convenient waste disposal container. If necessary: Neutralize the residue with a dilute solution of acetic acid.
Potassium Iodide		Anachemia	solid	not regulated	D-2A	1, 1, 1			light and water exposure will cause breakdown	Safety Glasses, Gloves	Eliminate all sources of ignition. In case of fire use measures dictated by surrounding fire. Will decompose at high temperatures and emit toxic I_2 fumes. Use appropriate SCBA.
Potassium permanganate		CAIROX	Solid	5.1	C, E	1, 0, 0, OX	50 kg		corrosive solid. Oxidizing solid	Safety Glasses, Gloves	Sweep up solid spill for possible reuse. If necessary reduce material in aqueous solution with sodium thiosulfate (hypo), In case of fire use flooding quantities of water, material will contribute to combustion.
Propane		Superior Propane	Liquefied Gas	2.1	A, B-1		any if container larger then 100 L		Extremely flammable. Liquefied gas, will produce extreme cold when released.	Goggles, gloves. SCBA if in confined space	close valve if possible without risk, or allow the vent. In case of fire use any media suitable for surrounding fire. Use water spray to cool fire exposed containers.
Selenium Standard - AA		Anachemia	Liquid	8	E	1, 0, 0	5 L		Dilute Nitric Acid <5%	Safety Glasses, Gloves	Neutralize with soda ash or lime. Contain spill, **do not** allow un-neutralized acid to enter water systems. Neutralized spill can be pumped to the pit or tailings system.
Sodium Borohydride		Anachemia	solid	4.3	B-6, B-4, D-1B, E	3, 1, 2	25 kg		Flammable solid. Reacts violently with water and acids to produce flammable H_2 gas. Strong reducing agent.	Safety Glasses, Gloves	Eliminate ignition sources, sweep up dry material. In case of fire use only dry chemical extinguisher, DO NOT USE WATER OR CO_2
Sodium Hydroxide Solutions (various strengths)	NaOH (The Anachemia MSDS is current, treat all solutions in the same manner regardless of strength.)	Various Suppliers	Liquid	8	E	3, 0, 1	5 L		Caustic solution. Avoid mixing with strong acids. Contact with metals such as aluminum, tin, lead and zinc generates hydrogen gas.	Safety Glasses, Gloves	Neutralize the residue with a dilute solution of acetic acid. Neutralized solution can be disposed of in the pit or tailings system.
Sodium Nitrite		Anachemia	solid	5.1, 6.1	C, D-1B, D-2A	3, 0, 2, OX	50 kg		**Strong Oxidizer** will Contribute to combustion of other materials.	Safety Glasses, Gloves	Eliminate all sources of ignition. In case of fire, use flooding quantities of water. Will decompose at high temperatures and emit acrid smoke. Strong oxidizer, may form compound that are sensitive to shock, friction. Sweep up solid spill for disposal. Dispose of contaminated solution in the pit or tailings system.
sodium sulphide Flakes	Sodium sulphide Hydrated	Quadra Chemicals	solid	8	D-1B, E		5 kg		caustic, very corrosive solid	Goggles, gloves. And a respirator, avoid creating dust and avoid any acids. Contact with acids liberate toxic H_2S	Sweep up spilled material an place in plastic sealed container for shipment off site.
TMT 15%	trisodium salt	Quadra Chemicals	Liquid	not regulated (treated as Cl. 9 Miscellaneous)	D-2B		25 L		water soluble	Safety Glasses, Gloves	No special clean up procedures, treated as Class 9 Miscellaneous as product does not meet Class 6 Toxicity standards but is an environmental hazard.
Urea	Carbamide	Anachemia	solid	not regulated	not regulated	1, 0, 0			Avoid contact with strong oxidizers. In fire conditions it can produce oxides of nitrogen. Also ammonia, and HCN	Safety Glasses, Gloves	Sweep up spilled material and it my be deposed of in dilute form to the pit or tailings system. In case of fire use appropriate measures for surrounding fire.
Vitec 7000		Avista Technologies	Liquid	not regulated	2A	1, 0, 0		Antiscalant in WTP	Avoid mixing with strong bases, strong oxidizers, very strong acids, water reactive materials	SCBA or SABA in confined space, Safety goggles/glasses, Chemical impervious gloves	Soak up or wet vacuum spilled liquid. Neutralize residue with sodium bicarbonate or other neutralizing agent for very dilute acids.Decontaminate the area thoroughly. Place all spill residues in suitable container and dispose of via a licensed waste disposal contractor.
VARSOL 3139 SOLVENT	Petroleum Hydrocarbons	Imperial Oil Chemicals	Liquid	3	B-3, D-2B	1, 2, 0	200 L		Flammable solvent	Safety Glasses, Gloves	Clean up uncontaminated material for reuse. Incinerate waste.
VoltEsso 35		Imperial Oil Chemicals	Liquid	not regulated	not regulated	1, 1, 0			electrical insulating oil	Safety Glasses, Gloves	Clean up uncontaminated material for reuse. Incinerate waste.
Zinc Standard - AA		Anachemia	Liquid	8	E	1, 0, 0	5 L		Dilute Nitric Acid <5%	Safety Glasses, Gloves	Neutralize with soda ash or lime. Contain spill, **do not** allow un-neutralized acid to enter water systems. Neutralized spill can be pumped to the pit or tailings system.

Appendix C: ERT Response to HazMat Spills

ERT Response to Hazmat Spill

Spill Contact: Yukon Territory Spill Line 1-867-667-7244

Canutec: 1-613-996-6666 Cell: *666

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1.0 Overall HAZMAT Response Procedures

1.1 Site Management and Control

Initial responders will :

- Approach the scene from uphill and upwind.
- Establish command uphill and upwind of spill at an appropriate distance.
- Establish 2 isolation perimeters: one that separates the hot zone from the warm zone and another that separates the warm zone from the cold zone. Emergency Response Guide or Canutec shall be referenced for perimeter size.
- Evacuate affected area or 'protect in place', as req'd. Emergency Response Guide or Canutec shall be referenced for evacuation zone.
- Identify contaminated persons and ensure they remain isolated until they can be decontaminated.
- Establish a staging area.
- Designate an information officer.
- Possible unification of command.

1.2 Identification of the problem

I/C will identify the:

- Spilled product, as per witness testimony, placards, labels, bill of lading, type of container, etc. If product cannot be identified from command position, then a recon team will be tasked with identification.
- Size of container.
- Size and nature of release.
- Conditions and # of victims at accident site.
- Topography of area, and exposures threatened.

1.3 Hazard &Risk Evaluation

A risk evaluation will be conducted, taking into consideration:

- Product hazards
- Access & Egress
- Size of Spill
- Condition of container
- Proximity of exposures
- Personnel available to perform operations, and their level of training/experience
- Information from MSDS, ERG, Canutec, etc., minimum 3 sources

1.4 Personal Protective Equipment

PPE will be selected for Ops, RIT, and Decon teams, considering:

- Flammability/explosiveness of product
- Toxicity of product
- Route of entry of product
- Permeation rate of PPE
- Breakthrough time of PPE
- Availability of PPE
- Visibility and workability while wearing PPE

1.5 Information Management and Resource Coordination

The information officer will begin to gather information about the product once it has been identified. The information officer can use the MSDS, ERG, Canutec, or many other resources to gather information, such as:

- Properties of the product
- Hazards of the product
- Expected travel of product released
- Populations/ environment in jeopardy
- PPE req'd by responders
- Decontamination requirements

Command will prioritize the information and ensure that the correct people receive the correct information.

1.6 Implementing Response Objectives

Command will develop an overall strategy, which may be offensive (entry of hot zone to gain quick control), defensive (contain from the cold zone to prevent spread), or passive (isolate only, and wait for incident to run its course), considering:

- Life safety
- Incident stabilization
- Environmental protection
- Property salvage

Command will delegate tactics to operations teams, such as:

- Reconnaissance for unknown product
- Evacuation for toxic gas leak, fire, or explosive hazard
- Fire control for flammable gas, flammable liquid, or oxidizer
- Search and rescue
- Leak control
- Neutralization of corrosives
- Deployment of boom, drain covers, etc.
- Building of dams, dykes, etc.

To follow: specific tactic options will be discussed in more detail, pertaining to hazardous materials that are commonly found in large quantities at the Minto Mine.

Entry teams will enter with a clear objective, but must assess for the next team's objective. For example, the 1st entry team may be tasked with rescuing the driver of a fuel truck that rolled down a bank and is spilling fuel. Although their objective is to rescue, while they are on scene they should observe where the leak is, consider what could be used to stop it, where the fuel is going, and what is needed to contain it. They should bring a camera, so that pictures can be brought back to command. This will give command crucial information and better prepare the next team for their task.

1.7 Decontamination

Considerations for decontamination should begin at the outset of the incident. A decontamination construct will exist in the warm zone prior to any team entering the hot zone. It will typically consist of a large berm fashioned out of a large chemical resistant tarp, wrapped over a charged 2 ½" hose-line. There will be a charged 1 ½" hose-line nearby for emergency decontamination. Within the berm, there will be a series of smaller berms, in which, personnel will stand while being decontaminated. Personnel conducting the decontamination will be wearing the appropriate PPE (typically 1 class below ops) and will use detergent and water to gently scrub and rinse ops personnel and rescuees as they exit the hot zone. Tools and anything else exiting the hot zone will be decontaminated as well.

Once decontamination is complete, all product collected by the berms, will be handled as per the MSDS.

1.8 Termination

Once emergency operations are complete, the scene will be handed over to clean-up & recovery operations. Command will ensure that the hand-off includes all pertinent information about the spilled product:

- Properties
- Hazards
- Location
- Safe-handling
- Exposure signs and symptoms
- Req'd PPE
- Disposal procedures

Command will conduct an on-site debrief. As well, a more formal debrief will be conducted, with all parties involved, at a later time. The incident will be documented, including exposure records for all personnel that entered the warm and/or hot zones.

2.0 Specific Chemical Responses

2.1 Emulsion

Site management and control

- Consider initial perimeter of 800m.
- Command, staging, & decon shall be positioned upwind.
- Eliminate sources of ignition.
- Unify command with Safety Superintendent, Mine Manager, Environmental Dept, Dyno Nobel, product carrier (if spill occurs during delivery to mine).

Identification



- UN# 0332.
- Viscous liquid.
- Pink, opaque.
- Slight fuel oil odour.
- Shipped in bulk by tanker truck.

Hazard & risk evaluation

- Emulsion explosives.
- Stable under normal conditions.
- May explode under fire conditions.
- Eye & skin irritant.
- Slight ingestion & inhalation hazard.
- Avoid contact with corrosives.
- Is there threat to a stream?

PPE

- Class C suit with long sleeves.
- Standard PPE

Information management and resource coordination

- See MSDS for product information.
- Work closely with Dyno.

- Standard decon set-up will be constructed.
- Have tools cribbed for entry teams.
- Ensure there is enough PPE at the site to complete the task.
- Ensure there is drinking water for responders.
- Have hazmat trailer, ambulance & fire truck in staging area, as req'd
- Have Site Services staged for digging, damming, product extraction, as req'd.

Implementing Response Objectives

- Rescue injured personnel.
- Fire-fighting: If fire reaches cargo, DO NOT ATTEMPT TO FIGHT FIRE. Cargo may explode. Evacuate in all directions for 1600m.
- Prevent from entering streams.
- If possible, stop anymore product from being spilled.
- Follow Dyno's recommendations for recovery and clean-up of product.

Decontamination

Standard decon set-up will be utilized in warm zone:

- Large berm fashioned out of large chemical resistant tarp, wrapped over charged 2 ½" hose-line, 2 small berms, will be in series, within the large berm.
- Decon personnel shall don class C suits without need for respiratory or splash protection, other than safety glasses.
- Ensure all personnel that entered hot zone are properly decontaminated.
- Ensure that all tools that entered the hot zone are properly decontaminated.

Termination

- Once operation complete, clean out berms under direction of Dyno.
- Safe and proper disposal of all spent PPE.
- Transition of command.
- Debrief.

2.2 Diesel, Kerosene, CFE 150

Note: LEL sensor will not detect presence of long-chain hydrocarbon vapour. Photo-ionization detector (PID) should be used, if available.

Site management and control

- Set up perimeter with at least 50m radius.
- Command, staging, & decon shall be positioned uphill and upwind.
- Eliminate sources of ignition.
- Unify command with Safety Superintendent, Mine Manager, Environmental Dept, Dyno Nobel (if spilled product is CFE 150), product carrier (if spill occurs during delivery to mine).

Identification



- UN# 1202.
- Liquid state.
- Colour varies.
- Petroleum odour.
- Transported by B-train, tidy-tanks.
- Stored in 5 large tanks at fuel farm (total volume of 3,282,000 L), one 70,000 l Tank by UG portal, and one tank at Dyno (45,000 L).
- What is downhill from spill??
- Is there threat to life?
- Is there threat to a stream?

Hazard & risk evaluation

- Combustible liquid.
- Vapour could be ignited by any source of ignition.
- Extraction methods could create static if not bonded/grounded, and serve as an ignition source.
- Ambient temperature relevant.
- Irritant to eyes and skin
- Ingestion and inhalation hazard
- Toxic to aquatic life.

PPE

- If there is a fire situation, PPE will consist of full turn-out gear with SCBA.
  Otherwise
- For offensive strategies, such as rescue or plugging, full turn-out gear with SCBA
- For defensive strategies, such as diverting, damming, booming, diking, class B suit.

- Respirator with OV cartridges.
- Oil resistant gloves & boots

Information management and resource coordination

- See MSDS for product information.
- Know the product's route of travel.
- Standard decon set-up will be constructed.
- Ensure tools are cribbed for entry teams.
- Ensure there is enough PPE at the site to complete the task.
- Ensure there is drinking water for responders.
- Have hazmat trailer, ambulance & fire truck in staging area, as req'd.
- Have Site Services staged for digging, damming, product extraction, as req'd.

Implementing Response Objectives

- Rescue injured personnel.
- Consider using fog stream to protect rescuers.
- Fire-fighting: Use dry chemical, CO2, Class B foam, or water with fog pattern.
- If using fog, considering increased run-off hazard
- Prevent from entering streams.
- If possible, stop the leak: close valves, use plugs, plug n' dyke, gaskets, straps, jacks, cribbing, etc.
- Containment berm at source, 'Surrey Condom'.
- If possible, contain by covering drains/culverts, diking, diverting to a berm, absorbing, etc.
- If product has entered a stream, use booms, hydrocarbon-only absorbent socks and pads, under-flow dams, diversion-booms, skimmers to contain and extract, as per instructions found later in this document.
- If transfer of product req'd, ensure entire system is bonded/grounded.
- Use non-sparking tools, such as pneumatics.
- Site Services Vac-truck is an option for cleaning up product.

Decontamination

Standard decon set-up will be utilized in warm zone:

- Large berm fashioned out of large chemical resistant tarp, wrapped over charged 2 ½" hose-line, 2 small berms, will be in series, within the large berm.
- Decon personnel shall don class C suits without need for respiratory or splash protection, other than safety glasses.
- Ensure all personnel that entered hot zone are properly decontaminated.
- Ensure that all tools that entered the hot zone are properly decontaminated.

Termination

- Once operation complete, vac-truck can be utilized to clean up solution contained with the decon berms.
- Safe and proper disposal of all spent PPE.
- Transition of command.
- Debrief

2.3 Gasoline

Note: Minto gas detectors are calibrated to pentane and are suitable for use during gasoline spill mitigation

Site management and control

- Set up perimeter. Consider radius up to 800m depending on amount of product and level of explosion hazard.
- Command, staging, & decon shall be positioned uphill and upwind.
- Eliminate sources of ignition.
- Unify command with Safety Superintendent, Mine Manager, Environmental Dept., product carrier (if spill occurs during delivery to mine).

Identification



- UN# 1203.
- Liquid state.
- Colourless to slightly yellow.
- Recognizable odour.
- Transported by B-train, tidy-tanks.
- Stored in 2 tank at fuel farm (34,150 L combined).
- What is downhill from spill??
- Is there threat to life?
- Is there threat to a stream?

Hazard & risk evaluation

- Flammable liquid. Extremely flammable in presence of ignition source, at nearly any temperature.
- Vapour could be ignited by any source of ignition.
- Vapour is heavier than air and may travel considerable distance to an ignition source, and flash back.
- Product extraction methods could create static if not bonded/grounded, and serve as an ignition source.
- Explosion hazard where flame impingement on tank.
- Irritant to eyes.
- Ingestion and inhalation hazard
- Toxic to aquatic life.

PPE

- If there is a fire situation, PPE will consist of full turn-out gear with SCBA.
  Otherwise
- For offensive strategies, such as rescue or plugging, full turn-out gear with SCBA
- For defensive strategies, such as diverting, damming, booming, diking, fire resistant class B suit.
- Respirator with OV cartridges, only if LEL's are being monitored, otherwise, do not dampen sense of smell. Rather, move upwind of product vapour.

Information management and resource coordination

- See MSDS for product information.
- Know the product's route of travel.
- Standard decon set-up will be constructed.
- Ensure tools are cribbed for entry teams.
- Ensure there is enough PPE at the site to complete the task.
- Ensure there is drinking water for responders.
- Have hazmat trailer, ambulance & fire truck in staging area, as req'd
- Have Site Services staged for digging, damming, product extraction, as req'd.

Implementing Response Objectives

- Offensive tactics for rescue of injured personnel only.
- Consider blanketing affected area with class B foam, prior to rescuers entering hot zone.
- Use fog stream to suppress vapours and protect rescuers.
- Rescuers will carry intrinsically-safe radios and gas-detector.
- Prevent from entering streams
- If possible, stop the leak.
- If possible, contain by covering drains/culverts, diking, diverting to a berm, absorbing, etc.
- If product can or has has entered a stream, use booms, hydrocarbon-only absorbent socks and pads, under-flow dams, diversion-booms, as per instructions found later in this document.
- Safe handling and disposal of all waste product.

Decontamination

Standard decon set-up will be utilized in warm zone:

- Large berm fashioned out of large chemical resistant tarp, wrapped over charged 2 ½" hose-line, 2 small berms, will be in series, within the large berm.
- Decon personnel shall don class C suits without need for respiratory or splash protection, other than safety glasses.
- Ensure all personnel that entered hot zone are properly decontaminated.
- Ensure that all tools that entered the hot zone are properly decontaminated.

Termination

- Once operation complete, safe disposal of decon berm contents
- Safe and proper disposal of all spent PPE
- Hand-over command of operation to Environmental Dept.
- Debrief

2.4 LPG (Propane)

Note: Minto gas detectors are calibrated to pentane, and require no correction prior to use during propane leak mitigation.

Site management and control

- Set up initial perimeter of at least 100m. For large tank where there is fire, set up perimeter of at least 1600m.
- Command, staging, & decon shall be positioned uphill and upwind.
- Eliminate sources of ignition.
- Unify command with Safety Superintendent, Mine Manager, Environmental Dept., product carrier (if spill occurs during delivery to mine).

Identification



- UN# 1075
- Colourless liquid and vapour while stored under pressure.
- Colourless and odourless gas in natural state at any concentration.
- Commercial propane has an odorant added which is commonly ethyl.
- Transported by tanker truck.
- Stored in 6 113,000L tanks West of the Main Pit, One 12,000L tank at the refill station near the airport, twin 3,000L tanks at Pelly, and twin 18,000L tanks at Km 0 of the access road.
- What is downhill from spill?
- Is there threat to life?
- Is there threat to a stream?

Hazard & risk evaluation

- Extremely flammable gas.
- Vapour could be ignited by any source of ignition.
- Vapour is heavier than air and may travel considerable distance to an ignition source, and flash back.
- Stored under pressure, as a liquid.
- Product extraction methods could create static if not bonded/grounded, and serve as an ignition source.
- Massive explosion hazard where flame impingement on tank.

PPE

- Full turn-out gear with SCBA.

Information management and resource coordination

- See SDS for product information.
- Consider contacting Canutec.
- Know the product's route of travel.
- Ensure tools are cribbed for entry teams.
- Have fire truck at scene and ambulance in staging area, as req'd

Implementing Response Objectives Leak in an enclosed space

- Evacuate structure.
- Close supply valve remotely if possible.
- Eliminate any source of ignition.
- Use positive pressure to ventilate space, ensure that it is exhausting to safe location.

If no remote isolation valve:

- Entry team (2 ERT members) & RIT team (2 ERT members) will don full turn-out gear & SCBA.
- Any electronic equipment being carried, such as radio or gas detector, must be intrinsically safe.
- Entry team will enter with charged 1 ½" hose-line and gas detector equipped with LEL sensor, while RIT stages in the cold zone .
- Once entry team is at 'reach of stream' distance from the leak, the nozzleman (Entry member 1) will set-up, with nozzle fixed on Entry member 2. Entry member 2 will continue toward valve, with gas detector.

If LEL sensor rises above 20%, entry team will retreat until ventilation can be made adequate.

- Once Entry member 2 reaches the valve, he will close the valve, then back away until he reaches entry member 1.
- Entry team will exit the structure, until it has been adequately ventilated.
- Once adequately ventilated, ERT members, wearing appropriate PPE, will sweep the structure with gas detector(s), to ensure there are no pockets of gas, before deeming the structure 'safe to enter'.

****** If no remote shut-off is available or accessible, the main propane lines can be shut off by cutting the Underground Power feed in the Tailings Building.***

2.5.1 LPG line on fire, with no impingement

Note: a propane leak that is burning is safer than one that is not burning, as long as there is no impingement on a tank or structure. Therefore, in this scenario, gas will be allowed to burn until the valve can be shut off.

- Evacuate immediate area.
- If possible, close isolation valve from remote location.

If no remote isolation valve:

- Eliminate any further source of ignition.
- 2 or more ERT members in full turn-out gear & SCBA will be on 1 ½" hose-line.
- Nozzle will be turned to full fog, which will create a water-curtain between the fire and the fire fighters.
- The fire team will approach the isolation valve, keeping the water-curtain between themselves and the fire at all times, being careful not to put the fire out with the stream
- When the valve is reached by the team, the 2nd member on the line will let go of the hose and approach the valve, while the nozzleman maintains the water-curtain between the fire and the valve/fire team.
- The 2nd member will close the valve then back away from the fire until he regains his position on the hose.
- The team will maintain the water-curtain while they back away from the damaged gas-line.
- Once the team is at a safe distance, a 45 degree pattern can be fixed on the broken gas-line to cool it, and disperse any residual gases.

2.5.2 LPG leak, not enclosed, not on fire

Note: LPG has a very high vapour pressure (1013 kPa) so it wants to be a gas, a high vapour density (1.52) so it's heavier than air, and a low flash point (-103.4 C). This combination means that it can form an explosive gas cloud that will stay close to the ground, may linger in incident area, or migrate downwind and/or downhill, possibly settling in low lying areas.

- Evacuate immediate area as well as areas downwind/downhill as per ERG recommendations.
- If possible, close isolation valve from remote location.
- From 'reach of stream', set up ground monitor and fix a 45 degree fog pattern on area of concern. This will push gas cloud away from area and disperse it. Be sure to push it to a safe location.

If no remote isolation valve:

- Entry team (2 ERT members) & RIT team (2 ERT members) will don full turn-out gear & SCBA.
- Any electronic equipment being carried, such as radio or gas detector, must be intrinsically safe.
- Entry team will enter with charged 1 ½" hose-line and gas detector equipped with LEL sensor, while RIT stages in the cold zone.
- While ground monitor continues to 'make it rain' in the hot zone, nozzleman (entry member 1) will fix nozzle on entry member 2, as entry member 2 approaches the isolation valve, with gas detector.

If LEL sensor rises above 20%, entry team will retreat until water stream can be made more effective

- Once Entry member 2 reaches the valve, he will close the valve, then back away until he reaches entry member 1.
- Entry team will retreat to the cold zone until gases are adequately dispersed
- Once the gas is adequately dispersed, ERT members, wearing appropriate PPE, will sweep the area with gas detector(s), including low-lying areas where gas may have migrated to, before deeming the area 'safe to enter'.

2.5.3 Fire where there is flame impingement on LPG tank

- Evacuate all non-ERT members for at least 1,800 m where there is flame impingement on either the 12,000 L tank or the tandem 18,000 L tanks.
- Command will know and understand the signs of imminent BLEVE.
- If Command witnesses signs of imminent BLEVE from an upright tank, there shall be no attempt made to cool tanks, rather, all focus shall be on a rapid evacuation of all personnel, at least 1,800m.
- If tank has been knocked over, there may be little or no warning signs of BLEVE, therefore no attempt shall be made to cool, rather, all focus shall be on a rapid evacuation of all personnel, at least 1,800m.
- If a BLEVE is not imminent, an attempt will be made to connect a ground monitor to the stand-pipe at the Tailings bldg.
- A narrow fog stream will be fixed on the tank at the area of flame impingement.
- The monitor will be left unmanned and the remaining ERT will evacuate at least 1,800m.

Where a tanker truck carrying propane has over-turned on the access road, causing damage to the tank trailer and subsequent rapid release of propane, the strategy for the hazmat portion of the incident response, will be passive and conducted from an upwind/uphill location, at a safe distance, as per the ERG. Transfer of residual product for the scenario, will be conducted by outside resource.

Decontamination

- 1 ½" charged hose-line, as emergency decon

Termination

- Debrief

BW GasAlert Micro 5 is intrinsically safe, as per: *http://directories.csa-international.org/xml_transform.asp?xml=certxml%5C080259_0_000-4828-82.xml&xsl=xsl/certrec.xsl*

- GasAlert Micro 5 Portable Gas Detector, Model M5-xwt1t2-r-p-d-a-b-cc & M5PID-xwt1t2-r-p-d-a-b-cc; utilizing electrochemical, catalytic bead and photo-ionization sensors; Intrinsically Safe when powered by one of the following AA Size Batteries / Battery Pack
  - Duracell MN1500; T-Code T4; Ambient -20 to +40°C; T-Code 139.8°C (T3C); Ambient -20 to +50°C
  - Energizer E91; T-Code 153°C(T3C); Ambient -20 to +40°C; T-Code 163°C (T3B); Ambient -20 to +50°C
  - NiMH Rechargeable Battery Pack "M5-BAT01"; T-code T4; Ambient -20 to +50°C
  - Lithium Polymer Rechargeable Battery pack "M5-BAT07B"; T-Code T4; Ambient -20 to +50°C

2.5 Nitric Acid 40%

Note: when it comes to corrosives such as Nitric Acid, the solution to pollution is NOT dilution. For a spill of 1 45 gal drum, it would take over 450,000 gal of pure water to make the solution habitable for fish. It would take over 45,000,000 gal of pure water to neutralize it.

Site management and control

- Set up perimeter with at least 50m radius.
- Command, staging, & decon shall be positioned uphill.
- Unify command with Safety Superintendent, Mine Manager, Environmental Dept., product Carrier (if spill occurs during delivery to mine).

Identification



- UN# 2031
- Liquid state
- Colourless to yellow
- Transported in 45 gallon drums
- # of 45 gal drums possibly damaged will help estimate size of spill.
- What is downhill from spill? Could acid reach a stream?

Hazard & risk evaluation

- Strong acid, very corrosive.
- Severely hazardous to eyes and skin
- Ingestion could cause death
- Inhalation hazard, although low vapour pressure 1.3kPa (wants to be a liquid).
- Could be devastating to stream life.
- Strong oxidizer, could have explosive reaction with organic or combustible materials

PPE

- If there is a fire situation, PPE will consist of full turn-out gear and SCBA.
  Otherwise
- Know and heed permeability rate and breakthrough times of all PPE.
- Acid resistant, class B suit with hood.
- Full-face respirator with appropriate chemical cartridges.
- Chemical resistant gloves & boots
- Chemical resistant tape used to seal between boots/suit, gloves/suit, and mask/hood.

Information management and resource coordination

- See MSDS for product information.
- Know the product's route of travel.
- Was anyone exposed?
- Will non-human life be exposed?
- Standard decon set-up will be constructed.
- Have tools cribbed for entry teams.
- Ensure there is enough PPE at the site to complete the task.
- Ensure there is enough neutralizing agent at the site to complete the task. ***See below for chart***
- Ensure there is drinking water for responders.
- Have hazmat trailer, ambulance & fire truck in staging area, as req'd
- Have Site Services staged for digging, damming, product extraction, as req'd.

Implementing Response Objectives

- Rescue injured/exposed personnel.
- Prevent from entering streams
- Prevent from contacting combustibles and organics.
- If possible, stop the leak.
- If possible, contain by covering drains/culverts, damming, diverting to a berm, etc.
- Use over-pack to contain leaking drums that still contain product.
- Neutralize spilled product with weak caustic – primary neutralizing agent is Ansul Spill X-A, alternatively hydrated lime or baking soda (if available). Be cautious of chemical reaction.
- Use Litmus paper to test for pH when neutralizing with lime or baking soda.
- Site Services Vac-truck is an option for cleaning up product before or after neutralized, as necessary.

Decontamination

Standard decon set-up will be utilized in warm zone:

- Large berm fashioned out of large chemical resistant tarp, wrapped over charged 2 ½" hose-line, 2 small berms, will be in series, within the large berm.
- Decon personnel shall don class C suits without need for respiratory or splash protection, other than safety glasses.
- Ensure all personnel that entered hot zone are properly decontaminated.
- Ensure that all tools that entered the hot zone are properly decontaminated.

Termination

- Once operation complete, vac-truck can be utilized to clean up solution contained with the decon berms.
- Safe and proper disposal of all spent PPE.
- Transition of command.
- Debrief

2.5.1 Chart for Estimating Caustic Req'd to Neutralize 40% Nitric Acid

For **Spill X-A**, use 1:1 ratio by volume, or 10lbs Spill X-A per 1 gal Nitric Acid.

Amount of Nitric Acid Spilled (in Gal.)	Amount of Baking Soda Req'd (in Lbs.)
1	5.6
2	11
5	28
10	56
20	110
45	252
90	504
135	756
180	1,008

Amount of Nitric Acid Spilled (in Gal.)	Amount of Lime Req'd (in Lbs.)
1	2.4
2	4.8
5	12
10	24
20	48
45	108
90	216
135	324
180	432

Charts derived from formulas below

Specific Gravity Nitric Acid: 1.2455

Concentration: 40%

1 gal HNO_3 x 1.24 x 8.34 lbs/gal x 0.40 = 4.14 lbs HNO_3

$HNO_3 + NaHCO_3 \rightarrow NaNO_3 + H_2O + CO_2$ Therefore 1 mol Nitric Acid per 1 mol Sodium Bicarb (Baking Soda)

$2HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + 2H_2O$ Therefore 2 mol Nitric Acid per 1 mol Calcium Hydroxide (Lime)

HNO_3 = 63 amu

$NaHCO_3$ = 85 amu

$Ca(NO_3)_2$ = 74 amu

(4.14 lbs HNO_3/63 amu-HNO_3) x 85 amu-$NaHCO_3$ = 5.6 lbs $NaHCO_3$

Therefore 1 gallon of Nitric Acid req's 5.6 lbs of baking soda

(4.14 lbs HNO_3/2(63) amu-HNO_3) x 74 amu-$Ca(OH)_2$ = 2.4lbs $Ca(NO_3)_2$

Neutralization Formulas and Quick Access Charts Formulas

The key to effective and efficient neutralization, is knowing how to use the following formulas.

1. The first formula indicates how much acid is spilled in weight.

Step #1- Determine the quantity of acid spilled, usually in gallons.
Step #2- Determine the specific gravity of the acid usually provided in MSDS.
Step #3- Determine the concentration of the acid spilled usually in %.
Step #4- The weight of water is 8.34 pounds per gallon.

After the above figures are known plug them into the following formula:

Quantity of spill X specific gravity X weight of water X concentration
= weight of the spill

Example:
One gallon of sulfuric X 1.84 X 8.34 X 98% = 15.04 pounds of sulfuric

2. The second formula will determine the quantity of the neutralizer needed. The type of neutralizer needs to be selected based on costs and availability. Plug numbers into the following formula:

Weight of the acid spilled X number in the chart for the selected neutralizer.

Example :

15.04 pounds of sulfuric X 1.06 for Soda Ash = 15.94 pounds of Soda Ash

Determination through Chemistry

To calculate the amount of neutralization agent needed the balanced chemical reaction must be written and the equivalent weights of acid and base determined.

Example: 1,000 gallons of 38% hydrochloric acid will be neutralized with lime.

Step #1 – Write the complete balanced neutralization reaction:
$2HCl + CaO \rightarrow CaCl_2 + H_2O$
This equation shows that 2 moles of HCl are required in the reaction with one mole of calcium oxide (lime).

Step #2 – Calculate the molecular weight of each compound:
HCl – H = 1, Cl = 35.5, Total = 36.5 amu
CaO – Ca = 40, O = 16, Total = 56

Step #3 – Calculate the weight of the HCl spill:
1,000 gallons X 1.20 X 8.34 X 0.38 = 3,803.04 pounds of HCl
Step #4 – Calculate the amount of neutralizer needed:
From Step #1 it was found that 2 moles of HCl are needed to react with 1 mole of CaO. From Step #2 it was found that 1 mole of HCl weighs 36.5 amu's so 2 moles weigh 73.0 amu's. The formula is**; weight of acid/formula weight of acid X formula weight of base = pounds of the neutralizer needed.**
3,803.04/73 X 56 = 2,917.4 pounds of lime

Finer Points
The final amount is an approximation and in actual practice more neutralizing agent should be obtained. The neutralization process needs to be checked at several spots to assure pH levels are acceptable and uniform.

Neutralization Precautions
Remember, the neutralization process is exothermic and it may involve splashing of product. Safety is paramount and proper protective equipment is very important. Also, the neutralizer is hazardous in its own right and needs to be handled with care. Consider expense and availability in selecting neutralizer. Other weak bases that may be used and their molecular weights are; sodium bicarbonate ($NaHCO_3$)- 85, and magnesium hydroxide ($Mg(OH)_2$)-58.

Neutralization Chart Information
Acids

Hydrochloric Acid, HCl, MW = 36.5, density/specific gravity is 1.19, weight of a gallon is 3.77 pounds at 38% concentration. Synonyms are chlorohydric acid and muriatic acid.

Nitric Acid, HNO_3, MW = 63, density/specific gravity is 1.41, weight of a gallon is 8.23 pounds at 70% concentration. Synonyms are Aqua Fortis and Azotic Acid. (Aqua Regia is a mixture of nitric and hydrochloric acids).

Phosphoric Acid, H_3PO_4, MW = 98, density/specific gravity is 1.69, weight of a gallon is 11.98 pounds at 85% concentration. Synonyms are orthophosphoric acid.

Sulfuric Acid, H_2SO_4, MW = 98, density/specific gravity is 1.84, weight of a gallon is 15.04 pounds at 98% concentration. Synonyms are Oil of vitriol and "oleum" is fuming sulfuric acid.

Bases

Ammonium hydroxide, NH_4OH, MW = 35, clear solution, synonyms are ammonia solution and aqua ammonia. Strong ammonia odor evolves from liquid. High vapor pressure.
Calcium carbonate, $CaCO_3$, MW = 100, white powder, synonyms are crushed limestone and dolomite. Low heat of reaction that gives off carbon dioxide gas.
Calcium hydroxide, $Ca(OH)_2$, MW = 74, white powder, synonyms are slaked lime, hydrated lime, and calcium hydrate.
Calcium oxide, CaO, MW = 56, white powder, synonyms are quicklime, lime, and unslaked lime. Most economical, lowest cost, neutralizer. **Best choice!** Maximum pH is 12.45 at 25C.
Magnesium carbonate, $MgCO_3$, MW = 84, synonyms are magnesia alba and carbonate magnesium.
Magnesium hydroxide, $Mg(OH)_2$, MW = 58, white powder, synonyms are milk of magnesia and magnesia hydrate. Good neutralization agent. Maximum pH is 10.6 at 25C.
Potassium hydroxide, KOH, MW = 56, white flakes, synonyms are caustic potash. High heat of reaction with toxic fumes. Maximum pH is 14 at 25C.
Sodium bicarbonate, $NaHCO_3$, MW = 85, white powder, synonyms are baking soda and sodium acid carbonate. Low heat of reaction with carbon dioxide gas evolution.
Sodium Carbonate, Na_2CO_3, MW = 106, white powder, synonyms are soda ash. **Second most economical neutralization agent next to lime.** Maximum pH is approximately 11 at 25C.
Sodium hydroxide, NaOH, MW = 40, white powder, synonyms are caustic soda, soda lye, caustic, and lye. High heat of reaction with toxic fumes. Maximum pH is 14 at 25C.

2.5.2 Quick Access Charts for Neutralizing Various Acids with Baking Soda

2.5.2.1 Sulfuric Acid neutralization using Baking Soda (Sodium Bicarbonate)

Amount of Sulfuric Acid spilled	Amount of Baking Soda needed in pounds
1 gallon	25.6
2 gallons	51.2
3 gallons	76.8
4 gallons	102.4
5 gallons	128.0
10 gallons	256.0
50 gallons	1280.0
55 gallons	1408.0
100 gallons	2560.0

2.5.2.2 Hydrochloric Acid neutralization using Baking Soda

Amount of Hydrochloric Acid spilled	Amount of Baking Soda needed in pounds
1 gallon	5.5
2 gallons	11.0
3 gallons	16.5
4 gallons	22.0
5 gallons	27.5
10 gallons	55.0
50 gallons	275.0
55 gallons	302.5
100 gallons	550.0

2.5.2.3 Nitric Acid neutralization using Baking Soda

Amount of Nitric Acid spilled	Amount of Baking Soda needed in pounds
1 gallon	7.4
2 gallons	14.8
3 gallons	22.2
4 gallons	29.6
5 gallons	37.0
10 gallons	74.0
50 gallons	370.0
55 gallons	407.0
100 gallons	740.0

2.6 Sodium Sulphide

Site management and control

- Set up perimeter with at least 50m radius if water introduced, or 25m if solid.
- Command, staging, & decon shall be position upwind and uphill.
- Unify command with Safety Superintendent, Mine Manager, Environmental Dept., product carrier (if spill occurs during delivery to mine).

Identification



- UN# 1849
- Solid state
- Yellow
- Smell sulfurous or like rotten eggs with introduction of moisture.
- Transported in 1000 Kg 'Super-Sacks'.
- # of super-sacks possibly damaged, will help estimate size of spill.
- Is water being introduced to the spill? If so, what is downhill form the spill? Could run-off reach a stream?
- Are corrosives being introduced to spill? If so, what is downwind?

Hazard & risk evaluation

- Strong caustic.
- Severely corrosive to digestive tract, respiratory system, eyes, and skin.
- Dust is powerful systemic poison. Inhalation could cause headache, dizziness, unconsciousness, pulmonary edema, asphyxiation, death.
- Contact with acid releases toxic and flammable Hydrogen Sulfide.
- Routes of entry include absorption, inhalation, and ingestion.
- Keep spilled product dry
- If water introduced, avoid run-off, contact with soil, waterways.

PPE

- If there is a fire situation, PPE will consist of full turn-out gear and SCBA.
  Otherwise
- Know and heed permeability rate and breakthrough times of all PPE.
- SCBA if significant H2S release, otherwise, full-face respirator & OV cartridges with pre-filter.
- Corrosive resistant, class B suit with hood.
- Chemical resistant gloves & boots
- Chemical resistant tape used to seal between boots/suit, gloves/suit, and mask/suit.

Information management and resource coordination

- See MSDS for product information.
- Was anyone exposed?
- Will non-human life be exposed?
- Standard decon set-up will be constructed.
- Have tools cribbed for entry team.
- Ensure there is enough PPE at the site to complete the task.
- Ensure there is drinking water for responders.
- Have hazmat trailer, ambulance & fire truck in staging area, as req'd
- Have Site Services staged for digging, damming, product extraction, as req'd.

Implementing Response Objectives

- Rescue injured/exposed personnel.
- Keep product dry.
- Monitor atmosphere for H2S and SO2.
- If water introduced, contain run-off by covering drains/culverts, damming, diverting to a berm, etc. Solution collected can be mixed with oxidizing agent, such as hydrogen peroxide or sodium hypochlorite to prevent evolution of H2S.
- If product has entered a stream, consider using over-flow dams to contain product, for extraction.
- Vacuum or sweep up dry product
- Disposal as per Environmental Dept. recommendations

Decontamination

Standard decon set-up will be utilized in warm zone:

- Large berm fashioned out of large chemical resistant tarp, wrapped over charged 2 ½" hose-line, 2 small berms, will be in series, within the large berm.
- Decon personnel shall don class C suits without need for respiratory or splash protection, other than safety glasses.
- Ensure all personnel that entered hot zone are properly decontaminated.
- Ensure that all tools that entered the hot zone are properly decontaminated.

Termination

- Once operation complete, solution in decon berms to be disposed of, as per Environmental recommendations.
- Safe and proper disposal of all spent PPE.
- Transition of command.
- Debrief

Appendix D: Tug and Barge Emergency Contingency Plan

Minto Mine

Tug and Barge Emergency Contingency Plan

2021-01

Prepared by:

Minto Explorations Ltd.

Minto Mine

January 2021

First Issue: January 15, 2013

Revision History

Revision Number	Issue Date	Description and Revisions Made
2013-01	January 2013	First Issue
2017-01	February 2017	Review, revision of document and update of information: • Revised format of document (added revision history and table of contents); • Section 2.0 and 3.1 - Removed references to JDS and mutual aid agreement (not in place); • Section 4.0 - updated level of NFPA training for ERT (472 HazMat awareness level); • Section 4.0 - updated reference to 2014 field and table top exercise.
2019-09	September 2019	Changed ownership from Capstone to Pembridge Resources.
2021-01	January 2021	Removed References to Pembridge Resources.

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Appendix B: Safe Job Procedure for Loading and Unloading the Barge.

1 Introduction

Minto Mine (Minto), is pleased to submit the following contingency plan (plan) as per requirements of the Selkirk First Nation Access and Land Use Permit "Minto Landing Ice Bridge and Marshalling Area and West Side Barge Landing and Marshalling Area" (the permit). It is Minto's intention that this plan will fulfill the requirement as stated in Schedule 2, Section 9.0 Contingency Plan of the permit. It is not Minto's objective for this plan to mitigate all possible accidents or malfunction in regards to the in-stream operation of the Copper Queen tug and barge.

The plan, as prepared, is adaptive and will be amended as is practicable. This plan is intended to deliver the best possible means of mitigating an accident or malfunction of the loading/unloading or in-stream operation of the tug and barge with the resources available at Minto. Preventing such an occurrence requires a combination of procedural and engineering controls, based on an awareness of at risk conditions. These documents exist in the form of the Spill Contingency Plan, Emergency Response Plan, and any procedures or plans on the tug or barge from Site Services. This document serves as a contingency plan in the event that an accident or malfunction occurs when loading, unloading, and during in-stream operations of the Copper Queen tug and barge (CQTB).

2 General Procedures

Any response to an emergency condition will be based on a priority sequence of Life, Environment, and Property. Every event will be regarded with these priorities in mind. Initial on scene assessment of the accident or malfunction will be called out on channel one as a "Code 1". The Emergency Response Team (ERT) will be dispatched, communication established, and the barge operator and deckhand will respond to control the scene.

Deckhands will mitigate all emergencies on the barge to the best of their ability given the resources available. The general procedure in the event of an emergency would have the barge move to the west landing if possible or practical, unless otherwise communicated to the barge captain. To mitigate an emergency in offloading or loading vehicles onto the barge the deckhand will utilize the anchor points on both landings. Slack will be left in the rope to ensure the barge captain can maneuver when docked at the

landing. Tying off to the anchor points will mitigate complete catastrophe if the barge loses power during loading and offloading and will be discussed further under the specific procedures section of this plan.

3 Specific Procedures

Below is a list of the current on-site procedures for dealing with various emergencies in regards to the CQTB at Minto Mine.

- Emergency Response to Sinking
- Emergency Response to Loss of Power or Control
- Emergency Response to Fire Onboard
- Emergency Response to Man Overboard
- Emergency Response to Freight or Vehicle Overboard
- Emergency Response to Medical Emergency on Board of the Barge
- Emergency Response to Spill Response

3.1 Emergency Response to Sinking of CQTB

1. The activation of Emergency Protocols onboard the CQTB, starting with calling “Code 1” to initiate an ERT response.
2. The Captain and deckhand will deploy Canadian Coast Guard approved life rafts.
3. As per the Emergency Response Plan, Incident Command (IC) will communicate with the deckhand by radio to determine any further details of events, number of injured or trapped people, and any risks to property and environment.
4. IC will respond to the scene in an emergency vehicle ahead of remaining ERT members. IC will, upon arrival, provide initial scene assessment and gather any additional information available. A minimum ERT response will include; a full ERT member compliment, an environmental lead, the hazardous materials response trailer, the fire truck, the ambulance, and all associated equipment. All ERT operations will be under the control of the ERT Captain. Additional response needs based on initial assessment and evaluation by IC will be communicated to the Emergency Communications Center (ECC), as per the Emergency Response Plan.

5. Incident Accountability will be established and adhered to throughout the operation.
6. IC will determine the need for necessary rescue of people downstream. The option to deploy rescue ropes via launcher will be considered for KM 12.
7. Alternate access to river will be determined by the nature of the incident (KM 20 provides a second potential access point). All other access would require trail cutting, which is possible, but would take more time.
8. The IC, ERT Captain, and Environmental Lead (Unified Incident Command Support) will assess the ongoing situation and potential need for additional resources.
9. The alternate Man-boat (see Appendix A for details on Man-boat) will be deployed from the landing as needed to support rescue and/or to gain more information regarding the location of the sunken vessel and determine a possible plan for retrieval/securing of the vessel. The Man-boat operator will work under the direction of IC.
10. Once rescued, all patients will be treated as per OFA3/EMR protocols, transported as per Yukon EMS dispatch, and confirmation will be aligned with the Minto Emergency Response Plan.

3.2 Emergency Response to Loss of Power or Control of CQTB

The tug operates on two engines so a total loss of power is unlikely; however, it is still possible and below is the emergency procedure that would be activated in the event that the total loss of control of the CQTB was to occur.

1. The activation of Emergency Protocols on board the CQTB, starting with calling a “Code 1” to initiate an ERT response. The Captain will also communicate freight details and passenger numbers on board.
2. Passengers and crew will follow instructions from the Captain and will remain on board if deemed safe to do so. The Captain and deckhand will follow MED protocol in decision making, in regards to passenger safety.
3. The Captain and deckhand will deploy Canadian Coast Guard approved life rafts if the Captain deems it unsafe to stay on board.

4. IC will respond to the scene (or as close to it as possible) in an emergency vehicle ahead of the remaining ERT members. IC will, upon arrival to scene, provide initial scene assessment and gather any additional information available. A minimum ERT response will include a full ERT member compliment, an Environmental Lead, the Hazardous materials response trailer, the fire truck, the ambulance, and all associated equipment. The ERT operations will be under the control of the ERT Captain. Any additional response needs, necessary downstream communications, and reporting requirements will be based on the initial assessment and evaluation by the IC and will be communicated to the Emergency Communications Center (ECC), as per the Emergency Response Plan.
5. Incident Accountability will be established and adhered to throughout the operation.
6. The Captain will navigate, to the best of their ability, to the safest downstream location possible.
7. The Captain will communicate the location and condition of the vessel and people, and will assist in determining plans for further action.
8. Once the vessel is secured to shore (or where landed in river), the Man boat will be deployed to assist with additional securing and the removal of non-essential people to a location where they can be transferred back to site or to an alternate safe location.
9. A plan for retrieval will be based on the conditions and location of the vessel. The plan will be developed cooperatively between the Barge Captain, Minto ECC, and Mutual Aid resources. Equipment and additional resources will be sourced through the ECC, as per the Minto Emergency Response Plan.

3.3 Emergency Response to Fire on the CQTB

1. The activation of Emergency Protocols onboard CQTB, starting with calling a “Code 1” to initiate an ERT response.
2. If safe to do so, the deckhand will attempt to supress the fire using equipment on board following the Marine Emergency Duty (MED) protocol.

3. The Captain and deckhand will deploy Canadian Coast Guard approved life rafts if vessel in immediate danger. If possible and practical, the Captain will position barge so that the wind is blowing port to starboard, attempting to keep smoke/flames away from the life raft.
4. If possible, the Barge will cross to the West Bank of crossing and continue to use barge supplied fire suppression equipment. All passengers will disembark under direction of the deckhand.
5. The IC will respond to the scene in an emergency vehicle ahead of the remaining ERT members. IC will, upon arrival to scene, provide initial scene assessment and gather any additional information available. A minimum ERT response will include a full ERT member compliment, an Environmental Lead, the Hazardous materials response trailer, the fire truck, the ambulance, and all associated equipment. ERT operations are to be under the control of the ERT Captain. Additional response needs based on the initial assessment and evaluation by the IC will be communicated to the Emergency Communications Center (ECC), as per the Emergency Response Plan.
6. Incident Accountability will be established and adhered to throughout the operation.
7. Once IC is on scene and the vessel is safely secured, fire suppression will be conducted under the direction of the IC, following NFPA 1081 standards (Industrial Fire Brigade).
8. The consideration of environmental sensitivity will be considered by IC in cooperation with the Environmental Lead (unified incident command support).
9. Defensive spill containment methods will be utilized to control run off and any releases from firefighting operations. This may include (but are not limited to) tactics such as extinguishing agent selection, damming and/or berming on the barge, the placement of a boom around the vessel, and the removal of burning equipment once the fire is controlled, etc.

3.4 Emergency Response to Man Overboard

1. The activation of the Emergency Protocol onboard CQTB, beginning with calling “Code 1” to initiate an ERT response.

2. The Captain and deckhand will throw out provided Canadian Coast Guard approved life-rings to all personnel overboard. The response from the barge crew will conducted as per their MED training.
3. If able to successfully rescue person overboard, the deckhand will treat person(s) based on marine first aid protocols, awaiting response by the ERT and site Medic.
4. If unable to successfully achieve a rescue, the vessel will continue to the West landing and the Man boat will be deployed for a downstream rescue (Communication to IC on Radio Channel 1 must be available at all times). The Man boat operation will be conducted under the direction of the IC, once in place.
5. The Captain will communicate to IC of any possible downstream rescue requirement.
6. IC will instruct the ERT to stage at KM 12, with the option to deploy rescue ropes via launcher considered.
7. Incident Accountability will be established and adhered to throughout the operation.
8. IC will stage the ambulance for patient pick up.
9. IC will communicate the need for mutual aid to ECC, who will follow the Minto ERP by contacting local agencies for assistance on the East side of the river.
10. Once rescued, all patients will be treated as per OFA3/EMR protocols and transported, as per Yukon EMS dispatch confirmation, aligning with the Minto Emergency Response Plan.

3.5 Emergency Response to Freight or Vehicle Overboard of the CQTB

1. The activation of Emergency Protocols onboard CQTB, starting with calling a “Code 1” to initiate an ERT response. The Captain will also communicate freight details and passenger numbers on board.
2. Passengers and crew will follow instructions from the Captain (the Captain will respond as per MED training) and will remain on board, if deemed safe to do so.
3. The Captain and deckhand will deploy Canadian Coast Guard approved life rafts if it is deemed unsafe to stay on board, and passengers will be offloaded to a safe location on shore.

4. IC will respond to the scene (or as close to it as possible) in an emergency vehicle, ahead of the remaining ERT members. IC will, upon arrival, provide initial scene assessment and gather any additional information available. A minimum ERT response will include a full ERT member compliment, an environmental lead, the hazardous materials response trailer, the fire truck, the ambulance, and all associated equipment. Any ERT operations will be under the control of the ERT Captain. Additional response needs, downstream communications, and reporting requirements based on the initial assessment and evaluation by the IC will be communicated to the Emergency Communications Center (ECC), as per the Emergency Response Plan.
5. Incident Accountability will be established and adhered to throughout the operation.
6. The captain will navigate, to the best of their ability, to the landing (preferably the west landing).
7. Once the vessel is secured to shore, the man boat will be deployed by the deckhand or ERT members to assist with any additional securing of the vessel/freight and for the deployment of containment booms, which are located at the landing and on the vessel itself. All Man boat operation will be under the direction of the IC, once in place.
8. A plan for retrieval of freight will be determined appropriate to the condition and location of freight. The plan will be developed cooperatively by the Barge Captain, Minto ECC, and Mutual Aid resources.
9. Equipment and additional resources will be sourced through the ECC, as per the Minto Emergency Response Plan, including (but not limited to) manpower, expertise, and heavy equipment.
10. Additional external support in the event of an incident occurring on the East side of the river will include (but is not limited to) Yukon Emergency Measures Organization, local first responders, and alternate equipment operation contractors.

3.6 Emergency Response to Medical Emergency on board CQTB

1. The activation of the Emergency Protocols onboard the CQTB, starting with calling a “Code 1” to initiate an ERT response.
2. For a serious injury, as defined in the ERP, Yukon EMS will be notified immediately.
3. The deckhand will treat the patient per Marine Emergency First Aid protocols.

4. The Captain will navigate the barge to the west bank of the Yukon River (if possible) and all vehicles will offload on west bank, giving clear passage for Ambulance.
5. An ERT response will include the medic, ambulance, fire truck and a full compliment of team members to assist with any necessary patient transfer and packaging.
6. Incident Accountability will be established and adhered to throughout the operation.
7. Yukon EMS dispatch will be updated of situation once history and assessment is confirmed.
8. Upon arrival, the Minto Medic will take control of the scene and advise the ERT Captain of resources needed on scene.
9. Upon assessment, the patient will be treated, packaged, and transported, as per Yukon EMS dispatch confirmation, aligned with the Minto Emergency Response Plan.

3.7 Emergency Response to a Spill

1. The activation of the Emergency Protocol onboard the CQTB, starting with calling a “Code 1” to initiate an ERT response.
2. The deckhand will attempt to contain the spill using the onboard spill kit to prevent the spill from entering the Yukon River.
3. IC will respond to the scene in an emergency vehicle, ahead of the remaining ERT members. IC will, upon arrival, provide initial scene assessment and gather any additional information available. A minimum ERT response will include a full ERT member compliment, an Environmental Lead, the Hazardous materials response trailer, the fire truck, the ambulance, and all associated equipment. All ERT operations will be under the control of the ERT Captain. Additional response needs, downstream communication, communication with CANUTEC, and reporting requirements based on initial assessment and evaluation by IC will be communicated to the ECC, as per the Emergency Response Plan and Spill Contingency Plan.
4. Incident Accountability will be established and adhered to throughout the operation.
5. If practical, the barge captain will navigate the barge to the west landing.
6. All passengers will disembark vessel.

7. All vehicles and machinery that are not in the spill zone will also disembark.
8. The deckhand and ERT members, under the direction of IC, will use the Man boat to deploy the containment booms around the barge.
9. IC, with advice from the Environment Lead, will develop and implement the SCP for stopping the spill if possible.
10. If the spill cannot be stopped, a plan to mitigate the quantity of contaminant that reaches the environment will be developed and implemented.
11. If safe and practical to do so, the Environment Lead will deploy environment staff to sample downstream of spill to measure the contamination.
12. IC, with advice from the Environment Lead, will oversee cleanup of the spill.

Appendix A: Man Boat Specifications



Brand/Model: Munson Packman Landing Craft

- **Hull Length:** 24 feet (7.3 meters)
- **Beam:** 8 feet 6 inches (2.6 meters)
- **Hull Type:** Packman mono hull
- **Power:** Twin Yamaha 150hp
- **Propulsion:** Outboard (25” shaft)
- **Outfitting:** 52” bow door

Appendix B: Safe Work Procedure for Loading and Unloading the Barge.

Capstone Minto Safe Work Practice

Barge Loading and Offloading

Purpose: To ensure the safe practice of loading and offloading the barge at the Yukon River. To educate workers on the hazards of loading and offloading the barge, and working on landings.

Scope: This Safe Work Practice pertains to the Captain and the crew of the Minto Mine property who are exposed to operating the barge for transport across river.

Definitions:

Certified Flotation Device – Personal Flotation Devices marked "Approved by Department of Transport Canada" or "Approved by Canadian Coast Guard, Department of Fisheries and Oceans"

Hypothermia - A potentially fatal condition that occurs when the body core temperature falls below 95°F (35°C). This can occurs quickly when immersed in cold water.

Responsibilities

Employer / Supervisor Responsibilities

- Make sure appropriate training and assistance are provided to crew.
- Make sure appropriate rescue devices such as a life hook and floatation devices are available to workers

Safety Department Responsibilities

- Ensure this SWP is in alignment with the Yukon Health and Safety Act and Regulations

Worker Responsibilities

- Read, understand, and follow this safe work practice
- If unsure then stop work and ask for assistance
- Wear appropriate PPE defined to their work area.
- Provide training for proper use of PFD to passangers

Reference to Legislative and Site Requirements

- Yukon Occupational Health and Safety Regulations – Part 1 – section 1.34 – Each worker shall be provided with and be required to use an appropriate personal flotation device with the required buoyancy where a worker is employed in a situation where there is a risk of drowning

Safe Work Practice:

The captain and crew will give direction in regards to the following.

1. Landings.

1.1. Assess landing and vehicles to be loaded and unloaded. The use of wooden ramps may be needed. (For more information reference safe work practice for wooden ramps.)

1.2. Use gauge on apron ram to determine the need for landing to be rebuilt. This gauge is located on the ram closest to deckhand shed and has a max angle marked on the gauge. If the apron should go past the marked max angle stop and fix landing. (For more information reference safe work practice for landing maintenance and apron angle.)

2. Transportation.

2.1. Due to landing and vehicle loads ask driver to back on or drive on. This may be determined by many factors, such as:

- Angle and length of landing
- Apron angle and how it contacts the landing
- Underwater debris
- Drivers skill
- Extra low trailers
- Frozen or icy landings
- Load weights

2.2. Deckhand must communicate with captain any concerns about previously mention conditions. It is ultimately the captains' decision on how the barge is loaded.

3. Priority Boarding

3.1. Emergency vehicles on medical runs are given the top priority. Compassionate reasons or special circumstances are considered when loading vehicle traffic. The bus will also be given high priority

along with con trucks. Loading priority will be determined by the Captain or the Supervisor.

3.2. Priority may change from day to day and we ask that drivers cooperate and be patient. Ultimately the captain will make the decision based on information available at the time.

4. Communication.

4.1. Drivers are given a handout of standard hand signals as endorsed by WCB and a signature logbook is maintained to who has received the handout and when.

4.2. The deckhand is in charge of directing and communicating with all traffic. Radios, hand signals, face to face communication are all used. An air horn is used as warning to stop the drivers quickly.

5. Hazards.

5.1. Working at or near water has its inherent risks. A JHA should be conducted for any new or unusual work being conducted on or near the water. Some hazards to be aware of are:

- Exposure to the environmental elements of the season
- Slips, trips and falls on uneven ground
- Slipping on slippery rocks and surfaces
- Eroding shore line sloughing or slipping on ice along shoreline
- Falling into cold water
- Ice flows and ice jams
- Swift current
- Drowning
- Hypothermia
- Wildlife
- Slippery deck

6. Emergency Equipment.

6.1. Life ring with rope and pole must be available on the barge. An emergency response container complete with first aid kit, oxygen therapy unit, spare dry coveralls and several blankets is located on the tug. This container is used to reduce the effects of hypothermia until emergency response arrives.

6.2. As the river is 27kms from the mine site emergency response will take at least 40 minutes to arrive at the scene. Deckhands should have marine first aid training and clear knowledge of where all safety equipment is and its condition.

6.3. Honda pump & fire hose along with fire extinguishers are also in place. Deckhands should be well train in this area and will instruct people as needed on what to do in case of an emergency.

7. Training.

7.1. All workers must be trained and competent to operate or run any equipment that pertains to their job.

7.2. At least one worker must have a valid marine first aid ticket in the event of an emergency due to the location of this worksite and the anticipated delay on response time by ERT.

SWP Development and Approval

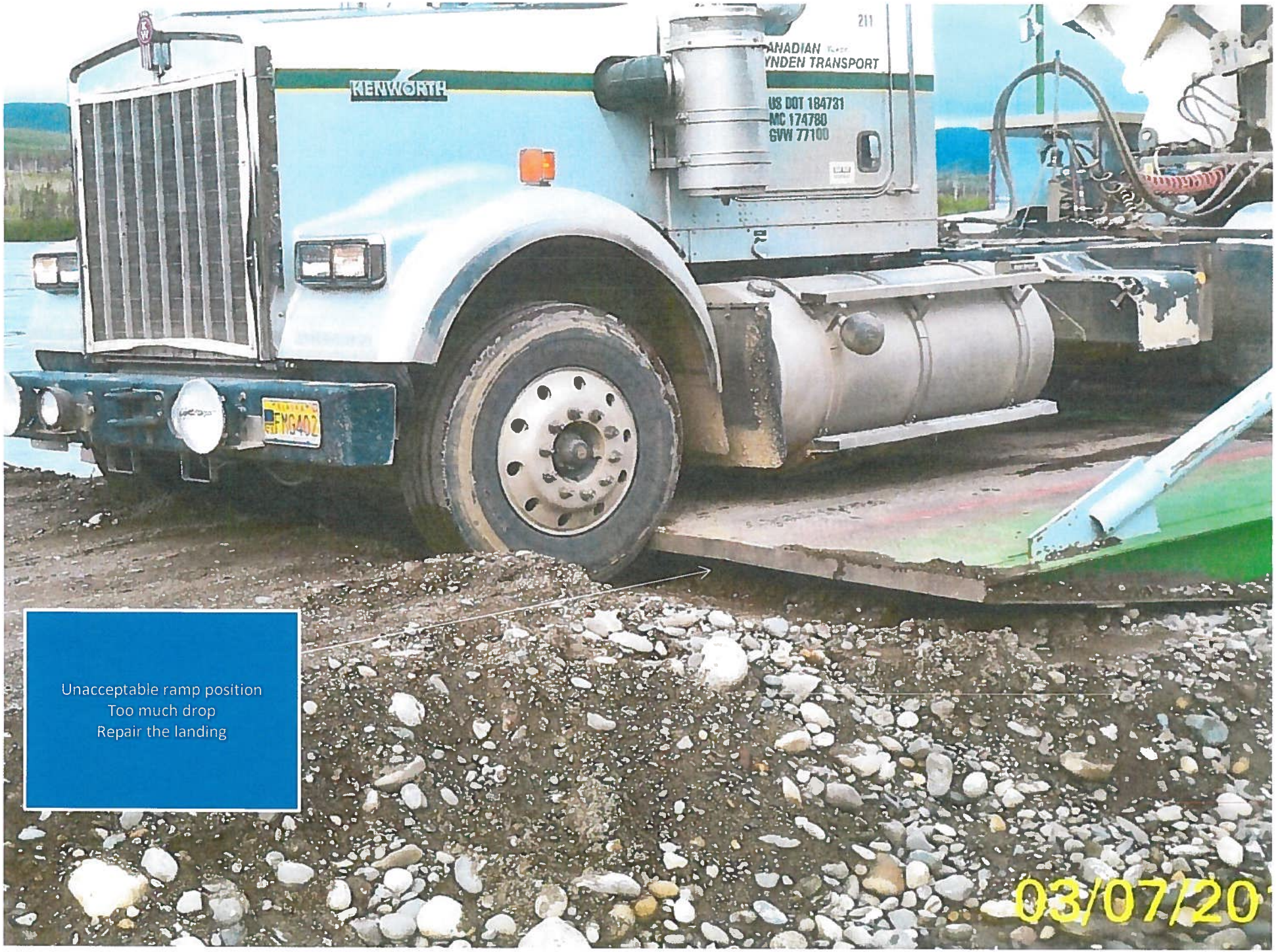
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Worker:		**Date:**
Worker:		**Date:**
JOHSC Representative:	Siana mills	**Date:24/08/2012**
Supervisor:	Stephen Maunder	**Date:26/08/2012**
Supervisor:	Captain Dave Johnstone	**Date: :26/08/2012**
Supervisor:	Jeff Billings	**Date: :26/08/2012**
Supervisor:		**Date:**
JOHSC Representative:		**Date:**
Senior Supervisor:		**Date:**
Senior Supervisor:		**Date:**
Departmental Manager:		**Date:**
	Print & Sign: Reviewed By:	
Safety Department:	MARK GOEBEL	
Safety Department:		**Date:** Sept 19/12
	Print & Sign: Approved By: **Determined by Safety Dept. Enter NA if not applicable.**	**Date:**
Departmental Manager:	stephen maunder	**Date:** 19/09/12
General Manager:		**Date:** 9.20.2012

Clarification of this safe work practice can be directed to the Safety Department.

Name of SWP:
Location: X:\Health & Safety\Safety Public\Procedures and Safe Work Procedures
Last revision date: April 21 2012


Ideal Ramp Position for Loading


Good Ramp
Position


KENWORTH
US DOT 184731
MC 174780
GVW 77100
Unacceptable ramp position
Too much drop
Repair the landing
03/07/20


Ramp Angle Gauge
Minimum and Maximum
Ramp Angle Indicators


Ramp Angle Gauge
Minimum and Maximum Ramp Angle Indicators

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000032**	Page	: 1 of 4
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 11-Feb-2020 14:29
PO	: 232818	Date Analysis Commenced	: 12-Feb-2020
C-O-C number	: 202002-11 C	Issue Date	: 24-Feb-2020 11:31
Sampler	: CR		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 2		
No. of samples analysed	: 2		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Aaron Yu	Laboratory Analyst	Metals, Burnaby, British Columbia
Angelo Salandanan	Lab Assistant	Metals, Burnaby, British Columbia
Bruna Botti	Analyst	Inorganics - Water Quality, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia

Appendix C – Groundwater Quality Results

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
µS/cm	Microsiemens per centimetre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Qualifiers

Qualifier	*Description*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW12-07-02	Dup	----	----	----
					Client sampling date / time	09-Feb-2020 10:45	09-Feb-2020	----	----	----
						WR2000032-001	WR2000032-002	--------	--------	--------
						Result	Result	----	----	----
Physical Tests										
alkalinity, total (as CaCO3)	----	E290-L	1.0	mg/L		206	196	----	----	----
conductivity	----	E100	2.0	µS/cm		887	896	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		82.1	394	----	----	----
pH	----	E108	0.10	pH units		7.75	7.78	----	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		709	620	----	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	----	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298-L	0.0050	mg/L		0.0126	0.0132	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		9.71	9.68	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		1.35	1.38	----	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.50	mg/L		1.43	1.54	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0799	0.156	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		288	294	----	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.721	0.0022	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		0.00178	<0.00010	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00739	0.00030	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.254	0.0208	----	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.072	0.128	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000150 DLM	0.000126	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		32.7	114	----	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.0187	<0.00010	----	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00039	0.00031	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00930	0.00368	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.086	<0.010	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0132	0.0154	----	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		0.118	26.3	----	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW12-07-02	Dup	----	----	----
					Client sampling date / time	09-Feb-2020 10:45	09-Feb-2020	----	----	----
						WR2000032-001	WR2000032-002	--------	--------	--------
						Result	Result	----	----	----
Dissolved Metals										
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.00028	0.562	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.0248	0.0195	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00164	<0.00050	----	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	----	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		28.8	2.58	----	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.00117	0.000893	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		3.84	5.89	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	----	----	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		208	32.5	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.986	3.16	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		9.99	95.6	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		0.00023	<0.00010	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		<0.000010	0.00377	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00684	<0.00050	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		<0.0010	0.0740	----	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	----	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	----	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000050**	Page	: 1 of 10
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 18-Feb-2020 15:40
PO	: ----	Date Analysis Commenced	: 20-Feb-2020
C-O-C number	: 2020-02-18 C	Issue Date	: 04-Mar-2020 17:07
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 17		
No. of samples analysed	: 17		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Aaron Yu	Laboratory Analyst	Metals, Burnaby, British Columbia
Bruna Botti	Analyst	Inorganics - Water Quality, Burnaby, British Columbia
Cristina Alexandre	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Matthew Woods	Lab Assistant	Metals, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Inorganics - Water Quality, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Qualifiers

Qualifier	*Description*
DLA	*Detection Limit adjusted for required dilution.*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW12-05-01	MW12-05-02	MW12-05-03	MW12-05-04	MW12-05-05
					Client sampling date / time	13-Feb-2020 10:55	13-Feb-2020 14:15	13-Feb-2020 14:35	13-Feb-2020 15:25	13-Feb-2020 15:45
						WR2000050-001	WR2000050-002	WR2000050-003	WR2000050-004	WR2000050-005
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, total (as CaCO3)	----	E290-L	1.0	mg/L		114	178	221	252	243
conductivity	----	E100	2.0	µS/cm		2470	2270	1650	535	560
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		1050	1060	774	246	255
pH	----	E108	0.10	pH units		7.72	8.03	7.87	7.94	7.98
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		1940	1860	1250	318	323
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		3.0	3.0	3.0	<3.0	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298-L	0.0050	mg/L		0.0440	0.0176	0.0118	0.0203	0.0080
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		14.1	12.9	7.08	4.77	4.80
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		<0.100 DLDS	<0.100 DLDS	<0.0500 DLDS	0.0201	0.0597
nitrate + nitrite (as N)	----	EC235.N+N	0.50	mg/L		0.11	0.02	0.02	0.03	0.07
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0290	<0.0200 DLDS	<0.0100 DLDS	0.0125	0.0102
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		1270	1180	728	44.4	54.4
Ion Balance										
anion sum	----	EC101	0.10	meq/L		29.1	28.4	19.8	6.10	6.12
cation sum	----	EC101	0.10	meq/L		28.8	27.9	19.7	5.88	5.92
ion balance (cation-anion difference)	----	EC101	0.010	%		0.518	0.888	0.253	1.84	1.66
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0070	0.0053	0.0044	0.0022	0.0022
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00020 DLA	<0.00020 DLA	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00047	0.00044	0.00020	0.00028	0.00013
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0293	0.0620	0.0358	0.0449	0.0660
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000040 DLA	<0.000040 DLA	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000100 DLA	<0.000100 DLA	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.076	0.072	0.051	0.051	0.027
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.000193	<0.0000100 DLA	<0.0000050	<0.0000100 DLM	<0.0000100 DLM
calcium, dissolved	7440-70-2	E421	0.050	mg/L		349	327	190	48.2	51.1
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00034	0.00031	0.00014	0.00038	0.00012
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00020 DLA	<0.00020 DLA	<0.00010	<0.00010	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00079	0.00054	0.00041	0.00030	0.00104

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW12-05-01	MW12-05-02	MW12-05-03	MW12-05-04	MW12-05-05
					Client sampling date / time	13-Feb-2020 10:55	13-Feb-2020 14:15	13-Feb-2020 14:35	13-Feb-2020 15:25	13-Feb-2020 15:45
						WR2000050-001	WR2000050-002	WR2000050-003	WR2000050-004	WR2000050-005
						Result	Result	Result	Result	Result
Dissolved Metals										
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.061	0.026	0.621	0.020	0.011
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000100 DLA	<0.000100 DLA	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0066	0.0044	0.0026	0.0027	0.0031
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		43.8	58.9	72.5	30.6	30.9
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.170	0.755	1.95	0.121	0.150
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.000233	0.000173	0.000702	0.00268	0.00522
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00100 DLA	<0.00100 DLA	<0.00050	<0.00050	<0.00050
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.100 DLA	<0.100 DLA	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		3.77	3.92	3.61	2.14	2.13
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000186	0.000402	0.000059	0.000850	0.000217
silicon, dissolved	7440-21-3	E421	0.050	mg/L		7.18	6.76	6.83	5.97	5.84
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000020 DLA	<0.000020 DLA	<0.000010	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		175	152	93.7	20.6	17.6
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		10.0	12.1	6.81	0.992	0.893
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		460	419	262	18.7	18.9
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000020 DLA	<0.000020 DLA	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00020 DLA	<0.00020 DLA	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00060 DLA	<0.00060 DLA	<0.00030	<0.00030	<0.00030
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000862	0.000823	0.00270	0.00305	0.00367
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00100 DLA	<0.00100 DLA	<0.00050	0.00057	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0268	<0.0020 DLA	<0.0010	0.0011	0.0039
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00040 DLA	<0.00040 DLA	<0.00020	<0.00020	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW12-05-06	MW12-05-07	DUP	MW17-12-01	MW17-12-02
					Client sampling date / time	13-Feb-2020 16:10	13-Feb-2020 16:55	13-Feb-2020	14-Feb-2020 11:45	14-Feb-2020 14:25
						WR2000050-006	WR2000050-007	WR2000050-008	WR2000050-009	WR2000050-010
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, total (as CaCO3)	----	E290-L	1.0	mg/L		249	241	114	198	212
conductivity	----	E100	2.0	µS/cm		569	563	2400	2480	2320
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		258	263	1040	944	832
pH	----	E108	0.10	pH units		7.95	7.92	7.63	7.91	7.82
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		331	329	1940	1980	1800
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	3.6	4.8	6.5	5.5
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298-L	0.0050	mg/L		0.0059	0.258	0.0596	0.0121	<0.0050
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		4.88	5.62	13.8	12.3	11.3
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.0870	0.0058	<0.100 DLDS	<0.100 DLDS	<0.100 DLDS
nitrate + nitrite (as N)	----	EC235.N+N	0.50	mg/L		0.12	0.008	0.07	0.05	0.02
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0282	0.0023	0.0271	0.0205	<0.0200 DLDS
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		56.1	53.8	1270	1230	1090
Ion Balance										
anion sum	----	EC101	0.10	meq/L		6.28	6.10	29.2	29.9	27.2
cation sum	----	EC101	0.10	meq/L		6.02	6.19	28.3	30.1	27.4
ion balance (cation-anion difference)	----	EC101	0.010	%		2.11	0.732	1.56	0.333	0.366
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0017	<0.0010	0.0049	<0.0020 DLA	0.0023
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00020 DLA	<0.00020 DLA	<0.00020 DLA
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00033	0.00123	0.00050	0.00191	0.00236
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0686	0.102	0.0291	0.00740	0.00656
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000040 DLA	0.000073	0.000046
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000100 DLA	<0.000100 DLA	<0.000100 DLA
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.061	0.026	0.076	0.156	0.140
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000418	0.0000177	0.000148	0.000151	0.0000241
calcium, dissolved	7440-70-2	E421	0.050	mg/L		53.8	55.4	346	291	254
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00030	0.00026	0.00027	0.00028	<0.00020 DLA
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00020	<0.00010	<0.00020 DLA	<0.00020 DLA	<0.00020 DLA
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00134	0.00036	0.00068	0.00146	0.00078
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.014	1.50	0.060	2.57	2.16

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW12-05-06	MW12-05-07	DUP	MW17-12-01	MW17-12-02
					Client sampling date / time	13-Feb-2020 16:10	13-Feb-2020 16:55	13-Feb-2020	14-Feb-2020 11:45	14-Feb-2020 14:25
						WR2000050-006	WR2000050-007	WR2000050-008	WR2000050-009	WR2000050-010
						Result	Result	Result	Result	Result
Dissolved Metals										
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000100 DLA	<0.000100 DLA	<0.000100 DLA
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0032	0.0030	0.0066	0.0132	0.0122
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		30.1	30.4	42.2	52.8	47.8
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.222	0.159	0.170	0.0924	0.0570
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00507	0.00284	0.000238	0.00784	0.00734
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00115	<0.00050	<0.00100 DLA	<0.00100 DLA	<0.00100 DLA
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	0.060	<0.100 DLA	<0.100 DLA	<0.100 DLA
potassium, dissolved	7440-09-7	E421	0.100	mg/L		2.08	2.16	3.63	3.42	3.33
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000222	0.000278	0.000832	0.000193	0.000119
silicon, dissolved	7440-21-3	E421	0.050	mg/L		5.91	6.53	7.13	6.95	7.25
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000020 DLA	<0.000020 DLA	<0.000020 DLA
sodium, dissolved	7440-23-5	E421	0.050	mg/L		17.8	17.7	172	253	243
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.846	0.823	10.1	9.55	10.5
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		19.5	19.0	459	432	381
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000020 DLA	<0.000020 DLA	<0.000020 DLA
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00020 DLA	<0.00020 DLA	<0.00020 DLA
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00060 DLA	<0.00060 DLA	<0.00060 DLA
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00362	0.00162	0.000837	0.000266	0.000491
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00100 DLA	<0.00100 DLA	<0.00100 DLA
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0435	0.0047	0.0208	0.0751	0.0255
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00040 DLA	<0.00040 DLA	<0.00040 DLA
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-12-03	MW17-12-04	MW17-12-05	MW17-12-06	MW17-12-07
					Client sampling date / time	14-Feb-2020 14:55	14-Feb-2020 15:20	14-Feb-2020 15:40	14-Feb-2020 16:00	14-Feb-2020 16:35
						WR2000050-011	WR2000050-012	WR2000050-013	WR2000050-014	WR2000050-015
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, total (as CaCO3)	----	E290-L	1.0	mg/L		304	304	326	334	256
conductivity	----	E100	2.0	µS/cm		809	763	757	752	584
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		331	342	357	356	282
pH	----	E108	0.10	pH units		8.01	8.08	8.07	8.04	8.03
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		502	454	450	453	352
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	<3.0	<3.0	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298-L	0.0050	mg/L		0.0068	<0.0050	<0.0050	<0.0050	<0.0050
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		1.89	1.84	2.67	2.91	5.19
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		<0.0250 DLDS	0.137	0.271	0.253	0.495
nitrate + nitrite (as N)	----	EC235.N+N	0.50	mg/L		0.007	0.14	0.27	0.26	0.50
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0050 DLDS	<0.0050 DLDS	<0.0050 DLDS	<0.0050 DLDS	<0.0010
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		122	102	86.4	84.8	62.2
Ion Balance										
anion sum	----	EC101	0.10	meq/L		8.66	8.27	8.42	8.55	6.58
cation sum	----	EC101	0.10	meq/L		9.42	8.60	8.58	8.55	6.62
ion balance (cation-anion difference)	----	EC101	0.010	%		4.20	1.96	0.941	<0.010	0.303
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0017	0.0020	0.0024	0.0033	0.0028
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00104	0.00019	0.00013	0.00017	0.00017
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0136	0.0200	0.0490	0.0481	0.0201
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.048	0.037	0.030	0.030	0.022
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000218	0.0000207	0.0000308	<0.0000300 DLM	<0.0000200 DLM
calcium, dissolved	7440-70-2	E421	0.050	mg/L		76.2	59.9	60.2	61.6	48.6
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	0.00012	0.00018	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00030	0.00116	0.00299	0.00332	0.00080
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.084	<0.010	<0.010	<0.010	<0.010

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-12-03	MW17-12-04	MW17-12-05	MW17-12-06	MW17-12-07
					Client sampling date / time	14-Feb-2020 14:55	14-Feb-2020 15:20	14-Feb-2020 15:40	14-Feb-2020 16:00	14-Feb-2020 16:35
						WR2000050-011	WR2000050-012	WR2000050-013	WR2000050-014	WR2000050-015
						Result	Result	Result	Result	Result
Dissolved Metals										
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0074	0.0064	0.0069	0.0079	0.0053
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		34.2	46.8	50.2	49.1	39.0
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.110	0.00208	0.104	0.111	0.00144
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00555	0.00491	0.0101	0.0189	0.00605
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	<0.00050	0.00214	0.00230	<0.00050
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		2.82	2.98	3.75	4.11	2.57
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000083	0.000444	0.000173	0.000122	0.000188
silicon, dissolved	7440-21-3	E421	0.050	mg/L		7.38	6.97	6.76	6.89	6.44
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	0.000014	<0.000010	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		62.5	38.5	30.7	30.2	21.0
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		3.36	1.34	1.52	1.50	1.02
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		41.6	36.6	30.8	30.3	21.7
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00421	0.00393	0.00400	0.00371	0.00271
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	0.00053	0.00062
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0189	0.0171	0.0239	0.0219	0.0193
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-12-08	DUP	----	----	----
					Client sampling date / time	14-Feb-2020 17:00	14-Feb-2020	----	----	----
						WR2000050-016	WR2000050-017	--------	--------	--------
						Result	Result	----	----	----
Physical Tests										
alkalinity, total (as CaCO3)	----	E290-L	1.0	mg/L		252	193	----	----	----
conductivity	----	E100	2.0	µS/cm		590	2500	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		272	949	----	----	----
pH	----	E108	0.10	pH units		7.99	7.88	----	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		347	2000	----	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	7.5	----	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298-L	0.0050	mg/L		0.0053	<0.0050	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		5.12	12.0	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.504	<0.100 DLDS	----	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.50	mg/L		0.50	0.03	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	<0.0200 DLDS	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		62.6	1240	----	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		6.52	30.1	----	----	----
cation sum	----	EC101	0.10	meq/L		6.43	30.3	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		0.695	0.331	----	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0013	<0.0020 DLA	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00020 DLA	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00015	0.00185	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0204	0.00745	----	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	0.000062	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000100 DLA	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.023	0.155	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000313	0.000139	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		47.0	290	----	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	0.00030	----	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00020 DLA	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00089	0.00129	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	2.64	----	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-12-08	DUP	----	----	----
					Client sampling date / time	14-Feb-2020 17:00	14-Feb-2020	----	----	----
						WR2000050-016	WR2000050-017	--------	--------	--------
						Result	Result	----	----	----
Dissolved Metals										
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000100 DLA	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0053	0.0131	----	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		37.5	54.4	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.00046	0.0947	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00717	0.00790	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	<0.00100 DLA	----	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.100 DLA	----	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		2.59	3.53	----	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000206	<0.000100 DLA	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		6.48	7.19	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000020 DLA	----	----	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		21.2	255	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.979	9.81	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		21.8	435	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000020 DLA	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00020 DLA	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00060 DLA	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00279	0.000262	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00063	<0.00100 DLA	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0203	0.0751	----	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00040 DLA	----	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	----	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000058**	Page	: 1 of 4
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 25-Feb-2020 15:00
PO	: 232818	Date Analysis Commenced	: 26-Feb-2020
C-O-C number	: 2020-02-25 D	Issue Date	: 04-Mar-2020 17:16
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 2		
No. of samples analysed	: 2		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Bruna Botti	Analyst	Inorganics - Water Quality, Burnaby, British Columbia
Cristina Alexandre	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Ilnaz Badbezanchi	Team Leader - Metals preparation	Metals, Burnaby, British Columbia
Shaneel Dayal	Metal Analyst	Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics - Water Quality, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW 09-03-01	MW 09-03-02	----	----	----
					Client sampling date / time	23-Feb-2020 09:10	22-Feb-2020 17:35	----	----	----
						WR2000058-001	WR2000058-002	--------	--------	--------
						Result	Result	----	----	----
Physical Tests										
alkalinity, total (as CaCO3)	----	E290-L	1.0	mg/L		154	138	----	----	----
conductivity	----	E100	2.0	µS/cm		309	314	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		164	171	----	----	----
pH	----	E108	0.10	pH units		8.08	8.02	----	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		194	207	----	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		3.5	7.7	----	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298-L	0.0050	mg/L		0.0356	0.0100	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.43	0.90	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.0149	6.79	----	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.500	mg/L		<0.500	6.92	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0463	0.134	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		17.4	6.40	----	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		3.46	3.41	----	----	----
cation sum	----	EC101	0.10	meq/L		3.75	3.76	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		4.02	4.88	----	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0018	0.0014	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		0.00010	0.00017	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00094	<0.00010	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0674	0.0150	----	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.100	0.299	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.00104	0.000185	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		45.4	56.7	----	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	0.00029	----	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00110	0.00149	----	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW 09-03-01	MW 09-03-02	----	----	----
					Client sampling date / time	23-Feb-2020 09:10	22-Feb-2020 17:35	----	----	----
						WR2000058-001	WR2000058-002	--------	--------	--------
						Result	Result	----	----	----
Dissolved Metals										
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.323	<0.010	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0039	0.0014	----	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		12.4	7.19	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0789	0.00185	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00489	0.00500	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00061	<0.00050	----	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	----	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		2.09	2.05	----	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000050	0.000324	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		5.37	5.24	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	----	----	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		8.63	6.22	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		1.15	0.394	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		5.70	2.26	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000926	0.00192	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0161	0.0524	----	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	----	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	----	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000084**	Page	: 1 of 6
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 11-Mar-2020 15:32
PO	: 232818 (GW)	Date Analysis Commenced	: 13-Mar-2020
C-O-C number	: 2020-03-10 B	Issue Date	: 18-Mar-2020 14:30
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 7		
No. of samples analysed	: 7		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Angelo Salandanan	Lab Assistant	Metals, Burnaby, British Columbia
Cindy Tang	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Cristina Alexandre	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Erick Magalhaes	Laboratory Analyst	Inorganics - Water Quality, Burnaby, British Columbia
Evan Ben-Oliel	Metal Analyst	Metals, Burnaby, British Columbia
Kinny Wu	Laboratory Analyst	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia

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Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
µS/cm	Microsiemens per centimetre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

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UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-11-01	MW17-11-02	MW17-11-03	MW17-10-01	MW17-10-02
					Client sampling date / time	05-Mar-2020 10:20	05-Mar-2020 11:00	05-Mar-2020 11:35	07-Mar-2020 10:55	07-Mar-2020 11:20
						WR2000084-001	WR2000084-002	WR2000084-003	WR2000084-004	WR2000084-005
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		174	151	171	131	114
conductivity	----	E100	2.0	µS/cm		337	351	309	439	519
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		134	150	151	212	246
pH	----	E108	0.10	pH units		8.11	8.07	8.11	8.05	7.94
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		230	222	200	292	361
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	3.5	<3.0	<3.0	3.1
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0068	<0.0050	<0.0050	0.0205	0.620
bromide	24959-67-9	E235.Br-L	0.050	mg/L		0.137	<0.050	<0.050	0.234	<0.050
chloride	16887-00-6	E235.Cl	0.50	mg/L		<0.50	<0.50	0.50	0.81	1.22
fluoride	16984-48-8	E235.F	0.020	mg/L		2.13	2.06	1.56	0.601	0.422
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		<0.0050	<0.0050	<0.0050	15.0	34.4
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	<0.0010	<0.0010	0.0072	<0.0010
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		37.2	42.0	16.4	47.4	27.5
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0044	0.0012	0.0044	0.0035	0.0020
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00184	0.00130	0.00039	0.00018	0.00020
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0382	0.0392	0.0601	0.0263	0.0357
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.034	0.025	0.016	0.016	0.010
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000576	0.0000463	0.000306	0.000190	0.000121
calcium, dissolved	7440-70-2	E421	0.050	mg/L		36.9	41.6	40.5	54.6	67.1
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00054	0.00054
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00042	<0.00020	0.00130	0.00429	0.00132
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.187	0.120	0.014	<0.010	<0.010
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0085	0.0072	0.0057	0.0022	0.0018

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-11-01	MW17-11-02	MW17-11-03	MW17-10-01	MW17-10-02
					Client sampling date / time	05-Mar-2020 10:20	05-Mar-2020 11:00	05-Mar-2020 11:35	07-Mar-2020 10:55	07-Mar-2020 11:20
						WR2000084-001	WR2000084-002	WR2000084-003	WR2000084-004	WR2000084-005
						Result	Result	Result	Result	Result
Dissolved Metals										
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		10.0	11.3	12.2	18.2	19.2
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0387	0.0451	0.0990	0.0255	0.00210
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00993	0.00591	0.00458	0.0141	0.00710
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00061	<0.00050	<0.00050	0.0119	0.00153
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	1.03
potassium, dissolved	7440-09-7	E421	0.100	mg/L		1.88	2.06	2.41	1.43	1.85
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000386	0.000223	0.000221	0.00171	0.00370
silicon, dissolved	7440-21-3	E421	0.050	mg/L		5.45	5.26	4.98	5.46	5.41
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		22.3	17.3	10.2	9.07	7.62
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.967	1.06	1.03	1.27	1.14
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		12.2	12.9	5.49	15.2	9.04
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000185	0.000237	0.00203	0.00248	0.00138
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	0.00096	0.00060
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0165	0.0251	0.0416	0.0408	0.0300
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-10-03	DUP	----	----	----
					Client sampling date / time	07-Mar-2020 11:55	05-Mar-2020	----	----	----
						WR2000084-006	WR2000084-007	--------	--------	--------
						Result	Result	----	----	----
Physical Tests										
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		116	143	----	----	----
conductivity	----	E100	2.0	µS/cm		526	349	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		255	139	----	----	----
pH	----	E108	0.10	pH units		7.99	8.05	----	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		366	216	----	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	6.3	----	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.207	<0.0050	----	----	----
bromide	24959-67-9	E235.Br-L	0.050	mg/L		<0.050	0.136	----	----	----
chloride	16887-00-6	E235.Cl	0.50	mg/L		1.24	1.54	----	----	----
fluoride	16984-48-8	E235.F	0.020	mg/L		0.370	2.13	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		34.5	0.0124	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	0.0028	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		27.5	37.9	----	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0014	0.0040	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00014	0.00196	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0370	0.0396	----	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		<0.010	0.028	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000944	0.0000224	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		71.2	38.6	----	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	----	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00035	<0.00010	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00120	<0.00020	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	0.202	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0018	0.0073	----	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		18.8	10.4	----	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-10-03	DUP	----	----	----
					Client sampling date / time	07-Mar-2020 11:55	05-Mar-2020	----	----	----
						WR2000084-006	WR2000084-007	--------	--------	--------
						Result	Result	----	----	----
Dissolved Metals										
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.00198	0.0399	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00664	0.00997	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00209	0.00051	----	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		0.385	<0.050	----	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		1.89	1.84	----	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.00404	0.000531	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		5.38	5.53	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		0.000016	<0.000010	----	----	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		7.46	22.8	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		1.08	0.984	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		9.16	12.8	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00143	0.000188	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00064	<0.00050	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0266	0.0166	----	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	----	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	----	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000101**	Page	: 1 of 6
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 17-Mar-2020 14:11
PO	: 232818 (GW)	Date Analysis Commenced	: 18-Mar-2020
C-O-C number	: 20200317B	Issue Date	: 31-Mar-2020 16:50
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 10		
No. of samples analysed	: 10		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Bruna Botti	Analyst	Inorganics - Water Quality, Burnaby, British Columbia
Cindy Tang	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Cristina Alexandre	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Evan Ben-Oliel	Metal Analyst	Metals, Burnaby, British Columbia
Ilnaz Badbezanchi	Team Leader - Metals preparation	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-08-01	MW17-08-02	MW17-08-03	MW12-06-01	MW12-06-02
					Client sampling date / time	13-Mar-2020 09:00	13-Mar-2020 09:50	13-Mar-2020 10:25	14-Mar-2020 11:35	14-Mar-2020 12:40
						WR2000101-001	WR2000101-002	WR2000101-003	WR2000101-004	WR2000101-005
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		227	165	88.1	488	366
conductivity	----	E100	2.0	µS/cm		460	305	185	1120	1000
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		222	141	81.2	438	500
pH	----	E108	0.10	pH units		7.80	7.86	7.89	7.03	7.46
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		265	178	103	648	666
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	<3.0	<3.0	19.5
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		227	165	88.1	488	366
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0218	<0.0050	<0.0050	0.850	0.0399
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.57	0.48	0.61	5.04	0.55
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.425	0.632	0.618	0.256	0.0304
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		0.429	0.635	0.622	0.612	0.138
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0035	0.0035	0.0036	0.355	0.108
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		31.2	9.76	2.70	85.0	198
Ion Balance										
anion sum	----	EC101	0.10	meq/L		5.23	3.56	1.88	11.7	11.5
cation sum	----	EC101	0.10	meq/L		4.83	3.07	1.80	12.2	11.9
ion balance (cation-anion difference)	----	EC101	0.010	%		3.98	7.39	2.17	2.09	1.71
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		<0.0010	0.0018	0.0048	0.0326	<0.0010
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00049	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		<0.00010	0.00018	0.00011	0.0178	0.00381
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.00736	0.0865	0.0459	0.274	0.0285
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	0.000232	0.000043
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.022	0.010	<0.010	1.25	0.115
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.000161	0.000104	0.000109	0.0000288	0.0000061

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-08-01	MW17-08-02	MW17-08-03	MW12-06-01	MW12-06-02
					Client sampling date / time	13-Mar-2020 09:00	13-Mar-2020 09:50	13-Mar-2020 10:25	14-Mar-2020 11:35	14-Mar-2020 12:40
						WR2000101-001	WR2000101-002	WR2000101-003	WR2000101-004	WR2000101-005
						Result	Result	Result	Result	Result
Dissolved Metals										
calcium, dissolved	7440-70-2	E421	0.050	mg/L		43.3	32.0	22.4	130	131
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	0.00011	0.00490	<0.00010
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00076	0.00267	0.00073	0.00035	<0.00020
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	<0.010	0.010	0.191	1.02
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0020	<0.0010	<0.0010	0.0122	0.0085
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		27.8	14.8	6.16	27.6	42.1
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.00131	0.00119	0.00093	0.295	0.0244
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00954	0.00307	0.000777	0.00265	0.0106
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	0.00084	<0.00050
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		0.067	<0.050	<0.050	0.070	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		1.95	1.15	1.10	3.60	3.83
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000475	0.000470	0.000202	0.00341	0.000169
silicon, dissolved	7440-21-3	E421	0.050	mg/L		5.49	4.98	4.06	8.88	10.7
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	0.000011
sodium, dissolved	7440-23-5	E421	0.050	mg/L		7.47	4.99	3.05	75.6	40.4
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		6.60	0.993	0.293	5.80	9.83
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		11.8	4.11	1.16	73.7	75.6
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00032	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	0.00370	<0.00030
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000236	0.000157	0.000092	0.000563	0.00275
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	0.00077	0.00099	0.0185	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0410	0.0185	0.0272	0.0072	0.0043
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	0.00115	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW12-06-03	MW12-06-04	MW12-06-05	MW12-06-06	DUP
					Client sampling date / time	14-Mar-2020 13:05	14-Mar-2020 13:30	14-Mar-2020 13:55	14-Mar-2020 14:15	14-Mar-2020
						WR2000101-006	WR2000101-007	WR2000101-008	WR2000101-009	WR2000101-010
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		386	403	403	322	244
conductivity	----	E100	2.0	µS/cm		985	1010	1010	859	466
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		445	481	474	387	225
pH	----	E108	0.10	pH units		7.68	7.60	7.63	7.67	7.96
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		618	647	637	529	275
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	<3.0	<3.0	<3.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		386	403	403	322	244
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0695	0.0085	0.0081	<0.0050	0.0291
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.53	0.57	0.53	7.18	0.57
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.0463	0.0457	0.0501	0.643	0.411
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		0.198	0.196	0.204	0.696	0.415
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.152	0.150	0.153	0.0527	0.0034
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		171	181	177	147	30.3
Ion Balance										
anion sum	----	EC101	0.10	meq/L		11.3	11.9	11.8	9.74	5.55
cation sum	----	EC101	0.10	meq/L		10.7	11.4	11.2	9.26	4.89
ion balance (cation-anion difference)	----	EC101	0.010	%		2.73	2.14	2.61	2.53	6.32
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		<0.0010	0.0014	<0.0010	0.0053	<0.0010
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00060	0.00259	0.00058	<0.00010	<0.00010
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0220	0.0161	0.0383	0.0130	0.00685
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	0.000029	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.129	0.125	0.124	0.066	0.022
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	0.0000091	0.000146
calcium, dissolved	7440-70-2	E421	0.050	mg/L		95.0	96.5	92.5	73.0	43.6

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW12-06-03	MW12-06-04	MW12-06-05	MW12-06-06	DUP
					Client sampling date / time	14-Mar-2020 13:05	14-Mar-2020 13:30	14-Mar-2020 13:55	14-Mar-2020 14:15	14-Mar-2020
						WR2000101-006	WR2000101-007	WR2000101-008	WR2000101-009	WR2000101-010
						Result	Result	Result	Result	Result
Dissolved Metals										
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00015	0.00012	<0.00010	<0.00010	<0.00010
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	0.00112	<0.00010	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	0.00051	0.00071
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.631	0.787	0.120	0.020	<0.010
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0074	0.0064	0.0061	0.0050	0.0020
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		50.4	58.4	59.0	49.7	28.1
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0126	0.0416	0.377	0.0400	0.00127
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00108	0.00889	0.0102	0.00616	0.00914
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	<0.00050	0.00059	<0.00050	<0.00050
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		3.93	3.87	3.90	3.54	1.93
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	0.000310	0.000438
silicon, dissolved	7440-21-3	E421	0.050	mg/L		9.80	9.37	8.85	7.39	5.33
silver, dissolved	7440-22-4	E421	0.000010	mg/L		0.000016	0.000012	0.000010	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		37.7	37.2	37.3	32.9	7.62
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		4.84	3.26	2.83	1.62	6.50
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		67.2	68.0	66.9	56.9	11.6
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	0.00042	<0.00030
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00190	0.00565	0.00581	0.00400	0.000228
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0040	0.0100	0.0150	0.0211	0.0416
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000113**	Page	: 1 of 4
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 25-Mar-2020 15:30
PO	: 232818	Date Analysis Commenced	: 25-Mar-2020
C-O-C number	: 2020-03-24 B	Issue Date	: 31-Mar-2020 16:56
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 4		
No. of samples analysed	: 4		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Bruna Botti	Analyst	Inorganics - Water Quality, Burnaby, British Columbia
Cristina Alexandre	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Evan Ben-Oliel	Metal Analyst	Metals, Burnaby, British Columbia
Ilnaz Badbezanchi	Team Leader - Metals preparation	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Qualifiers

Qualifier	*Description*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW09-03-01	MW09-03-02	MW12-07-01	MW12-07-02	----
					Client sampling date / time	19-Mar-2020 15:40	19-Mar-2020 16:10	20-Mar-2020 14:00	20-Mar-2020 14:30	----
						WR2000113-001	WR2000113-002	WR2000113-003	WR2000113-004	--------
						Result	Result	Result	Result	----
Physical Tests										
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		154	126	129	198	----
conductivity	----	E100	2.0	µS/cm		316	291	1370	923	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		142	129	568	412	----
pH	----	E108	0.10	pH units		8.12	8.04	8.02	8.07	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		185	178	1030	629	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	3.2	<3.0	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	----
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		154	126	129	198	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0391	0.0078	0.124	0.0104	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.34	0.84	1.82	9.98	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.0277	5.96	0.639	1.41	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		0.154	6.00	2.30	1.52	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.126	0.0348	1.66	0.115	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		17.9	6.22	631	296	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		3.47	3.11	15.9	10.5	----
cation sum	----	EC101	0.10	meq/L		3.28	2.86	15.0	9.75	----
ion balance (cation-anion difference)	----	EC101	0.010	%		2.81	4.19	2.91	3.70	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0012	0.0198	0.0015	0.0055	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		0.00010	0.00013	0.00037	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00125	0.00026	0.00837	0.00060	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0655	0.0174	0.0175	0.0235	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.177	0.159	1.08	0.121	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000100 DLM	0.0000759	<0.0000200 DLM	0.0000988	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW09-03-01	MW09-03-02	MW12-07-01	MW12-07-02	----
					Client sampling date / time	19-Mar-2020 15:40	19-Mar-2020 16:10	20-Mar-2020 14:00	20-Mar-2020 14:30	----
						WR2000113-001	WR2000113-002	WR2000113-003	WR2000113-004	--------
						Result	Result	Result	Result	----
Dissolved Metals										
calcium, dissolved	7440-70-2	E421	0.050	mg/L		37.6	41.8	188	115	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00036	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		<0.00020	0.00732	<0.00020	0.00626	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.301	0.043	0.221	<0.010	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	0.000066	<0.000050	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0038	0.0014	0.0202	0.0163	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		11.8	6.01	23.7	30.4	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0788	0.00497	0.0867	0.578	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00436	0.00393	0.0211	0.0194	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		2.00	2.01	2.42	2.86	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000079	0.000315	0.000714	0.000445	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		5.22	4.94	6.49	6.41	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		8.20	4.78	80.8	32.6	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.932	0.320	8.88	3.20	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		5.53	1.77	214	97.5	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	0.00132	<0.00030	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000758	0.00165	0.000201	0.00408	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0074	0.0363	0.0901	0.0306	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000139**	Page	: 1 of 4
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 21-Apr-2020 15:25
PO	: ----	Date Analysis Commenced	: 23-Apr-2020
C-O-C number	: 2020-04-21 B	Issue Date	: 29-Apr-2020 16:48
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 5		
No. of samples analysed	: 5		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Aaron Yu	Laboratory Analyst	Metals, Burnaby, British Columbia
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Bruna Botti	Analyst	Inorganics - Water Quality, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Kinny Wu	Laboratory Analyst	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Matthew Woods	Lab Assistant	Metals, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

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UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Qualifiers

Qualifier	*Description*
DLA	*Detection Limit adjusted for required dilution.*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW12-07-01	MW12-07-02	MW09-03-01	MW09-03-02	Dup
					Client sampling date / time	17-Apr-2020 09:10	17-Apr-2020 09:40	17-Apr-2020 11:15	17-Apr-2020 12:00	17-Apr-2020
						WR2000139-001	WR2000139-002	WR2000139-003	WR2000139-004	WR2000139-005
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		122	193	149	118	153
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		122	193	149	118	153
conductivity	----	E100	2.0	µS/cm		1340	920	307	273	309
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		675	523	176	159	180
pH	----	E108	0.10	pH units		7.93	7.99	8.08	8.00	8.07
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		1090	678	195	183	200
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	<3.0	<3.0	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.118	0.0087	0.0363	0.0056	0.0307
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		1.98	10.3	0.34	0.85	0.38
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.510	1.45	0.0058	5.67	0.0162
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		1.85	1.54	0.0734	5.69	0.0813
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		1.34	0.0932	0.0676	0.0135	0.0651
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		638	297	17.3	6.08	17.4
Ion Balance										
anion sum	----	EC101	0.10	meq/L		15.9	10.4	3.35	2.90	3.43
cation sum	----	EC101	0.10	meq/L		17.8	12.3	4.03	3.50	4.14
ion balance (cation-anion difference)	----	EC101	0.010	%		5.64	8.37	9.21	9.38	9.38
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0022	0.0023	0.0019	0.0018	0.0015
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		0.00028	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00609	0.00026	0.00091	0.00011	0.00090
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0174	0.0250	0.0696	0.0171	0.0684
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000040 DLA	<0.000020	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000100 DLA	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.830	0.106	0.125	0.102	0.119
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000300 DLM	0.000122	0.0000178	0.000161	<0.0000200 DLM

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW12-07-01	MW12-07-02	MW09-03-01	MW09-03-02	Dup
					Client sampling date / time	17-Apr-2020 09:10	17-Apr-2020 09:40	17-Apr-2020 11:15	17-Apr-2020 12:00	17-Apr-2020
						WR2000139-001	WR2000139-002	WR2000139-003	WR2000139-004	WR2000139-005
						Result	Result	Result	Result	Result
Dissolved Metals										
calcium, dissolved	7440-70-2	E421	0.050	mg/L		227	150	47.6	51.9	49.4
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00020 DLA	<0.00010	<0.00010	<0.00010	<0.00010
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00020 DLA	0.00038	<0.00010	<0.00010	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00104	0.00734	<0.00020	0.00131	0.00022
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.201	<0.010	0.332	<0.010	0.282
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000100 DLA	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0192	0.0163	0.0035	0.0012	0.0036
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		26.5	36.0	13.9	7.23	13.9
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0941	0.731	0.0916	0.00425	0.0933
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.0204	0.0188	0.00445	0.00416	0.00438
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00100 DLA	<0.00050	<0.00050	<0.00050	<0.00050
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.100 DLA	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		2.33	3.06	2.16	2.20	2.26
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000902	0.000548	0.000067	0.000336	0.000059
silicon, dissolved	7440-21-3	E421	0.050	mg/L		6.55	6.53	5.21	4.79	5.21
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000020 DLA	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		97.4	40.3	9.88	5.71	10.4
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		9.75	3.90	1.11	0.396	1.12
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		218	94.7	5.20	1.87	5.38
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000020 DLA	<0.000010	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00020 DLA	<0.00010	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00060 DLA	<0.00030	<0.00030	<0.00030	<0.00030
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000191	0.00436	0.000691	0.00156	0.000704
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00100 DLA	0.00050	<0.00050	<0.00050	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.112	0.0343	0.0036	0.0294	0.0044
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00040 DLA	<0.00020	<0.00020	<0.00020	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000159**	Page	: 1 of 6
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 28-Apr-2020 14:00
PO	: 232818 (GW)	Date Analysis Commenced	: 30-Apr-2020
C-O-C number	: 2020-04-28 B	Issue Date	: 05-May-2020 16:42
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 7		
No. of samples analysed	: 7		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Aaron Yu	Laboratory Analyst	Metals, Burnaby, British Columbia
Bruna Botti	Analyst	Inorganics - Water Quality, Burnaby, British Columbia
Cristina Alexandre	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Evan Ben-Oliel	Metal Analyst	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Matthew Woods	Lab Assistant	Metals, Burnaby, British Columbia
Owen Cheng		Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics - Water Quality, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Qualifiers

Qualifier	*Description*
DLA	*Detection Limit adjusted for required dilution.*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW12-05-01	MW12-05-02	MW12-05-03	MW12-05-04	MW12-05-05
					Client sampling date / time	25-Apr-2020 09:00	25-Apr-2020 09:30	25-Apr-2020 10:15	25-Apr-2020 10:55	25-Apr-2020 11:20
						WR2000159-001	WR2000159-002	WR2000159-003	WR2000159-004	WR2000159-005
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		120	154	195	225	233
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	5.2	<1.0	20.4	19.4
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	2.6	<1.0	10.2	9.7
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		120	159	195	245	252
conductivity	----	E100	2.0	µS/cm		2460	2390	1670	556	570
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		1000	1020	740	234	248
pH	----	E108	0.10	pH units		8.25	8.33	8.27	8.59	8.56
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		1980	1880	1220	316	328
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		7.4	<3.0	<3.0	3.6	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0210	0.0143	0.0155	0.0133	0.0060
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		13.8	12.7	6.74	4.64	4.90
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		<0.0500 DLDS	<0.100 DLDS	<0.0250 DLDS	0.0408	0.0300
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		<0.0510	<0.102	<0.0500	<0.0500	<0.0500
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0100 DLDS	<0.0200 DLDS	<0.0050 DLDS	<0.0010	0.0049
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		1340	1240	735	50.9	56.0
Ion Balance										
anion sum	----	EC101	0.10	meq/L		30.7	29.3	19.4	6.09	6.35
cation sum	----	EC101	0.10	meq/L		27.0	26.7	18.6	5.53	5.72
ion balance (cation-anion difference)	----	EC101	0.010	%		6.41	4.64	2.10	4.82	5.22
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0167	0.0053	0.0055	0.0024	0.0034
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00020 DLA	<0.00020 DLA	<0.00020 DLA	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00060	0.00035	<0.00020 DLA	0.00013	0.00014
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0298	0.0510	0.0354	0.0380	0.0688
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000040 DLA	<0.000040 DLA	<0.000040 DLA	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000100 DLA	<0.000100 DLA	<0.000100 DLA	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.076	0.070	0.064	0.046	0.041
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000100 DLA	<0.0000100 DLA	<0.0000100 DLA	<0.0000100 DLM	0.0000181

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW12-05-01	MW12-05-02	MW12-05-03	MW12-05-04	MW12-05-05
					Client sampling date / time	25-Apr-2020 09:00	25-Apr-2020 09:30	25-Apr-2020 10:15	25-Apr-2020 10:55	25-Apr-2020 11:20
						WR2000159-001	WR2000159-002	WR2000159-003	WR2000159-004	WR2000159-005
						Result	Result	Result	Result	Result
Dissolved Metals										
calcium, dissolved	7440-70-2	E421	0.050	mg/L		331	312	180	46.7	50.5
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00020 DLA	<0.00020 DLA	<0.00020 DLA	<0.00010	<0.00010
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00020 DLA	<0.00020 DLA	<0.00020 DLA	<0.00010	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00050	<0.00040 DLA	<0.00040 DLA	0.00038	0.00110
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.067	0.077	0.552	0.026	0.014
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000100 DLA	<0.000100 DLA	<0.000100 DLA	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0070	0.0045	0.0027	0.0032	0.0035
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		42.2	58.0	70.5	28.4	29.7
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.171	0.759	1.94	0.0903	0.155
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.000302	0.000373	0.000629	0.00378	0.00523
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00100 DLA	<0.00100 DLA	<0.00100 DLA	<0.00050	0.00052
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.100 DLA	<0.100 DLA	<0.100 DLA	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		3.70	3.90	3.68	2.17	2.22
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.00327	0.00123	0.000541	0.00184	0.000104
silicon, dissolved	7440-21-3	E421	0.050	mg/L		7.46	7.00	7.01	6.51	6.27
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000020 DLA	<0.000020 DLA	<0.000020 DLA	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		158	142	83.4	18.3	15.8
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		10.2	12.3	7.17	1.02	0.922
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		458	424	255	19.8	18.4
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000020 DLA	<0.000020 DLA	<0.000020 DLA	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00020 DLA	<0.00020 DLA	<0.00020 DLA	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00060 DLA	<0.00060 DLA	<0.00060 DLA	<0.00030	<0.00030
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000863	0.00104	0.00298	0.00333	0.00380
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00100 DLA	<0.00100 DLA	<0.00100 DLA	0.00058	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0116	<0.0020 DLA	<0.0020 DLA	<0.0010	0.0114
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00040 DLA	<0.00040 DLA	<0.00040 DLA	<0.00020	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW12-05-06	Dup	----	----	----
					Client sampling date / time	25-Apr-2020 12:20	25-Apr-2020	----	----	----
						WR2000159-006	WR2000159-007	--------	--------	--------
						Result	Result	----	----	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		235	160	----	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		21.6	11.8	----	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		10.8	5.9	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		257	172	----	----	----
conductivity	----	E100	2.0	µS/cm		577	2330	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		258	1040	----	----	----
pH	----	E108	0.10	pH units		8.58	8.40	----	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		336	1850	----	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	----	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0081	0.0126	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		5.00	12.3	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.0892	<0.0500 DLDS	----	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		0.0904	<0.0510	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0012	<0.0100 DLDS	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		57.2	1190	----	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		6.47	28.5	----	----	----
cation sum	----	EC101	0.10	meq/L		5.92	27.0	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		4.44	2.70	----	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0020	0.0079	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00050 DLA	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00015	<0.00050 DLA	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0652	0.0520	----	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000100 DLA	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000250 DLA	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.042	0.077	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000265	<0.0000250 DLA	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		54.9	323	----	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW12-05-06	Dup	----	----	----
					Client sampling date / time	25-Apr-2020 12:20	25-Apr-2020	----	----	----
						WR2000159-006	WR2000159-007	--------	--------	--------
						Result	Result	----	----	----
Dissolved Metals										
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00050 DLA	----	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00021	<0.00050 DLA	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00102	0.00122	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.014	0.078	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000250 DLA	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0035	<0.0050 DLA	----	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		29.3	57.5	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.203	0.777	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00460	0.000418	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00090	<0.00250 DLA	----	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.250 DLA	----	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		2.11	3.96	----	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000157	0.00102	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		6.20	6.96	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000050 DLA	----	----	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		16.1	138	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.945	12.3	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		19.3	404	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000050 DLA	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00050 DLA	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00150 DLA	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00374	0.00100	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00250 DLA	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0162	<0.0050 DLA	----	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00100 DLA	----	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	----	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000242**	Page	: 1 of 10
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: ----	Date Samples Received	: 26-May-2020 16:50
PO	: 232818	Date Analysis Commenced	: 28-May-2020
C-O-C number	: 2020-05-26 A, 2020-05-26 B	Issue Date	: 10-Jun-2020 16:04
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 18		
No. of samples analysed	: 17		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Bruna Botti	Analyst	Inorganics - Water Quality, Burnaby, British Columbia
Clarie Tejano		Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Shaneel Dayal	Metal Analyst	Metals, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Qualifiers

Qualifier	*Description*
DLA	*Detection Limit adjusted for required dilution.*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-12-01	MW17-12-02	MW17-12-03	MW17-12-04	MW17-12-05
					Client sampling date / time	23-May-2020 10:30	23-May-2020 11:00	23-May-2020 11:25	23-May-2020 11:55	23-May-2020 12:15
						WR2000242-001	WR2000242-002	WR2000242-003	WR2000242-004	WR2000242-005
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		207	221	344	335	346
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		207	221	344	335	346
conductivity	----	E100	2.0	µS/cm		2430	2210	835	762	747
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		1070	902	363	380	395
pH	----	E108	0.10	pH units		7.85	7.89	8.09	8.14	8.17
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		2100	1850	545	492	481
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		4.3	4.7	<3.0	<3.0	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0070	<0.0050	<0.0050	<0.0050	<0.0050
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		12.4	11.4	1.88	1.91	2.69
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		<0.100 DLDS	<0.100 DLDS	<0.0250 DLDS	0.127	0.318
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		<0.102	<0.102	<0.0500	0.128	0.319
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0200 DLDS	<0.0200 DLDS	<0.0050 DLDS	<0.0050 DLDS	<0.0050 DLDS
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		1270	1100	123	104	90.9
Ion Balance										
anion sum	----	EC101	0.10	meq/L		31.0	27.6	9.50	8.93	8.90
cation sum	----	EC101	0.10	meq/L		33.6	29.3	10.3	9.53	9.43
ion balance (cation-anion difference)	----	EC101	0.010	%		4.02	2.99	4.04	3.25	2.89
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0024	0.0026	0.0023	0.0026	0.0030
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00020 DLA	<0.00020 DLA	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00190	0.00236	0.00098	0.00013	<0.00010
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0124	0.00960	0.0160	0.0252	0.0478
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		0.000074	0.000046	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000100 DLA	<0.000100 DLA	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.168	0.152	0.052	0.040	0.034
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000581	0.0000233	0.0000191	0.0000443	0.0000444

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-12-01	MW17-12-02	MW17-12-03	MW17-12-04	MW17-12-05
					Client sampling date / time	23-May-2020 10:30	23-May-2020 11:00	23-May-2020 11:25	23-May-2020 11:55	23-May-2020 12:15
						WR2000242-001	WR2000242-002	WR2000242-003	WR2000242-004	WR2000242-005
						Result	Result	Result	Result	Result
Dissolved Metals										
calcium, dissolved	7440-70-2	E421	0.050	mg/L		331	276	81.9	66.0	67.2
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00020 DLA	<0.00020 DLA	<0.00010	<0.00010	<0.00010
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00020 DLA	<0.00020 DLA	<0.00010	<0.00010	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00149	<0.00040 DLA	<0.00020	0.00075	0.00214
iron, dissolved	7439-89-6	E421	0.010	mg/L		2.74	2.10	0.066	<0.010	<0.010
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000100 DLA	<0.000100 DLA	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0169	0.0161	0.0093	0.0078	0.0079
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		58.8	51.9	38.5	52.2	55.3
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0948	0.0583	0.111	0.00227	0.0313
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00777	0.00750	0.00540	0.00508	0.00518
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00100 DLA	<0.00100 DLA	<0.00050	<0.00050	0.00101
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.100 DLA	<0.100 DLA	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		3.68	3.50	3.00	3.09	3.67
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000135	<0.000100 DLA	0.000084	0.000567	0.000226
silicon, dissolved	7440-21-3	E421	0.050	mg/L		7.73	7.84	8.01	7.44	7.25
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000020 DLA	<0.000020 DLA	<0.000010	0.000011	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		274	254	67.6	42.5	32.6
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		10.7	12.3	3.73	1.55	1.63
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		474	397	44.5	39.1	32.9
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000020 DLA	<0.000020 DLA	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00020 DLA	<0.00020 DLA	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00060 DLA	<0.00060 DLA	<0.00030	<0.00030	<0.00030
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000277	0.000538	0.00450	0.00413	0.00427
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00100 DLA	<0.00100 DLA	<0.00050	<0.00050	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0848	0.0441	0.0370	0.0400	0.0351
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00040 DLA	<0.00040 DLA	<0.00020	<0.00020	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-12-06	MW17-12-07	MW17-12-08	DUP	MW-09-03-01
					Client sampling date / time	23-May-2020 14:15	23-May-2020 14:45	23-May-2020 15:00	23-May-2020	24-May-2020 09:30
						WR2000242-006	WR2000242-007	WR2000242-008	WR2000242-009	WR2000242-010
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		345	261	261	348	142
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		345	261	261	348	142
conductivity	----	E100	2.0	µS/cm		745	575	579	747	290
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		393	304	301	393	148
pH	----	E108	0.10	pH units		8.18	8.16	8.14	8.13	8.11
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		479	365	365	482	174
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	<3.0	<3.0	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	0.0274
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		2.96	5.41	5.36	2.68	0.39
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.238	0.445	0.459	0.319	<0.0050
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		0.238	0.445	0.459	0.319	<0.0500
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0050 DLDS	<0.0010	<0.0010	<0.0050 DLDS	0.0153
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		87.6	63.0	63.3	91.0	12.7
Ion Balance										
anion sum	----	EC101	0.10	meq/L		8.82	6.71	6.72	8.95	3.11
cation sum	----	EC101	0.10	meq/L		9.47	7.14	7.10	9.37	3.38
ion balance (cation-anion difference)	----	EC101	0.010	%		3.55	3.10	2.75	2.29	4.16
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0029	0.0020	0.0017	0.0028	0.0028
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00010	0.00011	<0.00010	<0.00010	0.00117
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0542	0.0238	0.0250	0.0394	0.0622
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.034	0.025	0.025	0.033	0.061
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000455	0.0000369	0.0000345	0.0000472	<0.0000050
calcium, dissolved	7440-70-2	E421	0.050	mg/L		66.6	53.4	52.7	67.9	40.0

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-12-06	MW17-12-07	MW17-12-08	DUP	MW-09-03-01
					Client sampling date / time	23-May-2020 14:15	23-May-2020 14:45	23-May-2020 15:00	23-May-2020	24-May-2020 09:30
						WR2000242-006	WR2000242-007	WR2000242-008	WR2000242-009	WR2000242-010
						Result	Result	Result	Result	Result
Dissolved Metals										
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00017	<0.00010	<0.00010	<0.00010	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00345	0.00064	0.00072	0.00215	<0.00020
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	0.546
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0097	0.0063	0.0065	0.0079	0.0024
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		55.0	41.6	41.0	54.2	11.6
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.117	0.00122	0.00060	0.0312	0.214
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.0182	0.00568	0.00683	0.00528	0.00980
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00251	<0.00050	<0.00050	0.00107	<0.00050
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		4.28	2.63	2.68	3.61	2.12
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000090	0.000200	0.000239	0.000216	0.000069
silicon, dissolved	7440-21-3	E421	0.050	mg/L		7.31	6.76	6.73	7.35	5.17
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		34.5	22.0	23.0	32.6	7.69
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		1.63	1.12	1.11	1.63	1.01
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		32.5	23.4	22.9	32.7	4.63
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00388	0.00292	0.00294	0.00445	0.000517
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00059	0.00062	0.00071	<0.00050	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0293	0.0874	0.0450	0.0355	0.0035
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW-09-03-02	MW17-11-01	MW17-11-02	MW17-11-03	MW17-11-04
					Client sampling date / time	24-May-2020 09:55	24-May-2020 11:05	24-May-2020 11:30	24-May-2020 11:45	24-May-2020 12:15
						WR2000242-011	WR2000242-012	WR2000242-013	WR2000242-014	WR2000242-015
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		205	143	146	153	146
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		205	143	146	153	146
conductivity	----	E100	2.0	µS/cm		457	335	346	302	281
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		241	140	158	152	151
pH	----	E108	0.10	pH units		8.13	8.15	8.12	8.17	8.09
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		301	214	221	188	174
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	<3.0	<3.0	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		1.08	0.44	0.39	0.41	0.82
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		12.9	0.0230	<0.0050	<0.0050	0.637
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		12.9	<0.0500	<0.0500	<0.0500	0.695
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0023	<0.0010	<0.0010	<0.0010	0.0584
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		6.15	37.7	41.9	16.4	9.18
Ion Balance										
anion sum	----	EC101	0.10	meq/L		5.18	3.66	3.81	3.41	3.18
cation sum	----	EC101	0.10	meq/L		5.14	3.91	4.06	3.57	3.36
ion balance (cation-anion difference)	----	EC101	0.010	%		0.388	3.30	3.18	2.29	2.75
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0015	0.0050	0.0028	0.0043	0.0056
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	0.00015
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		<0.00010	0.00208	0.00136	0.00032	0.00038
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0262	0.0370	0.0384	0.0563	0.0786
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.041	0.023	0.019	0.010	0.013
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000965	<0.0000100 DLM	0.0000092	0.0000065	0.0000362
calcium, dissolved	7440-70-2	E421	0.050	mg/L		79.1	37.7	41.6	39.6	44.3

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW-09-03-02	MW17-11-01	MW17-11-02	MW17-11-03	MW17-11-04
					Client sampling date / time	24-May-2020 09:55	24-May-2020 11:05	24-May-2020 11:30	24-May-2020 11:45	24-May-2020 12:15
						WR2000242-011	WR2000242-012	WR2000242-013	WR2000242-014	WR2000242-015
						Result	Result	Result	Result	Result
Dissolved Metals										
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00235	<0.00020	<0.00020	<0.00020	0.00104
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	0.180	0.121	0.014	0.043
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0015	0.0060	0.0057	0.0044	0.0043
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		10.5	11.3	13.1	12.9	9.72
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.00249	0.0376	0.0454	0.0997	0.0911
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00321	0.00984	0.00593	0.00417	0.00462
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	0.00125
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		2.74	1.88	2.23	2.39	2.78
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000180	<0.000050	<0.000050	<0.000050	0.000289
silicon, dissolved	7440-21-3	E421	0.050	mg/L		5.63	5.40	5.31	5.15	3.92
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	0.000015
sodium, dissolved	7440-23-5	E421	0.050	mg/L		5.85	24.0	19.2	10.5	6.04
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.533	1.03	1.12	1.10	0.740
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		2.47	13.8	14.8	5.80	3.41
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	0.00015
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00336	0.000226	0.000262	0.00171	0.00155
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0252	0.0048	0.0138	0.0147	0.0284
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-11-05	DUP	----	----	----
					Client sampling date / time	24-May-2020 12:55	24-May-2020	----	----	----
						WR2000242-016	WR2000242-017	--------	--------	--------
						Result	Result	----	----	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		475	208	----	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		475	208	----	----	----
conductivity	----	E100	2.0	µS/cm		948	457	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		685	243	----	----	----
pH	----	E108	0.10	pH units		7.86	8.14	----	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		707	304	----	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	----	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0707	0.0121	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		1.74	1.09	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		17.9	12.9	----	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		18.6	12.9	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.713	0.0023	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		8.25	6.16	----	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		11.0	5.23	----	----	----
cation sum	----	EC101	0.10	meq/L		14.8	5.19	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		14.7	0.384	----	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0057	<0.0010	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		0.00037	<0.00010	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00034	<0.00010	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.760	0.0250	----	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.019	0.041	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000697	0.0000874	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		237	80.2	----	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-11-05	DUP	----	----	----
					Client sampling date / time	24-May-2020 12:55	24-May-2020	----	----	----
						WR2000242-016	WR2000242-017	--------	--------	--------
						Result	Result	----	----	----
Dissolved Metals										
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	----	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00040	<0.00010	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00331	0.00234	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.010	<0.010	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0160	0.0015	----	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		22.6	10.4	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0346	0.00261	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00619	0.00316	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.0153	<0.00050	----	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	----	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		12.3	2.64	----	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000629	0.000189	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		15.4	5.69	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		0.000038	<0.000010	----	----	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		16.7	5.72	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		1.22	0.524	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		4.20	2.34	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		0.00023	<0.00010	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00886	0.00348	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00060	<0.00050	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0555	0.0242	----	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	----	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	----	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000265**	Page	: 1 of 6
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: ----	Date Samples Received	: 02-Jun-2020 14:40
PO	: 232818	Date Analysis Commenced	: 04-Jun-2020
C-O-C number	: 2020-06-02 B	Issue Date	: 16-Jun-2020 14:16
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 6		
No. of samples analysed	: 6		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Angelo Salandanan	Lab Assistant	Metals, Burnaby, British Columbia
Clarie Tejano		Metals, Burnaby, British Columbia
Cristina Alexandre	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Dee Lee	Analsyt	Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Qualifiers

Qualifier	*Description*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW12-06-01	MW12-06-02	MW12-06-03	MW12-06-04	MW12-06-05
					Client sampling date / time	29-May-2020 09:40	29-May-2020 10:35	29-May-2020 11:00	29-May-2020 11:20	29-May-2020 11:40
						WR2000265-001	WR2000265-002	WR2000265-003	WR2000265-004	WR2000265-005
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		484	361	387	400	399
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		484	361	387	400	399
conductivity	----	E100	2.0	µS/cm		1230	999	987	1000	1000
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		582	504	515	538	498
pH	----	E108	0.10	pH units		7.52	7.95	8.10	8.02	8.08
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		771	684	668	675	651
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	6.1	<3.0	<3.0	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.290	0.0347	0.0481	0.0098	0.0070
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		5.34	0.69	0.70	0.64	0.64
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.0789	0.0302	0.0314	0.0459	<0.0250 DLDS
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		0.151	0.130	0.115	0.124	0.105
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0722	0.100	0.0841	0.0782	0.0819
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		159	218	195	192	189
Ion Balance										
anion sum	----	EC101	0.10	meq/L		13.1	11.8	11.8	12.0	11.9
cation sum	----	EC101	0.10	meq/L		15.2	11.9	12.1	12.5	11.6
ion balance (cation-anion difference)	----	EC101	0.010	%		7.42	0.422	1.26	2.04	1.28
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0299	0.0011	0.0012	0.0016	0.0014
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		0.00019	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00953	0.00357	0.00059	0.00246	0.00047
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.320	0.0280	0.0234	0.0187	0.0404
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		0.000220	0.000040	0.000022	0.000029	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.763	0.106	0.088	0.082	0.072
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000116	<0.0000050	<0.0000050	<0.0000050	<0.0000100 DLM

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW12-06-01	MW12-06-02	MW12-06-03	MW12-06-04	MW12-06-05
					Client sampling date / time	29-May-2020 09:40	29-May-2020 10:35	29-May-2020 11:00	29-May-2020 11:20	29-May-2020 11:40
						WR2000265-001	WR2000265-002	WR2000265-003	WR2000265-004	WR2000265-005
						Result	Result	Result	Result	Result
Dissolved Metals										
calcium, dissolved	7440-70-2	E421	0.050	mg/L		177	137	114	112	99.3
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00438	<0.00010	0.00017	<0.00010	<0.00010
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	0.00122
copper, dissolved	7440-50-8	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.205	1.00	0.689	0.833	0.109
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0132	0.0082	0.0075	0.0067	0.0066
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		33.8	39.0	56.1	62.9	60.7
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.360	0.0242	0.0142	0.0457	0.401
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00145	0.0105	0.00115	0.00893	0.0103
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00080	<0.00050	<0.00050	<0.00050	0.00068
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		3.79	3.82	4.12	4.06	3.84
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.00200	<0.000050	0.000118	<0.000050	0.000085
silicon, dissolved	7440-21-3	E421	0.050	mg/L		8.20	10.4	9.77	9.28	8.37
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		77.9	38.0	37.6	36.6	34.8
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		6.90	10.3	4.97	3.41	2.92
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		141	74.4	67.6	68.2	68.2
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		0.00031	<0.00010	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		0.00327	<0.00030	<0.00030	<0.00030	<0.00030
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000457	0.00272	0.00196	0.00588	0.00574
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.0178	<0.00050	<0.00050	<0.00050	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0042	0.0027	0.0011	0.0096	0.0118
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		0.00098	<0.00020	<0.00020	<0.00020	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	MW12-06-06	----	----	----	----
					Client sampling date / time	29-May-2020 12:00	----	----	----	----
Analyte	CAS Number	Method	LOR	Unit		WR2000265-006	--------	--------	--------	--------
						Result	----	----	----	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		317	----	----	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	----	----	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	----	----	----	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	----	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		317	----	----	----	----
conductivity	----	E100	2.0	µS/cm		855	----	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		394	----	----	----	----
pH	----	E108	0.10	pH units		8.08	----	----	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		532	----	----	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	----	----	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		<0.0050	----	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		6.67	----	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.618	----	----	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		0.652	----	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0335	----	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		155	----	----	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		9.80	----	----	----	----
cation sum	----	EC101	0.10	meq/L		9.26	----	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		2.83	----	----	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0014	----	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	----	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		<0.00010	----	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0133	----	----	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	----	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	----	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.052	----	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000129	----	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		74.4	----	----	----	----

Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	MW12-06-06	----	----	----	----
					Client sampling date / time	29-May-2020 12:00	----	----	----	----
Analyte	CAS Number	Method	LOR	Unit		WR2000265-006	--------	--------	--------	--------
						Result	----	----	----	----
Dissolved Metals										
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	----	----	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	----	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00034	----	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	----	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	----	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0053	----	----	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		50.5	----	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0384	----	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	----	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00611	----	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	----	----	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	----	----	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		3.41	----	----	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000386	----	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		6.82	----	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	----	----	----	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		29.9	----	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		1.63	----	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		56.0	----	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	----	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	----	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	----	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00403	----	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	----	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0125	----	----	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	----	----	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	----	----	----	----
dissolved metals filtration location	----	EP421	-	-		Field	----	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **VA20A9532**	Page	: 1 of 8
Client	: **Minto Explorations Ltd.**	Laboratory	: Vancouver - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: 8081 Lougheed Highway Burnaby BC Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: Minto Mine Monitoring	Date Samples Received	: 01-Jul-2020 13:25
PO	: 232818 (GW)	Date Analysis Commenced	: 03-Jul-2020
C-O-C number	: 2020-06-30 B	Issue Date	: 13-Jul-2020 16:24
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 11		
No. of samples analysed	: 11		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Bruna Botti	Analyst	Inorganics - Water Quality, Burnaby, British Columbia
Ilnaz Badbezanchi	Team Leader - Metals preparation	Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics - Water Quality, Burnaby, British Columbia
Woochan Song	Lab Assistant	Metals, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Qualifiers

Qualifier	*Description*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-DP01	MW17-DP02	MW17-DP03	MW09-03-01	MW09-03-02
					Client sampling date / time	26-Jun-2020 11:15	26-Jun-2020 11:25	26-Jun-2020 11:40	26-Jun-2020 09:50	26-Jun-2020 10:50
						VA20A9532-001	VA20A9532-002	VA20A9532-003	VA20A9532-004	VA20A9532-005
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		154	156	109	145	137
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		154	156	109	145	137
conductivity	----	E100	2.0	µS/cm		799	1580	1230	310	319
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		168	668	443	145	149
pH	----	E108	0.10	pH units		8.16	7.96	7.94	7.91	7.97
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		502	1170	853	179	192
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		35.2	77.8	47.6	113	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		1.66	3.54	13.0	0.0627	<0.0050
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		20.6	20.2	30.0	0.61	1.15
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		<0.0250 DLDS	0.0298	0.120	0.0082	6.26
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		<0.0500	<0.0500	0.128	<0.0500	6.27
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0050 DLDS	<0.0050 DLDS	0.0074	<0.0010	0.0084
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		198	667	477	15.4	5.48
Ion Balance										
anion sum	----	EC101	0.10	meq/L		7.77	17.6	13.0	3.23	3.32
cation sum	----	EC101	0.10	meq/L		8.44	18.7	13.2	3.34	3.24
ion balance (cation-anion difference)	----	EC101	0.010	%		4.13	3.03	0.763	1.67	1.22
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0019	0.0014	0.0024	0.0026	0.0019
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	0.00010	<0.00010	0.00013	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00073	0.00065	0.00028	0.00258	0.00027
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0294	0.0113	0.0254	0.0633	0.0183
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.060	0.140	0.149	0.104	0.057
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.000356	0.00124	0.000838	0.000124	0.0000567

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-DP01	MW17-DP02	MW17-DP03	MW09-03-01	MW09-03-02
					Client sampling date / time	26-Jun-2020 11:15	26-Jun-2020 11:25	26-Jun-2020 11:40	26-Jun-2020 09:50	26-Jun-2020 10:50
						VA20A9532-001	VA20A9532-002	VA20A9532-003	VA20A9532-004	VA20A9532-005
						Result	Result	Result	Result	Result
Dissolved Metals										
calcium, dissolved	7440-70-2	E421	0.050	mg/L		44.1	194	139	38.8	49.0
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	0.00010	<0.00010	0.00010	0.00011
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00079	0.00566	0.00079	<0.00010	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.0807	0.229	0.0687	0.00130	0.00134
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	<0.010	<0.010	0.279	<0.010
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0044	0.0162	0.0056	0.0036	0.0012
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		14.1	44.6	23.3	11.6	6.46
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.536	2.51	0.960	0.0984	0.00245
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		----	----	----	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.114	0.0590	0.0453	0.00520	0.00379
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00280	0.00600	0.00400	0.00126	<0.00050
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		24.2	54.1	30.0	2.17	2.09
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.00122	0.00200	0.000833	0.000223	0.000239
silicon, dissolved	7440-21-3	E421	0.050	mg/L		2.50	3.99	3.49	5.45	5.20
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	0.000012	<0.000010	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		99.4	82.2	60.9	8.41	4.43
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		3.31	16.5	4.86	1.01	0.341
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		90.9	273	186	6.08	2.13
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		0.000018	0.000034	0.000022	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		0.00035	<0.00010	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000181	0.000983	0.00137	0.000601	0.00193
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0012	0.0043	0.0016	0.0066	0.0326
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
dissolved mercury filtration location	----	EP509	-	-		----	----	----	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-10-01	MW17-10-02	MW17-10-03	MW17-08-01	MW17-08-02
					Client sampling date / time	26-Jun-2020 14:45	26-Jun-2020 15:20	26-Jun-2020 16:00	29-Jun-2020 09:05	29-Jun-2020 09:20
						VA20A9532-006	VA20A9532-007	VA20A9532-008	VA20A9532-009	VA20A9532-010
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		120	112	118	219	141
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		120	112	118	219	141
conductivity	----	E100	2.0	µS/cm		458	544	547	466	285
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		202	238	232	240	144
pH	----	E108	0.10	pH units		7.93	7.78	7.26	8.04	8.09
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		285	335	288	267	164
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		6.2	4.6	8.8	6.3	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0364	0.145	0.345	<0.0050	0.0104
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		1.02	1.20	2.01	0.53	0.39
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		14.9	29.4	15.9	0.403	0.563
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		14.9	29.5	18.6	0.411	0.578
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0046	0.0579	2.68	0.0074	0.0148
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		51.0	29.9	29.3	32.9	10.2
Ion Balance										
anion sum	----	EC101	0.10	meq/L		4.56	5.01	4.36	5.10	3.08
cation sum	----	EC101	0.10	meq/L		4.50	5.14	5.16	5.16	3.10
ion balance (cation-anion difference)	----	EC101	0.010	%		0.662	1.28	8.40	0.585	0.324
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0041	0.0029	0.0032	0.0015	0.0023
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	0.00040	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00124	0.00035	0.00220	0.00089	0.00065
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0276	0.0379	0.0389	0.00738	0.0835
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.021	<0.010	0.030	0.022	0.010
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000544	0.0000329	0.000140	0.0000556	0.0000855
calcium, dissolved	7440-70-2	E421	0.050	mg/L		50.2	62.3	62.6	47.4	33.4

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-10-01	MW17-10-02	MW17-10-03	MW17-08-01	MW17-08-02
					Client sampling date / time	26-Jun-2020 14:45	26-Jun-2020 15:20	26-Jun-2020 16:00	29-Jun-2020 09:05	29-Jun-2020 09:20
						VA20A9532-006	VA20A9532-007	VA20A9532-008	VA20A9532-009	VA20A9532-010
						Result	Result	Result	Result	Result
Dissolved Metals										
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	0.00013	0.00010	0.00010
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00058	0.00043	0.00035	<0.00010	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00316	0.00088	0.00099	0.00037	0.00279
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	<0.010	0.010	<0.010	<0.010
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0014	0.0012	0.0013	0.0020	<0.0010
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		18.6	19.9	18.5	29.5	14.7
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0233	0.00189	0.00545	0.00070	0.00087
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.0146	0.00715	0.00717	0.00942	0.00293
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.0119	0.00162	0.00309	<0.00050	<0.00050
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		0.309	0.271	0.539	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		1.50	1.78	1.85	1.58	0.892
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.00195	0.00456	0.00802	0.000673	0.000500
silicon, dissolved	7440-21-3	E421	0.050	mg/L		5.70	5.40	5.27	5.32	4.57
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		9.21	7.41	9.02	7.19	4.42
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		1.30	1.13	1.01	6.55	1.01
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		17.9	10.8	10.7	11.8	3.82
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	0.00029	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00241	0.00145	0.00140	0.000218	0.000147
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00066	0.00055	0.00059	<0.00050	0.00076
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0459	0.0284	0.131	0.0521	0.0209
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-08-03	----	----	----	----
					Client sampling date / time	29-Jun-2020 09:25	----	----	----	----
						VA20A9532-011	--------	--------	--------	--------
						Result	----	----	----	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		137	----	----	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	----	----	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	----	----	----	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	----	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		137	----	----	----	----
conductivity	----	E100	2.0	µS/cm		266	----	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		134	----	----	----	----
pH	----	E108	0.10	pH units		8.09	----	----	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		153	----	----	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	----	----	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0054	----	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.43	----	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.654	----	----	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		0.674	----	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0206	----	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		4.80	----	----	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		2.89	----	----	----	----
cation sum	----	EC101	0.10	meq/L		2.87	----	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		0.347	----	----	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0033	----	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	----	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00082	----	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0802	----	----	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	----	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	----	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		<0.010	----	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000513	----	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		34.4	----	----	----	----

Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	MW17-08-03	----	----	----	----
					Client sampling date / time	29-Jun-2020 09:25	----	----	----	----
Analyte	CAS Number	Method	LOR	Unit		VA20A9532-011	--------	--------	--------	--------
						Result	----	----	----	----
Dissolved Metals										
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00014	----	----	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	----	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00083	----	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	----	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	----	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		<0.0010	----	----	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		11.6	----	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.00026	----	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	----	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.000978	----	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	----	----	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	----	----	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		0.938	----	----	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000407	----	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		4.43	----	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	----	----	----	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		3.74	----	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.663	----	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		1.93	----	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	----	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	----	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	----	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000125	----	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00074	----	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0202	----	----	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	----	----	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	----	----	----	----
dissolved metals filtration location	----	EP421	-	-		Field	----	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000515**	Page	: 1 of 4
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 21-Jul-2020 14:25
PO	: 232818 (GW)	Date Analysis Commenced	: 23-Jul-2020
C-O-C number	: 2020-07-21 B	Issue Date	: 29-Jul-2020 15:05
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 2		
No. of samples analysed	: 2		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Bruna Botti	Analyst	Inorganics - Water Quality, Burnaby, British Columbia
Clarie Tejano		Metals, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Muneeb Alam	Analyst	Metals, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW09-03-01	MW09-03-02	----	----	----
					Client sampling date / time	15-Jul-2020 14:10	15-Jul-2020 15:20	----	----	----
						WR2000515-001	WR2000515-002	--------	--------	--------
						Result	Result	----	----	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		142	132	----	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		142	132	----	----	----
conductivity	----	E100	2.0	µS/cm		308	309	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		150	159	----	----	----
pH	----	E108	0.10	pH units		8.11	8.06	----	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		181	193	----	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		6.9	<3.0	----	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0282	<0.0050	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.41	1.12	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.0116	6.17	----	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		<0.0500	6.17	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0088	0.0011	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		17.3	4.94	----	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		3.22	3.21	----	----	----
cation sum	----	EC101	0.10	meq/L		3.43	3.45	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		3.16	3.60	----	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0021	0.0023	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00093	<0.00010	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0687	0.0185	----	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.045	0.031	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000113	0.0000346	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		41.8	53.5	----	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW09-03-01	MW09-03-02	----	----	----
					Client sampling date / time	15-Jul-2020 14:10	15-Jul-2020 15:20	----	----	----
						WR2000515-001	WR2000515-002	--------	--------	--------
						Result	Result	----	----	----
Dissolved Metals										
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	----	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00029	0.00170	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.253	<0.010	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0038	0.0013	----	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		11.2	6.25	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0991	0.00447	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00464	0.00358	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	<0.00050	----	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	----	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		2.12	2.24	----	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		<0.000050	0.000172	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		5.17	5.09	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	----	----	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		7.96	4.45	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		1.13	0.385	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		5.75	1.56	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000783	0.00200	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	0.00054	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0143	0.0267	----	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	----	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	----	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000557**	Page	: 1 of 8
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 28-Jul-2020 14:18
PO	: 232818	Date Analysis Commenced	: 30-Jul-2020
C-O-C number	: 2020-07-28 B	Issue Date	: 04-Aug-2020 15:53
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 13		
No. of samples analysed	: 13		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Aaron Yu	Laboratory Analyst	Metals, Burnaby, British Columbia
Bruna Botti	Analyst	Inorganics - Water Quality, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Jashan Kaur	Lab Assistant	Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Kinny Wu	Laboratory Analyst	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Qualifiers

Qualifier	*Description*
DLA	*Detection Limit adjusted for required dilution.*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-10-01	MW17-10-02	MW17-10-03	MW17-11-01	MW17-11-03
					Client sampling date / time	21-Jul-2020 15:00	21-Jul-2020 16:30	22-Jul-2020 09:25	26-Jul-2020 14:12	26-Jul-2020 15:11
						WR2000557-001	WR2000557-002	WR2000557-003	WR2000557-004	WR2000557-005
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		119	112	114	137	144
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		119	112	114	137	144
conductivity	----	E100	2.0	µS/cm		455	544	559	351	316
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		199	233	235	129	138
pH	----	E108	0.10	pH units		7.63	7.76	7.52	7.96	8.02
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		284	340	350	207	177
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		4.7	<3.0	6.1	3.1	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0411	0.307	0.0360	0.0161	<0.0050
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.95	1.23	1.41	0.59	0.58
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		15.9	31.0	32.8	0.0147	<0.0050
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		15.9	31.0	32.8	0.125	<0.0500
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0092	0.0122	0.0746	0.110	0.0027
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		47.4	29.3	29.7	39.4	16.5
Ion Balance										
anion sum	----	EC101	0.10	meq/L		4.53	5.09	5.28	3.57	3.24
cation sum	----	EC101	0.10	meq/L		4.45	5.08	5.08	3.62	3.25
ion balance (cation-anion difference)	----	EC101	0.010	%		0.891	0.098	1.93	0.695	0.154
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0037	0.0024	0.0018	0.0046	0.0097
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.0124	0.00505	0.00289	0.0152	0.00797
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0287	0.0384	0.0391	0.0417	0.0622
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.017	<0.010	<0.010	0.086	0.012
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000877	0.0000450	0.0000268	0.0000178	0.0000164
calcium, dissolved	7440-70-2	E421	0.050	mg/L		49.7	61.3	63.2	35.0	36.4

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-10-01	MW17-10-02	MW17-10-03	MW17-11-01	MW17-11-03
					Client sampling date / time	21-Jul-2020 15:00	21-Jul-2020 16:30	22-Jul-2020 09:25	26-Jul-2020 14:12	26-Jul-2020 15:11
						WR2000557-001	WR2000557-002	WR2000557-003	WR2000557-004	WR2000557-005
						Result	Result	Result	Result	Result
Dissolved Metals										
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00061	0.00058	0.00030	<0.00010	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00390	0.00176	0.00094	<0.00020	0.00071
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	<0.010	<0.010	0.166	0.016
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0016	0.0013	0.0013	0.0061	0.0044
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		18.1	19.4	18.8	10.2	11.4
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0382	0.00202	0.00068	0.0419	0.102
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.0135	0.00664	0.00620	0.00917	0.00426
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.0122	0.00160	0.00170	<0.00050	<0.00050
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		0.103	1.08	0.072	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		1.64	1.88	1.80	1.91	2.40
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.00198	0.00409	0.00472	0.000126	0.000060
silicon, dissolved	7440-21-3	E421	0.050	mg/L		5.40	5.24	5.32	5.40	5.08
silver, dissolved	7440-22-4	E421	0.000010	mg/L		0.000015	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		9.22	7.84	7.31	22.4	9.58
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		1.26	1.14	1.03	0.954	0.992
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		16.2	10.2	10.3	13.2	5.33
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	0.00030
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00256	0.00156	0.00154	0.000229	0.00188
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00087	0.00065	0.00067	<0.00050	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0748	0.0452	0.0357	0.0060	0.0222
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW12-05-01	MW12-05-02	MW12-05-03	MW12-05-04	MW12-05-05
					Client sampling date / time	24-Jul-2020 09:00	24-Jul-2020 11:35	24-Jul-2020 13:55	24-Jul-2020 14:43	24-Jul-2020 15:45
						WR2000557-006	WR2000557-007	WR2000557-008	WR2000557-009	WR2000557-010
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		114	165	237	234	244
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		114	165	237	234	244
conductivity	----	E100	2.0	µS/cm		2380	2270	1810	553	570
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		1060	1030	822	244	259
pH	----	E108	0.10	pH units		7.80	8.07	7.94	8.01	7.87
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		2020	1880	1400	319	329
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		3.7	<3.0	4.5	3.5	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0146	0.0142	0.0183	0.0152	0.0069
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		14.2	12.8	8.95	4.70	5.27
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		<0.100 DLDS	<0.100 DLDS	<0.0500 DLDS	<0.0050	<0.0050
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		<0.102	<0.102	<0.0510	<0.0500	<0.0500
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0200 DLDS	<0.0200 DLDS	<0.0100 DLDS	<0.0010	<0.0010
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		1330	1210	829	54.7	55.5
Ion Balance										
anion sum	----	EC101	0.10	meq/L		30.4	28.9	22.2	5.95	6.19
cation sum	----	EC101	0.10	meq/L		28.9	27.5	21.2	5.83	6.02
ion balance (cation-anion difference)	----	EC101	0.010	%		2.53	2.48	2.30	1.02	1.39
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0074	0.0066	0.0025	0.0034	0.0045
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00020 DLA	<0.00020 DLA	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00835	0.00416	0.00312	0.00100	0.00313
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0323	0.0594	0.0390	0.0392	0.0681
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000040 DLA	<0.000040 DLA	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000100 DLA	<0.000100 DLA	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.109	0.087	0.076	0.034	0.050
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000100 DLA	<0.0000100 DLA	<0.0000050	<0.0000050	0.0000103
calcium, dissolved	7440-70-2	E421	0.050	mg/L		354	322	209	49.2	53.5
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00020 DLA	<0.00020 DLA	0.00015	<0.00010	<0.00010

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW12-05-01	MW12-05-02	MW12-05-03	MW12-05-04	MW12-05-05
					Client sampling date / time	24-Jul-2020 09:00	24-Jul-2020 11:35	24-Jul-2020 13:55	24-Jul-2020 14:43	24-Jul-2020 15:45
						WR2000557-006	WR2000557-007	WR2000557-008	WR2000557-009	WR2000557-010
						Result	Result	Result	Result	Result
Dissolved Metals										
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00020 DLA	<0.00020 DLA	<0.00010	<0.00010	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		<0.00040 DLA	<0.00040 DLA	<0.00020	0.00046	0.00116
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.084	0.053	0.464	0.035	0.032
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000100 DLA	<0.000100 DLA	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0085	0.0055	0.0041	0.0036	0.0040
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		41.4	55.8	72.9	29.4	30.4
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.174	0.794	2.15	0.0825	0.160
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.000257	0.000185	0.000241	0.00356	0.00480
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00100 DLA	<0.00100 DLA	<0.00050	<0.00050	<0.00050
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.100 DLA	<0.100 DLA	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		3.89	4.22	4.19	2.25	2.29
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000124	0.00255	0.000247	0.000704	0.000125
silicon, dissolved	7440-21-3	E421	0.050	mg/L		7.64	6.94	7.68	6.40	6.32
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000020 DLA	<0.000020 DLA	<0.000010	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		178	153	105	20.6	18.0
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		10.6	12.4	8.21	1.04	0.943
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		472	443	297	20.2	19.7
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000020 DLA	<0.000020 DLA	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00020 DLA	<0.00020 DLA	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00060 DLA	0.00077	<0.00030	<0.00030	<0.00030
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000890	0.000953	0.00161	0.00347	0.00377
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00100 DLA	<0.00100 DLA	<0.00050	0.00068	0.00059
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0088	<0.0020 DLA	0.0014	<0.0010	0.0083
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00040 DLA	<0.00040 DLA	<0.00020	<0.00020	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW12-05-06	MW12-05-07	DUP	----	----
					Client sampling date / time	24-Jul-2020 16:01	24-Jul-2020 16:37	24-Jul-2020	----	----
						WR2000557-011	WR2000557-012	WR2000557-013	--------	--------
						Result	Result	Result	----	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		245	252	114	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	----	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		245	252	114	----	----
conductivity	----	E100	2.0	µS/cm		571	577	2390	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		260	268	1060	----	----
pH	----	E108	0.10	pH units		7.91	7.81	7.81	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		331	340	2000	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	<3.0	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		<0.0050	0.208	0.0126	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		5.40	6.10	14.0	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		<0.0050	0.0110	<0.100 DLDS	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		<0.0500	<0.0500	<0.102	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0029	<0.0010	<0.0200 DLDS	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		57.0	55.3	1320	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		6.24	6.37	30.3	----	----
cation sum	----	EC101	0.10	meq/L		6.02	6.28	28.8	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		1.79	0.711	2.54	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0022	<0.0010	0.0022	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00020 DLA	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00092	0.00155	0.00378	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0680	0.0970	0.0294	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000040 DLA	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000100 DLA	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.033	0.029	0.095	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000158	<0.0000050	<0.0000100 DLA	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		54.4	57.4	355	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	<0.00020 DLA	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW12-05-06	MW12-05-07	DUP	----	----
					Client sampling date / time	24-Jul-2020 16:01	24-Jul-2020 16:37	24-Jul-2020	----	----
						WR2000557-011	WR2000557-012	WR2000557-013	--------	--------
						Result	Result	Result	----	----
Dissolved Metals										
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00021	<0.00010	<0.00020 DLA	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00112	<0.00020	<0.00040 DLA	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.019	1.56	0.074	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000100 DLA	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0040	0.0039	0.0082	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		30.1	30.2	41.2	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.216	0.158	0.172	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00463	0.00326	0.000266	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00074	<0.00050	<0.00100 DLA	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	0.067	<0.100 DLA	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		2.18	2.22	3.79	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000147	0.000055	0.00120	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		6.14	6.53	7.30	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000020 DLA	----	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		17.5	17.8	175	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.921	0.880	10.3	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		19.8	18.5	469	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000020 DLA	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00020 DLA	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00060 DLA	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00391	0.00184	0.000849	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00057	0.00057	<0.00100 DLA	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0075	0.0027	0.0035	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00040 DLA	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000557**	Page	: 1 of 8
Amendment	: **1**		
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 28-Jul-2020 14:18
PO	: 232818	Date Analysis Commenced	: 30-Jul-2020
C-O-C number	: 2020-07-28 B	Issue Date	: 21-Aug-2020 17:29
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 13		
No. of samples analysed	: 13		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Aaron Yu	Laboratory Analyst	Metals, Burnaby, British Columbia
Bruna Botti	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Cristina Alexandre	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Ilnaz Badbezanchi	Team Leader - Metals preparation	Metals, Burnaby, British Columbia
Jashan Kaur	Lab Assistant	Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Kinny Wu	Lab Analyst	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Qualifiers

Qualifier	*Description*
DLA	*Detection Limit adjusted for required dilution.*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-10-01	MW17-10-02	MW17-10-03	MW17-11-01	MW17-11-03
					Client sampling date / time	21-Jul-2020 15:00	21-Jul-2020 16:30	22-Jul-2020 09:25	26-Jul-2020 14:12	26-Jul-2020 15:11
						WR2000557-001	WR2000557-002	WR2000557-003	WR2000557-004	WR2000557-005
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		119	112	114	137	144
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		119	112	114	137	144
conductivity	----	E100	2.0	µS/cm		455	544	559	351	316
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		199	233	235	129	138
pH	----	E108	0.10	pH units		7.63	7.76	7.52	7.96	8.02
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		284	340	350	207	177
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		4.7	<3.0	6.1	3.1	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0411	0.307	0.0360	0.0161	<0.0050
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.95	1.23	1.41	0.59	0.58
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		15.9	31.0	32.8	0.0147	<0.0050
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		15.9	31.0	32.8	0.125	<0.0500
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0092	0.0122	0.0746	0.110	0.0027
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		47.4	29.3	29.7	39.4	16.5
Ion Balance										
anion sum	----	EC101	0.10	meq/L		4.53	5.09	5.28	3.57	3.24
cation sum	----	EC101	0.10	meq/L		4.45	5.08	5.08	3.62	3.25
ion balance (cation-anion difference)	----	EC101	0.010	%		0.891	0.098	1.93	0.695	0.154
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0037	0.0024	0.0018	0.0046	0.0097
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.0124	0.00039	0.00289	0.0152	0.00060
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0287	0.0384	0.0391	0.0417	0.0622
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.017	<0.010	<0.010	0.086	0.012
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000877	0.0000450	0.0000268	0.0000178	0.0000164
calcium, dissolved	7440-70-2	E421	0.050	mg/L		49.7	61.3	63.2	35.0	36.4

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-10-01	MW17-10-02	MW17-10-03	MW17-11-01	MW17-11-03
					Client sampling date / time	21-Jul-2020 15:00	21-Jul-2020 16:30	22-Jul-2020 09:25	26-Jul-2020 14:12	26-Jul-2020 15:11
						WR2000557-001	WR2000557-002	WR2000557-003	WR2000557-004	WR2000557-005
						Result	Result	Result	Result	Result
Dissolved Metals										
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00061	0.00058	0.00030	<0.00010	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00390	0.00176	0.00094	<0.00020	0.00071
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	<0.010	<0.010	0.166	0.016
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0016	0.0013	0.0013	0.0061	0.0044
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		18.1	19.4	18.8	10.2	11.4
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0382	0.00202	0.00068	0.0419	0.102
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.0135	0.00664	0.00620	0.00917	0.00426
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.0122	0.00160	0.00170	<0.00050	<0.00050
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		0.103	1.08	0.072	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		1.64	1.88	1.80	1.91	2.40
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.00198	0.00409	0.00472	0.000126	0.000060
silicon, dissolved	7440-21-3	E421	0.050	mg/L		5.40	5.24	5.32	5.40	5.08
silver, dissolved	7440-22-4	E421	0.000010	mg/L		0.000015	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		9.22	7.84	7.31	22.4	9.58
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		1.26	1.14	1.03	0.954	0.992
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		16.2	10.2	10.3	13.2	5.33
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	0.00030
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00256	0.00156	0.00154	0.000229	0.00188
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00087	0.00065	0.00067	<0.00050	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0748	0.0452	0.0357	0.0060	0.0222
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW12-05-01	MW12-05-02	MW12-05-03	MW12-05-04	MW12-05-05
					Client sampling date / time	24-Jul-2020 09:00	24-Jul-2020 11:35	24-Jul-2020 13:55	24-Jul-2020 14:43	24-Jul-2020 15:45
						WR2000557-006	WR2000557-007	WR2000557-008	WR2000557-009	WR2000557-010
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		114	165	237	234	244
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		114	165	237	234	244
conductivity	----	E100	2.0	µS/cm		2380	2270	1810	553	570
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		1060	1030	822	244	259
pH	----	E108	0.10	pH units		7.80	8.07	7.94	8.01	7.87
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		2020	1880	1400	319	329
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		3.7	<3.0	4.5	3.5	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0146	0.0142	0.0183	0.0152	0.0069
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		14.2	12.8	8.95	4.70	5.27
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		<0.100 DLDS	<0.100 DLDS	<0.0500 DLDS	<0.0050	<0.0050
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		<0.102	<0.102	<0.0510	<0.0500	<0.0500
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0200 DLDS	<0.0200 DLDS	<0.0100 DLDS	<0.0010	<0.0010
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		1330	1210	829	54.7	55.5
Ion Balance										
anion sum	----	EC101	0.10	meq/L		30.4	28.9	22.2	5.95	6.19
cation sum	----	EC101	0.10	meq/L		28.9	27.5	21.2	5.83	6.02
ion balance (cation-anion difference)	----	EC101	0.010	%		2.53	2.48	2.30	1.02	1.39
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0074	0.0066	0.0025	0.0034	0.0045
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00020 DLA	<0.00020 DLA	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00107	0.00048	0.00033	0.00012	0.00021
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0323	0.0594	0.0390	0.0392	0.0681
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000040 DLA	<0.000040 DLA	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000100 DLA	<0.000100 DLA	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.109	0.087	0.076	0.034	0.050
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000100 DLA	<0.0000100 DLA	<0.0000050	<0.0000050	0.0000103
calcium, dissolved	7440-70-2	E421	0.050	mg/L		354	322	209	49.2	53.5
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00020 DLA	<0.00020 DLA	0.00015	<0.00010	<0.00010

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW12-05-01	MW12-05-02	MW12-05-03	MW12-05-04	MW12-05-05
					Client sampling date / time	24-Jul-2020 09:00	24-Jul-2020 11:35	24-Jul-2020 13:55	24-Jul-2020 14:43	24-Jul-2020 15:45
						WR2000557-006	WR2000557-007	WR2000557-008	WR2000557-009	WR2000557-010
						Result	Result	Result	Result	Result
Dissolved Metals										
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00020 DLA	<0.00020 DLA	<0.00010	<0.00010	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		<0.00040 DLA	<0.00040 DLA	<0.00020	0.00046	0.00116
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.084	0.053	0.464	0.035	0.032
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000100 DLA	<0.000100 DLA	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0085	0.0055	0.0041	0.0036	0.0040
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		41.4	55.8	72.9	29.4	30.4
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.174	0.794	2.15	0.0825	0.160
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.000257	0.000185	0.000241	0.00356	0.00480
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00100 DLA	<0.00100 DLA	<0.00050	<0.00050	<0.00050
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.100 DLA	<0.100 DLA	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		3.89	4.22	4.19	2.25	2.29
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000124	0.00255	0.000247	0.000704	0.000125
silicon, dissolved	7440-21-3	E421	0.050	mg/L		7.64	6.94	7.68	6.40	6.32
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000020 DLA	<0.000020 DLA	<0.000010	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		178	153	105	20.6	18.0
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		10.6	12.4	8.21	1.04	0.943
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		472	443	297	20.2	19.7
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000020 DLA	<0.000020 DLA	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00020 DLA	<0.00020 DLA	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00060 DLA	0.00077	<0.00030	<0.00030	<0.00030
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000890	0.000953	0.00161	0.00347	0.00377
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00100 DLA	<0.00100 DLA	<0.00050	0.00068	0.00059
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0088	<0.0020 DLA	0.0014	<0.0010	0.0083
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00040 DLA	<0.00040 DLA	<0.00020	<0.00020	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW12-05-06	MW12-05-07	DUP	----	----
					Client sampling date / time	24-Jul-2020 16:01	24-Jul-2020 16:37	24-Jul-2020	----	----
						WR2000557-011	WR2000557-012	WR2000557-013	--------	--------
						Result	Result	Result	----	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		245	252	114	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	----	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		245	252	114	----	----
conductivity	----	E100	2.0	µS/cm		571	577	2390	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		260	268	1060	----	----
pH	----	E108	0.10	pH units		7.91	7.81	7.81	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		331	340	2000	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	<3.0	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		<0.0050	0.208	0.0126	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		5.40	6.10	14.0	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		<0.0050	0.0110	<0.100 DLDS	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		<0.0500	<0.0500	<0.102	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0029	<0.0010	<0.0200 DLDS	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		57.0	55.3	1320	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		6.24	6.37	30.3	----	----
cation sum	----	EC101	0.10	meq/L		6.02	6.28	28.8	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		1.79	0.711	2.54	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0022	<0.0010	0.0022	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00020 DLA	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00092	0.00155	0.00085	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0680	0.0970	0.0294	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000040 DLA	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000100 DLA	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.033	0.029	0.095	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000158	<0.0000050	<0.0000100 DLA	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		54.4	57.4	355	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	<0.00020 DLA	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW12-05-06	MW12-05-07	DUP	----	----
					Client sampling date / time	24-Jul-2020 16:01	24-Jul-2020 16:37	24-Jul-2020	----	----
						WR2000557-011	WR2000557-012	WR2000557-013	--------	--------
						Result	Result	Result	----	----
Dissolved Metals										
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00021	<0.00010	<0.00020 DLA	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00112	<0.00020	<0.00040 DLA	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.019	1.56	0.074	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000100 DLA	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0040	0.0039	0.0082	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		30.1	30.2	41.2	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.216	0.158	0.172	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00463	0.00326	0.000266	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00074	<0.00050	<0.00100 DLA	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	0.067	<0.100 DLA	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		2.18	2.22	3.79	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000147	0.000055	0.00120	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		6.14	6.53	7.30	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000020 DLA	----	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		17.5	17.8	175	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.921	0.880	10.3	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		19.8	18.5	469	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000020 DLA	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00020 DLA	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00060 DLA	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00391	0.00184	0.000849	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00057	0.00057	<0.00100 DLA	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0075	0.0027	0.0035	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00040 DLA	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WR2000557**	Page	: 1 of 25
Amendment	: 1		
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 28-Jul-2020 14:18
PO	: 232818	Issue Date	: 21-Aug-2020 17:29
C-O-C number	: 2020-07-28 B		
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 13		
No. of samples analysed	: 13		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- Method Blank value outliers occur - please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **Water**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Method Blank (MB) Values								
Anions and Nutrients	QC-MRG7-6610800 1	----	nitrate (as N)	14797-55-8	E235.NO3-L	0.0231 B mg/L	0.005 mg/L	Blank result exceeds permitted value

Result Qualifiers

Qualifier	Description
B	*Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.*

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW17-10-01	E298	21-Jul-2020	----	----	----		31-Jul-2020	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW17-10-02	E298	21-Jul-2020	----	----	----		31-Jul-2020	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW17-11-01	E298	26-Jul-2020	----	----	----		31-Jul-2020	28 days	5 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW17-11-03	E298	26-Jul-2020	----	----	----		31-Jul-2020	28 days	5 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
DUP	E298	24-Jul-2020	----	----	----		31-Jul-2020	28 days	7 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW12-05-01	E298	24-Jul-2020	----	----	----		31-Jul-2020	28 days	7 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW12-05-02	E298	24-Jul-2020	----	----	----		31-Jul-2020	28 days	7 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MW12-05-03	E298	24-Jul-2020	----	----	----		31-Jul-2020	28 days	7 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MW12-05-04	E298	24-Jul-2020	----	----	----		31-Jul-2020	28 days	7 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MW12-05-05	E298	24-Jul-2020	----	----	----		31-Jul-2020	28 days	7 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MW12-05-06	E298	24-Jul-2020	----	----	----		31-Jul-2020	28 days	7 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MW12-05-07	E298	24-Jul-2020	----	----	----		31-Jul-2020	28 days	7 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MW17-10-03	E298	22-Jul-2020	----	----	----		31-Jul-2020	28 days	9 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW17-11-01	E235.Cl-L	26-Jul-2020	----	----	----		30-Jul-2020	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW17-11-03	E235.Cl-L	26-Jul-2020	----	----	----		30-Jul-2020	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE DUP	E235.Cl-L	24-Jul-2020	----	----	----		30-Jul-2020	28 days	5 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW12-05-02	E235.Cl-L	24-Jul-2020	----	----	----		30-Jul-2020	28 days	5 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW12-05-03	E235.Cl-L	24-Jul-2020	----	----	----		30-Jul-2020	28 days	5 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW12-05-04	E235.Cl-L	24-Jul-2020	----	----	----		30-Jul-2020	28 days	5 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW12-05-05	E235.Cl-L	24-Jul-2020	----	----	----		30-Jul-2020	28 days	5 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW12-05-06	E235.Cl-L	24-Jul-2020	----	----	----		30-Jul-2020	28 days	5 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW12-05-07	E235.Cl-L	24-Jul-2020	----	----	----		30-Jul-2020	28 days	5 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW12-05-01	E235.Cl-L	24-Jul-2020	----	----	----		30-Jul-2020	28 days	6 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW17-10-01	E235.Cl-L	21-Jul-2020	----	----	----		30-Jul-2020	28 days	8 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW17-10-02	E235.Cl-L	21-Jul-2020	----	----	----		30-Jul-2020	28 days	8 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW17-10-03	E235.Cl-L	22-Jul-2020	----	----	----		30-Jul-2020	28 days	8 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-11-01	E235.NO3-L	26-Jul-2020	----	----	----		30-Jul-2020	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-11-03	E235.NO3-L	26-Jul-2020	----	----	----		30-Jul-2020	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE DUP	E235.NO3-L	24-Jul-2020	----	----	----		30-Jul-2020	3 days	5 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW12-05-02	E235.NO3-L	24-Jul-2020	----	----	----		30-Jul-2020	3 days	5 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW12-05-03	E235.NO3-L	24-Jul-2020	----	----	----		30-Jul-2020	3 days	5 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW12-05-04	E235.NO3-L	24-Jul-2020	----	----	----		30-Jul-2020	3 days	5 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW12-05-05	E235.NO3-L	24-Jul-2020	----	----	----		30-Jul-2020	3 days	5 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW12-05-06	E235.NO3-L	24-Jul-2020	----	----	----		30-Jul-2020	3 days	5 days	× EHTR

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW12-05-07	E235.NO3-L	24-Jul-2020	----	----	----		30-Jul-2020	3 days	5 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW12-05-01	E235.NO3-L	24-Jul-2020	----	----	----		30-Jul-2020	3 days	6 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-10-01	E235.NO3-L	21-Jul-2020	----	----	----		30-Jul-2020	3 days	8 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-10-02	E235.NO3-L	21-Jul-2020	----	----	----		30-Jul-2020	3 days	8 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-10-03	E235.NO3-L	22-Jul-2020	----	----	----		30-Jul-2020	3 days	8 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW17-11-01	E235.NO2-L	26-Jul-2020	----	----	----		30-Jul-2020	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW17-11-03	E235.NO2-L	26-Jul-2020	----	----	----		30-Jul-2020	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE DUP	E235.NO2-L	24-Jul-2020	----	----	----		30-Jul-2020	3 days	5 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW12-05-02	E235.NO2-L	24-Jul-2020	----	----	----		30-Jul-2020	3 days	5 days	× EHTR

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW12-05-03	E235.NO2-L	24-Jul-2020	----	----	----		30-Jul-2020	3 days	5 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW12-05-04	E235.NO2-L	24-Jul-2020	----	----	----		30-Jul-2020	3 days	5 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW12-05-05	E235.NO2-L	24-Jul-2020	----	----	----		30-Jul-2020	3 days	5 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW12-05-06	E235.NO2-L	24-Jul-2020	----	----	----		30-Jul-2020	3 days	5 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW12-05-07	E235.NO2-L	24-Jul-2020	----	----	----		30-Jul-2020	3 days	5 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW12-05-01	E235.NO2-L	24-Jul-2020	----	----	----		30-Jul-2020	3 days	6 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW17-10-01	E235.NO2-L	21-Jul-2020	----	----	----		30-Jul-2020	3 days	8 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW17-10-02	E235.NO2-L	21-Jul-2020	----	----	----		30-Jul-2020	3 days	8 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW17-10-03	E235.NO2-L	22-Jul-2020	----	----	----		30-Jul-2020	3 days	8 days	× EHTR

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW17-11-01	E235.SO4	26-Jul-2020	----	----	----		30-Jul-2020	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW17-11-03	E235.SO4	26-Jul-2020	----	----	----		30-Jul-2020	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE DUP	E235.SO4	24-Jul-2020	----	----	----		30-Jul-2020	28 days	5 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW12-05-02	E235.SO4	24-Jul-2020	----	----	----		30-Jul-2020	28 days	5 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW12-05-03	E235.SO4	24-Jul-2020	----	----	----		30-Jul-2020	28 days	5 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW12-05-04	E235.SO4	24-Jul-2020	----	----	----		30-Jul-2020	28 days	5 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW12-05-05	E235.SO4	24-Jul-2020	----	----	----		30-Jul-2020	28 days	5 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW12-05-06	E235.SO4	24-Jul-2020	----	----	----		30-Jul-2020	28 days	5 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW12-05-07	E235.SO4	24-Jul-2020	----	----	----		30-Jul-2020	28 days	5 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW12-05-01	E235.SO4	24-Jul-2020	----	----	----		30-Jul-2020	28 days	6 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW17-10-01	E235.SO4	21-Jul-2020	----	----	----		30-Jul-2020	28 days	8 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW17-10-02	E235.SO4	21-Jul-2020	----	----	----		30-Jul-2020	28 days	8 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW17-10-03	E235.SO4	22-Jul-2020	----	----	----		30-Jul-2020	28 days	8 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW17-11-01	E421.Cr-L	26-Jul-2020	30-Jul-2020	180 days	4 days	✓	30-Jul-2020	175 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW17-11-03	E421.Cr-L	26-Jul-2020	30-Jul-2020	180 days	4 days	✓	30-Jul-2020	175 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
DUP	E421.Cr-L	24-Jul-2020	30-Jul-2020	180 days	6 days	✓	30-Jul-2020	173 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW12-05-01	E421.Cr-L	24-Jul-2020	30-Jul-2020	180 days	6 days	✓	30-Jul-2020	173 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW12-05-02	E421.Cr-L	24-Jul-2020	30-Jul-2020	180 days	6 days	✓	30-Jul-2020	173 days	0 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MW12-05-03	E421.Cr-L	24-Jul-2020	30-Jul-2020	180 days	6 days	✓	30-Jul-2020	173 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MW12-05-04	E421.Cr-L	24-Jul-2020	30-Jul-2020	180 days	6 days	✓	30-Jul-2020	173 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MW12-05-05	E421.Cr-L	24-Jul-2020	30-Jul-2020	180 days	6 days	✓	30-Jul-2020	173 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MW12-05-06	E421.Cr-L	24-Jul-2020	30-Jul-2020	180 days	6 days	✓	30-Jul-2020	173 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MW12-05-07	E421.Cr-L	24-Jul-2020	30-Jul-2020	180 days	6 days	✓	30-Jul-2020	173 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MW17-10-03	E421.Cr-L	22-Jul-2020	30-Jul-2020	180 days	8 days	✓	30-Jul-2020	171 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MW17-10-01	E421.Cr-L	21-Jul-2020	30-Jul-2020	180 days	9 days	✓	30-Jul-2020	170 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MW17-10-02	E421.Cr-L	21-Jul-2020	30-Jul-2020	180 days	9 days	✓	30-Jul-2020	170 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW17-11-01	E509	26-Jul-2020	30-Jul-2020	28 days	3 days	✓	30-Jul-2020	24 days	0 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW17-11-03	E509	26-Jul-2020	30-Jul-2020	28 days	3 days	✓	30-Jul-2020	24 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW12-05-01	E509	24-Jul-2020	30-Jul-2020	28 days	6 days	✓	30-Jul-2020	21 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) DUP	E509	24-Jul-2020	01-Aug-2020	28 days	7 days	✓	01-Aug-2020	20 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW12-05-02	E509	24-Jul-2020	01-Aug-2020	28 days	7 days	✓	01-Aug-2020	20 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW12-05-03	E509	24-Jul-2020	01-Aug-2020	28 days	7 days	✓	01-Aug-2020	20 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW12-05-04	E509	24-Jul-2020	01-Aug-2020	28 days	7 days	✓	01-Aug-2020	20 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW12-05-05	E509	24-Jul-2020	01-Aug-2020	28 days	7 days	✓	01-Aug-2020	20 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW12-05-06	E509	24-Jul-2020	01-Aug-2020	28 days	7 days	✓	01-Aug-2020	20 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW12-05-07	E509	24-Jul-2020	01-Aug-2020	28 days	7 days	✓	01-Aug-2020	20 days	0 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW17-10-01	E509	21-Jul-2020	30-Jul-2020	28 days	8 days	✓	30-Jul-2020	19 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW17-10-02	E509	21-Jul-2020	30-Jul-2020	28 days	8 days	✓	30-Jul-2020	19 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW17-10-03	E509	22-Jul-2020	30-Jul-2020	28 days	8 days	✓	30-Jul-2020	19 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW17-11-01	E421	26-Jul-2020	30-Jul-2020	180 days	4 days	✓	30-Jul-2020	175 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW17-11-03	E421	26-Jul-2020	30-Jul-2020	180 days	4 days	✓	30-Jul-2020	175 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) DUP	E421	24-Jul-2020	30-Jul-2020	180 days	6 days	✓	30-Jul-2020	173 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW12-05-01	E421	24-Jul-2020	30-Jul-2020	180 days	6 days	✓	30-Jul-2020	173 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW12-05-02	E421	24-Jul-2020	30-Jul-2020	180 days	6 days	✓	30-Jul-2020	173 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW12-05-03	E421	24-Jul-2020	30-Jul-2020	180 days	6 days	✓	30-Jul-2020	173 days	0 days	✓

Matrix: **Water**

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Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW12-05-04	E421	24-Jul-2020	30-Jul-2020	180 days	6 days	✓	30-Jul-2020	173 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW12-05-05	E421	24-Jul-2020	30-Jul-2020	180 days	6 days	✓	30-Jul-2020	173 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW12-05-06	E421	24-Jul-2020	30-Jul-2020	180 days	6 days	✓	30-Jul-2020	173 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW12-05-07	E421	24-Jul-2020	30-Jul-2020	180 days	6 days	✓	30-Jul-2020	173 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW17-10-03	E421	22-Jul-2020	30-Jul-2020	180 days	8 days	✓	30-Jul-2020	171 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW17-10-01	E421	21-Jul-2020	30-Jul-2020	180 days	9 days	✓	30-Jul-2020	170 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW17-10-02	E421	21-Jul-2020	30-Jul-2020	180 days	9 days	✓	30-Jul-2020	170 days	0 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW17-11-01	E290	26-Jul-2020	----	----	----		30-Jul-2020	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW17-11-03	E290	26-Jul-2020	----	----	----		30-Jul-2020	14 days	3 days	✓

Matrix: **Water**

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Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE DUP	E290	24-Jul-2020	----	----	----		30-Jul-2020	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW12-05-02	E290	24-Jul-2020	----	----	----		30-Jul-2020	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW12-05-03	E290	24-Jul-2020	----	----	----		30-Jul-2020	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW12-05-04	E290	24-Jul-2020	----	----	----		30-Jul-2020	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW12-05-05	E290	24-Jul-2020	----	----	----		30-Jul-2020	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW12-05-06	E290	24-Jul-2020	----	----	----		30-Jul-2020	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW12-05-07	E290	24-Jul-2020	----	----	----		30-Jul-2020	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW12-05-01	E290	24-Jul-2020	----	----	----		30-Jul-2020	14 days	6 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW17-10-01	E290	21-Jul-2020	----	----	----		30-Jul-2020	14 days	8 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE MW17-10-02	E290	21-Jul-2020	----	----	----		30-Jul-2020	14 days	8 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW17-10-03	E290	22-Jul-2020	----	----	----		30-Jul-2020	14 days	8 days	✓
Physical Tests : Conductivity in Water										
HDPE MW17-11-01	E100	26-Jul-2020	----	----	----		30-Jul-2020	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE MW17-11-03	E100	26-Jul-2020	----	----	----		30-Jul-2020	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE DUP	E100	24-Jul-2020	----	----	----		30-Jul-2020	28 days	5 days	✓
Physical Tests : Conductivity in Water										
HDPE MW12-05-02	E100	24-Jul-2020	----	----	----		30-Jul-2020	28 days	5 days	✓
Physical Tests : Conductivity in Water										
HDPE MW12-05-03	E100	24-Jul-2020	----	----	----		30-Jul-2020	28 days	5 days	✓
Physical Tests : Conductivity in Water										
HDPE MW12-05-04	E100	24-Jul-2020	----	----	----		30-Jul-2020	28 days	5 days	✓
Physical Tests : Conductivity in Water										
HDPE MW12-05-05	E100	24-Jul-2020	----	----	----		30-Jul-2020	28 days	5 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Conductivity in Water										
HDPE MW12-05-06	E100	24-Jul-2020	----	----	----		30-Jul-2020	28 days	5 days	✓
Physical Tests : Conductivity in Water										
HDPE MW12-05-07	E100	24-Jul-2020	----	----	----		30-Jul-2020	28 days	5 days	✓
Physical Tests : Conductivity in Water										
HDPE MW12-05-01	E100	24-Jul-2020	----	----	----		30-Jul-2020	28 days	6 days	✓
Physical Tests : Conductivity in Water										
HDPE MW17-10-01	E100	21-Jul-2020	----	----	----		30-Jul-2020	28 days	8 days	✓
Physical Tests : Conductivity in Water										
HDPE MW17-10-02	E100	21-Jul-2020	----	----	----		30-Jul-2020	28 days	8 days	✓
Physical Tests : Conductivity in Water										
HDPE MW17-10-03	E100	22-Jul-2020	----	----	----		30-Jul-2020	28 days	8 days	✓
Physical Tests : pH by Meter										
HDPE MW12-05-07	E108	24-Jul-2020	----	----	----		30-Jul-2020	0.25 hrs	138 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW12-05-05	E108	24-Jul-2020	----	----	----		30-Jul-2020	0.25 hrs	139 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW12-05-06	E108	24-Jul-2020	----	----	----		30-Jul-2020	0.25 hrs	139 hrs	× EHTR-FM

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : pH by Meter										
HDPE DUP	E108	24-Jul-2020	----	----	----		30-Jul-2020	0.25 hrs	140 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW12-05-04	E108	24-Jul-2020	----	----	----		30-Jul-2020	0.25 hrs	140 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW12-05-03	E108	24-Jul-2020	----	----	----		30-Jul-2020	0.25 hrs	141 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW12-05-02	E108	24-Jul-2020	----	----	----		30-Jul-2020	0.25 hrs	143 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW12-05-01	E108	24-Jul-2020	----	----	----		30-Jul-2020	0.25 hrs	146 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW17-10-03	E108	22-Jul-2020	----	----	----		30-Jul-2020	0.25 hrs	194 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW17-10-02	E108	21-Jul-2020	----	----	----		30-Jul-2020	0.25 hrs	211 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW17-10-01	E108	21-Jul-2020	----	----	----		30-Jul-2020	0.25 hrs	212 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW17-11-03	E108	26-Jul-2020	----	----	----		30-Jul-2020	0.25 hrs	92 hrs	× EHTR-FM

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : pH by Meter										
HDPE MW17-11-01	E108	26-Jul-2020	----	----	----		30-Jul-2020	0.25 hrs	93 hrs	× EHTR-FM
Physical Tests : TSS by Gravimetry										
HDPE MW17-11-01	E160-H	26-Jul-2020	----	----	----		30-Jul-2020	7 days	3 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW17-11-03	E160-H	26-Jul-2020	----	----	----		30-Jul-2020	7 days	3 days	✓
Physical Tests : TSS by Gravimetry										
HDPE DUP	E160-H	24-Jul-2020	----	----	----		30-Jul-2020	7 days	5 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW12-05-03	E160-H	24-Jul-2020	----	----	----		30-Jul-2020	7 days	5 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW12-05-04	E160-H	24-Jul-2020	----	----	----		30-Jul-2020	7 days	5 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW12-05-05	E160-H	24-Jul-2020	----	----	----		30-Jul-2020	7 days	5 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW12-05-06	E160-H	24-Jul-2020	----	----	----		30-Jul-2020	7 days	5 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW12-05-07	E160-H	24-Jul-2020	----	----	----		30-Jul-2020	7 days	5 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TSS by Gravimetry										
HDPE MW12-05-01	E160-H	24-Jul-2020	----	----	----		30-Jul-2020	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW12-05-02	E160-H	24-Jul-2020	----	----	----		30-Jul-2020	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW17-10-01	E160-H	21-Jul-2020	----	----	----		30-Jul-2020	7 days	8 days	× EHTL
Physical Tests : TSS by Gravimetry										
HDPE MW17-10-02	E160-H	21-Jul-2020	----	----	----		30-Jul-2020	7 days	8 days	× EHTL
Physical Tests : TSS by Gravimetry										
HDPE MW17-10-03	E160-H	22-Jul-2020	----	----	----		30-Jul-2020	7 days	8 days	× EHTL

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	66102	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	66128	1	20	5.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	66114	1	13	7.6	5.0	✓
Conductivity in Water	E100	66103	1	13	7.6	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	66450	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	66238	3	35	8.5	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	66449	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	66111	1	18	5.5	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	66112	1	18	5.5	5.0	✓
pH by Meter	E108	66104	1	13	7.6	5.0	✓
Sulfate in Water by IC	E235.SO4	66113	1	18	5.5	5.0	✓
TSS by Gravimetry	E160-H	66257	1	17	5.8	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	66102	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	66128	1	20	5.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	66114	1	13	7.6	5.0	✓
Conductivity in Water	E100	66103	1	13	7.6	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	66450	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	66238	3	35	8.5	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	66449	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	66111	1	18	5.5	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	66112	1	18	5.5	5.0	✓
pH by Meter	E108	66104	1	13	7.6	5.0	✓
Sulfate in Water by IC	E235.SO4	66113	1	18	5.5	5.0	✓
TSS by Gravimetry	E160-H	66257	1	17	5.8	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	66102	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	66128	1	20	5.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	66114	1	13	7.6	5.0	✓
Conductivity in Water	E100	66103	1	13	7.6	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	66450	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	66238	3	35	8.5	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	66449	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	66111	1	18	5.5	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	66112	1	18	5.5	5.0	✓
Sulfate in Water by IC	E235.SO4	66113	1	18	5.5	5.0	✓
TSS by Gravimetry	E160-H	66257	1	17	5.8	5.0	✓

Matrix: **Water**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	66128	1	20	5.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	66114	1	13	7.6	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	66450	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	66238	3	35	8.5	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	66449	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	66111	1	18	5.5	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	66112	1	18	5.5	5.0	✓
Sulfate in Water by IC	E235.SO4	66113	1	18	5.5	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
TSS by Gravimetry	E160-H Vancouver - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
Chloride in Water by IC (Low Level)	E235.Cl-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Vancouver - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Ion Balance using Dissolved Metals	EC101 Vancouver - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
TDS in Water (Calculation)	EC103 Vancouver - Environmental	Water	APHA 1030E (mod)	Total Dissolved Solids is calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present.
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N Vancouver - Environmental	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **WR2000557**	Page	: 1 of 10
Amendment	: **1**		

Client	: Minto Explorations Ltd.	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 28-Jul-2020 14:18
PO	: 232818	Date Analysis Commenced	: 30-Jul-2020
C-O-C number	: 2020-07-28 B	Issue Date	: 21-Aug-2020 17:29
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 13		
No. of samples analysed	: 13		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Aaron Yu	Laboratory Analyst	Metals, Burnaby, British Columbia
Bruna Botti	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Cristina Alexandre	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Ilnaz Badbezanchi	Team Leader - Metals preparation	Metals, Burnaby, British Columbia
Jashan Kaur	Lab Assistant	Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Kinny Wu	Lab Analyst	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 66102)											
WR2000557-001	MW17-10-01	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	119	119	0.504%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	119	119	0.504%	20%	----
Physical Tests (QC Lot: 66103)											
WR2000557-001	MW17-10-01	conductivity	----	E100	2.0	µS/cm	455	454	0.220%	10%	----
Physical Tests (QC Lot: 66104)											
WR2000557-001	MW17-10-01	pH	----	E108	0.10	pH units	7.63	7.64	0.131%	4%	----
Physical Tests (QC Lot: 66257)											
WR2000556-004	Anonymous	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	53.7	55.3	2.94%	20%	----
Anions and Nutrients (QC Lot: 66111)											
WR2000552-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.250	mg/L	306	309	0.765%	20%	----
Anions and Nutrients (QC Lot: 66112)											
WR2000552-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0500	mg/L	0.352	0.342	0.0099	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 66113)											
WR2000552-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	15.0	mg/L	2250	2270	0.629%	20%	----
Anions and Nutrients (QC Lot: 66114)											
WR2000557-001	MW17-10-01	chloride	16887-00-6	E235.Cl-L	0.10	mg/L	0.95	0.96	0.01	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 66128)											
WR2000548-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0096	0.0086	0.0010	Diff <2x LOR	----
Dissolved Metals (QC Lot: 66238)											
WR2000557-001	MW17-10-01	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 66449)											
VA20B1465-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0053	0.0049	0.0003	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00049	0.00048	0.00002	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0173	0.0176	1.39%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 66449) - continued											
VA20B1465-001	Anonymous	cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	0.0000233	0.0000199	0.0000034	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	33.4	33.1	0.907%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	0.00029	0.00029	0.000001	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00026	0.00026	0.0000003	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	0.224	0.222	0.706%	20%	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0012	0.0012	0.00002	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	10.4	10.2	2.28%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.0715	0.0713	0.358%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.000387	0.000382	0.000005	Diff <2x LOR	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00053	0.00052	0.000008	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	2.98	3.03	1.50%	20%	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.000151	0.000143	0.000008	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	11.2	10.8	3.83%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	7440-23-5	E421	0.050	mg/L	30.7	30.0	2.32%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.226	0.230	1.72%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	3.62	3.63	0.01	Diff <2x LOR	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	0.00030	0.00030	0.000006	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.000821	0.000802	2.42%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	0.00252	0.00255	0.00003	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0090	0.0090	0.00001	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 66450)											
VA20B1465-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 67032)											
VA20B1539-007	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 67033)											
WR2000557-008	MW12-05-03	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 66102)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 66103)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 66257)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Anions and Nutrients (QCLot: 66111)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	# 0.0231	B
Anions and Nutrients (QCLot: 66112)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 66113)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 66114)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 66128)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Dissolved Metals (QCLot: 66238)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 66449)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 66449) - continued						
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----
Dissolved Metals (QCLot: 66450)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 67032)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 67033)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----

Qualifiers

Qualifier	Description
B	*Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.*

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 66102)									
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	229 mg/L	96.6	75.0	125	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	96.4	85.0	115	----
Physical Tests (QCLot: 66103)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	102	90.0	110	----
Physical Tests (QCLot: 66104)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 66257)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	90.8	85.0	115	----
Anions and Nutrients (QCLot: 66111)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	99.8	90.0	110	----
Anions and Nutrients (QCLot: 66112)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	103	90.0	110	----
Anions and Nutrients (QCLot: 66113)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 66114)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	99.5	90.0	110	----
Anions and Nutrients (QCLot: 66128)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.12 mg/L	100	85.0	115	----
Dissolved Metals (QCLot: 66238)									
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	106	80.0	120	----
Dissolved Metals (QCLot: 66449)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	99.0	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	99.9	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	97.5	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	103	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	96.7	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	95.1	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	92.2	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	96.7	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	97.8	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	99.8	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 66449) - continued									
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	98.8	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	98.1	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	99.2	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	97.4	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	99.5	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	96.7	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	100	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	95.2	70.0	130	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	102	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	96.7	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	97.4	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	103	80.0	120	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	105	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	106	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	90.5	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	96.4	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	98.7	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	92.2	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	97.3	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	100	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	102	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	95.4	80.0	120	----
Dissolved Metals (QCLot: 66450)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
Dissolved Metals (QCLot: 67032)									
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	96.5	80.0	120	----
Dissolved Metals (QCLot: 67033)									
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	99.0	80.0	120	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 66111)										
WR2000552-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	ND mg/L	125 mg/L	ND	75.0	125	MS-B
Anions and Nutrients (QCLot: 66112)										
WR2000552-002	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	23.8 mg/L	25 mg/L	95.4	75.0	125	----
Anions and Nutrients (QCLot: 66113)										
WR2000552-002	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	4620 mg/L	5000 mg/L	92.4	75.0	125	----
Anions and Nutrients (QCLot: 66114)										
WR2000557-002	MW17-10-02	chloride	16887-00-6	E235.Cl-L	99.8 mg/L	100 mg/L	99.8	75.0	125	----
Anions and Nutrients (QCLot: 66128)										
WR2000548-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.202 mg/L	0.2 mg/L	101	75.0	125	----
Dissolved Metals (QCLot: 66238)										
WR2000557-002	MW17-10-02	mercury, dissolved	7439-97-6	E509	0.0000997 mg/L	0.0001 mg/L	99.7	70.0	130	----
Dissolved Metals (QCLot: 66449)										
VA20B1527-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.198 mg/L	0.2 mg/L	98.8	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0203 mg/L	0.02 mg/L	101	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0199 mg/L	0.02 mg/L	99.7	70.0	130	----
		barium, dissolved	7440-39-3	E421	0.0195 mg/L	0.02 mg/L	97.7	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0409 mg/L	0.04 mg/L	102	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00918 mg/L	0.01 mg/L	91.8	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.100 mg/L	0.1 mg/L	100	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00391 mg/L	0.004 mg/L	97.7	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0194 mg/L	0.02 mg/L	97.1	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0191 mg/L	0.02 mg/L	95.6	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.92 mg/L	2 mg/L	96.0	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0188 mg/L	0.02 mg/L	93.9	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.103 mg/L	0.1 mg/L	103	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0194 mg/L	0.02 mg/L	97.2	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0385 mg/L	0.04 mg/L	96.3	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 66449) - continued										
VA20B1527-001	Anonymous	phosphorus, dissolved	7723-14-0	E421	10.3 mg/L	10 mg/L	103	70.0	130	----
		potassium, dissolved	7440-09-7	E421	3.99 mg/L	4 mg/L	99.7	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0424 mg/L	0.04 mg/L	106	70.0	130	----
		silicon, dissolved	7440-21-3	E421	ND mg/L	10 mg/L	ND	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00397 mg/L	0.004 mg/L	99.2	70.0	130	----
		sodium, dissolved	7440-23-5	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	20.0 mg/L	20 mg/L	99.8	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00370 mg/L	0.004 mg/L	92.4	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0195 mg/L	0.02 mg/L	97.7	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0400 mg/L	0.04 mg/L	100	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00392 mg/L	0.004 mg/L	98.0	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.0997 mg/L	0.1 mg/L	99.7	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.404 mg/L	0.4 mg/L	101	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0404 mg/L	0.04 mg/L	101	70.0	130	----
Dissolved Metals (QCLot: 66450)										
VA20B1527-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.0403 mg/L	0.04 mg/L	101	70.0	130	----
Dissolved Metals (QCLot: 67032)										
VA20B1539-008	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000942 mg/L	0.0001 mg/L	94.2	70.0	130	----
Dissolved Metals (QCLot: 67033)										
WR2000557-009	MW12-05-04	mercury, dissolved	7439-97-6	E509	0.0000949 mg/L	0.0001 mg/L	94.9	70.0	130	----

Qualifiers

Qualifier	Description
MS-B	*Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.*

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 2020-07-28 B

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Ruth Cayetano

Report Format / Distribution	
Select Report Format:	☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	mintoenvironment@mintomine.com
Email 2	
Email 3	

Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	ap@mintomine.com
Email 2	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:		Major/Minor Code:	Routing Code:
PO / AFE:	232818 (GW)	Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)		ALS Contact:	Sampler:

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐

EMERGENCY: 1 Business day [E1] ☐ | Same Day, Weekend or Statutory holiday [E0] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service le

Analysis R

Indicate Filtered (F), Preserved (P) or Filtered a

Environmental Division Whitehorse

Work Order Reference WR2000557

Telephone : +1 867 668 6689

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals(TM)	Dissolved Metals (DM)	Total Mercury, Hardness	Dissolved Mercury	Ammonia (Total Nutrients)	Dissolved Organic Carbon (DOC)	pH, Cond., TSS, TDS, Alkalinity, Anions	Dissolved Bromide (Br-D)						
					P	F/P	P	F/P	P	F/P								
	MW17-10-01	21-Jul-20	15:00	Water		R		R	R		R							4
	MW17-10-02	21-Jul-20	16:30	Water		R		R	R		R							4
	MW17-10-03	22-Jul-20	9:25	Water		R		R	R		R							4
	MW17-11-01	26-Jul-20	14:12	Water		R		R	R		R							4
	MW17-11-03	26-Jul-20	15:11	Water		R		R	R		R							4
	MW12-05-01	24-Jul-20	9:30	Water		R		R	R		R							4
	MW12-05-02	24-Jul-20	11:35	Water		R		R	R		R							4
	MW12-05-03	24-Jul-20	13:55	Water		R		R	R		R							4
	MW12-05-04	24-Jul-20	14:43	Water		R		R	R		R							4
	MW12-05-05	24-Jul-20	15:45	Water		R		R	R		R							4
	MW12-05-06	24-Jul-20	16:10	Water		R		R	R		R							4
	MW12-05-07	24-Jul-20	16:37	Water		R		R	R		R							4

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO

Are samples for human drinking water use? ☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☑ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
6					7

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Chris Wall	Date: 2020-07-28	Time:	Received by:	Date: July 28/20	Time: 14:38	Received by: HA	Date: 7 12 5	Time: 11:00P

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

Affix ALS barcode label here (lab use only)

COC Number: 2020-07-28 B

Page 2 of 2

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Ruth Cayetano

Report Format / Distribution	
Select Report Format:	☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	mintoenvironment@mintomine.com
Email 2	
Email 3	
Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	ap@mintomine.com
Email 2	

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)		EMERGENCY	
4 day [P4]	☐	1 Business day [E1]	☐
3 day [P3]	☐	Same Day, Weekend or Statutory holiday [E0]	☐
2 day [P2]	☐		

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information	
ALS Account # / Quote #:	
Job #:	
PO / AFE:	232818 (GW)
LSD:	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only)		ALS Contact:	Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals(TM) P	Dissolved Metals (DM) F/P	Total Mercury, Hardness P	Dissolved Mercury F/P	Ammonia (Total Nutrients) P	Dissolved Organic Carbon (DOC) F/P	pH, Cond., TSS, TDS, Alkalinity, Anions	Dissolved Bromide (Br-D)						Number of Containers
	DUP	July 24		Water		R		R	R		R							4

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO

Are samples for human drinking water use? ☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☑ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
					7

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Chris Wall	Date: 2020-07-28	Time:	Received by:	Date:	Time:	Received by: HA	Date: 7/29	Time: 11:10p

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

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1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000614**	Page	: 1 of 4
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 04-Aug-2020 14:50
PO	: ----	Date Analysis Commenced	: 07-Aug-2020
C-O-C number	: 2020-08-04 F	Issue Date	: 12-Aug-2020 16:32
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 2		
No. of samples analysed	: 2		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Annabelle Prasad	Analyst	Metals, Burnaby, British Columbia
Bruna Botti	Analyst	Inorganics - Water Quality, Burnaby, British Columbia
Cristina Alexandre	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Kinny Wu	Laboratory Analyst	Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics - Water Quality, Burnaby, British Columbia
Woochan Song	Lab Assistant	Metals, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW09-03-01	MW09-03-02	----	----	----
					Client sampling date / time	01-Aug-2020 11:10	01-Aug-2020 11:35	----	----	----
						WR2000614-001	WR2000614-002	--------	--------	--------
						Result	Result	----	----	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		144	126	----	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		144	126	----	----	----
conductivity	----	E100	2.0	µS/cm		307	310	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		143	144	----	----	----
pH	----	E108	0.10	pH units		8.14	8.04	----	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		180	186	----	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		3.3	4.9	----	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0291	<0.0050	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.36	1.18	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.0403	6.58	----	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		0.0827	6.58	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0424	<0.0010	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		17.4	4.90	----	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		3.25	3.13	----	----	----
cation sum	----	EC101	0.10	meq/L		3.31	3.14	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		0.915	0.159	----	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0027	0.0012	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00114	0.00012	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0686	0.0183	----	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.109	0.029	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000665	0.0000379	----	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW09-03-01	MW09-03-02	----	----	----
					Client sampling date / time	01-Aug-2020 11:10	01-Aug-2020 11:35	----	----	----
						WR2000614-001	WR2000614-002	--------	--------	--------
						Result	Result	----	----	----
Dissolved Metals										
calcium, dissolved	7440-70-2	E421	0.050	mg/L		39.1	47.2	----	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	----	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		<0.00020	0.00148	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.386	<0.010	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0038	0.0013	----	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		11.0	6.27	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0948	0.00397	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00485	0.00369	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00082	<0.00050	----	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	----	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		2.06	2.14	----	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		<0.000050	0.000251	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		5.53	5.42	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	----	----	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		8.42	4.58	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		1.00	0.347	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		5.83	1.58	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000871	0.00185	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0113	0.0258	----	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	----	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	----	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000616**	Page	: 1 of 4
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 04-Aug-2020 14:50
PO	: 232818 (GW)	Date Analysis Commenced	: 07-Aug-2020
C-O-C number	: 2020-08-04 B	Issue Date	: 12-Aug-2020 16:20
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Annabelle Prasad	Analyst	Metals, Burnaby, British Columbia
Bruna Botti	Analyst	Inorganics - Water Quality, Burnaby, British Columbia
Cristina Alexandre	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Kinny Wu	Laboratory Analyst	Metals, Burnaby, British Columbia
Monica Ko		Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics - Water Quality, Burnaby, British Columbia
Woochan Song	Lab Assistant	Metals, Burnaby, British Columbia

General Comments

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Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
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Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

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UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Qualifiers

Qualifier	*Description*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW12-07-01	MW12-07-02	MW17-11-02	----	----
					Client sampling date / time	28-Jul-2020 15:50	28-Jul-2020 16:30	28-Jul-2020 10:00	----	----
						WR2000616-001	WR2000616-002	WR2000616-003	--------	--------
						Result	Result	Result	----	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		126	189	140	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	----	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		126	189	140	----	----
conductivity	----	E100	2.0	µS/cm		1350	929	357	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		574	418	146	----	----
pH	----	E108	0.10	pH units		8.01	8.05	8.10	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		1060	644	216	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		3.9	<3.0	<3.0	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0815	0.0113	<0.0050	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		2.50	11.4	0.45	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		1.07	1.51	0.0667	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		3.66	1.59	0.118	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		2.59	0.0738	0.0515	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		646	307	44.2	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		16.3	10.6	3.73	----	----
cation sum	----	EC101	0.10	meq/L		15.5	9.89	3.82	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		2.52	3.46	1.19	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0027	0.0030	0.0197	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		0.00065	<0.00010	<0.00010	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.0153	0.00114	0.00227	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0218	0.0238	0.0410	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		1.58	0.115	0.051	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000600 DLM	0.000154	0.0000600	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		194	120	39.4	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW12-07-01	MW12-07-02	MW17-11-02	----	----
					Client sampling date / time	28-Jul-2020 15:50	28-Jul-2020 16:30	28-Jul-2020 10:00	----	----
						WR2000616-001	WR2000616-002	WR2000616-003	--------	--------
						Result	Result	Result	----	----
Dissolved Metals										
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00026	0.00011	0.00017	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00011	0.00041	<0.00010	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00131	0.0104	0.00138	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.215	<0.010	0.178	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0209	0.0167	0.0057	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		21.7	28.8	11.7	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0904	0.564	0.0518	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.0246	0.0196	0.00634	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00211	0.00051	<0.00050	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		2.72	3.04	2.23	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000962	0.000504	<0.000050	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		7.24	7.35	5.48	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		0.000020	<0.000010	<0.000010	----	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		88.0	32.8	18.7	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		9.26	3.42	1.05	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		237	117	14.9	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		0.00025	<0.00010	<0.00010	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	0.00192	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000299	0.00483	0.000272	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	0.00055	<0.00050	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.197	0.0352	0.0338	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000668**	Page	: 1 of 10
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 11-Aug-2020 15:05
PO	: 232818	Date Analysis Commenced	: 13-Aug-2020
C-O-C number	: 2020-08-11 A	Issue Date	: 21-Aug-2020 15:07
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 16		
No. of samples analysed	: 16		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Bruna Botti	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Ian Cronshaw	Analyst	Metals, Burnaby, British Columbia
Muneeb Alam	Analyst	Metals, Burnaby, British Columbia
Omar Beydoun	Lab Assistant	Metals, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Inorganics - Water Quality, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics - Water Quality, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
µS/cm	Microsiemens per centimetre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Qualifiers

Qualifier	*Description*
DLA	*Detection Limit adjusted for required dilution.*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-12-01 Water	MW17-12-02 Water	MW17-12-03 Water	MW17-12-04 Water	MW17-12-05 Water
					Client sampling date / time	06-Aug-2020 07:30	06-Aug-2020 08:15	06-Aug-2020 08:40	06-Aug-2020 09:20	06-Aug-2020 10:05
						WR2000668-001	WR2000668-002	WR2000668-003	WR2000668-004	WR2000668-005
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		205	222	345	329	340
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		205	222	345	329	340
conductivity	----	E100	2.0	µS/cm		2480	2230	833	765	751
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		937	863	352	338	357
pH	----	E108	0.10	pH units		7.97	8.00	8.12	8.12	8.15
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		2040	1830	549	470	460
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		5.4	3.4	<3.0	<3.0	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		<0.0050	0.0052	<0.0050	<0.0050	<0.0050
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		11.9	11.0	2.00	2.03	2.75
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		<0.0500 DLDS	<0.0500 DLDS	<0.0250 DLDS	0.127	0.311
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		<0.0510	<0.0510	<0.0255	0.129	0.320
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0100 DLDS	<0.0100 DLDS	<0.0050 DLDS	<0.0050 DLDS	0.0095
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		1290	1100	127	106	88.6
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0027	0.0022	0.0017	0.0029	0.0040
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00020 DLA	<0.00020 DLA	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00170	0.00275	0.00094	0.00012	<0.00010
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0107	0.00812	0.0135	0.0204	0.0394
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		0.000075	0.000048	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000100 DLA	<0.000100 DLA	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.158	0.150	0.061	0.035	0.029
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000126	0.0000205	0.0000153	0.0000189	0.0000309
calcium, dissolved	7440-70-2	E421	0.050	mg/L		296	267	80.1	60.6	61.3
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00020 DLA	<0.00020 DLA	0.00012	0.00014	0.00018
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00020 DLA	<0.00020 DLA	<0.00010	<0.00010	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		<0.00040 DLA	<0.00040 DLA	<0.00020	0.00078	0.00205

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-12-01 Water	MW17-12-02 Water	MW17-12-03 Water	MW17-12-04 Water	MW17-12-05 Water
					Client sampling date / time	06-Aug-2020 07:30	06-Aug-2020 08:15	06-Aug-2020 08:40	06-Aug-2020 09:20	06-Aug-2020 10:05
						WR2000668-001	WR2000668-002	WR2000668-003	WR2000668-004	WR2000668-005
						Result	Result	Result	Result	Result
Dissolved Metals										
iron, dissolved	7439-89-6	E421	0.010	mg/L		2.58	2.14	0.075	<0.010	<0.010
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000100 DLA	<0.000100 DLA	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0143	0.0146	0.0098	0.0074	0.0071
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		48.1	47.3	36.8	45.2	49.5
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0993	0.0685	0.119	0.00209	0.0220
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00736	0.00769	0.00556	0.00493	0.00422
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00100 DLA	<0.00100 DLA	<0.00050	<0.00050	0.00089
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.100 DLA	<0.100 DLA	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		3.44	3.59	3.18	2.99	3.57
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		<0.000100 DLA	<0.000100 DLA	0.000070	0.000617	0.000168
silicon, dissolved	7440-21-3	E421	0.050	mg/L		7.02	7.77	8.59	7.56	7.61
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000020 DLA	<0.000020 DLA	<0.000010	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		246	244	69.1	34.5	28.2
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		9.35	11.0	3.51	1.40	1.36
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		456	418	46.4	36.6	32.4
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000020 DLA	<0.000020 DLA	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		0.00022	<0.00020 DLA	<0.00010	0.00012	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00060 DLA	<0.00060 DLA	<0.00030	<0.00030	<0.00030
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000312	0.000500	0.00401	0.00407	0.00435
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00100 DLA	<0.00100 DLA	<0.00050	<0.00050	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0879	0.0517	0.0367	0.0363	0.0443
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00040 DLA	<0.00040 DLA	<0.00020	<0.00020	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-12-06 Water	MW17-12-07 Water	MW17-12-08 Water	DUP Water	MW12-06-01 Water
					Client sampling date / time	06-Aug-2020 10:25	06-Aug-2020 10:50	06-Aug-2020 11:05	06-Aug-2020	07-Aug-2020 08:20
						WR2000668-006	WR2000668-007	WR2000668-008	WR2000668-009	WR2000668-010
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		335	252	253	328	450
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		335	252	253	328	450
conductivity	----	E100	2.0	µS/cm		755	582	588	768	1280
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		349	265	271	335	603
pH	----	E108	0.10	pH units		8.11	8.20	8.14	8.20	7.45
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		456	344	349	470	831
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	<3.0	<3.0	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	0.872
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		3.08	5.46	5.44	2.02	5.34
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.233	0.401	0.409	0.124	0.0610
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		0.235	0.403	0.411	0.126	0.225
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0050 DLDS	0.0017	0.0019	<0.0050 DLDS	0.164
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		90.1	63.4	63.7	107	236
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0027	0.0028	0.0029	0.0031	0.0211
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	0.00022
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		<0.00010	0.00010	<0.00010	0.00012	0.00481
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0500	0.0209	0.0217	0.0202	0.292
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	0.000161
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.030	0.023	0.023	0.035	0.499
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000356	0.0000203	0.0000157	0.0000248	0.0000050
calcium, dissolved	7440-70-2	E421	0.050	mg/L		60.5	48.2	47.8	59.9	180
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	0.00023	0.00014	0.00337
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00018	<0.00010	<0.00010	<0.00010	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00343	0.00062	0.00073	0.00073	<0.00020
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	0.229

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-12-06 Water	MW17-12-07 Water	MW17-12-08 Water	DUP Water	MW12-06-01 Water
					Client sampling date / time	06-Aug-2020 10:25	06-Aug-2020 10:50	06-Aug-2020 11:05	06-Aug-2020	07-Aug-2020 08:20
						WR2000668-006	WR2000668-007	WR2000668-008	WR2000668-009	WR2000668-010
						Result	Result	Result	Result	Result
Dissolved Metals										
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0089	0.0060	0.0061	0.0074	0.0132
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		48.1	35.0	37.0	44.9	37.1
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.115	0.00188	0.00080	0.00191	0.397
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.0171	0.00535	0.00668	0.00495	0.000747
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00230	<0.00050	<0.00050	<0.00050	0.00067
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		4.07	2.53	2.63	2.92	3.54
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000064	0.000155	0.000194	0.000533	0.00319
silicon, dissolved	7440-21-3	E421	0.050	mg/L		7.47	6.84	7.16	7.55	7.58
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	0.000013	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		28.2	18.6	19.8	35.4	76.3
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		1.41	0.949	0.974	1.36	6.86
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		30.9	22.6	22.8	36.7	210
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	0.00042	<0.00010	<0.00010	0.00032
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	0.00234
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00374	0.00282	0.00290	0.00401	0.000329
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00062	0.00066	0.00071	<0.00050	0.0139
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0344	0.0304	0.0274	0.0317	0.0065
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	0.00069
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW12-06-02 Water	MW12-06-03 Water	MW12-06-04 Water	MW12-06-05 Water	MW12-06-06 Water
					Client sampling date / time	07-Aug-2020 09:30	07-Aug-2020 09:45	07-Aug-2020 10:10	07-Aug-2020 10:25	07-Aug-2020 10:50
						WR2000668-011	WR2000668-012	WR2000668-013	WR2000668-014	WR2000668-015
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		357	382	396	398	316
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		357	382	396	398	316
conductivity	----	E100	2.0	µS/cm		1000	997	1000	1000	853
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		471	490	494	500	408
pH	----	E108	0.10	pH units		7.96	8.06	8.01	8.03	8.12
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		670	664	658	662	545
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		7.0	<3.0	<3.0	<3.0	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0266	0.0736	0.0104	0.0062	<0.0050
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.65	0.63	0.58	0.60	7.26
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		<0.0250 DLDS	0.0327	<0.0250 DLDS	0.0431	0.639
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		0.103	0.168	0.0903	0.119	0.665
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0798	0.135	0.0711	0.0762	0.0260
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		223	206	196	200	162
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0022	0.0023	0.0019	0.0018	0.0012
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00329	0.00048	0.00214	0.00044	<0.00010
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0245	0.0210	0.0173	0.0404	0.0137
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		0.000034	0.000020	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.088	0.105	0.071	0.074	0.049
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000050	0.0000065	<0.0000050	<0.0000050	<0.0000100 DLM
calcium, dissolved	7440-70-2	E421	0.050	mg/L		124	108	101	102	77.7
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	0.00016	<0.00010	<0.00010	<0.00010
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00122	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		<0.00020	0.00029	<0.00020	<0.00020	<0.00020
iron, dissolved	7439-89-6	E421	0.010	mg/L		1.04	0.772	0.859	0.106	0.024

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW12-06-02 Water	MW12-06-03 Water	MW12-06-04 Water	MW12-06-05 Water	MW12-06-06 Water
					Client sampling date / time	07-Aug-2020 09:30	07-Aug-2020 09:45	07-Aug-2020 10:10	07-Aug-2020 10:25	07-Aug-2020 10:50
						WR2000668-011	WR2000668-012	WR2000668-013	WR2000668-014	WR2000668-015
						Result	Result	Result	Result	Result
Dissolved Metals										
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0080	0.0076	0.0063	0.0062	0.0051
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		38.8	53.2	59.0	59.5	52.0
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0240	0.0136	0.0444	0.417	0.0401
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00961	0.00164	0.00779	0.00917	0.00553
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	0.00058	<0.00050
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		3.48	3.76	3.70	3.74	3.38
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000351	0.000201	0.000100	0.000079	0.000321
silicon, dissolved	7440-21-3	E421	0.050	mg/L		10.6	9.87	9.10	8.47	7.08
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		35.4	33.9	33.8	33.7	30.3
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		9.08	4.61	2.92	2.70	1.54
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		75.6	71.8	67.8	67.7	56.5
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		0.00014	<0.00010	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00281	0.00216	0.00587	0.00612	0.00419
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0027	0.0078	0.0045	0.0099	0.0083
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	DUP Water	----	----	----	----
					Client sampling date / time	07-Aug-2020	----	----	----	----
						WR2000668-016	--------	--------	--------	--------
						Result	----	----	----	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		384	----	----	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	----	----	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	----	----	----	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	----	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		384	----	----	----	----
conductivity	----	E100	2.0	µS/cm		996	----	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		485	----	----	----	----
pH	----	E108	0.10	pH units		8.16	----	----	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		664	----	----	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	----	----	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0654	----	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.63	----	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.0322	----	----	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		0.167	----	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.135	----	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		207	----	----	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0038	----	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	----	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00045	----	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0209	----	----	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		0.000021	----	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	----	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.104	----	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000061	----	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		107	----	----	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00016	----	----	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	----	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00028	----	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.781	----	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	----	----	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	DUP Water	----	----	----	----
					Client sampling date / time	07-Aug-2020	----	----	----	----
						WR2000668-016	--------	--------	--------	--------
						Result	----	----	----	----
Dissolved Metals										
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0076	----	----	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		53.1	----	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0141	----	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	----	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00164	----	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	----	----	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	----	----	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		3.78	----	----	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000062	----	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		9.90	----	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	----	----	----	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		34.2	----	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		4.58	----	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		71.6	----	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	----	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	----	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		0.00032	----	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00219	----	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	----	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0016	----	----	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	----	----	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	----	----	----	----
dissolved metals filtration location	----	EP421	-	-		Field	----	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WR2000668**	Page	: 1 of 28
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 11-Aug-2020 15:05
PO	: 232818	Issue Date	: 21-Aug-2020 15:07
C-O-C number	: 2020-08-11 A		
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 16		
No. of samples analysed	: 16		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers occur - please see following pages for full details.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
DUP - Water	E298	07-Aug-2020	----	----	----		19-Aug-2020	28 days	11 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW12-06-01 - Water	E298	07-Aug-2020	----	----	----		19-Aug-2020	28 days	11 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW12-06-02 - Water	E298	07-Aug-2020	----	----	----		19-Aug-2020	28 days	11 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW12-06-03 - Water	E298	07-Aug-2020	----	----	----		19-Aug-2020	28 days	11 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW12-06-04 - Water	E298	07-Aug-2020	----	----	----		19-Aug-2020	28 days	11 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW12-06-05 - Water	E298	07-Aug-2020	----	----	----		19-Aug-2020	28 days	11 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW12-06-06 - Water	E298	07-Aug-2020	----	----	----		19-Aug-2020	28 days	11 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
DUP - Water	E298	06-Aug-2020	----	----	----		19-Aug-2020	28 days	12 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW17-12-01 - Water	E298	06-Aug-2020	----	----	----		19-Aug-2020	28 days	12 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW17-12-02 - Water	E298	06-Aug-2020	----	----	----		19-Aug-2020	28 days	12 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW17-12-03 - Water	E298	06-Aug-2020	----	----	----		19-Aug-2020	28 days	12 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW17-12-04 - Water	E298	06-Aug-2020	----	----	----		19-Aug-2020	28 days	12 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW17-12-05 - Water	E298	06-Aug-2020	----	----	----		19-Aug-2020	28 days	12 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW17-12-06 - Water	E298	06-Aug-2020	----	----	----		19-Aug-2020	28 days	12 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW17-12-07 - Water	E298	06-Aug-2020	----	----	----		19-Aug-2020	28 days	12 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW17-12-08 - Water	E298	06-Aug-2020	----	----	----		19-Aug-2020	28 days	12 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE DUP - Water	E235.Cl-L	07-Aug-2020	----	----	----		14-Aug-2020	28 days	7 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW12-06-01 - Water	E235.Cl-L	07-Aug-2020	----	----	----		14-Aug-2020	28 days	7 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW12-06-02 - Water	E235.Cl-L	07-Aug-2020	----	----	----		14-Aug-2020	28 days	7 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW12-06-03 - Water	E235.Cl-L	07-Aug-2020	----	----	----		14-Aug-2020	28 days	7 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW12-06-04 - Water	E235.Cl-L	07-Aug-2020	----	----	----		14-Aug-2020	28 days	7 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW12-06-05 - Water	E235.Cl-L	07-Aug-2020	----	----	----		14-Aug-2020	28 days	7 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW12-06-06 - Water	E235.Cl-L	07-Aug-2020	----	----	----		14-Aug-2020	28 days	7 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE DUP - Water	E235.Cl-L	06-Aug-2020	----	----	----		14-Aug-2020	28 days	8 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW17-12-01 - Water	E235.Cl-L	06-Aug-2020	----	----	----		14-Aug-2020	28 days	8 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW17-12-02 - Water	E235.Cl-L	06-Aug-2020	----	----	----		14-Aug-2020	28 days	8 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW17-12-03 - Water	E235.Cl-L	06-Aug-2020	----	----	----		14-Aug-2020	28 days	8 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW17-12-04 - Water	E235.Cl-L	06-Aug-2020	----	----	----		14-Aug-2020	28 days	8 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW17-12-05 - Water	E235.Cl-L	06-Aug-2020	----	----	----		14-Aug-2020	28 days	8 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW17-12-06 - Water	E235.Cl-L	06-Aug-2020	----	----	----		14-Aug-2020	28 days	8 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW17-12-07 - Water	E235.Cl-L	06-Aug-2020	----	----	----		14-Aug-2020	28 days	8 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW17-12-08 - Water	E235.Cl-L	06-Aug-2020	----	----	----		14-Aug-2020	28 days	8 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE DUP - Water	E235.NO3-L	07-Aug-2020	----	----	----		14-Aug-2020	3 days	7 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW12-06-01 - Water	E235.NO3-L	07-Aug-2020	----	----	----		14-Aug-2020	3 days	7 days	× EHTR

Matrix: **Water**

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Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW12-06-02 - Water	E235.NO3-L	07-Aug-2020	----	----	----		14-Aug-2020	3 days	7 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW12-06-03 - Water	E235.NO3-L	07-Aug-2020	----	----	----		14-Aug-2020	3 days	7 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW12-06-04 - Water	E235.NO3-L	07-Aug-2020	----	----	----		14-Aug-2020	3 days	7 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW12-06-05 - Water	E235.NO3-L	07-Aug-2020	----	----	----		14-Aug-2020	3 days	7 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW12-06-06 - Water	E235.NO3-L	07-Aug-2020	----	----	----		14-Aug-2020	3 days	7 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE DUP - Water	E235.NO3-L	06-Aug-2020	----	----	----		14-Aug-2020	3 days	8 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-12-01 - Water	E235.NO3-L	06-Aug-2020	----	----	----		14-Aug-2020	3 days	8 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-12-02 - Water	E235.NO3-L	06-Aug-2020	----	----	----		14-Aug-2020	3 days	8 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-12-03 - Water	E235.NO3-L	06-Aug-2020	----	----	----		14-Aug-2020	3 days	8 days	× EHTR

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Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-12-04 - Water	E235.NO3-L	06-Aug-2020	----	----	----		14-Aug-2020	3 days	8 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-12-05 - Water	E235.NO3-L	06-Aug-2020	----	----	----		14-Aug-2020	3 days	8 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-12-06 - Water	E235.NO3-L	06-Aug-2020	----	----	----		14-Aug-2020	3 days	8 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-12-07 - Water	E235.NO3-L	06-Aug-2020	----	----	----		14-Aug-2020	3 days	8 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-12-08 - Water	E235.NO3-L	06-Aug-2020	----	----	----		14-Aug-2020	3 days	8 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE DUP - Water	E235.NO2-L	07-Aug-2020	----	----	----		14-Aug-2020	3 days	7 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW12-06-01 - Water	E235.NO2-L	07-Aug-2020	----	----	----		14-Aug-2020	3 days	7 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW12-06-02 - Water	E235.NO2-L	07-Aug-2020	----	----	----		14-Aug-2020	3 days	7 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
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Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW12-06-04 - Water	E235.NO2-L	07-Aug-2020	----	----	----		14-Aug-2020	3 days	7 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW12-06-05 - Water	E235.NO2-L	07-Aug-2020	----	----	----		14-Aug-2020	3 days	7 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW12-06-06 - Water	E235.NO2-L	07-Aug-2020	----	----	----		14-Aug-2020	3 days	7 days	× EHTR
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HDPE DUP - Water	E235.NO2-L	06-Aug-2020	----	----	----		14-Aug-2020	3 days	8 days	× EHTR
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HDPE MW17-12-01 - Water	E235.NO2-L	06-Aug-2020	----	----	----		14-Aug-2020	3 days	8 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW17-12-02 - Water	E235.NO2-L	06-Aug-2020	----	----	----		14-Aug-2020	3 days	8 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW17-12-03 - Water	E235.NO2-L	06-Aug-2020	----	----	----		14-Aug-2020	3 days	8 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW17-12-04 - Water	E235.NO2-L	06-Aug-2020	----	----	----		14-Aug-2020	3 days	8 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW17-12-05 - Water	E235.NO2-L	06-Aug-2020	----	----	----		14-Aug-2020	3 days	8 days	× EHTR

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			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW17-12-06 - Water	E235.NO2-L	06-Aug-2020	----	----	----		14-Aug-2020	3 days	8 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW17-12-07 - Water	E235.NO2-L	06-Aug-2020	----	----	----		14-Aug-2020	3 days	8 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW17-12-08 - Water	E235.NO2-L	06-Aug-2020	----	----	----		14-Aug-2020	3 days	8 days	× EHTR
Anions and Nutrients : Sulfate in Water by IC										
HDPE DUP - Water	E235.SO4	07-Aug-2020	----	----	----		14-Aug-2020	28 days	7 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW12-06-01 - Water	E235.SO4	07-Aug-2020	----	----	----		14-Aug-2020	28 days	7 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW12-06-02 - Water	E235.SO4	07-Aug-2020	----	----	----		14-Aug-2020	28 days	7 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW12-06-03 - Water	E235.SO4	07-Aug-2020	----	----	----		14-Aug-2020	28 days	7 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW12-06-04 - Water	E235.SO4	07-Aug-2020	----	----	----		14-Aug-2020	28 days	7 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW12-06-05 - Water	E235.SO4	07-Aug-2020	----	----	----		14-Aug-2020	28 days	7 days	✓

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			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW12-06-06 - Water	E235.SO4	07-Aug-2020	----	----	----		14-Aug-2020	28 days	7 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
DUP - Water	E235.SO4	06-Aug-2020	----	----	----		14-Aug-2020	28 days	8 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW17-12-01 - Water	E235.SO4	06-Aug-2020	----	----	----		14-Aug-2020	28 days	8 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW17-12-02 - Water	E235.SO4	06-Aug-2020	----	----	----		14-Aug-2020	28 days	8 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW17-12-03 - Water	E235.SO4	06-Aug-2020	----	----	----		14-Aug-2020	28 days	8 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW17-12-04 - Water	E235.SO4	06-Aug-2020	----	----	----		14-Aug-2020	28 days	8 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW17-12-05 - Water	E235.SO4	06-Aug-2020	----	----	----		14-Aug-2020	28 days	8 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW17-12-06 - Water	E235.SO4	06-Aug-2020	----	----	----		14-Aug-2020	28 days	8 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW17-12-07 - Water	E235.SO4	06-Aug-2020	----	----	----		14-Aug-2020	28 days	8 days	✓

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			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW17-12-08 - Water	E235.SO4	06-Aug-2020	----	----	----		14-Aug-2020	28 days	8 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW17-12-04 - Water	E421.Cr-L	06-Aug-2020	16-Aug-2020	180 days	10 days	✓	17-Aug-2020	169 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW17-12-05 - Water	E421.Cr-L	06-Aug-2020	16-Aug-2020	180 days	10 days	✓	17-Aug-2020	169 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW17-12-06 - Water	E421.Cr-L	06-Aug-2020	16-Aug-2020	180 days	10 days	✓	17-Aug-2020	169 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW17-12-07 - Water	E421.Cr-L	06-Aug-2020	16-Aug-2020	180 days	10 days	✓	17-Aug-2020	169 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW17-12-08 - Water	E421.Cr-L	06-Aug-2020	16-Aug-2020	180 days	10 days	✓	17-Aug-2020	169 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
DUP - Water	E421.Cr-L	07-Aug-2020	16-Aug-2020	180 days	8 days	✓	17-Aug-2020	171 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
DUP - Water	E421.Cr-L	06-Aug-2020	16-Aug-2020	180 days	9 days	✓	17-Aug-2020	170 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW12-06-01 - Water	E421.Cr-L	07-Aug-2020	16-Aug-2020	180 days	9 days	✓	17-Aug-2020	170 days	0 days	✓

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			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MW12-06-02 - Water	E421.Cr-L	07-Aug-2020	16-Aug-2020	180 days	9 days	✓	17-Aug-2020	170 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MW12-06-03 - Water	E421.Cr-L	07-Aug-2020	16-Aug-2020	180 days	9 days	✓	17-Aug-2020	170 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MW12-06-04 - Water	E421.Cr-L	07-Aug-2020	16-Aug-2020	180 days	9 days	✓	17-Aug-2020	170 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MW12-06-05 - Water	E421.Cr-L	07-Aug-2020	16-Aug-2020	180 days	9 days	✓	17-Aug-2020	170 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MW12-06-06 - Water	E421.Cr-L	07-Aug-2020	16-Aug-2020	180 days	9 days	✓	17-Aug-2020	170 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MW17-12-01 - Water	E421.Cr-L	06-Aug-2020	15-Aug-2020	180 days	9 days	✓	16-Aug-2020	170 days	1 days	✓
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HDPE dissolved (nitric acid) MW17-12-02 - Water	E421.Cr-L	06-Aug-2020	15-Aug-2020	180 days	9 days	✓	16-Aug-2020	170 days	1 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MW17-12-03 - Water	E421.Cr-L	06-Aug-2020	15-Aug-2020	180 days	9 days	✓	16-Aug-2020	170 days	1 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) DUP - Water	E509	07-Aug-2020	14-Aug-2020	28 days	6 days	✓	14-Aug-2020	21 days	0 days	✓

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Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW12-06-01 - Water	E509	07-Aug-2020	14-Aug-2020	28 days	6 days	✓	14-Aug-2020	21 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW12-06-02 - Water	E509	07-Aug-2020	14-Aug-2020	28 days	6 days	✓	14-Aug-2020	21 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW12-06-03 - Water	E509	07-Aug-2020	14-Aug-2020	28 days	6 days	✓	14-Aug-2020	21 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW12-06-04 - Water	E509	07-Aug-2020	14-Aug-2020	28 days	6 days	✓	14-Aug-2020	21 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW12-06-05 - Water	E509	07-Aug-2020	14-Aug-2020	28 days	6 days	✓	14-Aug-2020	21 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW12-06-06 - Water	E509	07-Aug-2020	14-Aug-2020	28 days	6 days	✓	14-Aug-2020	21 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) DUP - Water	E509	06-Aug-2020	14-Aug-2020	28 days	7 days	✓	14-Aug-2020	20 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW17-12-01 - Water	E509	06-Aug-2020	14-Aug-2020	28 days	7 days	✓	14-Aug-2020	20 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW17-12-02 - Water	E509	06-Aug-2020	14-Aug-2020	28 days	7 days	✓	14-Aug-2020	20 days	0 days	✓

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Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
MW17-12-08 - Water	E509	06-Aug-2020	14-Aug-2020	28 days	7 days	✓	14-Aug-2020	20 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
MW17-12-04 - Water	E421	06-Aug-2020	16-Aug-2020	180 days	10 days	✓	17-Aug-2020	169 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
MW17-12-05 - Water	E421	06-Aug-2020	16-Aug-2020	180 days	10 days	✓	17-Aug-2020	169 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
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HDPE dissolved (nitric acid) MW12-06-01 - Water	E421	07-Aug-2020	16-Aug-2020	180 days	9 days	✓	17-Aug-2020	170 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW12-06-02 - Water	E421	07-Aug-2020	16-Aug-2020	180 days	9 days	✓	17-Aug-2020	170 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW12-06-03 - Water	E421	07-Aug-2020	16-Aug-2020	180 days	9 days	✓	17-Aug-2020	170 days	0 days	✓
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Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW12-06-06 - Water	E421	07-Aug-2020	16-Aug-2020	180 days	9 days	✓	17-Aug-2020	170 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW17-12-01 - Water	E421	06-Aug-2020	15-Aug-2020	180 days	9 days	✓	16-Aug-2020	170 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW17-12-02 - Water	E421	06-Aug-2020	15-Aug-2020	180 days	9 days	✓	16-Aug-2020	170 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW17-12-03 - Water	E421	06-Aug-2020	15-Aug-2020	180 days	9 days	✓	16-Aug-2020	170 days	1 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE DUP - Water	E290	07-Aug-2020	----	----	----		14-Aug-2020	14 days	6 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE DUP - Water	E290	06-Aug-2020	----	----	----		14-Aug-2020	14 days	7 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW12-06-01 - Water	E290	07-Aug-2020	----	----	----		14-Aug-2020	14 days	7 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW12-06-02 - Water	E290	07-Aug-2020	----	----	----		14-Aug-2020	14 days	7 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW12-06-03 - Water	E290	07-Aug-2020	----	----	----		14-Aug-2020	14 days	7 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE MW12-06-04 - Water	E290	07-Aug-2020	----	----	----		14-Aug-2020	14 days	7 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW12-06-05 - Water	E290	07-Aug-2020	----	----	----		14-Aug-2020	14 days	7 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW12-06-06 - Water	E290	07-Aug-2020	----	----	----		14-Aug-2020	14 days	7 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW17-12-01 - Water	E290	06-Aug-2020	----	----	----		14-Aug-2020	14 days	8 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW17-12-02 - Water	E290	06-Aug-2020	----	----	----		14-Aug-2020	14 days	8 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW17-12-03 - Water	E290	06-Aug-2020	----	----	----		14-Aug-2020	14 days	8 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW17-12-04 - Water	E290	06-Aug-2020	----	----	----		14-Aug-2020	14 days	8 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW17-12-05 - Water	E290	06-Aug-2020	----	----	----		14-Aug-2020	14 days	8 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW17-12-06 - Water	E290	06-Aug-2020	----	----	----		14-Aug-2020	14 days	8 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE										
MW17-12-07 - Water	E290	06-Aug-2020	----	----	----		14-Aug-2020	14 days	8 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
MW17-12-08 - Water	E290	06-Aug-2020	----	----	----		14-Aug-2020	14 days	8 days	✓
Physical Tests : Conductivity in Water										
HDPE										
DUP - Water	E100	07-Aug-2020	----	----	----		14-Aug-2020	28 days	6 days	✓
Physical Tests : Conductivity in Water										
HDPE										
DUP - Water	E100	06-Aug-2020	----	----	----		14-Aug-2020	28 days	7 days	✓
Physical Tests : Conductivity in Water										
HDPE										
MW12-06-01 - Water	E100	07-Aug-2020	----	----	----		14-Aug-2020	28 days	7 days	✓
Physical Tests : Conductivity in Water										
HDPE										
MW12-06-02 - Water	E100	07-Aug-2020	----	----	----		14-Aug-2020	28 days	7 days	✓
Physical Tests : Conductivity in Water										
HDPE										
MW12-06-03 - Water	E100	07-Aug-2020	----	----	----		14-Aug-2020	28 days	7 days	✓
Physical Tests : Conductivity in Water										
HDPE										
MW12-06-04 - Water	E100	07-Aug-2020	----	----	----		14-Aug-2020	28 days	7 days	✓
Physical Tests : Conductivity in Water										
HDPE										
MW12-06-05 - Water	E100	07-Aug-2020	----	----	----		14-Aug-2020	28 days	7 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Conductivity in Water										
HDPE MW12-06-06 - Water	E100	07-Aug-2020	----	----	----		14-Aug-2020	28 days	7 days	✓
Physical Tests : Conductivity in Water										
HDPE MW17-12-01 - Water	E100	06-Aug-2020	----	----	----		14-Aug-2020	28 days	8 days	✓
Physical Tests : Conductivity in Water										
HDPE MW17-12-02 - Water	E100	06-Aug-2020	----	----	----		14-Aug-2020	28 days	8 days	✓
Physical Tests : Conductivity in Water										
HDPE MW17-12-03 - Water	E100	06-Aug-2020	----	----	----		14-Aug-2020	28 days	8 days	✓
Physical Tests : Conductivity in Water										
HDPE MW17-12-04 - Water	E100	06-Aug-2020	----	----	----		14-Aug-2020	28 days	8 days	✓
Physical Tests : Conductivity in Water										
HDPE MW17-12-05 - Water	E100	06-Aug-2020	----	----	----		14-Aug-2020	28 days	8 days	✓
Physical Tests : Conductivity in Water										
HDPE MW17-12-06 - Water	E100	06-Aug-2020	----	----	----		14-Aug-2020	28 days	8 days	✓
Physical Tests : Conductivity in Water										
HDPE MW17-12-07 - Water	E100	06-Aug-2020	----	----	----		14-Aug-2020	28 days	8 days	✓
Physical Tests : Conductivity in Water										
HDPE MW17-12-08 - Water	E100	06-Aug-2020	----	----	----		14-Aug-2020	28 days	8 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : pH by Meter										
HDPE DUP - Water	E108	07-Aug-2020	----	----	----		14-Aug-2020	0.25 hrs	165 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW12-06-04 - Water	E108	07-Aug-2020	----	----	----		14-Aug-2020	0.25 hrs	170 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW12-06-05 - Water	E108	07-Aug-2020	----	----	----		14-Aug-2020	0.25 hrs	170 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW12-06-06 - Water	E108	07-Aug-2020	----	----	----		14-Aug-2020	0.25 hrs	170 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW12-06-02 - Water	E108	07-Aug-2020	----	----	----		14-Aug-2020	0.25 hrs	171 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW12-06-03 - Water	E108	07-Aug-2020	----	----	----		14-Aug-2020	0.25 hrs	171 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW12-06-01 - Water	E108	07-Aug-2020	----	----	----		14-Aug-2020	0.25 hrs	172 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE DUP - Water	E108	06-Aug-2020	----	----	----		14-Aug-2020	0.25 hrs	189 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW17-12-08 - Water	E108	06-Aug-2020	----	----	----		14-Aug-2020	0.25 hrs	193 hrs	× EHTR-FM

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : pH by Meter										
HDPE MW17-12-05 - Water	E108	06-Aug-2020	----	----	----		14-Aug-2020	0.25 hrs	194 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW17-12-06 - Water	E108	06-Aug-2020	----	----	----		14-Aug-2020	0.25 hrs	194 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW17-12-07 - Water	E108	06-Aug-2020	----	----	----		14-Aug-2020	0.25 hrs	194 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW17-12-04 - Water	E108	06-Aug-2020	----	----	----		14-Aug-2020	0.25 hrs	195 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW17-12-02 - Water	E108	06-Aug-2020	----	----	----		14-Aug-2020	0.25 hrs	196 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW17-12-03 - Water	E108	06-Aug-2020	----	----	----		14-Aug-2020	0.25 hrs	196 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW17-12-01 - Water	E108	06-Aug-2020	----	----	----		14-Aug-2020	0.25 hrs	197 hrs	× EHTR-FM
Physical Tests : TSS by Gravimetry										
HDPE DUP - Water	E160-H	07-Aug-2020	----	----	----		13-Aug-2020	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW12-06-01 - Water	E160-H	07-Aug-2020	----	----	----		13-Aug-2020	7 days	6 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TSS by Gravimetry										
HDPE MW12-06-02 - Water	E160-H	07-Aug-2020	----	----	----		13-Aug-2020	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW12-06-03 - Water	E160-H	07-Aug-2020	----	----	----		13-Aug-2020	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW12-06-04 - Water	E160-H	07-Aug-2020	----	----	----		13-Aug-2020	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW12-06-05 - Water	E160-H	07-Aug-2020	----	----	----		13-Aug-2020	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW12-06-06 - Water	E160-H	07-Aug-2020	----	----	----		13-Aug-2020	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE DUP - Water	E160-H	06-Aug-2020	----	----	----		13-Aug-2020	7 days	7 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW17-12-01 - Water	E160-H	06-Aug-2020	----	----	----		13-Aug-2020	7 days	7 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW17-12-02 - Water	E160-H	06-Aug-2020	----	----	----		13-Aug-2020	7 days	7 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW17-12-03 - Water	E160-H	06-Aug-2020	----	----	----		13-Aug-2020	7 days	7 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TSS by Gravimetry										
HDPE MW17-12-04 - Water	E160-H	06-Aug-2020	----	----	----		13-Aug-2020	7 days	7 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW17-12-05 - Water	E160-H	06-Aug-2020	----	----	----		13-Aug-2020	7 days	7 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW17-12-06 - Water	E160-H	06-Aug-2020	----	----	----		13-Aug-2020	7 days	7 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW17-12-07 - Water	E160-H	06-Aug-2020	----	----	----		13-Aug-2020	7 days	7 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW17-12-08 - Water	E160-H	06-Aug-2020	----	----	----		13-Aug-2020	7 days	7 days	✓

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	71999	1	16	6.2	5.0	✓
Ammonia by Fluorescence	E298	73454	1	20	5.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	71996	1	16	6.2	5.0	✓
Conductivity in Water	E100	71997	1	16	6.2	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	72642	1	35	2.8	5.0	×
Dissolved Mercury in Water by CVAAS	E509	72019	2	24	8.3	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	72641	2	38	5.2	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	71994	1	16	6.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	71995	1	16	6.2	5.0	✓
pH by Meter	E108	71998	1	16	6.2	5.0	✓
Sulfate in Water by IC	E235.SO4	71993	1	16	6.2	5.0	✓
TSS by Gravimetry	E160-H	71890	2	40	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	71999	1	16	6.2	5.0	✓
Ammonia by Fluorescence	E298	73454	1	20	5.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	71996	1	16	6.2	5.0	✓
Conductivity in Water	E100	71997	1	16	6.2	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	72642	2	35	5.7	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	72019	2	24	8.3	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	72641	2	38	5.2	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	71994	1	16	6.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	71995	1	16	6.2	5.0	✓
pH by Meter	E108	71998	1	16	6.2	5.0	✓
Sulfate in Water by IC	E235.SO4	71993	1	16	6.2	5.0	✓
TSS by Gravimetry	E160-H	71890	2	40	5.0	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	71999	1	16	6.2	5.0	✓
Ammonia by Fluorescence	E298	73454	1	20	5.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	71996	1	16	6.2	5.0	✓
Conductivity in Water	E100	71997	1	16	6.2	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	72642	2	35	5.7	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	72019	2	24	8.3	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	72641	2	38	5.2	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	71994	1	16	6.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	71995	1	16	6.2	5.0	✓
Sulfate in Water by IC	E235.SO4	71993	1	16	6.2	5.0	✓
TSS by Gravimetry	E160-H	71890	2	40	5.0	5.0	✓

Matrix: **Water**

Evaluation: ✗ = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	73454	1	20	5.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	71996	1	16	6.2	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	72642	1	35	2.8	5.0	✗
Dissolved Mercury in Water by CVAAS	E509	72019	2	24	8.3	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	72641	2	38	5.2	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	71994	1	16	6.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	71995	1	16	6.2	5.0	✓
Sulfate in Water by IC	E235.SO4	71993	1	16	6.2	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
TSS by Gravimetry	E160-H Vancouver - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
Chloride in Water by IC (Low Level)	E235.Cl-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Vancouver - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
TDS in Water (Calculation)	EC103 Vancouver - Environmental	Water	APHA 1030E (mod)	Total Dissolved Solids is calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present.
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N Vancouver - Environmental	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **WR2000668**	Page	: 1 of 14
Client	: Minto Explorations Ltd.	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 11-Aug-2020 15:05
PO	: 232818	Date Analysis Commenced	: 13-Aug-2020
C-O-C number	: 2020-08-11 A	Issue Date	: 21-Aug-2020 15:08
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 16		
No. of samples analysed	: 16		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Bruna Botti	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Ian Cronshaw	Analyst	Metals, Burnaby, British Columbia
Muneeb Alam	Analyst	Metals, Burnaby, British Columbia
Omar Beydoun	Lab Assistant	Metals, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Inorganics - Water Quality, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics - Water Quality, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 71890)											
VA20B2583-004	Anonymous	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	<3.0	<3.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 71891)											
WR2000668-002	MW17-12-02 Water	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	3.4	3.8	0.4	Diff <2x LOR	----
Physical Tests (QC Lot: 71997)											
WR2000668-003	MW17-12-03 Water	conductivity	----	E100	2.0	µS/cm	833	832	0.120%	10%	----
Physical Tests (QC Lot: 71998)											
WR2000668-003	MW17-12-03 Water	pH	----	E108	0.10	pH units	8.12	8.14	0.246%	4%	----
Physical Tests (QC Lot: 71999)											
WR2000668-003	MW17-12-03 Water	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	345	344	0.145%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	345	344	0.145%	20%	----
Anions and Nutrients (QC Lot: 71993)											
WR2000668-001	MW17-12-01 Water	sulfate (as SO4)	14808-79-8	E235.SO4	3.00	mg/L	1290	1290	0.357%	20%	----
Anions and Nutrients (QC Lot: 71994)											
WR2000668-001	MW17-12-01 Water	nitrate (as N)	14797-55-8	E235.NO3-L	0.0500	mg/L	<0.0500	<0.0500	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 71995)											
WR2000668-001	MW17-12-01 Water	nitrite (as N)	14797-65-0	E235.NO2-L	0.0100	mg/L	<0.0100	<0.0100	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 71996)											
WR2000668-001	MW17-12-01 Water	chloride	16887-00-6	E235.Cl-L	1.00	mg/L	11.9	11.9	0.166%	20%	----
Anions and Nutrients (QC Lot: 73454)											
KS2001357-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0500	mg/L	1.00	1.00	0.202%	20%	----
Dissolved Metals (QC Lot: 72019)											
VA20B2510-002	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 72020)											
WR2000668-013	MW12-06-04 Water	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 72641)											
VA20B2490-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0610	0.0613	0.474%	20%	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.0632	0.0628	0.639%	20%	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.0137	0.0138	0.700%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 72641) - continued											
VA20B2490-001	Anonymous	barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0871	0.0920	5.42%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	0.525	0.554	5.30%	20%	----
		cadmium, dissolved	7440-43-9	E421	0.0000200	mg/L	<0.0000200	<0.0000200	0	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	32.0	33.0	3.08%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	0.00013	0.00014	0.00001	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00035	0.00036	0.000004	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	0.000343	0.000341	0.000001	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.510	0.534	4.50%	20%	----
		magnesium, dissolved	7439-95-4	E421	0.100	mg/L	2.98	3.11	4.20%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.0807	0.0827	2.40%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.0650	0.0664	2.14%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	0.00051	0.00001	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.300	mg/L	<0.300	<0.300	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	77.6	79.7	2.74%	20%	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.0125	0.0123	1.86%	20%	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	3.92	4.11	4.62%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	0.000019	0.000011	0.000008	Diff <2x LOR	----
		sodium, dissolved	7440-23-5	E421	0.050	mg/L	271	282	4.04%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	1.41	1.42	0.468%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	181	187	3.62%	20%	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	0.000204	0.000202	0.881%	20%	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	0.00011	0.00012	0.000007	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.0100	mg/L	<0.0100	<0.0100	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00170	0.00170	0.0362%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	0.00081	0.00081	0.000003	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0021	0.0024	0.0003	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 72642)											
VA20B2490-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 72734)											
VA20B2559-002	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0096	0.0104	7.44%	20%	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00013	0.00012	0.00001	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 72734) - continued											
VA20B2559-002	Anonymous	barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0598	0.0605	1.16%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	47.5	48.7	2.53%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00123	0.00113	0.00010	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	0.023	0.022	0.0008	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	3.51	3.56	1.39%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.0579	0.0590	1.89%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.000582	0.000554	4.97%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	3.87	3.88	0.441%	20%	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.000052	0.000061	0.000010	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	4.02	4.08	1.42%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	7440-23-5	E421	0.050	mg/L	2.48	2.55	2.94%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.153	0.156	1.85%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	5.71	5.74	0.647%	20%	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00108	0.00110	2.12%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 71890)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Physical Tests (QCLot: 71891)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Physical Tests (QCLot: 71997)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 71999)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	1.0	----
Anions and Nutrients (QCLot: 71993)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 71994)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 71995)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 71996)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 73454)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Dissolved Metals (QCLot: 72019)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 72020)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 72641)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 72641) - continued						
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----
Dissolved Metals (QCLot: 72642)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 72734)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 72734) - continued						
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----
Dissolved Metals (QCLot: 72735)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 71890)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	91.0	85.0	115	----
Physical Tests (QCLot: 71891)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	90.3	85.0	115	----
Physical Tests (QCLot: 71997)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	102	90.0	110	----
Physical Tests (QCLot: 71998)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 71999)									
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	229 mg/L	99.2	75.0	125	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	99.1	85.0	115	----
Anions and Nutrients (QCLot: 71993)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	103	90.0	110	----
Anions and Nutrients (QCLot: 71994)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 71995)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 71996)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 73454)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.12 mg/L	102	85.0	115	----
Dissolved Metals (QCLot: 72019)									
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	100	80.0	120	----
Dissolved Metals (QCLot: 72020)									
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	92.9	80.0	120	----
Dissolved Metals (QCLot: 72641)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	107	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	99.5	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	98.3	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	98.5	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	99.5	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	95.7	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	102	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 72641) - continued									
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	99.8	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	99.1	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	98.8	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	97.8	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	94.6	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	96.1	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	104	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	99.7	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	98.3	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	98.8	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	110	70.0	130	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	99.0	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	92.7	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	95.4	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	99.8	80.0	120	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	106	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	106	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	99.6	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	97.5	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	98.0	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	95.9	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	96.8	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	98.8	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	99.6	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	98.5	80.0	120	----
Dissolved Metals (QCLot: 72642)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	98.7	80.0	120	----
Dissolved Metals (QCLot: 72734)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	97.4	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	101	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	95.5	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	99.2	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	95.7	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	101	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	89.6	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	99.1	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 72734) - continued									
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	97.1	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	98.9	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	96.5	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	98.8	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	98.6	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	97.5	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	97.0	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	95.6	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	98.0	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	111	70.0	130	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	104	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	102	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	98.9	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	85.2	80.0	120	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	99.8	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	98.6	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	97.3	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	102	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	94.8	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	96.4	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	103	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	101	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	97.4	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	94.6	80.0	120	----
Dissolved Metals (QCLot: 72735)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	99.2	80.0	120	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 71993)										
WR2000668-002	MW17-12-02 Water	sulfate (as SO4)	14808-79-8	E235.SO4	ND mg/L	1000 mg/L	ND	75.0	125	----
Anions and Nutrients (QCLot: 71994)										
WR2000668-002	MW17-12-02 Water	nitrate (as N)	14797-55-8	E235.NO3-L	26.8 mg/L	25 mg/L	107	75.0	125	----
Anions and Nutrients (QCLot: 71995)										
WR2000668-002	MW17-12-02 Water	nitrite (as N)	14797-65-0	E235.NO2-L	5.24 mg/L	5 mg/L	105	75.0	125	----
Anions and Nutrients (QCLot: 71996)										
WR2000668-002	MW17-12-02 Water	chloride	16887-00-6	E235.Cl-L	1060 mg/L	1000 mg/L	106	75.0	125	----
Anions and Nutrients (QCLot: 73454)										
KS2001357-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	18.8 mg/L	20 mg/L	94.1	75.0	125	----
Dissolved Metals (QCLot: 72019)										
VA20B2510-003	Anonymous	mercury, dissolved	7439-97-6	E509	0.000101 mg/L	0.0001 mg/L	101	70.0	130	----
Dissolved Metals (QCLot: 72020)										
WR2000668-014	MW12-06-05 Water	mercury, dissolved	7439-97-6	E509	0.0000876 mg/L	0.0001 mg/L	87.6	70.0	130	----
Dissolved Metals (QCLot: 72641)										
VA20B2490-002	Anonymous	aluminum, dissolved	7429-90-5	E421	0.192 mg/L	0.2 mg/L	96.2	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0196 mg/L	0.02 mg/L	98.2	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0207 mg/L	0.02 mg/L	104	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0397 mg/L	0.04 mg/L	99.3	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00892 mg/L	0.01 mg/L	89.2	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.099 mg/L	0.1 mg/L	98.8	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00398 mg/L	0.004 mg/L	99.4	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0190 mg/L	0.02 mg/L	95.0	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0183 mg/L	0.02 mg/L	91.6	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.89 mg/L	2 mg/L	94.4	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0181 mg/L	0.02 mg/L	90.7	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0923 mg/L	0.1 mg/L	92.3	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 72641) - continued										
VA20B2490-002	Anonymous	manganese, dissolved	7439-96-5	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0194 mg/L	0.02 mg/L	96.8	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0373 mg/L	0.04 mg/L	93.2	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	11.3 mg/L	10 mg/L	113	70.0	130	----
		potassium, dissolved	7440-09-7	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0452 mg/L	0.04 mg/L	113	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.52 mg/L	10 mg/L	95.2	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00368 mg/L	0.004 mg/L	92.1	70.0	130	----
		sodium, dissolved	7440-23-5	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	ND mg/L	20 mg/L	ND	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00353 mg/L	0.004 mg/L	88.3	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0192 mg/L	0.02 mg/L	96.2	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0388 mg/L	0.04 mg/L	96.9	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00371 mg/L	0.004 mg/L	92.7	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.0988 mg/L	0.1 mg/L	98.8	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.392 mg/L	0.4 mg/L	98.1	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0404 mg/L	0.04 mg/L	101	70.0	130	----
Dissolved Metals (QCLot: 72642)										
VA20B2490-002	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.0377 mg/L	0.04 mg/L	94.4	70.0	130	----
Dissolved Metals (QCLot: 72734)										
VA20B2568-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.192 mg/L	0.2 mg/L	95.8	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0191 mg/L	0.02 mg/L	95.5	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0195 mg/L	0.02 mg/L	97.7	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0377 mg/L	0.04 mg/L	94.2	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00871 mg/L	0.01 mg/L	87.1	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.082 mg/L	0.1 mg/L	82.3	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00383 mg/L	0.004 mg/L	95.9	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0195 mg/L	0.02 mg/L	97.7	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0188 mg/L	0.02 mg/L	93.9	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.95 mg/L	2 mg/L	97.6	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0180 mg/L	0.02 mg/L	90.2	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0986 mg/L	0.1 mg/L	98.6	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 72734) - continued										
VA20B2568-001	Anonymous	manganese, dissolved	7439-96-5	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0196 mg/L	0.02 mg/L	97.8	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0394 mg/L	0.04 mg/L	98.6	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	10.7 mg/L	10 mg/L	107	70.0	130	----
		potassium, dissolved	7440-09-7	E421	4.06 mg/L	4 mg/L	102	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0429 mg/L	0.04 mg/L	107	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.46 mg/L	10 mg/L	94.6	70.0	130	----
		sodium, dissolved	7440-23-5	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	ND mg/L	20 mg/L	ND	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00363 mg/L	0.004 mg/L	90.7	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0191 mg/L	0.02 mg/L	95.6	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0397 mg/L	0.04 mg/L	99.3	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00388 mg/L	0.004 mg/L	97.0	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.101 mg/L	0.1 mg/L	101	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.379 mg/L	0.4 mg/L	94.7	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0388 mg/L	0.04 mg/L	97.0	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

COC Number: 2020-08-11 A

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Report To	Contact and company name below will appear on the final report	Report Format / Distribution	Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply
Company:	Minto Explorations Ltd.	Select Report Format: ☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)	Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply
Contact:	Minto Environment - Coordinator	Quality Control (QC) Report with Report ☑ YES ☐ NO	PRIORITY (Business Days): 4 day [P4] ☐ / 3 day [P3] ☐ / 2 day [P2] ☐ — EMERGENCY: 1 Business day [E1] ☐ / Same Day, Weekend or Statutory holiday [E0] ☐
Phone:	1-604-759-4659	☑ Compare Results to Criteria on Report - provide details below if box checked	
	Company address below will appear on the final report	Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	
Street:	2100-510 West Georgia St.	Email 1 or Fax mintoenvironment@mintomine.com	Date and Time Required for all E&P TATs:
City/Province:	Vancouver, British Columbia	Email 2	For tests that can not be performed according to the service level selected, you will be contacted.
Postal Code:	V6B 0M3	Email 3	Analysis Request
Invoice To	Same as Report To ☐ YES ☑ NO	Invoice Distribution	Indicate Filtered (F), Preserved (P) or Filtered and P
	Copy of Invoice with Report ☐ YES ☑ NO	Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	
Company:	Minto Explorations Ltd.	Email 1 or Fax ap@mintomine.com	
Contact:	Ruth Cayetano	Email 2	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:		Major/Minor Code:	Routing Code:
PO / AFE:	232818 (GW)	Requisitioner:	
LSD:		Location:	

ALS Lab Work Order # (lab use only):

ALS Contact:

Sampler:

Environmental Division Whitehorse

Work Order Reference WR2000668

Telephone : +1 867 668 6689

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals(TM)	Dissolved Metals (DM)	Total Mercury, Hardness	Dissolved Mercury	Ammonia (Total Nutrients)	Dissolved Organic Carbon (DOC)	pH, Cond., TSS, TDS, Alkalinity, Anions	Dissolved Bromide (Br-D)						
					P	F/P	P	F/P	P	F/P								
	MW17-12-01	6-Aug-20	7:30	Water		R		R	R		R							4
	MW17-12-02	6-Aug-20	8:15	Water		R		R	R		R							4
	MW17-12-03	6-Aug-20	8:40	Water		R		R	R		R							4
	MW17-12-04	6-Aug-20	9:20	Water		R		R	R		R							4
	MW17-12-05	6-Aug-20	10:05	Water		R		R	R		R							4
	MW17-12-06	6-Aug-20	10:25	Water		R		R	R		R							4
	MW17-12-07	6-Aug-20	10:50	Water		R		R	R		R							4
	MW17-12-08	6-Aug-20	11:05	Water		R		R	R		R							4
	DUP	6-Aug-20		Water		R		R	R		R							4
	MW12-06-01	7-Aug-20	8:20	Water		R		R	R		R							4
	MW12-06-02	7-Aug-20	9:30	Water		R		R	R		R							4
	MW12-06-03	7-Aug-20	9:45	Water		R		R	R		R							4

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☑ NO	
Are samples for human drinking water use? ☐ YES ☑ NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
11	8	11	19		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Ian Smith	Date: 2020-08-11	Time:	Received by:	Date: AUG 11/20	Time: 15:05	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 2020-08-11 A

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Ruth Cayetano

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: mintoenvironment@mintomine.com
Email 2:
Email 3:

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: ap@mintomine.com
Email 2:

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐

EMERGENCY: 1 Business day [E1] ☐ | Same Day, Weekend or Statutory holiday [E0] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#:
Job #:		Major/Minor Code:	Routing Code:
PO / AFE:	232818 (GW)	Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)		ALS Contact:	Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals(TM) P	Dissolved Metals (DM) F/P	Total Mercury, Hardness P	Dissolved Mercury F/P	Ammonia (Total Nutrients) P	Dissolved Organic Carbon (DOC) F/P	pH, Cond., TSS, TDS, Alkalinity, Anions	Dissolved Bromide (Br-D)	Number of Containers
	MW12-06-04	7-Aug-20	10:10	Water		R		R	R		R		4
	MW12-06-05	7-Aug-20	10:25	Water		R		R	R		R		4
	MW12-06-06	7-Aug-20	10:50	Water		R		R	R		R		4
	DUP	7-Aug-20		Water		R		R	R		R		4

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?
☐ YES ☑ NO

Are samples for human drinking water use?
☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Ian Smith	Date: 2020-08-11	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000709**	Page	: 1 of 4
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 18-Aug-2020 15:00
PO	: 232818	Date Analysis Commenced	: 20-Aug-2020
C-O-C number	: 2020-08-18 A	Issue Date	: 26-Aug-2020 15:41
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Bruna Botti	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Omar Beydoun	Lab Assistant	Metals, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Qualifiers

Qualifier	*Description*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-DP03	MW17-DP02	MW17-DP01	----	----
					Client sampling date / time	14-Aug-2020 14:50	14-Aug-2020 15:15	14-Aug-2020 15:30	----	----
						WR2000709-001	WR2000709-002	WR2000709-003	--------	--------
						Result	Result	Result	----	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		119	173	168	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	----	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		119	173	168	----	----
conductivity	----	E100	2.0	µS/cm		1220	882	1920	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		436	217	848	----	----
pH	----	E108	0.10	pH units		7.85	8.08	7.92	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		811	581	1480	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		3.1	5.7	21.5	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		7.86	1.82	3.87	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		42.5	23.1	25.7	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		2.14	<0.0250 DLDS	0.377	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		2.14	<0.0255	0.401	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0050 DLDS	<0.0050 DLDS	0.0231	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		416	234	858	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		12.4	8.99	22.0	----	----
cation sum	----	EC101	0.10	meq/L		12.6	9.72	23.6	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		0.800	3.90	3.51	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0039	0.0013	0.0020	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		0.00439	<0.00010	0.00014	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00037	0.00062	0.00068	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0269	0.0273	0.0101	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.154	0.086	0.151	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.00319	0.000393	0.00170	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-DP03	MW17-DP02	MW17-DP01	----	----
					Client sampling date / time	14-Aug-2020 14:50	14-Aug-2020 15:15	14-Aug-2020 15:30	----	----
						WR2000709-001	WR2000709-002	WR2000709-003	--------	--------
						Result	Result	Result	----	----
Dissolved Metals										
calcium, dissolved	7440-70-2	E421	0.050	mg/L		142	62.1	255	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00013	<0.00010	<0.00010	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00025	0.00036	0.00648	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.0679	0.0453	0.174	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	<0.010	<0.010	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0067	0.0067	0.0186	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		19.8	15.2	51.4	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.630	0.296	3.79	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.0577	0.0725	0.112	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00430	0.00337	0.00771	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		28.1	28.9	63.8	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.00134	0.00114	0.00229	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		3.70	2.76	4.51	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	0.000013	----	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		60.4	103	105	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		3.61	4.04	17.5	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		145	92.6	326	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		0.000020	0.000023	0.000041	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		0.00022	0.00036	0.00018	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00136	0.000267	0.00156	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0132	0.0021	0.0061	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WR2000709**	Page	: 1 of 11
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 18-Aug-2020 15:00
PO	: 232818	Issue Date	: 26-Aug-2020 15:41
C-O-C number	: 2020-08-18 A		
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- Duplicate outliers occur - please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **Water**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Duplicate (DUP) RPDs								
Physical Tests	Anonymous	Anonymous	pH	----	E108	4.33 %	4%	Duplicate RPD does not meet the DQO for this test.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MW17-DP01	E298	14-Aug-2020	----	----	----		24-Aug-2020	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MW17-DP02	E298	14-Aug-2020	----	----	----		24-Aug-2020	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MW17-DP03	E298	14-Aug-2020	----	----	----		24-Aug-2020	28 days	10 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW17-DP01	E235.Cl-L	14-Aug-2020	----	----	----		24-Aug-2020	28 days	9 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW17-DP02	E235.Cl-L	14-Aug-2020	----	----	----		24-Aug-2020	28 days	9 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW17-DP03	E235.Cl-L	14-Aug-2020	----	----	----		24-Aug-2020	28 days	9 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-DP01	E235.NO3-L	14-Aug-2020	----	----	----		24-Aug-2020	3 days	9 days	× EHTR

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-DP02	E235.NO3-L	14-Aug-2020	----	----	----		24-Aug-2020	3 days	9 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-DP03	E235.NO3-L	14-Aug-2020	----	----	----		24-Aug-2020	3 days	9 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW17-DP01	E235.NO2-L	14-Aug-2020	----	----	----		24-Aug-2020	3 days	9 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW17-DP02	E235.NO2-L	14-Aug-2020	----	----	----		24-Aug-2020	3 days	9 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW17-DP03	E235.NO2-L	14-Aug-2020	----	----	----		24-Aug-2020	3 days	9 days	× EHTR
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW17-DP01	E235.SO4	14-Aug-2020	----	----	----		24-Aug-2020	28 days	9 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW17-DP02	E235.SO4	14-Aug-2020	----	----	----		24-Aug-2020	28 days	9 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW17-DP03	E235.SO4	14-Aug-2020	----	----	----		24-Aug-2020	28 days	9 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MW17-DP01	E421.Cr-L	14-Aug-2020	22-Aug-2020	180 days	7 days	✓	23-Aug-2020	172 days	0 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MW17-DP02	E421.Cr-L	14-Aug-2020	22-Aug-2020	180 days	7 days	✓	23-Aug-2020	172 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MW17-DP03	E421.Cr-L	14-Aug-2020	22-Aug-2020	180 days	7 days	✓	23-Aug-2020	172 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW17-DP01	E421	14-Aug-2020	22-Aug-2020	180 days	7 days	✓	23-Aug-2020	172 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW17-DP02	E421	14-Aug-2020	22-Aug-2020	180 days	7 days	✓	23-Aug-2020	172 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW17-DP03	E421	14-Aug-2020	22-Aug-2020	180 days	7 days	✓	23-Aug-2020	172 days	0 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW17-DP01	E290	14-Aug-2020	----	----	----		21-Aug-2020	14 days	7 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW17-DP02	E290	14-Aug-2020	----	----	----		21-Aug-2020	14 days	7 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW17-DP03	E290	14-Aug-2020	----	----	----		21-Aug-2020	14 days	7 days	✓
Physical Tests : Conductivity in Water										
HDPE MW17-DP01	E100	14-Aug-2020	----	----	----		21-Aug-2020	28 days	7 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Conductivity in Water										
HDPE MW17-DP02	E100	14-Aug-2020	----	----	----		21-Aug-2020	28 days	7 days	✓
Physical Tests : Conductivity in Water										
HDPE MW17-DP03	E100	14-Aug-2020	----	----	----		21-Aug-2020	28 days	7 days	✓
Physical Tests : pH by Meter										
HDPE MW17-DP01	E108	14-Aug-2020	----	----	----		21-Aug-2020	0.25 hrs	169 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW17-DP02	E108	14-Aug-2020	----	----	----		21-Aug-2020	0.25 hrs	169 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW17-DP03	E108	14-Aug-2020	----	----	----		21-Aug-2020	0.25 hrs	170 hrs	× EHTR-FM
Physical Tests : TSS by Gravimetry										
HDPE MW17-DP01	E160-H	14-Aug-2020	----	----	----		20-Aug-2020	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW17-DP02	E160-H	14-Aug-2020	----	----	----		20-Aug-2020	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW17-DP03	E160-H	14-Aug-2020	----	----	----		20-Aug-2020	7 days	6 days	✓

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	75019	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	75139	1	19	5.2	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	76015	1	14	7.1	5.0	✓
Conductivity in Water	E100	75017	1	20	5.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	75684	1	18	5.5	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	75685	1	18	5.5	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	76017	1	12	8.3	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	76018	1	12	8.3	5.0	✓
pH by Meter	E108	75018	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	76016	1	12	8.3	5.0	✓
TSS by Gravimetry	E160-H	74891	1	20	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	75019	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	75139	1	19	5.2	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	76015	1	14	7.1	5.0	✓
Conductivity in Water	E100	75017	1	20	5.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	75684	1	18	5.5	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	75685	1	18	5.5	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	76017	1	12	8.3	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	76018	1	12	8.3	5.0	✓
pH by Meter	E108	75018	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	76016	1	12	8.3	5.0	✓
TSS by Gravimetry	E160-H	74891	1	20	5.0	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	75019	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	75139	1	19	5.2	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	76015	1	14	7.1	5.0	✓
Conductivity in Water	E100	75017	1	20	5.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	75684	1	18	5.5	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	75685	1	18	5.5	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	76017	1	12	8.3	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	76018	1	12	8.3	5.0	✓
Sulfate in Water by IC	E235.SO4	76016	1	12	8.3	5.0	✓
TSS by Gravimetry	E160-H	74891	1	20	5.0	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	75139	1	19	5.2	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	76015	1	14	7.1	5.0	✓

Matrix: **Water**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Matrix Spikes (MS) - Continued							
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	75684	1	18	5.5	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	75685	1	18	5.5	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	76017	1	12	8.3	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	76018	1	12	8.3	5.0	✓
Sulfate in Water by IC	E235.SO4	76016	1	12	8.3	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
TSS by Gravimetry	E160-H Vancouver - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
Chloride in Water by IC (Low Level)	E235.Cl-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Vancouver - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Ion Balance using Dissolved Metals	EC101 Vancouver - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
TDS in Water (Calculation)	EC103 Vancouver - Environmental	Water	APHA 1030E (mod)	Total Dissolved Solids is calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present.
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N Vancouver - Environmental	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **WR2000709**	Page	: 1 of 10
Client	: Minto Explorations Ltd.	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 18-Aug-2020 15:00
PO	: 232818	Date Analysis Commenced	: 20-Aug-2020
C-O-C number	: 2020-08-18 A	Issue Date	: 26-Aug-2020 15:41
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Bruna Botti	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Omar Beydoun	Lab Assistant	Metals, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 74891)											
VA20B2926-005	Anonymous	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	<3.0	<3.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 75017)											
VA20B3216-004	Anonymous	conductivity	----	E100	2.0	µS/cm	<2.0	<2.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 75018)											
VA20B3216-004	Anonymous	pH	----	E108	0.10	pH units	5.43	5.20	4.33%	4%	----
Physical Tests (QC Lot: 75019)											
VA20B3216-004	Anonymous	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 75139)											
WR2000706-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0629	0.0596	5.40%	20%	----
Anions and Nutrients (QC Lot: 76015)											
WR2000709-001	MW17-DP03	chloride	16887-00-6	E235.Cl-L	0.50	mg/L	42.5	42.6	0.0917%	20%	----
Anions and Nutrients (QC Lot: 76016)											
WR2000709-001	MW17-DP03	sulfate (as SO4)	14808-79-8	E235.SO4	1.50	mg/L	416	417	0.136%	20%	----
Anions and Nutrients (QC Lot: 76017)											
WR2000709-001	MW17-DP03	nitrate (as N)	14797-55-8	E235.NO3-L	0.0250	mg/L	2.14	2.13	0.596%	20%	----
Anions and Nutrients (QC Lot: 76018)											
WR2000709-001	MW17-DP03	nitrite (as N)	14797-65-0	E235.NO2-L	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 75684)											
WR2000709-001	MW17-DP03	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	0.00013	<0.00010	0.00003	Diff <2x LOR	----
Dissolved Metals (QC Lot: 75685)											
WR2000709-001	MW17-DP03	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0039	0.0043	0.0004	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00439	0.00435	1.08%	20%	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00037	0.00036	0.00001	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0269	0.0256	4.85%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	0.154	0.153	0.546%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 75685) - continued											
WR2000709-001	MW17-DP03	cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	0.00319	0.00306	4.02%	20%	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	142	142	0.120%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	0.00025	0.00024	0.00001	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.0679	0.0658	3.23%	20%	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0067	0.0066	0.0001	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.100	mg/L	19.8	19.1	3.46%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.630	0.631	0.0342%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.0577	0.0571	1.13%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00430	0.00404	0.00026	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.100	mg/L	28.1	27.0	3.95%	20%	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.00134	0.00142	5.72%	20%	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	3.70	3.68	0.430%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	7440-23-5	E421	0.050	mg/L	60.4	58.6	3.08%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	3.61	3.56	1.51%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	145	146	0.633%	20%	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	0.000020	0.000021	0.000002	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	0.00022	0.00019	0.00002	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00136	0.00139	1.75%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0132	0.0125	5.76%	20%	----
		zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 74891)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Physical Tests (QCLot: 75017)						
conductivity	----	E100	1	µS/cm	1.0	----
Physical Tests (QCLot: 75019)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Anions and Nutrients (QCLot: 75139)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 76015)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 76016)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 76017)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 76018)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Dissolved Metals (QCLot: 75684)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 75685)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 75685) - continued						
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 74891)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	92.2	85.0	115	----
Physical Tests (QCLot: 75017)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	107	90.0	110	----
Physical Tests (QCLot: 75018)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 75019)									
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	229 mg/L	89.7	75.0	125	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	106	85.0	115	----
Anions and Nutrients (QCLot: 75139)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.12 mg/L	99.7	85.0	115	----
Anions and Nutrients (QCLot: 76015)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 76016)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 76017)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 76018)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	100	90.0	110	----
Dissolved Metals (QCLot: 75684)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	106	80.0	120	----
Dissolved Metals (QCLot: 75685)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	106	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	104	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	99.7	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	108	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	104	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	102	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	101	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	108	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	103	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	103	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 75685) - continued									
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	97.9	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	104	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	110	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	102	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	106	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	107	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	102	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	118	70.0	130	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	106	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	99.6	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	108	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	102	80.0	120	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	108	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	114	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	99.8	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	108	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	101	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	99.9	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	100	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	103	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	100	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	103	80.0	120	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 75139)										
WR2000706-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.192 mg/L	0.2 mg/L	95.9	75.0	125	----
Anions and Nutrients (QCLot: 76015)										
WR2000709-002	MW17-DP02	chloride	16887-00-6	E235.Cl-L	523 mg/L	500 mg/L	105	75.0	125	----
Anions and Nutrients (QCLot: 76016)										
WR2000709-002	MW17-DP02	sulfate (as SO4)	14808-79-8	E235.SO4	516 mg/L	500 mg/L	103	75.0	125	----
Anions and Nutrients (QCLot: 76017)										
WR2000709-002	MW17-DP02	nitrate (as N)	14797-55-8	E235.NO3-L	13.1 mg/L	12.5 mg/L	105	75.0	125	----
Anions and Nutrients (QCLot: 76018)										
WR2000709-002	MW17-DP02	nitrite (as N)	14797-65-0	E235.NO2-L	2.60 mg/L	2.5 mg/L	104	75.0	125	----
Dissolved Metals (QCLot: 75684)										
WR2000709-002	MW17-DP02	chromium, dissolved	7440-47-3	E421.Cr-L	0.0407 mg/L	0.04 mg/L	102	70.0	130	----
Dissolved Metals (QCLot: 75685)										
WR2000709-002	MW17-DP02	aluminum, dissolved	7429-90-5	E421	0.202 mg/L	0.2 mg/L	101	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0209 mg/L	0.02 mg/L	105	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0201 mg/L	0.02 mg/L	100	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0423 mg/L	0.04 mg/L	106	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00878 mg/L	0.01 mg/L	87.8	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.090 mg/L	0.1 mg/L	90.2	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00396 mg/L	0.004 mg/L	99.0	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0196 mg/L	0.02 mg/L	98.2	70.0	130	----
		copper, dissolved	7440-50-8	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.92 mg/L	2 mg/L	95.9	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0187 mg/L	0.02 mg/L	93.6	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.106 mg/L	0.1 mg/L	106	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0390 mg/L	0.04 mg/L	97.5	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 75685) - continued										
WR2000709-002	MW17-DP02	phosphorus, dissolved	7723-14-0	E421	11.6 mg/L	10 mg/L	116	70.0	130	----
		potassium, dissolved	7440-09-7	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0420 mg/L	0.04 mg/L	105	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.80 mg/L	10 mg/L	98.0	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00388 mg/L	0.004 mg/L	97.0	70.0	130	----
		sodium, dissolved	7440-23-5	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	ND mg/L	20 mg/L	ND	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00373 mg/L	0.004 mg/L	93.2	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0201 mg/L	0.02 mg/L	100	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0397 mg/L	0.04 mg/L	99.3	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00387 mg/L	0.004 mg/L	96.8	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.102 mg/L	0.1 mg/L	102	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.387 mg/L	0.4 mg/L	96.8	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0436 mg/L	0.04 mg/L	109	70.0	130	----

ALS Environmental
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Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number: 2020-08-18 A

Page 1 of 1

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Ruth Cayetano

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: mintoenvironment@mintomine.com
Email 2:
Email 3:

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: ap@mintomine.com
Email 2:

Project Information

ALS Account # / Quote #:
Job #:
PO / AFE: 232818 (GW)
LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#:
Major/Minor Code: Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only)

ALS Contact: **Sampler:**

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐
EMERGENCY: 1 Business day [E1] ☐ | Same Day, Weekend or ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service le

Analysis F

Indicate Filtered (F), Preserved (P) or Filtered a

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	P	F/P	P	F/P	P	F/P								
					Total Metals(TM)	Disolved Metals (DM)	Total Mercury, Hardness	Dissolved Mercury	Ammonia (Total Nutrients)	Dissolved Organic Carbon (DOC)	pH, Cond., TSS, TDS, Alkalinity, Anions	Dissolved Bromide (Br-D)						N
	MW17-DP03	14-Aug-20	14:50	Water		R			R		R							3
	MW17-DP02	14-Aug-20	15:15	Water		R			R		R							3
	MW17-DP01	14-Aug-20	15:30	Water		R			R		R							3

Environmental Division
Whitehorse
Work Order Reference
WR2000709

Telephone : +1 867 668 6689

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?
☐ YES ☑ NO
Are samples for human drinking water use?
☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
8°	7°				

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Ian Smith	Date: 2020-08-18	Time:	Received by: D	Date: AUG 18/20	Time: 15:00	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

ALS Environmental

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Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number: 2020-08-18 A

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Ruth Cayetano

Report Format / Distribution	
Select Report Format:	☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	mintoenvironment@mintomine.com
Email 2	
Email 3	

Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	ap@mintomine.com
Email 2	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:		Major/Minor Code:	Routing Code:
PO / AFE:	232818 (GW)	Requisitioner:	
LSD:		Location:	

ALS Lab Work Order # (lab use only)		ALS Contact:	Sampler:

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐

EMERGENCY: 1 Business day [E1] ☐ | Same Day, Weekend or [illegible] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service le

Analysis R

Indicate Filtered (F), Preserved (P) or Filtered a

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals(TM)	Dissolved Metals (DM)	Total Mercury, Hardness	Dissolved Mercury	Ammonia (Total Nutrients)	Dissolved Organic Carbon (DOC)	pH, Cond., TSS, TDS, Alkalinity, Anions	Dissolved Bromide (Br-D)						
					P	F/P	P	F/P	P	F/P								N
	MW17-DP03	14-Aug-20	14:50	Water		R			R		R							3
	MW17-DP02	14-Aug-20	15:15	Water		R			R		R							3
	MW17-DP01	14-Aug-20	15:30	Water		R			R		R							3

Environmental Division
Whitehorse
Work Order Reference
WR2000709

Telephone : +1 867 668 6689

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☑ NO	
Are samples for human drinking water use? ☐ YES ☑ NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C
8°	7°		6 (4 CAR)

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Ian Smith	Date: 2020-08-18	Time:	Received by: (D)	Date: Aug 18/20	Time: 15:00	Received by: TC	Date: Aug 19	Time: 3:45

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000924**	Page	: 1 of 4
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 22-Sep-2020 14:47
PO	: 232824	Date Analysis Commenced	: 24-Sep-2020
C-O-C number	: 2020-09-22 B	Issue Date	: 06-Oct-2020 17:30
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 2		
No. of samples analysed	: 2		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Annabelle Prasad	Analyst	Metals, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics - Water Quality, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW09-03-01	MW-09-03-02	----	----	----
					Client sampling date / time	18-Sep-2020 14:55	18-Sep-2020 15:25	----	----	----
						WR2000924-001	WR2000924-002	--------	--------	--------
						Result	Result	----	----	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		145	117	----	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		145	117	----	----	----
conductivity	----	E100	2.0	µS/cm		277	284	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		151	156	----	----	----
pH	----	E108	0.10	pH units		8.16	8.03	----	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		183	201	----	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	----	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0358	<0.0050	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.37	1.70	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.0136	10.4	----	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		0.0271	10.4	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0134	0.0017	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		18.2	5.10	----	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		3.28	3.23	----	----	----
cation sum	----	EC101	0.10	meq/L		3.46	3.36	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		2.67	1.97	----	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0024	0.0015	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00091	<0.00010	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0681	0.0177	----	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.063	0.026	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.000228	0.0000673	----	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW09-03-01	MW-09-03-02	----	----	----
					Client sampling date / time	18-Sep-2020 14:55	18-Sep-2020 15:25	----	----	----
						WR2000924-001	WR2000924-002	--------	--------	--------
						Result	Result	----	----	----
Dissolved Metals										
calcium, dissolved	7440-70-2	E421	0.050	mg/L		40.7	51.6	----	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00014	<0.00010	----	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00025	0.00137	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.429	<0.010	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0037	0.0013	----	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		11.9	6.56	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0951	0.00244	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00419	0.00308	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00108	<0.00050	----	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	----	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		2.04	2.13	----	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		<0.000050	0.000284	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		5.03	4.91	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	----	----	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L		8.56	4.40	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		1.04	0.356	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		6.15	1.54	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000883	0.00145	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.183	0.0360	----	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	----	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	----	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WR2000924**	Page	: 1 of 9
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 22-Sep-2020 14:47
PO	: 232824	Issue Date	: 06-Oct-2020 17:30
C-O-C number	: 2020-09-22 B		
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 2		
No. of samples analysed	: 2		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW09-03-01	E298	18-Sep-2020	----	----	----		29-Sep-2020	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW-09-03-02	E298	18-Sep-2020	----	----	----		29-Sep-2020	28 days	10 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
MW09-03-01	E235.Cl-L	18-Sep-2020	----	----	----		24-Sep-2020	28 days	5 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
MW-09-03-02	E235.Cl-L	18-Sep-2020	----	----	----		24-Sep-2020	28 days	5 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE										
MW09-03-01	E235.NO3-L	18-Sep-2020	----	----	----		24-Sep-2020	3 days	5 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE										
MW-09-03-02	E235.NO3-L	18-Sep-2020	----	----	----		24-Sep-2020	3 days	5 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
MW09-03-01	E235.NO2-L	18-Sep-2020	----	----	----		24-Sep-2020	3 days	5 days	× EHTR

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
MW-09-03-02	E235.NO2-L	18-Sep-2020	----	----	----		24-Sep-2020	3 days	5 days	× EHTR
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW09-03-01	E235.SO4	18-Sep-2020	----	----	----		24-Sep-2020	28 days	5 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW-09-03-02	E235.SO4	18-Sep-2020	----	----	----		24-Sep-2020	28 days	5 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW09-03-01	E421.Cr-L	18-Sep-2020	24-Sep-2020	180 days	6 days	✓	26-Sep-2020	173 days	1 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW-09-03-02	E421.Cr-L	18-Sep-2020	24-Sep-2020	180 days	6 days	✓	26-Sep-2020	173 days	1 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
MW09-03-01	E509	18-Sep-2020	29-Sep-2020	28 days	10 days	✓	29-Sep-2020	17 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
MW-09-03-02	E509	18-Sep-2020	29-Sep-2020	28 days	10 days	✓	29-Sep-2020	17 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
MW09-03-01	E421	18-Sep-2020	24-Sep-2020	180 days	6 days	✓	26-Sep-2020	173 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
MW-09-03-02	E421	18-Sep-2020	24-Sep-2020	180 days	6 days	✓	26-Sep-2020	173 days	1 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE MW09-03-01	E290	18-Sep-2020	----	----	----		24-Sep-2020	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW-09-03-02	E290	18-Sep-2020	----	----	----		24-Sep-2020	14 days	5 days	✓
Physical Tests : Conductivity in Water										
HDPE MW09-03-01	E100	18-Sep-2020	----	----	----		24-Sep-2020	28 days	5 days	✓
Physical Tests : Conductivity in Water										
HDPE MW-09-03-02	E100	18-Sep-2020	----	----	----		24-Sep-2020	28 days	5 days	✓
Physical Tests : pH by Meter										
HDPE MW-09-03-02	E108	18-Sep-2020	----	----	----		24-Sep-2020	0.25 hrs	141 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW09-03-01	E108	18-Sep-2020	----	----	----		24-Sep-2020	0.25 hrs	142 hrs	× EHTR-FM
Physical Tests : TSS by Gravimetry										
HDPE MW09-03-01	E160-H	18-Sep-2020	----	----	----		24-Sep-2020	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW-09-03-02	E160-H	18-Sep-2020	----	----	----		24-Sep-2020	7 days	6 days	✓

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	90933	1	14	7.1	5.0	✓
Ammonia by Fluorescence	E298	92794	1	17	5.8	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	90930	1	14	7.1	5.0	✓
Conductivity in Water	E100	90932	1	14	7.1	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	91587	1	16	6.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	93894	1	12	8.3	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	91588	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	90928	1	14	7.1	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	90929	1	14	7.1	5.0	✓
pH by Meter	E108	90931	1	14	7.1	5.0	✓
Sulfate in Water by IC	E235.SO4	90927	1	14	7.1	5.0	✓
TSS by Gravimetry	E160-H	91728	1	20	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	90933	1	14	7.1	5.0	✓
Ammonia by Fluorescence	E298	92794	1	17	5.8	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	90930	1	14	7.1	5.0	✓
Conductivity in Water	E100	90932	1	14	7.1	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	91587	1	16	6.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	93894	1	12	8.3	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	91588	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	90928	1	14	7.1	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	90929	1	14	7.1	5.0	✓
pH by Meter	E108	90931	1	14	7.1	5.0	✓
Sulfate in Water by IC	E235.SO4	90927	1	14	7.1	5.0	✓
TSS by Gravimetry	E160-H	91728	1	20	5.0	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	90933	1	14	7.1	5.0	✓
Ammonia by Fluorescence	E298	92794	1	17	5.8	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	90930	1	14	7.1	5.0	✓
Conductivity in Water	E100	90932	1	14	7.1	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	91587	1	16	6.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	93894	1	12	8.3	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	91588	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	90928	1	14	7.1	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	90929	1	14	7.1	5.0	✓
Sulfate in Water by IC	E235.SO4	90927	1	14	7.1	5.0	✓
TSS by Gravimetry	E160-H	91728	1	20	5.0	5.0	✓

Matrix: **Water**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	92794	1	17	5.8	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	90930	1	14	7.1	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	91587	1	16	6.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	93894	1	12	8.3	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	91588	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	90928	1	14	7.1	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	90929	1	14	7.1	5.0	✓
Sulfate in Water by IC	E235.SO4	90927	1	14	7.1	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
TSS by Gravimetry	E160-H Vancouver - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
Chloride in Water by IC (Low Level)	E235.Cl-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Vancouver - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Ion Balance using Dissolved Metals	EC101 Vancouver - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
TDS in Water (Calculation)	EC103 Vancouver - Environmental	Water	APHA 1030E (mod)	Total Dissolved Solids is calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present.
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N Vancouver - Environmental	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **WR2000924**	Page	: 1 of 10
Client	: Minto Explorations Ltd.	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 22-Sep-2020 14:47
PO	: 232824	Date Analysis Commenced	: 24-Sep-2020
C-O-C number	: 2020-09-22 B	Issue Date	: 06-Oct-2020 17:30
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 2		
No. of samples analysed	: 2		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Annabelle Prasad	Analyst	Metals, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics - Water Quality, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 90931)											
WR2000921-001	Anonymous	pH	----	E108	0.10	pH units	8.01	8.01	0.00%	4%	----
Physical Tests (QC Lot: 90932)											
WR2000921-001	Anonymous	conductivity	----	E100	2.0	µS/cm	796	797	0.126%	10%	----
Physical Tests (QC Lot: 90933)											
WR2000921-001	Anonymous	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	63.0	63.6	0.948%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	63.0	63.6	0.948%	20%	----
Physical Tests (QC Lot: 91728)											
VA20B6165-010	Anonymous	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	<3.0	<3.0	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 90927)											
WR2000921-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	1.50	mg/L	391	381	2.48%	20%	----
Anions and Nutrients (QC Lot: 90928)											
WR2000921-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0250	mg/L	3.04	2.96	2.72%	20%	----
Anions and Nutrients (QC Lot: 90929)											
WR2000921-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0050	mg/L	<0.0050	0.0063	0.0013	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 90930)											
WR2000921-001	Anonymous	chloride	16887-00-6	E235.Cl-L	0.50	mg/L	1.31	1.30	0.02	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 92794)											
WR2000907-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0833	0.0825	0.941%	20%	----
Dissolved Metals (QC Lot: 91587)											
VA20B6010-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 91588)											
VA20B6010-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0039	0.0038	0.000008	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00024	0.00022	0.00002	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.194	0.199	2.74%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 91588) - continued											
VA20B6010-001	Anonymous	cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	0.0000162	0.0000112	0.0000050	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	50.0	48.8	2.48%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	0.00017	0.00016	0.00002	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	0.084	0.083	0.001	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	0.000252	0.000291	0.000039	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0039	0.0038	0.00004	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	9.92	9.38	5.66%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.448	0.451	0.714%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00164	0.00170	3.61%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	0.607	0.600	1.26%	20%	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	2.38	2.32	2.60%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E421	0.050	mg/L	2.78	2.71	2.78%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.173	0.166	4.25%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	8.10	7.78	3.98%	20%	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	0.000021	0.000020	0.0000008	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.000503	0.000504	0.103%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0024	0.0024	0.00001	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 93894)											
VA20B5935-006	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 90932)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 90933)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 91728)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Anions and Nutrients (QCLot: 90927)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 90928)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 90929)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 90930)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 92794)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Dissolved Metals (QCLot: 91587)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 91588)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 91588) - continued						
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----
Dissolved Metals (QCLot: 93894)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 90931)									
pH	----	E108	----	pH units	7 pH units	99.8	98.0	102	----
Physical Tests (QCLot: 90932)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	101	90.0	110	----
Physical Tests (QCLot: 90933)									
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	229 mg/L	100	75.0	125	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	99.3	85.0	115	----
Physical Tests (QCLot: 91728)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	96.6	85.0	115	----
Anions and Nutrients (QCLot: 90927)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	100.0	90.0	110	----
Anions and Nutrients (QCLot: 90928)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	99.3	90.0	110	----
Anions and Nutrients (QCLot: 90929)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	99.8	90.0	110	----
Anions and Nutrients (QCLot: 90930)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	98.6	90.0	110	----
Anions and Nutrients (QCLot: 92794)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.12 mg/L	99.8	85.0	115	----
Dissolved Metals (QCLot: 91587)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	103	80.0	120	----
Dissolved Metals (QCLot: 91588)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	101	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	96.8	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	101	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	95.7	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	108	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	88.3	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	96.8	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	97.2	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	100	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	102	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 91588) - continued									
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	101	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	97.9	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	98.3	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	102	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	108	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	97.7	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	102	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	115	70.0	130	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	100	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	101	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	99.7	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	99.8	80.0	120	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	106	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	103	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	98.0	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	99.7	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	94.6	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	103	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	102	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	103	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	106	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	94.0	80.0	120	----
Dissolved Metals (QCLot: 93894)									
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	102	80.0	120	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 90927)										
WR2000921-002	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	484 mg/L	500 mg/L	96.8	75.0	125	----
Anions and Nutrients (QCLot: 90928)										
WR2000921-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	12.2 mg/L	12.5 mg/L	97.7	75.0	125	----
Anions and Nutrients (QCLot: 90929)										
WR2000921-002	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	2.45 mg/L	2.5 mg/L	98.0	75.0	125	----
Anions and Nutrients (QCLot: 90930)										
WR2000921-002	Anonymous	chloride	16887-00-6	E235.Cl-L	491 mg/L	500 mg/L	98.3	75.0	125	----
Anions and Nutrients (QCLot: 92794)										
WR2000907-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	2.05 mg/L	2 mg/L	103	75.0	125	----
Dissolved Metals (QCLot: 91587)										
VA20B6010-002	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.0443 mg/L	0.04 mg/L	111	70.0	130	----
Dissolved Metals (QCLot: 91588)										
VA20B6010-002	Anonymous	aluminum, dissolved	7429-90-5	E421	0.218 mg/L	0.2 mg/L	109	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0220 mg/L	0.02 mg/L	110	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0224 mg/L	0.02 mg/L	112	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0444 mg/L	0.04 mg/L	111	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00977 mg/L	0.01 mg/L	97.7	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.097 mg/L	0.1 mg/L	97.2	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00430 mg/L	0.004 mg/L	108	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0214 mg/L	0.02 mg/L	107	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0212 mg/L	0.02 mg/L	106	70.0	130	----
		iron, dissolved	7439-89-6	E421	2.13 mg/L	2 mg/L	106	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0203 mg/L	0.02 mg/L	102	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.115 mg/L	0.1 mg/L	115	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0205 mg/L	0.02 mg/L	102	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0425 mg/L	0.04 mg/L	106	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 91588) - continued										
VA20B6010-002	Anonymous	phosphorus, dissolved	7723-14-0	E421	12.0 mg/L	10 mg/L	120	70.0	130	----
		potassium, dissolved	7440-09-7	E421	4.48 mg/L	4 mg/L	112	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0454 mg/L	0.04 mg/L	113	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.89 mg/L	10 mg/L	98.9	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00432 mg/L	0.004 mg/L	108	70.0	130	----
		sodium, dissolved	17341-25-2	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	22.0 mg/L	20 mg/L	110	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00396 mg/L	0.004 mg/L	99.1	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0210 mg/L	0.02 mg/L	105	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0457 mg/L	0.04 mg/L	114	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00422 mg/L	0.004 mg/L	106	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.114 mg/L	0.1 mg/L	114	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.453 mg/L	0.4 mg/L	113	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0421 mg/L	0.04 mg/L	105	70.0	130	----
Dissolved Metals (QCLot: 93894)										
WR2000923-001	Anonymous	mercury, dissolved	7439-97-6	E509	0.000101 mg/L	0.0001 mg/L	101	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number: 2020-09-22 B

Page 1 of 1

Environmental Division Whitehorse
Work Order Reference
WR2000924

Telephone : +1 867 668 6689

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Ruth Cayetano

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax mintoenvironment@mintomine.com
Email 2
Email 3

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax ap@mintomine.com
Email 2

Project Information

ALS Account # / Quote #:	
Job #:	
PO / AFE:	232824 (Seepage)
LSD:	

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only)

ALS Contact: **Sampler:**

Select Service Level Below - Please confirm all E&P TA

Regular [R] ☑ Standard TAT if re

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐ | EMERGENCY

Date and Time Required for all E&P TATs

For tests that can not be performed according to the se

Anal

Indicate Filtered (F), Preserved (P) or Fil

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals(TM)	Disolved Metals (DM)	Total Mercury, Hardness	Dissolved Mercury	Ammonia (Total Nutrients)	Dissolved Organic Carbon (DOC)	pH, Cond., TSS, TDS, Alkalinity, Anions							Number of Containers
					P	F/P	P	F/P	P	F/P								
	MW09-03-01	18-Sep-20	14:55	Water		R		R	R		R							4
	MW-09-03-02	18-Sep-20	15:25	Water		R		R	R		R							4
				Water														
				Water														
				Water														
				Water														
				Water														
				Water														
				Water														
				Water														
				Water														
				Water														

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?
☐ YES ☑ NO

Are samples for human drinking water use?
☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C	FINAL COOLER TEMPERATURES °C
1/4/4/4/4/4.	

SHIPMENT RELEASE (client use)		
Released by: Chris Wall	Date: 2020-09-22	Time:

INITIAL SHIPMENT RECEPTION (lab use only)		
Received by:	Date: Sept 22/20	Time: 14:47

FINAL SHIPMENT RECEPTION (lab use only)		
Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000981**	Page	: 1 of 4
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 29-Sep-2020 14:15
PO	: 232824	Date Analysis Commenced	: 01-Oct-2020
C-O-C number	: 2020-09-29 B	Issue Date	: 27-Oct-2020 17:27
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 4		
No. of samples analysed	: 4		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Bruna Botti	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Cristina Alexandre	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Gloria Chan	Lab Analyst	Metals, Burnaby, British Columbia
Gloria Wan	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Monica Ko	Lab Assistant	Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics - Water Quality, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Qualifiers

Qualifier	*Description*
DLA	*Detection Limit adjusted for required dilution.*
RRV	*Reported result verified by repeat analysis.*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-08-01	MW17-08-02	MW17-08-03	F-BL	----
					Client sampling date / time	24-Sep-2020 09:00	24-Sep-2020 09:30	24-Sep-2020 10:00	24-Sep-2020	----
						WR2000981-001	WR2000981-002	WR2000981-003	WR2000981-004	--------
						Result	Result	Result	Result	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		221	153	87.6	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		221	153	87.6	<1.0	----
conductivity	----	E100	2.0	µS/cm		451	302	182	<2.0	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		236	154	91.2	<0.60	----
pH	----	E108	0.10	pH units		8.01	7.99	7.89	5.40	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		266	175	105	<1.0	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	<3.0	<3.0	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.48	0.39	0.49	<0.10	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.490	0.654	0.630	<0.0050	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		0.492	0.660	0.635	<0.0051	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0025	0.0049	0.0047	<0.0010	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		31.3	10.0	2.80	<0.30	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		5.12	3.32	1.87	<0.10	----
cation sum	----	EC101	0.10	meq/L		5.11	3.32	1.97	<0.10	----
ion balance (cation-anion difference)	----	EC101	0.010	%		0.098	<0.010	2.60	<0.010	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0072	0.0028	0.0047	0.0025 RRV	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00020 DLA	<0.00010	<0.00010	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00020	0.00021	0.00014	<0.00010	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.00792	0.0968	0.0456	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000040 DLA	<0.000020	<0.000020	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000100 DLA	<0.000050	<0.000050	<0.000050	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.023	0.011	<0.010	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.000123	0.0000619	0.0000407	<0.0000050	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-08-01	MW17-08-02	MW17-08-03	F-BL	----
					Client sampling date / time	24-Sep-2020 09:00	24-Sep-2020 09:30	24-Sep-2020 10:00	24-Sep-2020	----
						WR2000981-001	WR2000981-002	WR2000981-003	WR2000981-004	--------
						Result	Result	Result	Result	----
Dissolved Metals										
calcium, dissolved	7440-70-2	E421	0.050	mg/L		46.2	35.7	25.9	<0.050	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00020 DLA	0.00018	0.00022	0.00026 RRV	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00020 DLA	<0.00010	<0.00010	<0.00010	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00532	0.00338	0.00524	0.00051 RRV	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.020 DLA	<0.010	<0.010	<0.010	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000100 DLA	<0.000050	<0.000050	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		<0.0020 DLA	<0.0010	<0.0010	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		29.4	15.7	6.44	<0.100	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.00110	0.00057	0.00042	<0.00010	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00925	0.00289	0.000820	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00100 DLA	<0.00050	<0.00050	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.100 DLA	<0.050	<0.050	<0.050	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		1.68	1.03	0.776	<0.100	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000562	0.000497	0.000198	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		5.22	4.78	3.98	<0.050	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000020 DLA	<0.000010	<0.000010	<0.000010	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L		7.46	4.79	2.80	<0.050	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		6.32	1.02	0.260	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		10.5	3.49	0.98	<0.50	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000020 DLA	<0.000010	<0.000010	<0.000010	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00020 DLA	<0.00010	<0.00010	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00060 DLA	<0.00030	<0.00030	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000227	0.000147	0.000085	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00100 DLA	0.00079	0.00110	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0563	0.0232	0.0124	<0.0010	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00040 DLA	<0.00020	<0.00020	<0.00020	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WR2000981**	Page	: 1 of 12
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 29-Sep-2020 14:15
PO	: 232824	Issue Date	: 27-Oct-2020 17:27
C-O-C number	: 2020-09-29 B		
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 4		
No. of samples analysed	: 4		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
F-BL	E298	24-Sep-2020	----	----	----		19-Oct-2020	28 days	25 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW17-08-01	E298	24-Sep-2020	----	----	----		19-Oct-2020	28 days	25 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW17-08-02	E298	24-Sep-2020	----	----	----		19-Oct-2020	28 days	25 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW17-08-03	E298	24-Sep-2020	----	----	----		19-Oct-2020	28 days	25 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
F-BL	E235.Cl-L	24-Sep-2020	----	----	----		07-Oct-2020	28 days	12 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
MW17-08-01	E235.Cl-L	24-Sep-2020	----	----	----		07-Oct-2020	28 days	12 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
MW17-08-02	E235.Cl-L	24-Sep-2020	----	----	----		07-Oct-2020	28 days	12 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW17-08-03	E235.Cl-L	24-Sep-2020	----	----	----		07-Oct-2020	28 days	12 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE F-BL	E235.NO3-L	24-Sep-2020	----	----	----		07-Oct-2020	3 days	12 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-08-01	E235.NO3-L	24-Sep-2020	----	----	----		07-Oct-2020	3 days	12 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-08-02	E235.NO3-L	24-Sep-2020	----	----	----		07-Oct-2020	3 days	12 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-08-03	E235.NO3-L	24-Sep-2020	----	----	----		07-Oct-2020	3 days	12 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE F-BL	E235.NO2-L	24-Sep-2020	----	----	----		07-Oct-2020	3 days	12 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW17-08-01	E235.NO2-L	24-Sep-2020	----	----	----		07-Oct-2020	3 days	12 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW17-08-02	E235.NO2-L	24-Sep-2020	----	----	----		07-Oct-2020	3 days	12 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW17-08-03	E235.NO2-L	24-Sep-2020	----	----	----		07-Oct-2020	3 days	12 days	× EHTR

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
F-BL	E235.SO4	24-Sep-2020	----	----	----		07-Oct-2020	28 days	12 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW17-08-01	E235.SO4	24-Sep-2020	----	----	----		07-Oct-2020	28 days	12 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW17-08-02	E235.SO4	24-Sep-2020	----	----	----		07-Oct-2020	28 days	12 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW17-08-03	E235.SO4	24-Sep-2020	----	----	----		07-Oct-2020	28 days	12 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
F-BL	E421.Cr-L	24-Sep-2020	04-Oct-2020	180 days	10 days	✓	06-Oct-2020	169 days	1 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW17-08-01	E421.Cr-L	24-Sep-2020	04-Oct-2020	180 days	10 days	✓	06-Oct-2020	169 days	1 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW17-08-02	E421.Cr-L	24-Sep-2020	04-Oct-2020	180 days	10 days	✓	06-Oct-2020	169 days	1 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW17-08-03	E421.Cr-L	24-Sep-2020	04-Oct-2020	180 days	10 days	✓	06-Oct-2020	169 days	1 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
F-BL	E509	24-Sep-2020	19-Oct-2020	28 days	24 days	✓	19-Oct-2020	3 days	0 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW17-08-01	E509	24-Sep-2020	19-Oct-2020	28 days	25 days	✓	19-Oct-2020	2 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW17-08-02	E509	24-Sep-2020	19-Oct-2020	28 days	25 days	✓	19-Oct-2020	2 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW17-08-03	E509	24-Sep-2020	19-Oct-2020	28 days	25 days	✓	19-Oct-2020	2 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) F-BL	E421	24-Sep-2020	04-Oct-2020	180 days	10 days	✓	06-Oct-2020	169 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW17-08-01	E421	24-Sep-2020	04-Oct-2020	180 days	10 days	✓	06-Oct-2020	169 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW17-08-02	E421	24-Sep-2020	04-Oct-2020	180 days	10 days	✓	06-Oct-2020	169 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW17-08-03	E421	24-Sep-2020	04-Oct-2020	180 days	10 days	✓	06-Oct-2020	169 days	1 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE F-BL	E290	24-Sep-2020	----	----	----		07-Oct-2020	14 days	12 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW17-08-01	E290	24-Sep-2020	----	----	----		07-Oct-2020	14 days	12 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE										
MW17-08-02	E290	24-Sep-2020	----	----	----		07-Oct-2020	14 days	12 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
MW17-08-03	E290	24-Sep-2020	----	----	----		07-Oct-2020	14 days	12 days	✓
Physical Tests : Conductivity in Water										
HDPE										
F-BL	E100	24-Sep-2020	----	----	----		07-Oct-2020	28 days	12 days	✓
Physical Tests : Conductivity in Water										
HDPE										
MW17-08-01	E100	24-Sep-2020	----	----	----		07-Oct-2020	28 days	12 days	✓
Physical Tests : Conductivity in Water										
HDPE										
MW17-08-02	E100	24-Sep-2020	----	----	----		07-Oct-2020	28 days	12 days	✓
Physical Tests : Conductivity in Water										
HDPE										
MW17-08-03	E100	24-Sep-2020	----	----	----		07-Oct-2020	28 days	12 days	✓
Physical Tests : pH by Meter										
HDPE										
F-BL	E108	24-Sep-2020	----	----	----		07-Oct-2020	0.25 hrs	305 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE										
MW17-08-03	E108	24-Sep-2020	----	----	----		07-Oct-2020	0.25 hrs	310 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE										
MW17-08-01	E108	24-Sep-2020	----	----	----		07-Oct-2020	0.25 hrs	311 hrs	× EHTR-FM

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : pH by Meter										
HDPE MW17-08-02	E108	24-Sep-2020	----	----	----		07-Oct-2020	0.25 hrs	311 hrs	× EHTR-FM
Physical Tests : TSS by Gravimetry										
HDPE F-BL	E160-H	24-Sep-2020	----	----	----		01-Oct-2020	7 days	7 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW17-08-01	E160-H	24-Sep-2020	----	----	----		01-Oct-2020	7 days	7 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW17-08-02	E160-H	24-Sep-2020	----	----	----		01-Oct-2020	7 days	7 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW17-08-03	E160-H	24-Sep-2020	----	----	----		01-Oct-2020	7 days	7 days	✓

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	98401	1	18	5.5	5.0	✓
Ammonia by Fluorescence	E298	104925	1	11	9.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	98398	1	8	12.5	5.0	✓
Conductivity in Water	E100	98400	1	16	6.2	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	97107	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	104881	1	8	12.5	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	97108	2	20	10.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	98396	1	8	12.5	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	98397	1	8	12.5	5.0	✓
pH by Meter	E108	98399	1	17	5.8	5.0	✓
Sulfate in Water by IC	E235.SO4	98395	1	19	5.2	5.0	✓
TSS by Gravimetry	E160-H	95557	1	16	6.2	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	98401	1	18	5.5	5.0	✓
Ammonia by Fluorescence	E298	104925	1	11	9.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	98398	1	8	12.5	5.0	✓
Conductivity in Water	E100	98400	1	16	6.2	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	97107	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	104881	1	8	12.5	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	97108	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	98396	1	8	12.5	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	98397	1	8	12.5	5.0	✓
pH by Meter	E108	98399	1	17	5.8	5.0	✓
Sulfate in Water by IC	E235.SO4	98395	1	19	5.2	5.0	✓
TSS by Gravimetry	E160-H	95557	1	16	6.2	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	98401	1	18	5.5	5.0	✓
Ammonia by Fluorescence	E298	104925	1	11	9.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	98398	1	8	12.5	5.0	✓
Conductivity in Water	E100	98400	1	16	6.2	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	97107	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	104881	1	8	12.5	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	97108	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	98396	1	8	12.5	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	98397	1	8	12.5	5.0	✓
Sulfate in Water by IC	E235.SO4	98395	1	19	5.2	5.0	✓
TSS by Gravimetry	E160-H	95557	1	16	6.2	5.0	✓

Matrix: **Water**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	104925	1	11	9.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	98398	1	8	12.5	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	97107	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	104881	1	8	12.5	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	97108	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	98396	1	8	12.5	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	98397	1	8	12.5	5.0	✓
Sulfate in Water by IC	E235.SO4	98395	1	19	5.2	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
TSS by Gravimetry	E160-H Vancouver - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
Chloride in Water by IC (Low Level)	E235.Cl-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Vancouver - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Ion Balance using Dissolved Metals	EC101 Vancouver - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
TDS in Water (Calculation)	EC103 Vancouver - Environmental	Water	APHA 1030E (mod)	Total Dissolved Solids is calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present.
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N Vancouver - Environmental	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **WR2000981**	Page	: 1 of 10
Client	: Minto Explorations Ltd.	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 29-Sep-2020 14:15
PO	: 232824	Date Analysis Commenced	: 01-Oct-2020
C-O-C number	: 2020-09-29 B	Issue Date	: 27-Oct-2020 17:27
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 4		
No. of samples analysed	: 4		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Bruna Botti	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Cristina Alexandre	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Gloria Chan	Lab Analyst	Metals, Burnaby, British Columbia
Gloria Wan	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Monica Ko	Lab Assistant	Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics - Water Quality, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 95557)											
VA20B6942-003	Anonymous	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	44.2	38.4	14.0%	20%	----
Physical Tests (QC Lot: 98399)											
VA20B7313-003	Anonymous	pH	----	E108	0.10	pH units	7.57	7.57	0.00%	4%	----
Physical Tests (QC Lot: 98400)											
VA20B7313-003	Anonymous	conductivity	----	E100	2.0	µS/cm	1310	1310	0.0765%	10%	----
Physical Tests (QC Lot: 98401)											
VA20B7313-003	Anonymous	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	279	272	2.50%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	279	272	2.50%	20%	----
Anions and Nutrients (QC Lot: 104925)											
VA20B7955-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.500	mg/L	7.37	7.56	2.44%	20%	----
Anions and Nutrients (QC Lot: 98395)											
VA20B7109-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	2.19	2.19	0.002	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 98396)											
WR2000981-001	MW17-08-01	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.490	0.490	0.100%	20%	----
Anions and Nutrients (QC Lot: 98397)											
WR2000981-001	MW17-08-01	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	0.0025	0.0027	0.0002	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 98398)											
WR2000981-001	MW17-08-01	chloride	16887-00-6	E235.Cl-L	0.10	mg/L	0.48	0.50	0.02	Diff <2x LOR	----
Dissolved Metals (QC Lot: 104881)											
WR2000973-001	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 97107)											
KS2001981-003	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	0.00012	0.00011	0.000010	Diff <2x LOR	----
Dissolved Metals (QC Lot: 97108)											
KS2001981-003	Anonymous	copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00314	0.00314	0.145%	20%	----
KS2001981-003	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0331	0.0336	1.40%	20%	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0247	0.0249	0.896%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 97108) - continued											
KS2001981-003	Anonymous	beryllium, dissolved	7440-41-7	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	4.84	4.92	1.48%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	0.073	0.073	0.0006	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	0.000099	0.000105	0.000006	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	0.812	0.832	2.38%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.0189	0.0195	2.89%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.000197	0.000177	0.000020	Diff <2x LOR	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	2.00	2.06	2.89%	20%	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	4.14	4.10	1.14%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E421	0.050	mg/L	35.4	35.8	1.000%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.0525	0.0532	1.32%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	0.56	0.66	0.10	Diff <2x LOR	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	0.00064	0.00058	0.00006	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.000091	0.000096	0.000005	Diff <2x LOR	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0023	0.0024	0.00006	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 95557)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Physical Tests (QCLot: 98400)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 98401)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Anions and Nutrients (QCLot: 104925)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 98395)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 98396)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 98397)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 98398)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Dissolved Metals (QCLot: 104881)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 97107)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 97108)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 97108) - continued						
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 95557)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	104	85.0	115	----
Physical Tests (QCLot: 98399)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 98400)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	99.7	90.0	110	----
Physical Tests (QCLot: 98401)									
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	229 mg/L	102	75.0	125	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	97.8	85.0	115	----
Anions and Nutrients (QCLot: 104925)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.12 mg/L	102	85.0	115	----
Anions and Nutrients (QCLot: 98395)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	104	90.0	110	----
Anions and Nutrients (QCLot: 98396)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	103	90.0	110	----
Anions and Nutrients (QCLot: 98397)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	103	90.0	110	----
Anions and Nutrients (QCLot: 98398)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	104	90.0	110	----
Dissolved Metals (QCLot: 104881)									
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	100	80.0	120	----
Dissolved Metals (QCLot: 97107)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
Dissolved Metals (QCLot: 97108)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	104	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	100	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	101	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	105	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	99.6	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	98.1	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	95.6	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	104	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	98.0	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 97108) - continued									
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	100	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	102	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	101	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	100	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	93.7	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	102	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	105	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	99.6	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	105	70.0	130	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	103	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	96.3	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	102	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	101	80.0	120	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	102	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	101	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	101	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	96.7	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	100	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	94.4	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	104	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	104	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	102	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	99.8	80.0	120	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 104925)										
VA20B8017-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	1.00 mg/L	1 mg/L	100	75.0	125	----
Anions and Nutrients (QCLot: 98395)										
WR2000981-002	MW17-08-02	sulfate (as SO4)	14808-79-8	E235.SO4	105 mg/L	100 mg/L	105	75.0	125	----
Anions and Nutrients (QCLot: 98396)										
WR2000981-002	MW17-08-02	nitrate (as N)	14797-55-8	E235.NO3-L	2.63 mg/L	2.5 mg/L	105	75.0	125	----
Anions and Nutrients (QCLot: 98397)										
WR2000981-002	MW17-08-02	nitrite (as N)	14797-65-0	E235.NO2-L	0.524 mg/L	0.5 mg/L	105	75.0	125	----
Anions and Nutrients (QCLot: 98398)										
WR2000981-002	MW17-08-02	chloride	16887-00-6	E235.Cl-L	106 mg/L	100 mg/L	106	75.0	125	----
Dissolved Metals (QCLot: 104881)										
WR2000973-002	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000934 mg/L	0.0001 mg/L	93.4	70.0	130	----
Dissolved Metals (QCLot: 97107)										
KS2001981-004	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.0407 mg/L	0.04 mg/L	102	70.0	130	----
Dissolved Metals (QCLot: 97108)										
KS2001981-004	Anonymous	aluminum, dissolved	7429-90-5	E421	0.200 mg/L	0.2 mg/L	99.9	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0206 mg/L	0.02 mg/L	103	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0206 mg/L	0.02 mg/L	103	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0420 mg/L	0.04 mg/L	105	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00942 mg/L	0.01 mg/L	94.2	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.098 mg/L	0.1 mg/L	97.7	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00418 mg/L	0.004 mg/L	104	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0199 mg/L	0.02 mg/L	99.7	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0195 mg/L	0.02 mg/L	97.4	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.93 mg/L	2 mg/L	96.3	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0201 mg/L	0.02 mg/L	100	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0959 mg/L	0.1 mg/L	95.9	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	0.987 mg/L	1 mg/L	98.7	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 97108) - continued										
KS2001981-004	Anonymous	manganese, dissolved	7439-96-5	E421	0.0202 mg/L	0.02 mg/L	101	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0210 mg/L	0.02 mg/L	105	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0389 mg/L	0.04 mg/L	97.2	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	10.8 mg/L	10 mg/L	108	70.0	130	----
		potassium, dissolved	7440-09-7	E421	3.93 mg/L	4 mg/L	98.3	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0415 mg/L	0.04 mg/L	104	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.50 mg/L	10 mg/L	95.0	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00401 mg/L	0.004 mg/L	100	70.0	130	----
		sodium, dissolved	17341-25-2	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	21.9 mg/L	20 mg/L	109	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00383 mg/L	0.004 mg/L	95.8	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0203 mg/L	0.02 mg/L	102	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0392 mg/L	0.04 mg/L	98.0	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00411 mg/L	0.004 mg/L	103	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.106 mg/L	0.1 mg/L	106	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.422 mg/L	0.4 mg/L	106	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0412 mg/L	0.04 mg/L	103	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number: 2020-09-29 B

Page 1 of 1

Environmental Division
Whitehorse
Work Order Reference
WR2000981

Telephone : +1 867 668 6689

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Ruth Cayetano

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax mintoenvironment@mintomine.com
Email 2
Email 3

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax ap@mintomine.com
Email 2

Select Service Level Below - Please confirm all E&P TATs wit

Regular [R] ☑ Standard TAT if receive

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐
EMERGENCY: 1

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service lev

Analysis R

Indicate Filtered (F), Preserved (P) or Filtered and

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:		Major/Minor Code:	Routing Code:
PO / AFE:	232824 (Seepage)	Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)		ALS Contact:	Sampler:

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals(TM)	P	Disolved Metals (DM)	F/P	Total Mercury, Hardness	P	Dissolved Mercury	F/P	Ammonia (Total Nutrients)	P	Dissolved Organic Carbon (DOC)	F/P	pH, Cond., TSS, TDS, Alkalinity, Anions		Number of Containers
	MW17-08-01	24-Sep-20	9:00	Water			R				R		R				R		4
	MW17-08-02	24-Sep-20	9:30	Water			R				R		R				R		4
	MW17-08-03	24-Sep-20	10:00	Water			R				R		R				R		4
	F-BL	24-Sep-20		Water			R				R		R				R		4

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?
☐ YES ☑ NO

Are samples for human drinking water use?
☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
2°	1°				

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Chris Wall	Date: 2020-09-29	Time:	Received by:	Date: Sept 29/20	Time: 14:15	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number: 2020-09-29 B

Page 1 of 1

Environmental Division Whitehorse
Work Order Reference
WR2000981

Telephone : +1 867 668 6689

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Ruth Cayetano

Report Format / Distribution	
Select Report Format:	☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	mintoenvironment@mintomine.com
Email 2	
Email 3	
Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	ap@mintomine.com
Email 2	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:		Major/Minor Code:	Routing Code:
PO / AFE:	232824 (Seepage)	Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)		ALS Contact:	Sampler:

Select Service Level Below - Please confirm all E&P TATs wit

Regular [R] ☑ Standard TAT if receive

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐ | EMERGENCY 1

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service lev

Analysis R

Indicate Filtered (F), Preserved (P) or Filtered and

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	P	F/P	P	F/P	P	F/P								Number of Containers
					Total Metals(TM)	Dissolved Metals (DM)	Total Mercury, Hardness	Dissolved Mercury	Ammonia (Total Nutrients)	Dissolved Organic Carbon (DOC)	pH, Cond., TSS, TDS, Alkalinity, Anions							
	MW17-08-01	24-Sep-20	9:00	Water		R		R	R		R							4
	MW17-08-02	24-Sep-20	9:30	Water		R		R	R		R							4
	MW17-08-03	24-Sep-20	10:00	Water		R		R	R		R							4
	F-BL	24-Sep-20		Water		R		R	R		R							4

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?
☐ YES ☑ NO

Are samples for human drinking water use?
☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ | SIF Observations Yes ☐ No ☐
Ice Packs ☑ Ice Cubes ☐ | Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
2°	1°		10		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Chris Wall	Date: 2020-09-29	Time:	Received by:	Date: Sept 29/20	Time: 14:15	Received by:	Date: SEP 30 2020	Time: 5:15

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2001040**	Page	: 1 of 10
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 06-Oct-2020 13:45
PO	: 232818	Date Analysis Commenced	: 08-Oct-2020
C-O-C number	: 2020-10-06 B	Issue Date	: 21-Oct-2020 18:56
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 16		
No. of samples analysed	: 16		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Bruna Botti	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Clarie Tejano		Metals, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Gloria Chan	Lab Analyst	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Sample Comments

Sample	Client Id	*Comment*
WR2001040-001	MW12-05-01	Sample 6: Hg vial broke, take from metals. Water sample for dissolved mercury analysis was not submitted in glass or PTFE container with HCl preservative. Results may be biased low.

Qualifiers

Qualifier	*Description*
DLA	*Detection Limit adjusted for required dilution.*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW12-05-01	MW12-05-02	MW12-05-03	MW12-05-04	MW12-05-05
					Client sampling date / time	02-Oct-2020 09:00	02-Oct-2020 09:30	02-Oct-2020 10:15	02-Oct-2020 10:40	02-Oct-2020 11:00
						WR2001040-001	WR2001040-002	WR2001040-003	WR2001040-004	WR2001040-005
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		110	154	234	260	246
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		110	154	234	260	246
conductivity	----	E100	2.0	µS/cm		2330	2240	1780	534	561
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		1160	1130	922	260	279
pH	----	E108	0.10	pH units		7.83	8.04	7.91	7.90	7.86
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		2070	1980	1450	338	339
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		3.0	<3.0	<3.0	<3.0	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0142	0.0120	0.0169	0.0137	<0.0050
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		14.1	13.3	8.98	4.75	5.30
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		<0.100 DLDS	<0.100 DLDS	<0.0500 DLDS	<0.0050	<0.0050
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		<0.102	<0.102	<0.0510	<0.0051	<0.0051
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0200 DLDS	<0.0200 DLDS	<0.0100 DLDS	<0.0010	<0.0010
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		1350	1280	847	51.8	57.3
Ion Balance										
anion sum	----	EC101	0.10	meq/L		30.8	30.2	22.6	6.42	6.26
cation sum	----	EC101	0.10	meq/L		30.8	29.2	23.2	6.18	6.44
ion balance (cation-anion difference)	----	EC101	0.010	%		<0.010	1.68	1.31	1.90	1.42
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0029	0.0048	0.0040	0.0031	0.0021
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00020 DLA	<0.00020 DLA	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00063	0.00031	0.00016	0.00012	0.00013
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0313	0.0500	0.0403	0.0394	0.0696
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000040 DLA	<0.000040 DLA	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000100 DLA	<0.000100 DLA	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.084	0.074	0.070	0.044	0.038
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000138	<0.0000100 DLA	<0.0000050	<0.0000050	0.0000060

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW12-05-01	MW12-05-02	MW12-05-03	MW12-05-04	MW12-05-05
					Client sampling date / time	02-Oct-2020 09:00	02-Oct-2020 09:30	02-Oct-2020 10:15	02-Oct-2020 10:40	02-Oct-2020 11:00
						WR2001040-001	WR2001040-002	WR2001040-003	WR2001040-004	WR2001040-005
						Result	Result	Result	Result	Result
Dissolved Metals										
calcium, dissolved	7440-70-2	E421	0.050	mg/L		394	363	246	54.7	60.6
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00042	0.00037	0.00045	0.00034	<0.00010
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00020 DLA	<0.00020 DLA	<0.00010	<0.00010	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		<0.00040 DLA	<0.00040 DLA	<0.00020	0.00038	0.00091
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.069	0.068	0.445	0.026	0.028
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000100 DLA	<0.000100 DLA	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0081	0.0052	0.0042	0.0034	0.0037
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		41.8	53.5	75.0	29.8	31.1
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.186	0.813	2.36	0.0834	0.149
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.000258	0.000392	0.000220	0.00359	0.00513
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00100 DLA	<0.00100 DLA	<0.00050	<0.00050	<0.00050
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.100 DLA	<0.100 DLA	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		3.79	3.93	4.15	2.28	2.29
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000188	0.000179	0.000094	0.00132	0.000100
silicon, dissolved	7440-21-3	E421	0.050	mg/L		7.32	6.80	7.52	6.08	6.01
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000020 DLA	<0.000020 DLA	<0.000010	<0.000010	<0.000010
sodium, dissolved	17341-25-2	E421	0.050	mg/L		175	149	106	21.4	18.3
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		10.8	12.9	9.00	1.05	0.981
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		465	430	288	18.4	18.4
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000020 DLA	<0.000020 DLA	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00020 DLA	<0.00020 DLA	<0.00010	<0.00010	0.00069
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00060 DLA	<0.00060 DLA	<0.00030	<0.00030	<0.00030
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000818	0.00105	0.00149	0.00321	0.00355
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00100 DLA	<0.00100 DLA	<0.00050	0.00058	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0140	<0.0020 DLA	0.0014	<0.0010	0.0056
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00040 DLA	<0.00040 DLA	<0.00020	<0.00020	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW12-05-06	MW12-05-07	DUP	MW17-12-01	MW17-12-02
					Client sampling date / time	02-Oct-2020 11:20	02-Oct-2020 11:45	02-Oct-2020	04-Oct-2020 09:45	04-Oct-2020 10:20
						WR2001040-006	WR2001040-007	WR2001040-008	WR2001040-009	WR2001040-010
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		246	244	153	194	213
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		246	244	153	194	213
conductivity	----	E100	2.0	µS/cm		561	561	2240	2460	2210
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		281	281	1110	1020	862
pH	----	E108	0.10	pH units		7.87	7.91	8.04	7.68	7.70
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		340	340	1950	2120	1820
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	<3.0	6.2	5.6
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0074	0.208	0.0132	<0.0050	<0.0050
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		5.29	5.91	13.1	12.2	11.2
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.0125	<0.0050	<0.100 DLDS	<0.100 DLDS	<0.100 DLDS
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		0.0125	<0.0051	<0.102	<0.102	<0.102
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	<0.0010	<0.0200 DLDS	<0.0200 DLDS	<0.0200 DLDS
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		58.1	56.0	1260	1340	1110
Ion Balance										
anion sum	----	EC101	0.10	meq/L		6.27	6.22	29.7	32.1	27.7
cation sum	----	EC101	0.10	meq/L		6.46	6.54	29.1	31.4	27.4
ion balance (cation-anion difference)	----	EC101	0.010	%		1.49	2.51	1.02	1.10	0.544
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0031	0.0016	0.0044	0.0027	0.0060
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00020 DLA	<0.00020 DLA	<0.00020 DLA
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00014	0.00131	0.00035	0.00172	0.00226
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0656	0.0988	0.0495	0.0103	0.00986
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000040 DLA	0.000078	<0.000040 DLA
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000100 DLA	<0.000100 DLA	<0.000100 DLA
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.029	0.023	0.070	0.168	0.151
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000102	<0.0000050	<0.0000100 DLA	0.0000152	<0.0000100 DLA
calcium, dissolved	7440-70-2	E421	0.050	mg/L		61.7	61.3	350	325	274

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW12-05-06	MW12-05-07	DUP	MW17-12-01	MW17-12-02
					Client sampling date / time	02-Oct-2020 11:20	02-Oct-2020 11:45	02-Oct-2020	04-Oct-2020 09:45	04-Oct-2020 10:20
						WR2001040-006	WR2001040-007	WR2001040-008	WR2001040-009	WR2001040-010
						Result	Result	Result	Result	Result
Dissolved Metals										
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	0.00025	0.00023	<0.00020 DLA	<0.00020 DLA
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00024	<0.00010	<0.00020 DLA	<0.00020 DLA	<0.00020 DLA
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00106	<0.00020	<0.00040 DLA	<0.00040 DLA	0.00230
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.018	1.68	0.065	2.65	2.04
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	0.000108	<0.000100 DLA	<0.000100 DLA	<0.000100 DLA
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0038	0.0037	0.0051	0.0150	0.0147
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		30.7	31.0	56.7	50.3	43.3
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.198	0.172	0.837	0.108	0.0708
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00464	0.00357	0.000373	0.00772	0.00769
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00075	<0.00050	<0.00100 DLA	<0.00100 DLA	<0.00100 DLA
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	0.054	<0.100 DLA	<0.100 DLA	<0.100 DLA
potassium, dissolved	7440-09-7	E421	0.100	mg/L		2.25	2.28	4.05	3.46	3.47
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000119	<0.000050	<0.000100 DLA	<0.000100 DLA	<0.000100 DLA
silicon, dissolved	7440-21-3	E421	0.050	mg/L		5.90	6.27	6.80	7.22	7.32
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000020 DLA	<0.000020 DLA	<0.000020 DLA
sodium, dissolved	17341-25-2	E421	0.050	mg/L		18.0	18.1	156	251	229
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		1.01	0.919	12.8	9.95	11.2
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		18.2	18.0	440	453	386
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000020 DLA	<0.000020 DLA	<0.000020 DLA
tin, dissolved	7440-31-5	E421	0.00010	mg/L		0.00034	0.00048	<0.00020 DLA	<0.00020 DLA	<0.00020 DLA
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00060 DLA	<0.00060 DLA	<0.00060 DLA
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00367	0.00173	0.00106	0.000255	0.000466
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00100 DLA	<0.00100 DLA	<0.00100 DLA
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0059	0.0017	<0.0020 DLA	0.146	0.0521
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00040 DLA	<0.00040 DLA	<0.00040 DLA
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-12-03	MW17-12-04	MW17-12-05	MW17-12-06	MW17-12-07
					Client sampling date / time	04-Oct-2020 10:45	04-Oct-2020 11:25	04-Oct-2020 11:45	04-Oct-2020 12:10	04-Oct-2020 12:25
						WR2001040-011	WR2001040-012	WR2001040-013	WR2001040-014	WR2001040-015
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		353	332	348	330	278
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		353	332	348	330	278
conductivity	----	E100	2.0	µS/cm		828	757	746	744	578
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		346	354	360	368	280
pH	----	E108	0.10	pH units		7.94	7.95	7.95	8.04	8.04
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		537	484	471	461	367
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	<3.0	<3.0	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0057	<0.0050	0.0058	<0.0050	<0.0050
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		1.88	1.99	2.73	3.12	5.38
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		<0.0250 DLDS	0.125	0.313	0.237	0.428
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		<0.0255	0.126	0.314	0.238	0.429
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0050 DLDS	<0.0050 DLDS	<0.0050 DLDS	<0.0050 DLDS	0.0012
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		123	109	92.8	88.0	63.7
Ion Balance										
anion sum	----	EC101	0.10	meq/L		9.66	8.97	8.98	8.53	7.07
cation sum	----	EC101	0.10	meq/L		9.65	8.84	8.56	8.82	6.56
ion balance (cation-anion difference)	----	EC101	0.010	%		0.052	0.730	2.39	1.67	3.74
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0019	0.0041	0.0027	0.0030	0.0036
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00071	0.00014	<0.00010	0.00010	0.00010
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0135	0.0211	0.0369	0.0498	0.0215
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.050	0.038	0.032	0.034	0.024
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000124	0.0000152	0.0000188	0.0000302	0.0000144
calcium, dissolved	7440-70-2	E421	0.050	mg/L		82.7	67.8	66.7	69.0	52.3

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-12-03	MW17-12-04	MW17-12-05	MW17-12-06	MW17-12-07
					Client sampling date / time	04-Oct-2020 10:45	04-Oct-2020 11:25	04-Oct-2020 11:45	04-Oct-2020 12:10	04-Oct-2020 12:25
						WR2001040-011	WR2001040-012	WR2001040-013	WR2001040-014	WR2001040-015
						Result	Result	Result	Result	Result
Dissolved Metals										
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00018	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		<0.00020	0.00064	0.00184	0.00392	0.00090
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.059	<0.010	<0.010	<0.010	<0.010
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0091	0.0078	0.0074	0.0096	0.0063
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		33.9	44.8	46.9	47.7	36.3
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.119	0.00208	0.0199	0.121	0.00141
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00566	0.00541	0.00425	0.0178	0.00583
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	<0.00050	0.00065	0.00232	<0.00050
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		3.02	3.17	3.60	4.24	2.73
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000081	0.000486	0.000215	0.000120	0.000217
silicon, dissolved	7440-21-3	E421	0.050	mg/L		7.32	6.83	6.82	6.90	6.44
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	0.000019	<0.000010	<0.000010	0.000012
sodium, dissolved	17341-25-2	E421	0.050	mg/L		60.9	38.7	29.5	31.0	20.5
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		3.60	1.56	1.49	1.57	1.05
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		39.9	33.8	29.4	29.1	20.7
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00420	0.00384	0.00402	0.00364	0.00271
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	0.00060	0.00064
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0392	0.0366	0.0376	0.0363	0.0315
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-12-08	----	----	----	----
					Client sampling date / time	04-Oct-2020 12:50	----	----	----	----
						WR2001040-016	--------	--------	--------	--------
						Result	----	----	----	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		283	----	----	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	----	----	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	----	----	----	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	----	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		283	----	----	----	----
conductivity	----	E100	2.0	µS/cm		572	----	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		282	----	----	----	----
pH	----	E108	0.10	pH units		8.04	----	----	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		371	----	----	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	----	----	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		<0.0050	----	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		5.40	----	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.425	----	----	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		0.426	----	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	----	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		63.0	----	----	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		7.15	----	----	----	----
cation sum	----	EC101	0.10	meq/L		6.62	----	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		3.85	----	----	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0022	----	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	----	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		<0.00010	----	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0224	----	----	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	----	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	----	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.024	----	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000109	----	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		53.3	----	----	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-12-08	----	----	----	----
					Client sampling date / time	04-Oct-2020 12:50	----	----	----	----
						WR2001040-016	--------	--------	--------	--------
						Result	----	----	----	----
Dissolved Metals										
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	----	----	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	----	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00063	----	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	----	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	----	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0064	----	----	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		36.2	----	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.00050	----	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	----	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00703	----	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	----	----	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	----	----	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		2.76	----	----	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000188	----	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		6.41	----	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	----	----	----	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L		21.0	----	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		1.08	----	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		20.3	----	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	----	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	----	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	----	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00277	----	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00067	----	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0234	----	----	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	----	----	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	----	----	----	----
dissolved metals filtration location	----	EP421	-	-		Field	----	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WR2001040**	Page	: 1 of 28
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 06-Oct-2020 13:45
PO	: 232818	Issue Date	: 21-Oct-2020 18:56
C-O-C number	: 2020-10-06 B		
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 16		
No. of samples analysed	: 16		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW17-12-01	E298	04-Oct-2020	----	----	----		14-Oct-2020	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW17-12-02	E298	04-Oct-2020	----	----	----		14-Oct-2020	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW17-12-03	E298	04-Oct-2020	----	----	----		14-Oct-2020	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW17-12-04	E298	04-Oct-2020	----	----	----		14-Oct-2020	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW17-12-05	E298	04-Oct-2020	----	----	----		14-Oct-2020	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW17-12-06	E298	04-Oct-2020	----	----	----		14-Oct-2020	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW17-12-07	E298	04-Oct-2020	----	----	----		14-Oct-2020	28 days	10 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW17-12-08	E298	04-Oct-2020	----	----	----		14-Oct-2020	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
DUP	E298	02-Oct-2020	----	----	----		14-Oct-2020	28 days	12 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW12-05-01	E298	02-Oct-2020	----	----	----		14-Oct-2020	28 days	12 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW12-05-02	E298	02-Oct-2020	----	----	----		14-Oct-2020	28 days	12 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW12-05-03	E298	02-Oct-2020	----	----	----		14-Oct-2020	28 days	12 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW12-05-04	E298	02-Oct-2020	----	----	----		14-Oct-2020	28 days	12 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW12-05-05	E298	02-Oct-2020	----	----	----		14-Oct-2020	28 days	12 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW12-05-06	E298	02-Oct-2020	----	----	----		14-Oct-2020	28 days	12 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW12-05-07	E298	02-Oct-2020	----	----	----		14-Oct-2020	28 days	12 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW12-05-01	E235.Cl-L	02-Oct-2020	----	----	----		12-Oct-2020	28 days	10 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW12-05-02	E235.Cl-L	02-Oct-2020	----	----	----		12-Oct-2020	28 days	10 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW12-05-03	E235.Cl-L	02-Oct-2020	----	----	----		12-Oct-2020	28 days	10 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW12-05-04	E235.Cl-L	02-Oct-2020	----	----	----		12-Oct-2020	28 days	10 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW12-05-05	E235.Cl-L	02-Oct-2020	----	----	----		12-Oct-2020	28 days	10 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW12-05-06	E235.Cl-L	02-Oct-2020	----	----	----		12-Oct-2020	28 days	10 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW17-12-04	E235.Cl-L	04-Oct-2020	----	----	----		12-Oct-2020	28 days	7 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW17-12-05	E235.Cl-L	04-Oct-2020	----	----	----		12-Oct-2020	28 days	7 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW17-12-06	E235.Cl-L	04-Oct-2020	----	----	----		12-Oct-2020	28 days	7 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW17-12-07	E235.Cl-L	04-Oct-2020	----	----	----		12-Oct-2020	28 days	7 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW17-12-08	E235.Cl-L	04-Oct-2020	----	----	----		12-Oct-2020	28 days	7 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW17-12-01	E235.Cl-L	04-Oct-2020	----	----	----		12-Oct-2020	28 days	8 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW17-12-02	E235.Cl-L	04-Oct-2020	----	----	----		12-Oct-2020	28 days	8 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW17-12-03	E235.Cl-L	04-Oct-2020	----	----	----		12-Oct-2020	28 days	8 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE DUP	E235.Cl-L	02-Oct-2020	----	----	----		12-Oct-2020	28 days	9 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW12-05-07	E235.Cl-L	02-Oct-2020	----	----	----		12-Oct-2020	28 days	9 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW12-05-01	E235.NO3-L	02-Oct-2020	----	----	----		12-Oct-2020	3 days	10 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW12-05-02	E235.NO3-L	02-Oct-2020	----	----	----		12-Oct-2020	3 days	10 days	× EHTR

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW12-05-03	E235.NO3-L	02-Oct-2020	----	----	----		12-Oct-2020	3 days	10 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW12-05-04	E235.NO3-L	02-Oct-2020	----	----	----		12-Oct-2020	3 days	10 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW12-05-05	E235.NO3-L	02-Oct-2020	----	----	----		12-Oct-2020	3 days	10 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW12-05-06	E235.NO3-L	02-Oct-2020	----	----	----		12-Oct-2020	3 days	10 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-12-04	E235.NO3-L	04-Oct-2020	----	----	----		12-Oct-2020	3 days	7 days	× EHTL
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-12-05	E235.NO3-L	04-Oct-2020	----	----	----		12-Oct-2020	3 days	7 days	× EHTL
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-12-06	E235.NO3-L	04-Oct-2020	----	----	----		12-Oct-2020	3 days	7 days	× EHTL
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-12-07	E235.NO3-L	04-Oct-2020	----	----	----		12-Oct-2020	3 days	7 days	× EHTL
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-12-08	E235.NO3-L	04-Oct-2020	----	----	----		12-Oct-2020	3 days	7 days	× EHTL

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-12-01	E235.NO3-L	04-Oct-2020	----	----	----		12-Oct-2020	3 days	8 days	× EHTL
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-12-02	E235.NO3-L	04-Oct-2020	----	----	----		12-Oct-2020	3 days	8 days	× EHTL
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-12-03	E235.NO3-L	04-Oct-2020	----	----	----		12-Oct-2020	3 days	8 days	× EHTL
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE DUP	E235.NO3-L	02-Oct-2020	----	----	----		12-Oct-2020	3 days	9 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW12-05-07	E235.NO3-L	02-Oct-2020	----	----	----		12-Oct-2020	3 days	9 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW12-05-01	E235.NO2-L	02-Oct-2020	----	----	----		12-Oct-2020	3 days	10 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW12-05-02	E235.NO2-L	02-Oct-2020	----	----	----		12-Oct-2020	3 days	10 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW12-05-03	E235.NO2-L	02-Oct-2020	----	----	----		12-Oct-2020	3 days	10 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW12-05-04	E235.NO2-L	02-Oct-2020	----	----	----		12-Oct-2020	3 days	10 days	× EHTR

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW12-05-05	E235.NO2-L	02-Oct-2020	----	----	----		12-Oct-2020	3 days	10 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW12-05-06	E235.NO2-L	02-Oct-2020	----	----	----		12-Oct-2020	3 days	10 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW17-12-04	E235.NO2-L	04-Oct-2020	----	----	----		12-Oct-2020	3 days	7 days	× EHTL
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW17-12-05	E235.NO2-L	04-Oct-2020	----	----	----		12-Oct-2020	3 days	7 days	× EHTL
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW17-12-06	E235.NO2-L	04-Oct-2020	----	----	----		12-Oct-2020	3 days	7 days	× EHTL
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW17-12-07	E235.NO2-L	04-Oct-2020	----	----	----		12-Oct-2020	3 days	7 days	× EHTL
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW17-12-08	E235.NO2-L	04-Oct-2020	----	----	----		12-Oct-2020	3 days	7 days	× EHTL
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW17-12-01	E235.NO2-L	04-Oct-2020	----	----	----		12-Oct-2020	3 days	8 days	× EHTL
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW17-12-02	E235.NO2-L	04-Oct-2020	----	----	----		12-Oct-2020	3 days	8 days	× EHTL

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
MW17-12-03	E235.NO2-L	04-Oct-2020	----	----	----		12-Oct-2020	3 days	8 days	× EHTL
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
DUP	E235.NO2-L	02-Oct-2020	----	----	----		12-Oct-2020	3 days	9 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
MW12-05-07	E235.NO2-L	02-Oct-2020	----	----	----		12-Oct-2020	3 days	9 days	× EHTR
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW12-05-01	E235.SO4	02-Oct-2020	----	----	----		12-Oct-2020	28 days	10 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW12-05-02	E235.SO4	02-Oct-2020	----	----	----		12-Oct-2020	28 days	10 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW12-05-03	E235.SO4	02-Oct-2020	----	----	----		12-Oct-2020	28 days	10 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW12-05-04	E235.SO4	02-Oct-2020	----	----	----		12-Oct-2020	28 days	10 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW12-05-05	E235.SO4	02-Oct-2020	----	----	----		12-Oct-2020	28 days	10 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW12-05-06	E235.SO4	02-Oct-2020	----	----	----		12-Oct-2020	28 days	10 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW17-12-04	E235.SO4	04-Oct-2020	----	----	----		12-Oct-2020	28 days	7 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW17-12-05	E235.SO4	04-Oct-2020	----	----	----		12-Oct-2020	28 days	7 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW17-12-06	E235.SO4	04-Oct-2020	----	----	----		12-Oct-2020	28 days	7 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW17-12-07	E235.SO4	04-Oct-2020	----	----	----		12-Oct-2020	28 days	7 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW17-12-08	E235.SO4	04-Oct-2020	----	----	----		12-Oct-2020	28 days	7 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW17-12-01	E235.SO4	04-Oct-2020	----	----	----		12-Oct-2020	28 days	8 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW17-12-02	E235.SO4	04-Oct-2020	----	----	----		12-Oct-2020	28 days	8 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW17-12-03	E235.SO4	04-Oct-2020	----	----	----		12-Oct-2020	28 days	8 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE DUP	E235.SO4	02-Oct-2020	----	----	----		12-Oct-2020	28 days	9 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW12-05-07	E235.SO4	02-Oct-2020	----	----	----		12-Oct-2020	28 days	9 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW17-12-01	E421.Cr-L	04-Oct-2020	15-Oct-2020	180 days	11 days	✓	19-Oct-2020	168 days	3 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW17-12-02	E421.Cr-L	04-Oct-2020	15-Oct-2020	180 days	11 days	✓	19-Oct-2020	168 days	3 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW17-12-03	E421.Cr-L	04-Oct-2020	15-Oct-2020	180 days	11 days	✓	19-Oct-2020	168 days	3 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW17-12-04	E421.Cr-L	04-Oct-2020	15-Oct-2020	180 days	11 days	✓	19-Oct-2020	168 days	3 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW17-12-05	E421.Cr-L	04-Oct-2020	15-Oct-2020	180 days	11 days	✓	19-Oct-2020	168 days	3 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW17-12-06	E421.Cr-L	04-Oct-2020	15-Oct-2020	180 days	11 days	✓	19-Oct-2020	168 days	3 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW17-12-07	E421.Cr-L	04-Oct-2020	15-Oct-2020	180 days	11 days	✓	19-Oct-2020	168 days	3 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW17-12-08	E421.Cr-L	04-Oct-2020	15-Oct-2020	180 days	11 days	✓	19-Oct-2020	168 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) DUP	E421.Cr-L	02-Oct-2020	15-Oct-2020	180 days	13 days	✓	19-Oct-2020	166 days	3 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MW12-05-01	E421.Cr-L	02-Oct-2020	15-Oct-2020	180 days	13 days	✓	19-Oct-2020	166 days	3 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MW12-05-02	E421.Cr-L	02-Oct-2020	15-Oct-2020	180 days	13 days	✓	19-Oct-2020	166 days	3 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MW12-05-03	E421.Cr-L	02-Oct-2020	15-Oct-2020	180 days	13 days	✓	19-Oct-2020	166 days	3 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MW12-05-04	E421.Cr-L	02-Oct-2020	15-Oct-2020	180 days	13 days	✓	19-Oct-2020	166 days	3 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MW12-05-05	E421.Cr-L	02-Oct-2020	15-Oct-2020	180 days	13 days	✓	19-Oct-2020	166 days	3 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MW12-05-06	E421.Cr-L	02-Oct-2020	15-Oct-2020	180 days	13 days	✓	19-Oct-2020	166 days	3 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MW12-05-07	E421.Cr-L	02-Oct-2020	15-Oct-2020	180 days	13 days	✓	19-Oct-2020	166 days	3 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) DUP	E509	02-Oct-2020	13-Oct-2020	28 days	10 days	✓	13-Oct-2020	17 days	0 days	✓

Matrix: **Water**

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Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW12-05-01	E509	02-Oct-2020	13-Oct-2020	28 days	11 days	✓	13-Oct-2020	16 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW12-05-02	E509	02-Oct-2020	13-Oct-2020	28 days	11 days	✓	13-Oct-2020	16 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW12-05-03	E509	02-Oct-2020	13-Oct-2020	28 days	11 days	✓	13-Oct-2020	16 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW12-05-04	E509	02-Oct-2020	13-Oct-2020	28 days	11 days	✓	13-Oct-2020	16 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW12-05-05	E509	02-Oct-2020	13-Oct-2020	28 days	11 days	✓	13-Oct-2020	16 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW12-05-07	E509	02-Oct-2020	13-Oct-2020	28 days	11 days	✓	13-Oct-2020	16 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW12-05-06	E509	02-Oct-2020	17-Oct-2020	28 days	14 days	✓	17-Oct-2020	13 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW17-12-01	E509	04-Oct-2020	13-Oct-2020	28 days	9 days	✓	13-Oct-2020	18 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW17-12-02	E509	04-Oct-2020	13-Oct-2020	28 days	9 days	✓	13-Oct-2020	18 days	0 days	✓

Matrix: **Water**

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Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW17-12-03	E509	04-Oct-2020	13-Oct-2020	28 days	9 days	✓	13-Oct-2020	18 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW17-12-04	E509	04-Oct-2020	13-Oct-2020	28 days	9 days	✓	13-Oct-2020	18 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW17-12-05	E509	04-Oct-2020	13-Oct-2020	28 days	9 days	✓	13-Oct-2020	18 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW17-12-06	E509	04-Oct-2020	13-Oct-2020	28 days	9 days	✓	13-Oct-2020	18 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW17-12-07	E509	04-Oct-2020	13-Oct-2020	28 days	9 days	✓	13-Oct-2020	18 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW17-12-08	E509	04-Oct-2020	13-Oct-2020	28 days	9 days	✓	13-Oct-2020	18 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW17-12-01	E421	04-Oct-2020	15-Oct-2020	180 days	11 days	✓	19-Oct-2020	168 days	3 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW17-12-02	E421	04-Oct-2020	15-Oct-2020	180 days	11 days	✓	19-Oct-2020	168 days	3 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW17-12-03	E421	04-Oct-2020	15-Oct-2020	180 days	11 days	✓	19-Oct-2020	168 days	3 days	✓

Matrix: **Water**

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Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW17-12-04	E421	04-Oct-2020	15-Oct-2020	180 days	11 days	✓	19-Oct-2020	168 days	3 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW17-12-05	E421	04-Oct-2020	15-Oct-2020	180 days	11 days	✓	19-Oct-2020	168 days	3 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW17-12-06	E421	04-Oct-2020	15-Oct-2020	180 days	11 days	✓	19-Oct-2020	168 days	3 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW17-12-07	E421	04-Oct-2020	15-Oct-2020	180 days	11 days	✓	19-Oct-2020	168 days	3 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW17-12-08	E421	04-Oct-2020	15-Oct-2020	180 days	11 days	✓	19-Oct-2020	168 days	3 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) DUP	E421	02-Oct-2020	15-Oct-2020	180 days	13 days	✓	19-Oct-2020	166 days	3 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW12-05-01	E421	02-Oct-2020	15-Oct-2020	180 days	13 days	✓	19-Oct-2020	166 days	3 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW12-05-02	E421	02-Oct-2020	15-Oct-2020	180 days	13 days	✓	19-Oct-2020	166 days	3 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW12-05-03	E421	02-Oct-2020	15-Oct-2020	180 days	13 days	✓	19-Oct-2020	166 days	3 days	✓

Matrix: **Water**

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Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW12-05-04	E421	02-Oct-2020	15-Oct-2020	180 days	13 days	✓	19-Oct-2020	166 days	3 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW12-05-05	E421	02-Oct-2020	15-Oct-2020	180 days	13 days	✓	19-Oct-2020	166 days	3 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW12-05-06	E421	02-Oct-2020	15-Oct-2020	180 days	13 days	✓	19-Oct-2020	166 days	3 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW12-05-07	E421	02-Oct-2020	15-Oct-2020	180 days	13 days	✓	19-Oct-2020	166 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW17-12-01	E290	04-Oct-2020	----	----	----		08-Oct-2020	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW17-12-02	E290	04-Oct-2020	----	----	----		08-Oct-2020	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW17-12-03	E290	04-Oct-2020	----	----	----		08-Oct-2020	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW17-12-04	E290	04-Oct-2020	----	----	----		08-Oct-2020	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW17-12-05	E290	04-Oct-2020	----	----	----		08-Oct-2020	14 days	4 days	✓

Matrix: **Water**

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Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE MW17-12-06	E290	04-Oct-2020	----	----	----		08-Oct-2020	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW17-12-07	E290	04-Oct-2020	----	----	----		08-Oct-2020	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW17-12-08	E290	04-Oct-2020	----	----	----		08-Oct-2020	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE DUP	E290	02-Oct-2020	----	----	----		08-Oct-2020	14 days	6 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW12-05-01	E290	02-Oct-2020	----	----	----		08-Oct-2020	14 days	6 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW12-05-02	E290	02-Oct-2020	----	----	----		08-Oct-2020	14 days	6 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW12-05-03	E290	02-Oct-2020	----	----	----		08-Oct-2020	14 days	6 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW12-05-04	E290	02-Oct-2020	----	----	----		08-Oct-2020	14 days	6 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW12-05-05	E290	02-Oct-2020	----	----	----		08-Oct-2020	14 days	6 days	✓

Matrix: **Water**

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Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE										
MW12-05-06	E290	02-Oct-2020	----	----	----		08-Oct-2020	14 days	6 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
MW12-05-07	E290	02-Oct-2020	----	----	----		08-Oct-2020	14 days	6 days	✓
Physical Tests : Conductivity in Water										
HDPE										
MW17-12-01	E100	04-Oct-2020	----	----	----		08-Oct-2020	28 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE										
MW17-12-02	E100	04-Oct-2020	----	----	----		08-Oct-2020	28 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE										
MW17-12-03	E100	04-Oct-2020	----	----	----		08-Oct-2020	28 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE										
MW17-12-04	E100	04-Oct-2020	----	----	----		08-Oct-2020	28 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE										
MW17-12-05	E100	04-Oct-2020	----	----	----		08-Oct-2020	28 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE										
MW17-12-06	E100	04-Oct-2020	----	----	----		08-Oct-2020	28 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE										
MW17-12-07	E100	04-Oct-2020	----	----	----		08-Oct-2020	28 days	4 days	✓

Matrix: **Water**

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Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Conductivity in Water										
HDPE MW17-12-08	E100	04-Oct-2020	----	----	----		08-Oct-2020	28 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE DUP	E100	02-Oct-2020	----	----	----		08-Oct-2020	28 days	6 days	✓
Physical Tests : Conductivity in Water										
HDPE MW12-05-01	E100	02-Oct-2020	----	----	----		08-Oct-2020	28 days	6 days	✓
Physical Tests : Conductivity in Water										
HDPE MW12-05-02	E100	02-Oct-2020	----	----	----		08-Oct-2020	28 days	6 days	✓
Physical Tests : Conductivity in Water										
HDPE MW12-05-03	E100	02-Oct-2020	----	----	----		08-Oct-2020	28 days	6 days	✓
Physical Tests : Conductivity in Water										
HDPE MW12-05-04	E100	02-Oct-2020	----	----	----		08-Oct-2020	28 days	6 days	✓
Physical Tests : Conductivity in Water										
HDPE MW12-05-05	E100	02-Oct-2020	----	----	----		08-Oct-2020	28 days	6 days	✓
Physical Tests : Conductivity in Water										
HDPE MW12-05-06	E100	02-Oct-2020	----	----	----		08-Oct-2020	28 days	6 days	✓
Physical Tests : Conductivity in Water										
HDPE MW12-05-07	E100	02-Oct-2020	----	----	----		08-Oct-2020	28 days	6 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : pH by Meter										
HDPE MW17-12-04	E108	04-Oct-2020	----	----	----		08-Oct-2020	0.25 hrs	100 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW17-12-05	E108	04-Oct-2020	----	----	----		08-Oct-2020	0.25 hrs	100 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW17-12-02	E108	04-Oct-2020	----	----	----		08-Oct-2020	0.25 hrs	101 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW17-12-03	E108	04-Oct-2020	----	----	----		08-Oct-2020	0.25 hrs	101 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW17-12-01	E108	04-Oct-2020	----	----	----		08-Oct-2020	0.25 hrs	102 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE DUP	E108	02-Oct-2020	----	----	----		08-Oct-2020	0.25 hrs	145 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW12-05-06	E108	02-Oct-2020	----	----	----		08-Oct-2020	0.25 hrs	148 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW12-05-07	E108	02-Oct-2020	----	----	----		08-Oct-2020	0.25 hrs	148 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW12-05-03	E108	02-Oct-2020	----	----	----		08-Oct-2020	0.25 hrs	149 hrs	× EHTR-FM

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : pH by Meter										
HDPE MW12-05-04	E108	02-Oct-2020	----	----	----		08-Oct-2020	0.25 hrs	149 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW12-05-05	E108	02-Oct-2020	----	----	----		08-Oct-2020	0.25 hrs	149 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW12-05-02	E108	02-Oct-2020	----	----	----		08-Oct-2020	0.25 hrs	150 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW12-05-01	E108	02-Oct-2020	----	----	----		08-Oct-2020	0.25 hrs	151 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW17-12-06	E108	04-Oct-2020	----	----	----		08-Oct-2020	0.25 hrs	99 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW17-12-07	E108	04-Oct-2020	----	----	----		08-Oct-2020	0.25 hrs	99 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW17-12-08	E108	04-Oct-2020	----	----	----		08-Oct-2020	0.25 hrs	99 hrs	× EHTR-FM
Physical Tests : TSS by Gravimetry										
HDPE MW17-12-01	E160-H	04-Oct-2020	----	----	----		09-Oct-2020	7 days	4 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW17-12-02	E160-H	04-Oct-2020	----	----	----		09-Oct-2020	7 days	4 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TSS by Gravimetry										
HDPE MW17-12-03	E160-H	04-Oct-2020	----	----	----		09-Oct-2020	7 days	5 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW17-12-04	E160-H	04-Oct-2020	----	----	----		09-Oct-2020	7 days	5 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW17-12-05	E160-H	04-Oct-2020	----	----	----		09-Oct-2020	7 days	5 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW17-12-06	E160-H	04-Oct-2020	----	----	----		09-Oct-2020	7 days	5 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW17-12-07	E160-H	04-Oct-2020	----	----	----		09-Oct-2020	7 days	5 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW17-12-08	E160-H	04-Oct-2020	----	----	----		09-Oct-2020	7 days	5 days	✓
Physical Tests : TSS by Gravimetry										
HDPE DUP	E160-H	02-Oct-2020	----	----	----		08-Oct-2020	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW12-05-01	E160-H	02-Oct-2020	----	----	----		08-Oct-2020	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW12-05-02	E160-H	02-Oct-2020	----	----	----		08-Oct-2020	7 days	6 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TSS by Gravimetry										
HDPE MW12-05-03	E160-H	02-Oct-2020	----	----	----		08-Oct-2020	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW12-05-04	E160-H	02-Oct-2020	----	----	----		08-Oct-2020	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW12-05-05	E160-H	02-Oct-2020	----	----	----		08-Oct-2020	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW12-05-06	E160-H	02-Oct-2020	----	----	----		08-Oct-2020	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW12-05-07	E160-H	02-Oct-2020	----	----	----		08-Oct-2020	7 days	6 days	✓

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	99379	2	23	8.7	5.0	✓
Ammonia by Fluorescence	E298	101933	1	16	6.2	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	101439	1	16	6.2	5.0	✓
Conductivity in Water	E100	99378	2	25	8.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	103320	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	101717	3	33	9.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	103321	2	20	10.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	101438	1	18	5.5	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	101437	1	18	5.5	5.0	✓
pH by Meter	E108	99377	2	36	5.5	5.0	✓
Sulfate in Water by IC	E235.SO4	101436	1	18	5.5	5.0	✓
TSS by Gravimetry	E160-H	99893	3	60	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	99379	2	23	8.7	5.0	✓
Ammonia by Fluorescence	E298	101933	1	16	6.2	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	101439	1	16	6.2	5.0	✓
Conductivity in Water	E100	99378	2	25	8.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	103320	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	101717	3	33	9.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	103321	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	101438	1	18	5.5	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	101437	1	18	5.5	5.0	✓
pH by Meter	E108	99377	2	36	5.5	5.0	✓
Sulfate in Water by IC	E235.SO4	101436	1	18	5.5	5.0	✓
TSS by Gravimetry	E160-H	99893	3	60	5.0	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	99379	2	23	8.7	5.0	✓
Ammonia by Fluorescence	E298	101933	1	16	6.2	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	101439	1	16	6.2	5.0	✓
Conductivity in Water	E100	99378	2	25	8.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	103320	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	101717	3	33	9.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	103321	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	101438	1	18	5.5	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	101437	1	18	5.5	5.0	✓
Sulfate in Water by IC	E235.SO4	101436	1	18	5.5	5.0	✓
TSS by Gravimetry	E160-H	99893	3	60	5.0	5.0	✓

Matrix: **Water**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	101933	1	16	6.2	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	101439	1	16	6.2	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	103320	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	101717	3	33	9.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	103321	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	101438	1	18	5.5	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	101437	1	18	5.5	5.0	✓
Sulfate in Water by IC	E235.SO4	101436	1	18	5.5	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
TSS by Gravimetry	E160-H Vancouver - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
Chloride in Water by IC (Low Level)	E235.Cl-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Vancouver - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Ion Balance using Dissolved Metals	EC101 Vancouver - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
TDS in Water (Calculation)	EC103 Vancouver - Environmental	Water	APHA 1030E (mod)	Total Dissolved Solids is calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present.
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N Vancouver - Environmental	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **WR2001040**	Page	: 1 of 13
Client	: Minto Explorations Ltd.	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 06-Oct-2020 13:45
PO	: 232818	Date Analysis Commenced	: 08-Oct-2020
C-O-C number	: 2020-10-06 B	Issue Date	: 21-Oct-2020 18:56
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 16		
No. of samples analysed	: 16		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Bruna Botti	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Clarie Tejano		Metals, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Gloria Chan	Lab Analyst	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 100180)											
VA20B7644-001	Anonymous	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	151	129	15.6%	20%	----
Physical Tests (QC Lot: 100397)											
VA20B7267-003	Anonymous	solids, total suspended [TSS]	----	E160-H	5.0	mg/L	26.2	26.8	0.7	Diff <2x LOR	----
Physical Tests (QC Lot: 99377)											
WR2001040-003	MW12-05-03	pH	----	E108	0.10	pH units	7.91	7.90	0.164%	4%	----
Physical Tests (QC Lot: 99378)											
WR2001040-003	MW12-05-03	conductivity	----	E100	2.0	µS/cm	1780	1790	0.503%	10%	----
Physical Tests (QC Lot: 99379)											
WR2001040-003	MW12-05-03	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	234	234	0.0427%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	234	234	0.0427%	20%	----
Physical Tests (QC Lot: 99380)											
VA20B7514-009	Anonymous	pH	----	E108	0.10	pH units	7.17	7.19	0.223%	4%	----
Physical Tests (QC Lot: 99381)											
VA20B7514-009	Anonymous	conductivity	----	E100	2.0	µS/cm	37.6	37.1	0.5	Diff <2x LOR	----
Physical Tests (QC Lot: 99382)											
VA20B7514-009	Anonymous	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	11.8	11.6	1.71%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	11.8	11.6	1.71%	20%	----
Physical Tests (QC Lot: 99893)											
VA20B7314-003	Anonymous	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	<3.0	<3.0	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 101436)											
WR2001040-001	MW12-05-01	sulfate (as SO4)	14808-79-8	E235.SO4	6.00	mg/L	1350	1340	1.25%	20%	----
Anions and Nutrients (QC Lot: 101437)											
WR2001040-001	MW12-05-01	nitrite (as N)	14797-65-0	E235.NO2-L	0.0200	mg/L	<0.0200	<0.0200	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 101438)											

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Anions and Nutrients (QC Lot: 101438) - continued											
WR2001040-001	MW12-05-01	nitrate (as N)	14797-55-8	E235.NO3-L	0.100	mg/L	<0.100	<0.100	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 101439)											
WR2001040-001	MW12-05-01	chloride	16887-00-6	E235.Cl-L	2.00	mg/L	14.1	13.9	0.17	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 101933)											
WR2001040-001	MW12-05-01	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0142	0.0146	0.0004	Diff <2x LOR	----
Dissolved Metals (QC Lot: 101717)											
VA20B7582-002	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 101718)											
WR2001040-015	MW17-12-07	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 103320)											
WR2001031-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 103321)											
WR2001031-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0034	0.0036	0.0002	Diff <2x LOR	----
WR2001031-001	Anonymous	antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00014	0.00014	0.000002	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00029	0.00032	0.00003	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0809	0.0757	6.62%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	0.0000408	0.0000458	0.0000051	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	47.4	44.8	5.57%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	0.00096	0.00092	0.00004	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00131	0.00122	0.00009	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	0.010	0.014	0.004	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0040	0.0038	0.0002	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.100	mg/L	7.67	7.39	3.67%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.174	0.167	4.03%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.000902	0.000899	0.317%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00173	0.00169	0.00004	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.100	mg/L	1.60	1.53	4.46%	20%	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.000181	0.000184	0.000003	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	4.82	4.71	2.34%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 103321) - continued											
WR2001031-001	Anonymous	sodium, dissolved	17341-25-2	E421	0.050	mg/L	2.52	2.33	7.82%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.188	0.185	1.42%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	9.74	9.21	5.57%	20%	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00102	0.000982	4.07%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0030	0.0029	0.00010	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 104048)											
VA20B8200-001	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000250	mg/L	0.0000290	0.0000286	0.0000004	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 100180)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Physical Tests (QCLot: 100397)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Physical Tests (QCLot: 99378)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 99379)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 99381)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 99382)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 99893)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Anions and Nutrients (QCLot: 101436)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 101437)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 101438)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 101439)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 101933)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Dissolved Metals (QCLot: 101717)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 101718)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 103320)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 103321)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 103321) - continued						
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----
Dissolved Metals (QCLot: 104048)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 100180)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	99.3	85.0	115	----
Physical Tests (QCLot: 100397)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	87.8	85.0	115	----
Physical Tests (QCLot: 99377)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 99378)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	98.6	90.0	110	----
Physical Tests (QCLot: 99379)									
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	229 mg/L	115	75.0	125	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	97.8	85.0	115	----
Physical Tests (QCLot: 99380)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 99381)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	99.0	90.0	110	----
Physical Tests (QCLot: 99382)									
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	229 mg/L	100	75.0	125	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	98.7	85.0	115	----
Physical Tests (QCLot: 99893)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	90.7	85.0	115	----
Anions and Nutrients (QCLot: 101436)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 101437)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	98.3	90.0	110	----
Anions and Nutrients (QCLot: 101438)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	98.1	90.0	110	----
Anions and Nutrients (QCLot: 101439)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	98.9	90.0	110	----
Anions and Nutrients (QCLot: 101933)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.12 mg/L	103	85.0	115	----
Dissolved Metals (QCLot: 101717)									
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	99.8	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 101718)									
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	100.0	80.0	120	----
Dissolved Metals (QCLot: 103320)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	99.0	80.0	120	----
Dissolved Metals (QCLot: 103321)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	101	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	102	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	100	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	105	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	93.8	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	103	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	89.8	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	102	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	109	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	99.2	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	99.8	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	118	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	101	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	94.5	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	92.0	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	113	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	104	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	102	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	103	70.0	130	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	102	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	100	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	96.4	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	106	80.0	120	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	98.1	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	108	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	87.5	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	101	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	103	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	105	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	97.8	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	102	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	98.9	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	101	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 104048)									
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	95.6	80.0	120	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 101436)										
WR2001040-002	MW12-05-02	sulfate (as SO4)	14808-79-8	E235.SO4	1980 mg/L	2000 mg/L	98.8	75.0	125	----
Anions and Nutrients (QCLot: 101437)										
WR2001040-002	MW12-05-02	nitrite (as N)	14797-65-0	E235.NO2-L	9.94 mg/L	10 mg/L	99.4	75.0	125	----
Anions and Nutrients (QCLot: 101438)										
WR2001040-002	MW12-05-02	nitrate (as N)	14797-55-8	E235.NO3-L	50.0 mg/L	50 mg/L	100.0	75.0	125	----
Anions and Nutrients (QCLot: 101439)										
WR2001040-002	MW12-05-02	chloride	16887-00-6	E235.Cl-L	2000 mg/L	2000 mg/L	100	75.0	125	----
Anions and Nutrients (QCLot: 101933)										
WR2001040-002	MW12-05-02	ammonia, total (as N)	7664-41-7	E298	0.205 mg/L	0.2 mg/L	102	75.0	125	----
Dissolved Metals (QCLot: 101717)										
WR2001038-004	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000938 mg/L	0.0001 mg/L	93.8	70.0	130	----
Dissolved Metals (QCLot: 101718)										
WR2001040-016	MW17-12-08	mercury, dissolved	7439-97-6	E509	0.0000970 mg/L	0.0001 mg/L	97.0	70.0	130	----
Dissolved Metals (QCLot: 103320)										
WR2001032-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.0406 mg/L	0.04 mg/L	101	70.0	130	----
Dissolved Metals (QCLot: 103321)										
WR2001032-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.204 mg/L	0.2 mg/L	102	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0221 mg/L	0.02 mg/L	110	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0205 mg/L	0.02 mg/L	102	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0390 mg/L	0.04 mg/L	97.6	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00910 mg/L	0.01 mg/L	91.0	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.085 mg/L	0.1 mg/L	85.2	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00412 mg/L	0.004 mg/L	103	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0199 mg/L	0.02 mg/L	99.5	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0196 mg/L	0.02 mg/L	97.8	70.0	130	----
		iron, dissolved	7439-89-6	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0189 mg/L	0.02 mg/L	94.7	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 103321) - continued										
WR2001032-001	Anonymous	lithium, dissolved	7439-93-2	E421	0.0990 mg/L	0.1 mg/L	99.0	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0215 mg/L	0.02 mg/L	107	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0406 mg/L	0.04 mg/L	102	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	10.6 mg/L	10 mg/L	106	70.0	130	----
		potassium, dissolved	7440-09-7	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0423 mg/L	0.04 mg/L	106	70.0	130	----
		silicon, dissolved	7440-21-3	E421	ND mg/L	10 mg/L	ND	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00410 mg/L	0.004 mg/L	102	70.0	130	----
		sodium, dissolved	17341-25-2	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	ND mg/L	20 mg/L	ND	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00377 mg/L	0.004 mg/L	94.4	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0206 mg/L	0.02 mg/L	103	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0434 mg/L	0.04 mg/L	108	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00366 mg/L	0.004 mg/L	91.4	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.105 mg/L	0.1 mg/L	105	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.401 mg/L	0.4 mg/L	100	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0450 mg/L	0.04 mg/L	112	70.0	130	----
Dissolved Metals (QCLot: 104048)										
VA20B8200-002	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000938 mg/L	0.0001 mg/L	93.8	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number: 2020-10-06 B

Environmental Division
Whitehorse
Work Order Reference
WR2001040

Telephone : +1 867 668 6689

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Ruth Cayetano

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax mintoenvironment@mintomine.com
Email 2
Email 3

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax ap@mintomine.com
Email 2

Project Information

ALS Account # / Quote #:
Job #:
PO / AFE: 232818 (GW)
LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#
Major/Minor Code: Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only)

ALS Contact: **Sampler:**

Select Service Level Below - Please confirm all E&P TATs with

Regular [R] ☑ Standard TAT if received

PRIORITY (Business Days): 4 day [P4] ☐ 3 day [P3] ☐ 2 day [P2] ☐ EMERGENCY 1

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service le

Analysis R

Indicate Filtered (F), Preserved (P) or Filtered ar

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	P	F/P	P	F/P	P	F/P								Number of Containers
					Total Metals(TM)	Disolved Metals (DM)	Total Mercury, Hardness	Dissolved Mercury	Ammonia (Total Nutrients)	Dissolved Organic Carbon (DOC)	pH, Cond., TSS, TDS, Alkalinity, Anions	Dissolved Bromide (Br-D)						
	MW12-05-01	2-Oct-20	9:00	Water		R		R	R		R							4
	MW12-05-02	2-Oct-20	9:30	Water		R		R	R		R							4
	MW12-05-03	2-Oct-20	10:15	Water		R		R	R		R							4
	MW12-05-04	2-Oct-20	10:40	Water		R		R	R		R							4
	MW12-05-05	2-Oct-20	11:00	Water		R		R	R		R							4
	MW12-05-06	2-Oct-20	11:20	Water		R		R	R		R							4
	MW12-05-07	2-Oct-20	11:45	Water		R		R	R		R							4
	DUP	2-Oct-20		Water		R		R	R		R							4
	MW17-12-01	4-Oct-20	9:45	Water		R		R	R		R							4
	MW17-12-02	4-Oct-20	10:20	Water		R		R	R		R							4
	MW17-12-03	4-Oct-20	10:45	Water		R		R	R		R							4
	MW17-12-04	4-Oct-20	11:25	Water		R		R	R		R							4

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?
☐ YES ☑ NO

Are samples for human drinking water use?
☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C							FINAL COOLER TEMPERATURES °C		
1	3.2	2.2	2.2	2.2	2.2	2.4			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Ian Smith	Date: 2020-10-06	Time:	Received by:	Date: OCT 6/20	Time: 13:45	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 2020-10-06 B

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Ruth Cayetano

Project Information

ALS Account # / Quote #:	
Job #:	
PO / AFE:	232818 (GW)
LSD:	
ALS Lab Work Order # (lab use only)	

Report Format / Distribution

Select Report Format:	☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	mintoenvironment@mintomine.com
Email 2	
Email 3	

Invoice Distribution

Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	ap@mintomine.com
Email 2	

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact:	Sampler:

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐

EMERGENCY: 1 Business day [E1] ☐ | Same Day, Weekend or Statutory holiday [E0] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	P	F/P	P	F/P	P	F/P								Number of Containers
					Total Metals(TM)	Disolved Metals (DM)	Total Mercury, Hardness	Dissolved Mercury	Ammonia (Total Nutrients)	Dissolved Organic Carbon (DOC)	pH, Cond., TSS, TDS, Alkalinity, Anions	Dissolved Bromide (Br-D)						
	MW17-12-05	4-Oct-20	11:45	Water		R		R	R		R							4
	MW17-12-06	4-Oct-20	12:10	Water		R		R	R		R							4
	MW17-12-07	4-Oct-20	12:25	Water		R		R	R		R							4
	MW17-12-08	4-Oct-20	12:50	Water		R		R	R		R							4

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO

Are samples for human drinking water use? ☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Ian Smith	Date: 2020-10-06	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2001100**	Page	: 1 of 6
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 20-Oct-2020 13:55
PO	: 232818 (GW)	Date Analysis Commenced	: 22-Oct-2020
C-O-C number	: 2020-10-20 B	Issue Date	: 30-Oct-2020 14:45
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 9		
No. of samples analysed	: 9		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Aaron Yu	Laboratory Analyst	Metals, Burnaby, British Columbia
Bruna Botti	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Clarie Tejano		Metals, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW09-03-01	MW09-03-02	MW12-06-01	MW12-06-02	MW12-06-03
					Client sampling date / time	16-Oct-2020 15:00	16-Oct-2020 15:45	19-Oct-2020 10:00	19-Oct-2020 11:00	19-Oct-2020 11:30
						WR2001100-001	WR2001100-002	WR2001100-003	WR2001100-004	WR2001100-005
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		147	114	377	368	387
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		147	114	377	368	387
conductivity	----	E100	2.0	µS/cm		305	346	1420	1010	1000
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		140	157	685	475	491
pH	----	E108	0.10	pH units		8.13	8.02	7.81	7.97	8.11
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		181	221	1000	674	658
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		31.0	4.8	<3.0	6.3	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0383	<0.0050	0.278	0.0406	0.0602
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.51	2.28	5.54	0.70	0.61
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.0060	14.8	0.134	0.0353	0.0342
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		0.0109	14.8	0.366	0.116	0.141
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0049	<0.0010	0.231	0.0805	0.107
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		17.7	5.32	414	215	194
Ion Balance										
anion sum	----	EC101	0.10	meq/L		3.32	3.50	16.3	11.9	11.8
cation sum	----	EC101	0.10	meq/L		3.21	3.38	17.5	11.2	11.6
ion balance (cation-anion difference)	----	EC101	0.010	%		1.68	1.74	3.55	3.03	0.855
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0013	0.0013	0.0148	0.0019	0.0016
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	0.00020	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00088	<0.00010	0.00672	0.00410	0.00148
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0666	0.0182	0.258	0.0262	0.0215
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	0.000142	0.000039	0.000021
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.058	0.030	0.328	0.104	0.104
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000155	0.0000368	0.0000073	<0.0000050	<0.0000050

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW09-03-01	MW09-03-02	MW12-06-01	MW12-06-02	MW12-06-03
					Client sampling date / time	16-Oct-2020 15:00	16-Oct-2020 15:45	19-Oct-2020 10:00	19-Oct-2020 11:00	19-Oct-2020 11:30
						WR2001100-001	WR2001100-002	WR2001100-003	WR2001100-004	WR2001100-005
						Result	Result	Result	Result	Result
Dissolved Metals										
calcium, dissolved	7440-70-2	E421	0.050	mg/L		37.9	51.6	210	128	106
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	0.00234	<0.00010	0.00015
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		<0.00020	0.00115	<0.00020	<0.00020	0.00072
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.272	<0.010	0.116	0.940	0.641
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0035	0.0013	0.0152	0.0078	0.0071
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		11.0	6.82	39.2	37.6	54.7
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0854	0.00230	0.401	0.0261	0.0138
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00430	0.00304	0.000511	0.0101	0.00113
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00055	<0.00050	0.00054	<0.00050	<0.00050
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		1.96	2.17	3.62	3.45	3.75
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		<0.000050	0.000404	0.00340	0.000176	0.000115
silicon, dissolved	7440-21-3	E421	0.050	mg/L		5.55	5.34	7.39	10.5	10.2
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	17341-25-2	E421	0.050	mg/L		7.96	4.34	84.7	37.6	37.3
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.994	0.363	7.95	9.34	4.85
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		6.03	1.87	226	80.1	73.6
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	0.00029	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	0.00195	<0.00030	<0.00030
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000947	0.00149	0.000326	0.00279	0.00191
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	0.0116	<0.00050	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0153	0.0332	0.0045	0.0017	0.0013
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	0.00059	<0.00020	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW12-06-04	MW12-06-05	MW12-06-06	DUP	----
					Client sampling date / time	19-Oct-2020 12:00	19-Oct-2020 12:15	19-Oct-2020 12:35	19-Oct-2020	----
						WR2001100-006	WR2001100-007	WR2001100-008	WR2001100-009	--------
						Result	Result	Result	Result	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		402	400	314	372	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		402	400	314	372	----
conductivity	----	E100	2.0	µS/cm		1020	1030	865	1440	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		510	499	399	683	----
pH	----	E108	0.10	pH units		8.09	8.10	8.17	7.83	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		664	714	536	1000	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	7.3	3.9	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0108	0.0107	<0.0050	0.284	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.62	52.9	7.10	6.13	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.0370	0.0286	0.646	0.140	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		0.122	0.0956	0.692	0.365	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0848	0.0670	0.0461	0.225	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		189	195	155	416	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		12.0	13.5	9.74	16.3	----
cation sum	----	EC101	0.10	meq/L		11.9	11.6	9.42	17.4	----
ion balance (cation-anion difference)	----	EC101	0.010	%		0.418	7.57	1.67	3.26	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0019	0.0023	0.0015	0.0165	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00021	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00296	0.00110	0.00043	0.00655	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0176	0.0384	0.0134	0.254	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		0.000030	<0.000020	<0.000020	0.000134	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.082	0.084	0.066	0.322	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000066	<0.0000050	0.0000054	0.0000074	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		106	104	78.6	209	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW12-06-04	MW12-06-05	MW12-06-06	DUP	----
					Client sampling date / time	19-Oct-2020 12:00	19-Oct-2020 12:15	19-Oct-2020 12:35	19-Oct-2020	----
						WR2001100-006	WR2001100-007	WR2001100-008	WR2001100-009	--------
						Result	Result	Result	Result	----
Dissolved Metals										
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00038	0.00013	<0.00010	0.00230	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	0.00114	<0.00010	<0.00010	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	0.00022	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.886	0.134	0.014	0.117	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0064	0.0062	0.0051	0.0153	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		59.5	58.0	49.2	39.2	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0438	0.402	0.0444	0.393	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00796	0.00956	0.00590	0.000589	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	0.00063	<0.00050	0.00053	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		3.72	3.72	3.33	3.59	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000087	0.000087	0.000296	0.000385	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		9.70	9.05	7.48	7.44	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L		36.3	35.6	31.2	83.9	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		3.16	2.80	1.58	8.16	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		73.0	71.5	58.8	174	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00031	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	0.00205	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00559	0.00586	0.00406	0.000338	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	0.0116	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0041	0.0055	0.0084	0.0049	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	0.00061	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WR2001100**	Page	: 1 of 19
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 20-Oct-2020 13:55
PO	: 232818 (GW)	Issue Date	: 30-Oct-2020 14:45
C-O-C number	: 2020-10-20 B		
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 9		
No. of samples analysed	: 9		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers occur - please see following pages for full details.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
DUP	E298	19-Oct-2020	----	----	----		23-Oct-2020	28 days	4 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW12-06-01	E298	19-Oct-2020	----	----	----		23-Oct-2020	28 days	4 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW12-06-02	E298	19-Oct-2020	----	----	----		23-Oct-2020	28 days	4 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW12-06-03	E298	19-Oct-2020	----	----	----		23-Oct-2020	28 days	4 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW12-06-04	E298	19-Oct-2020	----	----	----		23-Oct-2020	28 days	4 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW12-06-05	E298	19-Oct-2020	----	----	----		23-Oct-2020	28 days	4 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW12-06-06	E298	19-Oct-2020	----	----	----		23-Oct-2020	28 days	4 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW09-03-01	E298	16-Oct-2020	----	----	----		23-Oct-2020	28 days	7 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW09-03-02	E298	16-Oct-2020	----	----	----		23-Oct-2020	28 days	7 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
DUP	E235.Cl-L	19-Oct-2020	----	----	----		22-Oct-2020	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
MW12-06-01	E235.Cl-L	19-Oct-2020	----	----	----		22-Oct-2020	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
MW12-06-02	E235.Cl-L	19-Oct-2020	----	----	----		22-Oct-2020	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
MW12-06-03	E235.Cl-L	19-Oct-2020	----	----	----		22-Oct-2020	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
MW12-06-04	E235.Cl-L	19-Oct-2020	----	----	----		22-Oct-2020	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
MW12-06-05	E235.Cl-L	19-Oct-2020	----	----	----		22-Oct-2020	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
MW12-06-06	E235.Cl-L	19-Oct-2020	----	----	----		22-Oct-2020	28 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW09-03-01	E235.Cl-L	16-Oct-2020	----	----	----		22-Oct-2020	28 days	6 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW09-03-02	E235.Cl-L	16-Oct-2020	----	----	----		22-Oct-2020	28 days	6 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE DUP	E235.NO3-L	19-Oct-2020	----	----	----		22-Oct-2020	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW12-06-01	E235.NO3-L	19-Oct-2020	----	----	----		22-Oct-2020	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW12-06-02	E235.NO3-L	19-Oct-2020	----	----	----		22-Oct-2020	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW12-06-03	E235.NO3-L	19-Oct-2020	----	----	----		22-Oct-2020	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW12-06-04	E235.NO3-L	19-Oct-2020	----	----	----		22-Oct-2020	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW12-06-05	E235.NO3-L	19-Oct-2020	----	----	----		22-Oct-2020	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW12-06-06	E235.NO3-L	19-Oct-2020	----	----	----		22-Oct-2020	3 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE										
MW09-03-01	E235.NO3-L	16-Oct-2020	----	----	----		22-Oct-2020	3 days	6 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE										
MW09-03-02	E235.NO3-L	16-Oct-2020	----	----	----		22-Oct-2020	3 days	6 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
DUP	E235.NO2-L	19-Oct-2020	----	----	----		22-Oct-2020	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
MW12-06-01	E235.NO2-L	19-Oct-2020	----	----	----		22-Oct-2020	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
MW12-06-02	E235.NO2-L	19-Oct-2020	----	----	----		22-Oct-2020	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
MW12-06-03	E235.NO2-L	19-Oct-2020	----	----	----		22-Oct-2020	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
MW12-06-04	E235.NO2-L	19-Oct-2020	----	----	----		22-Oct-2020	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
MW12-06-05	E235.NO2-L	19-Oct-2020	----	----	----		22-Oct-2020	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
MW12-06-06	E235.NO2-L	19-Oct-2020	----	----	----		22-Oct-2020	3 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
MW09-03-01	E235.NO2-L	16-Oct-2020	----	----	----		22-Oct-2020	3 days	6 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
MW09-03-02	E235.NO2-L	16-Oct-2020	----	----	----		22-Oct-2020	3 days	6 days	× EHTR
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
DUP	E235.SO4	19-Oct-2020	----	----	----		22-Oct-2020	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW12-06-01	E235.SO4	19-Oct-2020	----	----	----		22-Oct-2020	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW12-06-02	E235.SO4	19-Oct-2020	----	----	----		22-Oct-2020	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW12-06-03	E235.SO4	19-Oct-2020	----	----	----		22-Oct-2020	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW12-06-04	E235.SO4	19-Oct-2020	----	----	----		22-Oct-2020	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW12-06-05	E235.SO4	19-Oct-2020	----	----	----		22-Oct-2020	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW12-06-06	E235.SO4	19-Oct-2020	----	----	----		22-Oct-2020	28 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW09-03-01	E235.SO4	16-Oct-2020	----	----	----		22-Oct-2020	28 days	6 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW09-03-02	E235.SO4	16-Oct-2020	----	----	----		22-Oct-2020	28 days	6 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
DUP	E421.Cr-L	19-Oct-2020	23-Oct-2020	180 days	3 days	✓	28-Oct-2020	176 days	4 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW12-06-01	E421.Cr-L	19-Oct-2020	23-Oct-2020	180 days	4 days	✓	28-Oct-2020	175 days	4 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW12-06-02	E421.Cr-L	19-Oct-2020	23-Oct-2020	180 days	4 days	✓	28-Oct-2020	175 days	4 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW12-06-03	E421.Cr-L	19-Oct-2020	23-Oct-2020	180 days	4 days	✓	28-Oct-2020	175 days	4 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW12-06-04	E421.Cr-L	19-Oct-2020	23-Oct-2020	180 days	4 days	✓	28-Oct-2020	175 days	4 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW12-06-05	E421.Cr-L	19-Oct-2020	23-Oct-2020	180 days	4 days	✓	28-Oct-2020	175 days	4 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW12-06-06	E421.Cr-L	19-Oct-2020	23-Oct-2020	180 days	4 days	✓	28-Oct-2020	175 days	4 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MW09-03-01	E421.Cr-L	16-Oct-2020	23-Oct-2020	180 days	6 days	✓	28-Oct-2020	173 days	4 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MW09-03-02	E421.Cr-L	16-Oct-2020	23-Oct-2020	180 days	6 days	✓	28-Oct-2020	173 days	4 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW09-03-01	E509	16-Oct-2020	27-Oct-2020	28 days	11 days	✓	27-Oct-2020	16 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW09-03-02	E509	16-Oct-2020	27-Oct-2020	28 days	11 days	✓	27-Oct-2020	16 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) DUP	E509	19-Oct-2020	27-Oct-2020	28 days	8 days	✓	27-Oct-2020	19 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW12-06-01	E509	19-Oct-2020	27-Oct-2020	28 days	8 days	✓	27-Oct-2020	19 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW12-06-02	E509	19-Oct-2020	27-Oct-2020	28 days	8 days	✓	27-Oct-2020	19 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW12-06-03	E509	19-Oct-2020	27-Oct-2020	28 days	8 days	✓	27-Oct-2020	19 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW12-06-04	E509	19-Oct-2020	27-Oct-2020	28 days	8 days	✓	27-Oct-2020	19 days	0 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW12-06-05	E509	19-Oct-2020	27-Oct-2020	28 days	8 days	✓	27-Oct-2020	19 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW12-06-06	E509	19-Oct-2020	27-Oct-2020	28 days	8 days	✓	27-Oct-2020	19 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) DUP	E421	19-Oct-2020	23-Oct-2020	180 days	3 days	✓	28-Oct-2020	176 days	4 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW12-06-01	E421	19-Oct-2020	23-Oct-2020	180 days	4 days	✓	28-Oct-2020	175 days	4 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW12-06-02	E421	19-Oct-2020	23-Oct-2020	180 days	4 days	✓	28-Oct-2020	175 days	4 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW12-06-03	E421	19-Oct-2020	23-Oct-2020	180 days	4 days	✓	28-Oct-2020	175 days	4 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW12-06-04	E421	19-Oct-2020	23-Oct-2020	180 days	4 days	✓	28-Oct-2020	175 days	4 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW12-06-05	E421	19-Oct-2020	23-Oct-2020	180 days	4 days	✓	28-Oct-2020	175 days	4 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW12-06-06	E421	19-Oct-2020	23-Oct-2020	180 days	4 days	✓	28-Oct-2020	175 days	4 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
MW09-03-01	E421	16-Oct-2020	23-Oct-2020	180 days	6 days	✓	28-Oct-2020	173 days	4 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
MW09-03-02	E421	16-Oct-2020	23-Oct-2020	180 days	6 days	✓	28-Oct-2020	173 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
DUP	E290	19-Oct-2020	----	----	----		22-Oct-2020	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
MW12-06-01	E290	19-Oct-2020	----	----	----		22-Oct-2020	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
MW12-06-02	E290	19-Oct-2020	----	----	----		22-Oct-2020	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
MW12-06-03	E290	19-Oct-2020	----	----	----		22-Oct-2020	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
MW12-06-04	E290	19-Oct-2020	----	----	----		22-Oct-2020	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
MW12-06-05	E290	19-Oct-2020	----	----	----		22-Oct-2020	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
MW12-06-06	E290	19-Oct-2020	----	----	----		22-Oct-2020	14 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE										
MW09-03-01	E290	16-Oct-2020	----	----	----		22-Oct-2020	14 days	6 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
MW09-03-02	E290	16-Oct-2020	----	----	----		22-Oct-2020	14 days	6 days	✓
Physical Tests : Conductivity in Water										
HDPE										
DUP	E100	19-Oct-2020	----	----	----		22-Oct-2020	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE										
MW12-06-01	E100	19-Oct-2020	----	----	----		22-Oct-2020	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE										
MW12-06-02	E100	19-Oct-2020	----	----	----		22-Oct-2020	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE										
MW12-06-03	E100	19-Oct-2020	----	----	----		22-Oct-2020	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE										
MW12-06-04	E100	19-Oct-2020	----	----	----		22-Oct-2020	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE										
MW12-06-05	E100	19-Oct-2020	----	----	----		22-Oct-2020	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE										
MW12-06-06	E100	19-Oct-2020	----	----	----		22-Oct-2020	28 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Conductivity in Water										
HDPE MW09-03-01	E100	16-Oct-2020	----	----	----		22-Oct-2020	28 days	6 days	✓
Physical Tests : Conductivity in Water										
HDPE MW09-03-02	E100	16-Oct-2020	----	----	----		22-Oct-2020	28 days	6 days	✓
Physical Tests : pH by Meter										
HDPE MW09-03-02	E108	16-Oct-2020	----	----	----		22-Oct-2020	0.25 hrs	148 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW09-03-01	E108	16-Oct-2020	----	----	----		22-Oct-2020	0.25 hrs	149 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE DUP	E108	19-Oct-2020	----	----	----		22-Oct-2020	0.25 hrs	77 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW12-06-04	E108	19-Oct-2020	----	----	----		22-Oct-2020	0.25 hrs	80 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW12-06-05	E108	19-Oct-2020	----	----	----		22-Oct-2020	0.25 hrs	80 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW12-06-06	E108	19-Oct-2020	----	----	----		22-Oct-2020	0.25 hrs	80 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW12-06-02	E108	19-Oct-2020	----	----	----		22-Oct-2020	0.25 hrs	81 hrs	× EHTR-FM

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : pH by Meter										
HDPE MW12-06-03	E108	19-Oct-2020	----	----	----		22-Oct-2020	0.25 hrs	81 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW12-06-01	E108	19-Oct-2020	----	----	----		22-Oct-2020	0.25 hrs	82 hrs	× EHTR-FM
Physical Tests : TSS by Gravimetry										
HDPE DUP	E160-H	19-Oct-2020	----	----	----		23-Oct-2020	7 days	3 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW12-06-01	E160-H	19-Oct-2020	----	----	----		23-Oct-2020	7 days	3 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW12-06-02	E160-H	19-Oct-2020	----	----	----		23-Oct-2020	7 days	3 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW12-06-03	E160-H	19-Oct-2020	----	----	----		23-Oct-2020	7 days	3 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW12-06-04	E160-H	19-Oct-2020	----	----	----		23-Oct-2020	7 days	3 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW12-06-05	E160-H	19-Oct-2020	----	----	----		23-Oct-2020	7 days	3 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW12-06-06	E160-H	19-Oct-2020	----	----	----		23-Oct-2020	7 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TSS by Gravimetry										
HDPE										
MW09-03-01	E160-H	16-Oct-2020	----	----	----		22-Oct-2020	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE										
MW09-03-02	E160-H	16-Oct-2020	----	----	----		22-Oct-2020	7 days	6 days	✓

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	106817	1	14	7.1	5.0	✓
Ammonia by Fluorescence	E298	107202	1	18	5.5	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	106813	0	9	0.0	5.0	×
Conductivity in Water	E100	106815	1	14	7.1	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	107287	1	15	6.6	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	109007	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	107288	1	17	5.8	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	106810	1	18	5.5	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	106811	1	18	5.5	5.0	✓
pH by Meter	E108	106816	1	16	6.2	5.0	✓
Sulfate in Water by IC	E235.SO4	106812	1	10	10.0	5.0	✓
TSS by Gravimetry	E160-H	106980	3	37	8.1	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	106817	1	14	7.1	5.0	✓
Ammonia by Fluorescence	E298	107202	1	18	5.5	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	106813	1	9	11.1	5.0	✓
Conductivity in Water	E100	106815	1	14	7.1	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	107287	1	15	6.6	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	109007	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	107288	1	17	5.8	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	106810	1	18	5.5	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	106811	1	18	5.5	5.0	✓
pH by Meter	E108	106816	1	16	6.2	5.0	✓
Sulfate in Water by IC	E235.SO4	106812	1	10	10.0	5.0	✓
TSS by Gravimetry	E160-H	106980	3	37	8.1	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	106817	1	14	7.1	5.0	✓
Ammonia by Fluorescence	E298	107202	1	18	5.5	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	106813	1	9	11.1	5.0	✓
Conductivity in Water	E100	106815	1	14	7.1	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	107287	1	15	6.6	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	109007	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	107288	1	17	5.8	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	106810	1	18	5.5	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	106811	1	18	5.5	5.0	✓
Sulfate in Water by IC	E235.SO4	106812	1	10	10.0	5.0	✓
TSS by Gravimetry	E160-H	106980	3	37	8.1	5.0	✓

Matrix: **Water**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	107202	1	18	5.5	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	106813	0	9	0.0	5.0	×
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	107287	1	15	6.6	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	109007	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	107288	1	17	5.8	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	106810	1	18	5.5	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	106811	1	18	5.5	5.0	✓
Sulfate in Water by IC	E235.SO4	106812	0	10	0.0	5.0	×

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
TSS by Gravimetry	E160-H Vancouver - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
Chloride in Water by IC (Low Level)	E235.Cl-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Vancouver - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Ion Balance using Dissolved Metals	EC101 Vancouver - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
TDS in Water (Calculation)	EC103 Vancouver - Environmental	Water	APHA 1030E (mod)	Total Dissolved Solids is calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present.
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N Vancouver - Environmental	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

QUALITY CONTROL REPORT

Work Order	: **WR2001100**	Page	: 1 of 10
Client	: Minto Explorations Ltd.	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 20-Oct-2020 13:55
PO	: 232818 (GW)	Date Analysis Commenced	: 22-Oct-2020
C-O-C number	: 2020-10-20 B	Issue Date	: 30-Oct-2020 14:45
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 9		
No. of samples analysed	: 9		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Aaron Yu	Laboratory Analyst	Metals, Burnaby, British Columbia
Bruna Botti	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Clarie Tejano		Metals, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 106815)											
KS2002233-001	Anonymous	conductivity	----	E100	2.0	µS/cm	1320	1300	1.07%	10%	----
Physical Tests (QC Lot: 106816)											
KS2002233-001	Anonymous	pH	----	E108	0.10	pH units	8.00	8.07	0.871%	4%	----
Physical Tests (QC Lot: 106817)											
KS2002233-001	Anonymous	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	493	497	0.828%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	493	497	0.828%	20%	----
Physical Tests (QC Lot: 106980)											
VA20B8830-001	Anonymous	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	21.6	21.2	0.4	Diff <2x LOR	----
Physical Tests (QC Lot: 106984)											
VA20B8759-002	Anonymous	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	7.9	6.7	1.2	Diff <2x LOR	----
Physical Tests (QC Lot: 106985)											
WR2001100-005	MW12-06-03	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	<3.0	<3.0	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 106810)											
KS2002233-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0250	mg/L	0.0346	0.0349	0.0003	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 106811)											
KS2002233-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 106812)											
KS2002233-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	1.50	mg/L	107	107	0.241%	20%	----
Anions and Nutrients (QC Lot: 107202)											
VA20B8538-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0065	0.0062	0.0003	Diff <2x LOR	----
Dissolved Metals (QC Lot: 107287)											
VA20B8641-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00020	mg/L	0.0119	0.0123	3.06%	20%	----
Dissolved Metals (QC Lot: 107288)											
VA20B8641-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0020	mg/L	0.0321	0.0321	0.135%	20%	----
		antimony, dissolved	7440-36-0	E421	0.00020	mg/L	0.00095	0.00094	0.000006	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00020	mg/L	0.00349	0.00352	0.906%	20%	----
		barium, dissolved	7440-39-3	E421	0.00020	mg/L	0.0992	0.102	3.26%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000200	mg/L	<0.000200	<0.000200	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 107288) - continued											
VA20B8641-001	Anonymous	bismuth, dissolved	7440-69-9	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.020	mg/L	1.66	1.67	0.513%	20%	----
		cadmium, dissolved	7440-43-9	E421	0.0000100	mg/L	0.0000157	<0.0000100	0.0000057	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.100	mg/L	86.8	88.5	1.96%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.00020	mg/L	0.00723	0.00724	0.175%	20%	----
		copper, dissolved	7440-50-8	E421	0.00040	mg/L	0.00354	0.00352	0.00003	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.020	mg/L	0.850	0.860	1.18%	20%	----
		lead, dissolved	7439-92-1	E421	0.000100	mg/L	0.000133	0.000136	0.000002	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0020	mg/L	0.0086	0.0085	0.00009	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.0100	mg/L	25.7	25.4	1.18%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00020	mg/L	1.05	1.08	2.86%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000100	mg/L	0.000895	0.000934	0.000039	Diff <2x LOR	----
		nickel, dissolved	7440-02-0	E421	0.00100	mg/L	0.0233	0.0236	1.29%	20%	----
		phosphorus, dissolved	7723-14-0	E421	0.100	mg/L	1.10	1.18	7.62%	20%	----
		potassium, dissolved	7440-09-7	E421	0.100	mg/L	82.2	81.0	1.51%	20%	----
		selenium, dissolved	7782-49-2	E421	0.000100	mg/L	0.000329	0.000298	0.000031	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.100	mg/L	10.7	10.7	0.418%	20%	----
		silver, dissolved	7440-22-4	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E421	0.100	mg/L	264	261	1.00%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00040	mg/L	0.622	0.629	1.10%	20%	----
		sulfur, dissolved	7704-34-9	E421	1.00	mg/L	20.5	20.4	0.615%	20%	----
		thallium, dissolved	7440-28-0	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00020	mg/L	0.00193	0.00197	0.00004	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00060	mg/L	0.0128	0.0126	1.92%	20%	----
		uranium, dissolved	7440-61-1	E421	0.000020	mg/L	0.000232	0.000233	0.619%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00100	mg/L	0.00489	0.00488	0.00001	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0020	mg/L	0.0190	0.0188	0.00010	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00040	mg/L	0.00272	0.00276	0.00005	Diff <2x LOR	----
Dissolved Metals (QC Lot: 109007)											
VA20B8783-004	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 106815)						
conductivity	----	E100	1	µS/cm	1.0	----
Physical Tests (QCLot: 106817)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	1.1	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	1.1	----
Physical Tests (QCLot: 106980)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Physical Tests (QCLot: 106984)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Physical Tests (QCLot: 106985)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Anions and Nutrients (QCLot: 106810)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 106811)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 106812)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 106813)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 107202)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Dissolved Metals (QCLot: 107287)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 107288)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 107288) - continued						
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----
Dissolved Metals (QCLot: 109007)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 106815)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	103	90.0	110	----
Physical Tests (QCLot: 106816)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 106817)									
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	229 mg/L	86.4	75.0	125	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	99.3	85.0	115	----
Physical Tests (QCLot: 106980)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	89.3	85.0	115	----
Physical Tests (QCLot: 106984)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	92.1	85.0	115	----
Physical Tests (QCLot: 106985)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	90.8	85.0	115	----
Anions and Nutrients (QCLot: 106810)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 106811)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	99.9	90.0	110	----
Anions and Nutrients (QCLot: 106812)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 106813)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	103	90.0	110	----
Anions and Nutrients (QCLot: 107202)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.12 mg/L	101	85.0	115	----
Dissolved Metals (QCLot: 107287)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	99.7	80.0	120	----
Dissolved Metals (QCLot: 107288)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	101	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	98.9	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	100	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	98.5	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	101	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	99.7	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 107288) - continued									
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	102	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	102	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	100	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	102	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	97.0	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	96.4	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	99.7	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	98.2	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	101	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	105	70.0	130	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	101	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	101	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	112	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	96.6	80.0	120	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	104	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	103	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	99.0	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	97.9	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	101	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	93.6	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	104	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	102	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	100	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	98.6	80.0	120	----
Dissolved Metals (QCLot: 109007)									
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	104	80.0	120	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 106810)										
VA20B7539-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	122 mg/L	125 mg/L	97.9	75.0	125	----
Anions and Nutrients (QCLot: 106811)										
VA20B7539-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	25.4 mg/L	25 mg/L	102	75.0	125	----
Anions and Nutrients (QCLot: 107202)										
VA20B8538-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.206 mg/L	0.2 mg/L	103	75.0	125	----
Dissolved Metals (QCLot: 107287)										
VA20B8783-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.0389 mg/L	0.04 mg/L	97.2	70.0	130	----
Dissolved Metals (QCLot: 107288)										
VA20B8783-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.198 mg/L	0.2 mg/L	99.2	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0206 mg/L	0.02 mg/L	103	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0201 mg/L	0.02 mg/L	101	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0405 mg/L	0.04 mg/L	101	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00958 mg/L	0.01 mg/L	95.8	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.091 mg/L	0.1 mg/L	90.8	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00405 mg/L	0.004 mg/L	101	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0195 mg/L	0.02 mg/L	97.5	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0192 mg/L	0.02 mg/L	96.1	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.94 mg/L	2 mg/L	97.1	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0188 mg/L	0.02 mg/L	93.9	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0952 mg/L	0.1 mg/L	95.2	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0200 mg/L	0.02 mg/L	100	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0383 mg/L	0.04 mg/L	95.8	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	10.0 mg/L	10 mg/L	100	70.0	130	----
		potassium, dissolved	7440-09-7	E421	3.86 mg/L	4 mg/L	96.5	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0423 mg/L	0.04 mg/L	106	70.0	130	----
		silicon, dissolved	7440-21-3	E421	ND mg/L	10 mg/L	ND	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 107288) - continued										
VA20B8783-001	Anonymous	silver, dissolved	7440-22-4	E421	0.00335 mg/L	0.004 mg/L	83.7	70.0	130	----
		sodium, dissolved	17341-25-2	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	21.8 mg/L	20 mg/L	109	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00372 mg/L	0.004 mg/L	93.1	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0204 mg/L	0.02 mg/L	102	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0389 mg/L	0.04 mg/L	97.2	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00408 mg/L	0.004 mg/L	102	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.102 mg/L	0.1 mg/L	102	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.393 mg/L	0.4 mg/L	98.4	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0407 mg/L	0.04 mg/L	102	70.0	130	----
Dissolved Metals (QCLot: 109007)										
VA20B8783-005	Anonymous	mercury, dissolved	7439-97-6	E509	0.000102 mg/L	0.0001 mg/L	102	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 2020-10-20 B

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Ruth Cayetano

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ YES ☐ NO

☑ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: mintoenvironment@mintomine.com

Email 2:

Email 3:

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: ap@mintomine.com

Email 2:

Project Information

ALS Account # / Quote #:

Job #:

PO / AFE: 232818 (GW)

LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#:

Major/Minor Code: Routing Code:

Requisitioner:

Location:

ALS Lab Work Order # (lab use only):

ALS Contact: Sampler:

Select Service Level Below - Please confirm all F

Regular [R] ☑ Standard T

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐

Date and Time Required for all E&P

For tests that can not be performed according to

Indicate Filtered (F), Preserved (P)

Environmental Division Whitehorse

Work Order Reference WR2001100

Telephone : +1 867 668 6689

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals(TM)	Dissolved Metals (DM)	Total Mercury, Hardness	Dissolved Mercury	Ammonia (Total Nutrients)	Dissolved Organic Carbon (DOC)	pH, Cond., TSS, TDS, Alkalinity, An	Dissolved Bromide (Br-D)	Number of Containers
					P	F/P	P	F/P	P	F/P			
	MW09-03-01	16-Oct-20	15:00	Water		R		R	R		R		4
	MW09-03-02	16-Oct-20	15:45	Water		R		R	R		R		4
	MW12-06-01	19-Oct-20	10:00	Water		R		R	R		R		4
	MW12-06-02	19-Oct-20	11:00	Water		R		R	R		R		4
	MW12-06-03	19-Oct-20	11:30	Water		R		R	R		R		4
	MW12-06-04	19-Oct-20	12:00	Water		R		R	R		R		4
	MW12-06-05	19-Oct-20	12:15	Water		R		R	R		R		4
	MW12-06-06	19-Oct-20	12:35	Water		R		R	R		R		4
	DUP	19-Oct-20		Water		R		R	R		R		4

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO

Are samples for human drinking water use? ☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☑ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
1°			7		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Chris W	Date: 2020-10-20	Time:	Received by:	Date: OCT 20/20	Time: 13:55	Received by:	Date: Oct 21	Time: 8:40

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2001167**	Page	: 1 of 6
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: 232818 (GW)	Date Samples Received	: 30-Oct-2020 14:30
PO	: ----	Date Analysis Commenced	: 01-Nov-2020
C-O-C number	: 2020-10-29-B	Issue Date	: 10-Nov-2020 18:04
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 7		
No. of samples analysed	: 7		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Bruna Botti	Team Leader - Inorganics	Inorganics, Burnaby, British Columbia
Clarie Tejano		Metals, Burnaby, British Columbia
Cristina Alexandre	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-10-01	MW17-10-02	MW17-10-03	MW17-08-01	MW17-08-02
					Client sampling date / time	27-Oct-2020 14:15	27-Oct-2020 14:35	27-Oct-2020 15:10	28-Oct-2020 10:15	28-Oct-2020 11:15
						WR2001167-001	WR2001167-002	WR2001167-003	WR2001167-004	WR2001167-005
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		119	112	114	237	154
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		119	112	114	237	154
conductivity	----	E100	2.0	µS/cm		466	552	571	457	303
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		226	269	274	263	172
pH	----	E108	0.10	pH units		7.98	7.98	7.95	8.08	8.09
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		302	386	398	285	183
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	<3.0	<3.0	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0135	0.0074	0.0107	0.0059	<0.0050
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.91	1.27	1.30	0.43	0.45
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		17.2	37.7	39.8	0.471	0.696
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0028	<0.0010	<0.0010	0.0018	<0.0010
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		50.0	31.2	31.7	31.4	10.0
Ion Balance										
anion sum	----	EC101	0.10	meq/L		4.66	5.62	5.82	5.44	3.35
cation sum	----	EC101	0.10	meq/L		5.00	5.78	5.87	5.64	3.70
ion balance (cation-anion difference)	----	EC101	0.010	%		3.52	1.40	0.428	1.80	4.96
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0046	0.0017	0.0020	0.0016	0.0018
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00020	<0.00010	<0.00010	<0.00010	0.00021
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0268	0.0398	0.0423	0.00780	0.0909
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.018	<0.010	<0.010	0.023	0.012
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000633	0.0000325	0.0000350	0.0000426	0.0000221
calcium, dissolved	7440-70-2	E421	0.050	mg/L		56.7	71.8	74.8	53.2	39.8

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-10-01	MW17-10-02	MW17-10-03	MW17-08-01	MW17-08-02
					Client sampling date / time	27-Oct-2020 14:15	27-Oct-2020 14:35	27-Oct-2020 15:10	28-Oct-2020 10:15	28-Oct-2020 11:15
						WR2001167-001	WR2001167-002	WR2001167-003	WR2001167-004	WR2001167-005
						Result	Result	Result	Result	Result
Dissolved Metals										
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00062	0.00048	0.00030	<0.00010	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00420	0.00082	0.00078	0.00031	0.00309
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0014	0.0012	0.0012	0.0021	<0.0010
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		20.4	21.7	21.2	31.6	17.7
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0233	0.00161	0.00085	0.00099	0.00043
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.0142	0.00734	0.00632	0.00926	0.00287
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.0138	0.00104	0.00136	<0.00050	<0.00050
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		1.56	1.90	1.90	1.70	0.996
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.00187	0.00462	0.00559	0.000536	0.000578
silicon, dissolved	7440-21-3	E421	0.050	mg/L		5.63	5.62	5.46	5.27	4.81
silver, dissolved	7440-22-4	E421	0.000010	mg/L		0.000015	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	17341-25-2	E421	0.050	mg/L		10.3	8.23	7.91	7.86	5.31
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		1.40	1.24	1.11	6.84	1.12
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		17.6	11.4	11.3	10.8	3.68
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00257	0.00155	0.00156	0.000224	0.000145
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00115	0.00059	0.00060	<0.00050	0.00080
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0367	0.0262	0.0284	0.0276	0.0112
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-08-03	DUP	----	----	----
					Client sampling date / time	28-Oct-2020 11:30	28-Oct-2020	----	----	----
						WR2001167-006	WR2001167-007	--------	--------	--------
						Result	Result	----	----	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		87.0	222	----	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		87.0	222	----	----	----
conductivity	----	E100	2.0	µS/cm		183	460	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		96.6	259	----	----	----
pH	----	E108	0.10	pH units		8.05	8.06	----	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		107	275	----	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	----	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		<0.0050	0.0070	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.43	0.98	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.626	0.498	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	0.0050	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		2.95	31.7	----	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		1.86	5.16	----	----	----
cation sum	----	EC101	0.10	meq/L		2.07	5.54	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		5.34	3.55	----	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0039	<0.0010	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00012	0.00011	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0395	0.00792	----	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		<0.010	0.023	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000179	0.0000420	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		27.7	52.7	----	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00017	<0.00010	----	----	----

Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	MW17-08-03	DUP	----	----	----
					Client sampling date / time	28-Oct-2020 11:30	28-Oct-2020	----	----	----
Analyte	CAS Number	Method	LOR	Unit		WR2001167-006	WR2001167-007	--------	--------	--------
						Result	Result	----	----	----
Dissolved Metals										
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00033	0.00032	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	<0.010	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		<0.0010	0.0021	----	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		6.66	31.0	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.00024	0.00092	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.000738	0.00928	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	<0.00050	----	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	----	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		0.723	1.64	----	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000288	0.000566	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		3.82	5.20	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	----	----	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L		2.85	7.49	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.262	6.48	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		0.91	11.0	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000088	0.000221	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00108	<0.00050	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0091	0.0280	----	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	----	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	----	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WR2001167**	Page	: 1 of 16
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: 232818 (GW)	Date Samples Received	: 30-Oct-2020 14:30
PO	: ----	Issue Date	: 10-Nov-2020 18:04
C-O-C number	: 2020-10-29-B		
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 7		
No. of samples analysed	: 7		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW17-08-01	E298	28-Oct-2020	----	----	----		05-Nov-2020	28 days	7 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW17-08-02	E298	28-Oct-2020	----	----	----		05-Nov-2020	28 days	7 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW17-08-03	E298	28-Oct-2020	----	----	----		05-Nov-2020	28 days	7 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
DUP	E298	28-Oct-2020	----	----	----		05-Nov-2020	28 days	8 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW17-10-01	E298	27-Oct-2020	----	----	----		05-Nov-2020	28 days	8 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW17-10-02	E298	27-Oct-2020	----	----	----		05-Nov-2020	28 days	8 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW17-10-03	E298	27-Oct-2020	----	----	----		05-Nov-2020	28 days	8 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW17-08-02	E235.Cl-L	28-Oct-2020	----	----	----		02-Nov-2020	28 days	4 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW17-08-03	E235.Cl-L	28-Oct-2020	----	----	----		02-Nov-2020	28 days	4 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE DUP	E235.Cl-L	28-Oct-2020	----	----	----		02-Nov-2020	28 days	5 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW17-08-01	E235.Cl-L	28-Oct-2020	----	----	----		02-Nov-2020	28 days	5 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW17-10-01	E235.Cl-L	27-Oct-2020	----	----	----		02-Nov-2020	28 days	5 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW17-10-02	E235.Cl-L	27-Oct-2020	----	----	----		02-Nov-2020	28 days	5 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW17-10-03	E235.Cl-L	27-Oct-2020	----	----	----		02-Nov-2020	28 days	5 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-08-02	E235.NO3-L	28-Oct-2020	----	----	----		02-Nov-2020	3 days	4 days	× EHTL
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-08-03	E235.NO3-L	28-Oct-2020	----	----	----		02-Nov-2020	3 days	4 days	× EHTL

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE DUP	E235.NO3-L	28-Oct-2020	----	----	----		02-Nov-2020	3 days	5 days	× EHTL
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-08-01	E235.NO3-L	28-Oct-2020	----	----	----		02-Nov-2020	3 days	5 days	× EHTL
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-10-02	E235.NO3-L	27-Oct-2020	----	----	----		02-Nov-2020	3 days	5 days	× EHTL
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-10-03	E235.NO3-L	27-Oct-2020	----	----	----		02-Nov-2020	3 days	5 days	× EHTL
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-10-01	E235.NO3-L	27-Oct-2020	----	----	----		02-Nov-2020	3 days	5 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW17-08-02	E235.NO2-L	28-Oct-2020	----	----	----		02-Nov-2020	3 days	4 days	× EHTL
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW17-08-03	E235.NO2-L	28-Oct-2020	----	----	----		02-Nov-2020	3 days	4 days	× EHTL
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE DUP	E235.NO2-L	28-Oct-2020	----	----	----		02-Nov-2020	3 days	5 days	× EHTL
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW17-08-01	E235.NO2-L	28-Oct-2020	----	----	----		02-Nov-2020	3 days	5 days	× EHTL

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW17-10-02	E235.NO2-L	27-Oct-2020	----	----	----		02-Nov-2020	3 days	5 days	× EHTL
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW17-10-03	E235.NO2-L	27-Oct-2020	----	----	----		02-Nov-2020	3 days	5 days	× EHTL
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW17-10-01	E235.NO2-L	27-Oct-2020	----	----	----		02-Nov-2020	3 days	5 days	× EHTR
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW17-08-02	E235.SO4	28-Oct-2020	----	----	----		02-Nov-2020	28 days	4 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW17-08-03	E235.SO4	28-Oct-2020	----	----	----		02-Nov-2020	28 days	4 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE DUP	E235.SO4	28-Oct-2020	----	----	----		02-Nov-2020	28 days	5 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW17-08-01	E235.SO4	28-Oct-2020	----	----	----		02-Nov-2020	28 days	5 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW17-10-01	E235.SO4	27-Oct-2020	----	----	----		02-Nov-2020	28 days	5 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW17-10-02	E235.SO4	27-Oct-2020	----	----	----		02-Nov-2020	28 days	5 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW17-10-03	E235.SO4	27-Oct-2020	----	----	----		02-Nov-2020	28 days	5 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
DUP	E421.Cr-L	28-Oct-2020	02-Nov-2020	180 days	5 days	✓	04-Nov-2020	174 days	2 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW17-08-01	E421.Cr-L	28-Oct-2020	02-Nov-2020	180 days	5 days	✓	04-Nov-2020	174 days	2 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW17-08-02	E421.Cr-L	28-Oct-2020	02-Nov-2020	180 days	5 days	✓	04-Nov-2020	174 days	2 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW17-08-03	E421.Cr-L	28-Oct-2020	02-Nov-2020	180 days	5 days	✓	04-Nov-2020	174 days	2 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW17-10-01	E421.Cr-L	27-Oct-2020	02-Nov-2020	180 days	5 days	✓	04-Nov-2020	174 days	2 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW17-10-02	E421.Cr-L	27-Oct-2020	02-Nov-2020	180 days	5 days	✓	04-Nov-2020	174 days	2 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW17-10-03	E421.Cr-L	27-Oct-2020	02-Nov-2020	180 days	5 days	✓	04-Nov-2020	174 days	2 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
MW17-08-01	E509	28-Oct-2020	06-Nov-2020	28 days	8 days	✓	06-Nov-2020	19 days	0 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW17-08-02	E509	28-Oct-2020	06-Nov-2020	28 days	8 days	✓	06-Nov-2020	19 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW17-08-03	E509	28-Oct-2020	06-Nov-2020	28 days	8 days	✓	06-Nov-2020	19 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) DUP	E509	28-Oct-2020	06-Nov-2020	28 days	9 days	✓	06-Nov-2020	18 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW17-10-01	E509	27-Oct-2020	06-Nov-2020	28 days	9 days	✓	06-Nov-2020	18 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW17-10-02	E509	27-Oct-2020	06-Nov-2020	28 days	9 days	✓	06-Nov-2020	18 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW17-10-03	E509	27-Oct-2020	06-Nov-2020	28 days	9 days	✓	06-Nov-2020	18 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) DUP	E421	28-Oct-2020	02-Nov-2020	180 days	5 days	✓	04-Nov-2020	174 days	2 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW17-08-01	E421	28-Oct-2020	02-Nov-2020	180 days	5 days	✓	04-Nov-2020	174 days	2 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW17-08-02	E421	28-Oct-2020	02-Nov-2020	180 days	5 days	✓	04-Nov-2020	174 days	2 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW17-08-03	E421	28-Oct-2020	02-Nov-2020	180 days	5 days	✓	04-Nov-2020	174 days	2 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW17-10-01	E421	27-Oct-2020	02-Nov-2020	180 days	5 days	✓	04-Nov-2020	174 days	2 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW17-10-02	E421	27-Oct-2020	02-Nov-2020	180 days	5 days	✓	04-Nov-2020	174 days	2 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW17-10-03	E421	27-Oct-2020	02-Nov-2020	180 days	5 days	✓	04-Nov-2020	174 days	2 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE DUP	E290	28-Oct-2020	----	----	----		02-Nov-2020	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW17-08-01	E290	28-Oct-2020	----	----	----		02-Nov-2020	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW17-08-02	E290	28-Oct-2020	----	----	----		02-Nov-2020	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW17-08-03	E290	28-Oct-2020	----	----	----		02-Nov-2020	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW17-10-01	E290	27-Oct-2020	----	----	----		02-Nov-2020	14 days	5 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE MW17-10-02	E290	27-Oct-2020	----	----	----		02-Nov-2020	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW17-10-03	E290	27-Oct-2020	----	----	----		02-Nov-2020	14 days	5 days	✓
Physical Tests : Conductivity in Water										
HDPE DUP	E100	28-Oct-2020	----	----	----		02-Nov-2020	28 days	5 days	✓
Physical Tests : Conductivity in Water										
HDPE MW17-08-01	E100	28-Oct-2020	----	----	----		02-Nov-2020	28 days	5 days	✓
Physical Tests : Conductivity in Water										
HDPE MW17-08-02	E100	28-Oct-2020	----	----	----		02-Nov-2020	28 days	5 days	✓
Physical Tests : Conductivity in Water										
HDPE MW17-08-03	E100	28-Oct-2020	----	----	----		02-Nov-2020	28 days	5 days	✓
Physical Tests : Conductivity in Water										
HDPE MW17-10-01	E100	27-Oct-2020	----	----	----		02-Nov-2020	28 days	5 days	✓
Physical Tests : Conductivity in Water										
HDPE MW17-10-02	E100	27-Oct-2020	----	----	----		02-Nov-2020	28 days	5 days	✓
Physical Tests : Conductivity in Water										
HDPE MW17-10-03	E100	27-Oct-2020	----	----	----		02-Nov-2020	28 days	5 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : pH by Meter										
HDPE MW17-08-02	E108	28-Oct-2020	----	----	----		02-Nov-2020	0.25 hrs	120 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW17-08-03	E108	28-Oct-2020	----	----	----		02-Nov-2020	0.25 hrs	120 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW17-08-01	E108	28-Oct-2020	----	----	----		02-Nov-2020	0.25 hrs	121 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE DUP	E108	28-Oct-2020	----	----	----		02-Nov-2020	0.25 hrs	131 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW17-10-03	E108	27-Oct-2020	----	----	----		02-Nov-2020	0.25 hrs	140 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW17-10-01	E108	27-Oct-2020	----	----	----		02-Nov-2020	0.25 hrs	141 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW17-10-02	E108	27-Oct-2020	----	----	----		02-Nov-2020	0.25 hrs	141 hrs	× EHTR-FM
Physical Tests : TSS by Gravimetry										
HDPE MW17-08-01	E160-H	28-Oct-2020	----	----	----		01-Nov-2020	7 days	3 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW17-08-02	E160-H	28-Oct-2020	----	----	----		01-Nov-2020	7 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TSS by Gravimetry										
HDPE MW17-08-03	E160-H	28-Oct-2020	----	----	----		01-Nov-2020	7 days	3 days	✓
Physical Tests : TSS by Gravimetry										
HDPE DUP	E160-H	28-Oct-2020	----	----	----		01-Nov-2020	7 days	4 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW17-10-01	E160-H	27-Oct-2020	----	----	----		01-Nov-2020	7 days	4 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW17-10-02	E160-H	27-Oct-2020	----	----	----		01-Nov-2020	7 days	4 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW17-10-03	E160-H	27-Oct-2020	----	----	----		01-Nov-2020	7 days	4 days	✓

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	111898	1	8	12.5	5.0	✓
Ammonia by Fluorescence	E298	113478	1	20	5.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	111908	1	7	14.2	5.0	✓
Conductivity in Water	E100	111897	1	19	5.2	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	111966	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	114009	1	8	12.5	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	111967	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	111903	1	19	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	111907	1	11	9.0	5.0	✓
pH by Meter	E108	111896	1	19	5.2	5.0	✓
Sulfate in Water by IC	E235.SO4	111904	1	19	5.2	5.0	✓
TSS by Gravimetry	E160-H	111704	1	14	7.1	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	111898	1	8	12.5	5.0	✓
Ammonia by Fluorescence	E298	113478	1	20	5.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	111908	1	7	14.2	5.0	✓
Conductivity in Water	E100	111897	1	19	5.2	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	111966	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	114009	1	8	12.5	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	111967	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	111903	1	19	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	111907	1	11	9.0	5.0	✓
pH by Meter	E108	111896	1	19	5.2	5.0	✓
Sulfate in Water by IC	E235.SO4	111904	1	19	5.2	5.0	✓
TSS by Gravimetry	E160-H	111704	1	14	7.1	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	111898	1	8	12.5	5.0	✓
Ammonia by Fluorescence	E298	113478	1	20	5.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	111908	1	7	14.2	5.0	✓
Conductivity in Water	E100	111897	1	19	5.2	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	111966	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	114009	1	8	12.5	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	111967	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	111903	1	19	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	111907	1	11	9.0	5.0	✓
Sulfate in Water by IC	E235.SO4	111904	1	19	5.2	5.0	✓
TSS by Gravimetry	E160-H	111704	1	14	7.1	5.0	✓

Matrix: **Water**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	113478	1	20	5.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	111908	1	7	14.2	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	111966	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	114009	1	8	12.5	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	111967	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	111903	1	19	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	111907	1	11	9.0	5.0	✓
Sulfate in Water by IC	E235.SO4	111904	1	19	5.2	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
TSS by Gravimetry	E160-H Vancouver - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
Chloride in Water by IC (Low Level)	E235.Cl-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Vancouver - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Ion Balance using Dissolved Metals	EC101 Vancouver - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
TDS in Water (Calculation)	EC103 Vancouver - Environmental	Water	APHA 1030E (mod)	Total Dissolved Solids is calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **WR2001167**	Page	: 1 of 10
Client	: Minto Explorations Ltd.	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: 232818 (GW)	Date Samples Received	: 30-Oct-2020 14:30
PO	: ----	Date Analysis Commenced	: 01-Nov-2020
C-O-C number	: 2020-10-29-B	Issue Date	: 10-Nov-2020 18:04
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 7		
No. of samples analysed	: 7		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Bruna Botti	Team Leader - Inorganics	Inorganics, Burnaby, British Columbia
Clarie Tejano		Metals, Burnaby, British Columbia
Cristina Alexandre	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 111704)											
WR2001162-004	Anonymous	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	<3.0	<3.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 111896)											
WR2001167-002	MW17-10-02	pH	----	E108	0.10	pH units	7.98	7.98	0.00%	4%	----
Physical Tests (QC Lot: 111897)											
WR2001167-002	MW17-10-02	conductivity	----	E100	2.0	µS/cm	552	550	0.363%	10%	----
Physical Tests (QC Lot: 111898)											
WR2001167-002	MW17-10-02	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	112	112	0.178%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	112	112	0.178%	20%	----
Anions and Nutrients (QC Lot: 111903)											
WR2001133-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 111904)											
WR2001133-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	6.48	6.42	1.01%	20%	----
Anions and Nutrients (QC Lot: 111907)											
WR2001133-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 111908)											
WR2001167-001	MW17-10-01	chloride	16887-00-6	E235.Cl-L	0.10	mg/L	0.91	0.91	0.0005	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 113478)											
VA20B9558-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0388	0.0385	0.0003	Diff <2x LOR	----
Dissolved Metals (QC Lot: 111966)											
VA20B9425-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.100	mg/L	0.13 µg/L	0.00011	0.00001	Diff <2x LOR	----
Dissolved Metals (QC Lot: 111967)											
VA20B9425-001	Anonymous	aluminum, dissolved	7429-90-5	E421	1.00	mg/L	2.0 µg/L	0.0012	0.0008	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.100	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.100	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.100	mg/L	5.96 µg/L	0.00599	0.537%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.100	mg/L	<0.100 µg/L	<0.000100	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.0500	mg/L	<0.050 µg/L	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	10.0	mg/L	<10 µg/L	<0.010	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 111967) - continued											
VA20B9425-001	Anonymous	cadmium, dissolved	7440-43-9	E421	0.00500	mg/L	0.0101 µg/L	0.0000121	0.0000021	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	50.0	mg/L	73600 µg/L	70.4	4.32%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.100	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.200	mg/L	0.69 µg/L	0.00063	0.00006	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	10.0	mg/L	<10 µg/L	<0.010	0	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.0500	mg/L	<0.050 µg/L	<0.000050	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	1.00	mg/L	5.0 µg/L	0.0048	0.0002	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	5.00	mg/L	8230 µg/L	7.76	5.89%	20%	----
		manganese, dissolved	7439-96-5	E421	0.100	mg/L	0.61 µg/L	0.00057	0.00004	Diff <2x LOR	----
		molybdenum, dissolved	7439-98-7	E421	0.0500	mg/L	9.28 µg/L	0.00925	0.278%	20%	----
		nickel, dissolved	7440-02-0	E421	0.500	mg/L	<0.50 µg/L	<0.00050	0	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	50.0	mg/L	<50 µg/L	<0.050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	50.0	mg/L	471 µg/L	0.436	0.034	Diff <2x LOR	----
		selenium, dissolved	7782-49-2	E421	0.0500	mg/L	<0.050 µg/L	<0.000050	0	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	50.0	mg/L	11100 µg/L	11.2	0.401%	20%	----
		silver, dissolved	7440-22-4	E421	0.0100	mg/L	<0.010 µg/L	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E421	50.0	mg/L	7150 µg/L	6.92	3.23%	20%	----
		strontium, dissolved	7440-24-6	E421	0.200	mg/L	735 µg/L	0.709	3.62%	20%	----
		sulfur, dissolved	7704-34-9	E421	500	mg/L	19500 µg/L	20.2	3.44%	20%	----
		thallium, dissolved	7440-28-0	E421	0.0100	mg/L	<0.010 µg/L	<0.000010	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.100	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.300	mg/L	<0.30 µg/L	<0.00030	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.0100	mg/L	4.21 µg/L	0.00412	1.99%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.500	mg/L	<0.50 µg/L	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	1.00	mg/L	5.9 µg/L	0.0061	0.0002	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.200	mg/L	<0.20 µg/L	<0.00020	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 114009)											
WR2001165-001	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 111704)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Physical Tests (QCLot: 111897)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 111898)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Anions and Nutrients (QCLot: 111903)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 111904)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 111907)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 111908)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 113478)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Dissolved Metals (QCLot: 111966)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 111967)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 111967) - continued						
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----
Dissolved Metals (QCLot: 114009)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 111704)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	94.0	85.0	115	----
Physical Tests (QCLot: 111896)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 111897)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	100	90.0	110	----
Physical Tests (QCLot: 111898)									
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	229 mg/L	100	75.0	125	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	97.9	85.0	115	----
Anions and Nutrients (QCLot: 111903)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 111904)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 111907)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	99.7	90.0	110	----
Anions and Nutrients (QCLot: 111908)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 113478)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.12 mg/L	96.6	85.0	115	----
Dissolved Metals (QCLot: 111966)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	106	80.0	120	----
Dissolved Metals (QCLot: 111967)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	103	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	105	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	102	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	109	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	111	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	103	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	107	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	113	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	106	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	104	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 111967) - continued									
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	102	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	110	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	105	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	112	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	105	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	108	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	108	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	113	70.0	130	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	106	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	107	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	111	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	110	80.0	120	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	114	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	102	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	98.7	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	111	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	108	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	103	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	107	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	110	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	101	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	104	80.0	120	----
Dissolved Metals (QCLot: 114009)									
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	95.7	80.0	120	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 111903)										
WR2001154-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.58 mg/L	2.5 mg/L	103	75.0	125	----
Anions and Nutrients (QCLot: 111904)										
WR2001154-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	99.5 mg/L	100 mg/L	99.5	75.0	125	----
Anions and Nutrients (QCLot: 111907)										
WR2001154-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.507 mg/L	0.5 mg/L	101	75.0	125	----
Anions and Nutrients (QCLot: 111908)										
WR2001167-002	MW17-10-02	chloride	16887-00-6	E235.Cl-L	103 mg/L	100 mg/L	103	75.0	125	----
Anions and Nutrients (QCLot: 113478)										
VA20B9558-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.210 mg/L	0.2 mg/L	105	75.0	125	----
Dissolved Metals (QCLot: 111966)										
VA20B9425-002	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.0401 mg/L	0.04 mg/L	100	70.0	130	----
Dissolved Metals (QCLot: 111967)										
VA20B9425-002	Anonymous	aluminum, dissolved	7429-90-5	E421	0.184 mg/L	0.2 mg/L	91.9	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0208 mg/L	0.02 mg/L	104	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0200 mg/L	0.02 mg/L	100	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0395 mg/L	0.04 mg/L	98.7	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00866 mg/L	0.01 mg/L	86.6	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.086 mg/L	0.1 mg/L	85.8	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00401 mg/L	0.004 mg/L	100	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0187 mg/L	0.02 mg/L	93.4	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0186 mg/L	0.02 mg/L	92.9	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.96 mg/L	2 mg/L	97.8	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0189 mg/L	0.02 mg/L	94.6	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0983 mg/L	0.1 mg/L	98.3	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	0.0190 mg/L	0.02 mg/L	95.0	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0199 mg/L	0.02 mg/L	99.6	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0389 mg/L	0.04 mg/L	97.3	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 111967) - continued										
VA20B9425-002	Anonymous	phosphorus, dissolved	7723-14-0	E421	10.2 mg/L	10 mg/L	102	70.0	130	----
		potassium, dissolved	7440-09-7	E421	3.73 mg/L	4 mg/L	93.2	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0426 mg/L	0.04 mg/L	106	70.0	130	----
		silicon, dissolved	7440-21-3	E421	8.47 mg/L	10 mg/L	84.7	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00403 mg/L	0.004 mg/L	101	70.0	130	----
		sodium, dissolved	17341-25-2	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	ND mg/L	20 mg/L	ND	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00369 mg/L	0.004 mg/L	92.3	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0204 mg/L	0.02 mg/L	102	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0388 mg/L	0.04 mg/L	97.1	70.0	130	----
		uranium, dissolved	7440-61-1	E421	ND mg/L	0.004 mg/L	ND	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.100 mg/L	0.1 mg/L	100	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.372 mg/L	0.4 mg/L	93.0	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0430 mg/L	0.04 mg/L	107	70.0	130	----
Dissolved Metals (QCLot: 114009)										
WR2001167-001	MW17-10-01	mercury, dissolved	7439-97-6	E509	0.0000951 mg/L	0.0001 mg/L	95.1	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

COC Number: 2020-10-29 B

Affix ALS barcode label here
(lab use only)

Environmental Division
Whitehorse
Work Order Reference
WR2001167

Telephone : +1 867 668 6689

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Ruth Cayetano

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: mintoenvironment@mintomine.com
Email 2:
Email 3:

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: ap@mintomine.com
Email 2:

Project Information

ALS Account # / Quote #:
Job #:
PO / AFE: 232818 (GW)
LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#:
Major/Minor Code: Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only)

ALS Contact: **Sampler:**

Select Service Level Below - Please confirm all E&P TATs with you

Regular [R] ☑ Standard TAT if received by

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐

EMERGENCY: 1 Bu | Sai | St

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level

Analysis Req

Indicate Filtered (F), Preserved (P) or Filtered and P

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals(TM) P	Dissolved Metals (DM) F/P	Total Mercury, Hardness P	Dissolved Mercury F/P	Ammonia (Total Nutrients) P	Dissolved Organic Carbon (DOC) F/P	pH, Cond., TSS, TDS, Alkalinity, Anions	Dissolved Bromide (Br-D)	Number of Containers
	MW17-10-01	27-Oct-20	14:15	Water		R		R	R		R		4
	MW17-10-02	27-Oct-20	14:35	Water		R		R	R		R		4
	MW17-10-03	27-Oct-20	15:10	Water		R		R	R		R		4
	MW17-08-01	28-Oct-20	10:15	Water		R		R	R		R		4
	MW17-08-02	28-Oct-20	11:15	Water		R		R	R		R		4
	MW17-08-03	28-Oct-20	11:30	Water		R		R	R		R		4
	DUP	28-Oct-20		Water		R		R	R		R		4

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?
☐ YES ☑ NO

Are samples for human drinking water use?
☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
2	2				

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Chris W	Date: 2020-10-29	Time:	Received by:	Date: OCT 30	Time: 230	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2001184**	Page	: 1 of 6
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 05-Nov-2020 16:20
PO	: 232818	Date Analysis Commenced	: 09-Nov-2020
C-O-C number	: 2020-11-05 B	Issue Date	: 24-Nov-2020 14:20
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 7		
No. of samples analysed	: 7		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Clarie Tejano		Metals, Burnaby, British Columbia
Gloria Chan	Lab Analyst	Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics, Burnaby, British Columbia
Kinny Wu	Lab Analyst	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Inorganics, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Qualifiers

Qualifier	*Description*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-11-01	MW17-11-02	MW17-11-03	MW12-07-01	MW12-07-02
					Client sampling date / time	31-Oct-2020 10:00	31-Oct-2020 10:35	31-Oct-2020 11:15	31-Oct-2020 13:35	31-Oct-2020 14:05
						WR2001184-001	WR2001184-002	WR2001184-003	WR2001184-004	WR2001184-005
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		137	139	150	122	195
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	10.4	11.4	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	5.2	5.7	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		137	139	161	134	195
conductivity	----	E100	2.0	µS/cm		350	356	319	1300	945
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		134	144	137	556	431
pH	----	E108	0.10	pH units		8.26	8.27	8.33	8.33	8.27
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		210	213	186	1040	648
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		3.1	<3.0	<3.0	5.1	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0100	<0.0050	<0.0050	0.105	0.0159
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.42	0.38	0.43	2.73	11.9
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		<0.0050	<0.0050	<0.0050	2.95	1.57
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		<0.0051	<0.0051	<0.0051	10.0	1.67
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	<0.0010	<0.0010	7.06	0.0992
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		42.0	44.5	17.3	586	305
Ion Balance										
anion sum	----	EC101	0.10	meq/L		3.62	3.71	3.58	15.7	10.7
cation sum	----	EC101	0.10	meq/L		3.70	3.72	3.19	15.7	10.1
ion balance (cation-anion difference)	----	EC101	0.010	%		1.09	0.134	5.76	<0.010	2.88
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0047	0.0020	0.0040	0.0023	0.0019
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00135	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00231	0.00217	0.00030	0.00824	0.00028
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0430	0.0409	0.0610	0.0211	0.0248
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.023	0.019	<0.010	3.79	0.116
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000150 DLM	<0.0000150 DLM	0.0000113	<0.0000250 DLM	0.000175

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW17-11-01	MW17-11-02	MW17-11-03	MW12-07-01	MW12-07-02
					Client sampling date / time	31-Oct-2020 10:00	31-Oct-2020 10:35	31-Oct-2020 11:15	31-Oct-2020 13:35	31-Oct-2020 14:05
						WR2001184-001	WR2001184-002	WR2001184-003	WR2001184-004	WR2001184-005
						Result	Result	Result	Result	Result
Dissolved Metals										
calcium, dissolved	7440-70-2	E421	0.050	mg/L		36.4	38.7	35.0	185	120
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00012	<0.00010
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	0.00039
copper, dissolved	7440-50-8	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	0.0153
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.226	0.159	<0.010	0.084	<0.010
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0056	0.0054	0.0040	0.0186	0.0154
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		10.4	11.6	12.0	23.0	31.7
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0399	0.0466	0.0988	0.0854	0.616
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00923	0.00623	0.00433	0.0220	0.0186
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		1.89	2.23	2.34	2.66	3.00
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000183	0.000117	0.000078	0.00631	0.000850
silicon, dissolved	7440-21-3	E421	0.050	mg/L		5.42	5.48	4.83	6.41	6.54
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	17341-25-2	E421	0.050	mg/L		22.2	17.7	8.96	104	32.9
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.995	1.09	0.992	8.84	3.39
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		13.6	14.9	5.24	209	108
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00029	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000236	0.000268	0.00199	0.000341	0.00495
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	0.00059
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0083	0.0182	0.0097	0.0078	0.0249
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	DUP	F-BL	----	----	----
					Client sampling date / time	31-Oct-2020	31-Oct-2020 14:05	----	----	----
						WR2001184-006	WR2001184-007	--------	--------	--------
						Result	Result	----	----	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		145	<1.0	----	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		145	<1.0	----	----	----
conductivity	----	E100	2.0	µS/cm		357	<2.0	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		147	<0.60	----	----	----
pH	----	E108	0.10	pH units		8.25	5.45	----	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		216	<1.0	----	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	----	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		<0.0050	<0.0050	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.37	<0.10	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		<0.0050	<0.0050	----	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		<0.0051	<0.0051	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	<0.0010	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		44.5	<0.30	----	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		3.83	<0.10	----	----	----
cation sum	----	EC101	0.10	meq/L		3.73	<0.10	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		1.32	<0.010	----	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0024	<0.0010	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00221	<0.00010	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0405	<0.00010	----	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.020	<0.010	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000100 DLM	<0.0000050	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		39.4	<0.050	----	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	DUP	F-BL	----	----	----
					Client sampling date / time	31-Oct-2020	31-Oct-2020 14:05	----	----	----
						WR2001184-006	WR2001184-007	--------	--------	--------
						Result	Result	----	----	----
Dissolved Metals										
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	----	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		<0.00020	<0.00020	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.153	<0.010	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0054	<0.0010	----	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		11.7	<0.100	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0452	<0.00010	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00613	<0.000050	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	<0.00050	----	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	----	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		2.24	<0.100	----	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000056	<0.000050	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		5.23	<0.050	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	----	----	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L		16.9	<0.050	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		1.05	<0.00020	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		13.8	<0.50	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000253	<0.000010	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0156	<0.0010	----	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	----	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	----	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WR2001184**	Page	: 1 of 16
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 05-Nov-2020 16:20
PO	: 232818	Issue Date	: 24-Nov-2020 14:20
C-O-C number	: 2020-11-05 B		
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 7		
No. of samples analysed	: 7		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
DUP	E298	31-Oct-2020	----	----	----		13-Nov-2020	28 days	12 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
F-BL	E298	31-Oct-2020	----	----	----		13-Nov-2020	28 days	12 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW12-07-01	E298	31-Oct-2020	----	----	----		13-Nov-2020	28 days	12 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW12-07-02	E298	31-Oct-2020	----	----	----		13-Nov-2020	28 days	12 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW17-11-01	E298	31-Oct-2020	----	----	----		13-Nov-2020	28 days	12 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW17-11-02	E298	31-Oct-2020	----	----	----		13-Nov-2020	28 days	12 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW17-11-03	E298	31-Oct-2020	----	----	----		13-Nov-2020	28 days	12 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE DUP	E235.Cl-L	31-Oct-2020	----	----	----		09-Nov-2020	28 days	9 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE F-BL	E235.Cl-L	31-Oct-2020	----	----	----		09-Nov-2020	28 days	9 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW12-07-01	E235.Cl-L	31-Oct-2020	----	----	----		09-Nov-2020	28 days	9 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW12-07-02	E235.Cl-L	31-Oct-2020	----	----	----		09-Nov-2020	28 days	9 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW17-11-01	E235.Cl-L	31-Oct-2020	----	----	----		09-Nov-2020	28 days	9 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW17-11-02	E235.Cl-L	31-Oct-2020	----	----	----		09-Nov-2020	28 days	9 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW17-11-03	E235.Cl-L	31-Oct-2020	----	----	----		09-Nov-2020	28 days	9 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE DUP	E235.NO3-L	31-Oct-2020	----	----	----		09-Nov-2020	3 days	9 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE F-BL	E235.NO3-L	31-Oct-2020	----	----	----		09-Nov-2020	3 days	9 days	× EHTR

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW12-07-01	E235.NO3-L	31-Oct-2020	----	----	----		09-Nov-2020	3 days	9 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW12-07-02	E235.NO3-L	31-Oct-2020	----	----	----		09-Nov-2020	3 days	9 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-11-01	E235.NO3-L	31-Oct-2020	----	----	----		09-Nov-2020	3 days	9 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-11-02	E235.NO3-L	31-Oct-2020	----	----	----		09-Nov-2020	3 days	9 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW17-11-03	E235.NO3-L	31-Oct-2020	----	----	----		09-Nov-2020	3 days	9 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE DUP	E235.NO2-L	31-Oct-2020	----	----	----		09-Nov-2020	3 days	9 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE F-BL	E235.NO2-L	31-Oct-2020	----	----	----		09-Nov-2020	3 days	9 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW12-07-01	E235.NO2-L	31-Oct-2020	----	----	----		09-Nov-2020	3 days	9 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW12-07-02	E235.NO2-L	31-Oct-2020	----	----	----		09-Nov-2020	3 days	9 days	× EHTR

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW17-11-01	E235.NO2-L	31-Oct-2020	----	----	----		09-Nov-2020	3 days	9 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW17-11-02	E235.NO2-L	31-Oct-2020	----	----	----		09-Nov-2020	3 days	9 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW17-11-03	E235.NO2-L	31-Oct-2020	----	----	----		09-Nov-2020	3 days	9 days	× EHTR
Anions and Nutrients : Sulfate in Water by IC										
HDPE DUP	E235.SO4	31-Oct-2020	----	----	----		09-Nov-2020	28 days	9 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE F-BL	E235.SO4	31-Oct-2020	----	----	----		09-Nov-2020	28 days	9 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW12-07-01	E235.SO4	31-Oct-2020	----	----	----		09-Nov-2020	28 days	9 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW12-07-02	E235.SO4	31-Oct-2020	----	----	----		09-Nov-2020	28 days	9 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW17-11-01	E235.SO4	31-Oct-2020	----	----	----		09-Nov-2020	28 days	9 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW17-11-02	E235.SO4	31-Oct-2020	----	----	----		09-Nov-2020	28 days	9 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW17-11-03	E235.SO4	31-Oct-2020	----	----	----		09-Nov-2020	28 days	9 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
DUP	E421.Cr-L	31-Oct-2020	10-Nov-2020	180 days	10 days	✓	12-Nov-2020	169 days	2 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
F-BL	E421.Cr-L	31-Oct-2020	10-Nov-2020	180 days	10 days	✓	12-Nov-2020	169 days	2 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW12-07-01	E421.Cr-L	31-Oct-2020	10-Nov-2020	180 days	10 days	✓	12-Nov-2020	169 days	2 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW12-07-02	E421.Cr-L	31-Oct-2020	10-Nov-2020	180 days	10 days	✓	12-Nov-2020	169 days	2 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW17-11-01	E421.Cr-L	31-Oct-2020	10-Nov-2020	180 days	10 days	✓	12-Nov-2020	169 days	2 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW17-11-02	E421.Cr-L	31-Oct-2020	10-Nov-2020	180 days	10 days	✓	12-Nov-2020	169 days	2 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
MW17-11-03	E421.Cr-L	31-Oct-2020	10-Nov-2020	180 days	10 days	✓	12-Nov-2020	169 days	2 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
DUP	E509	31-Oct-2020	16-Nov-2020	28 days	15 days	✓	16-Nov-2020	12 days	0 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
F-BL	E509	31-Oct-2020	16-Nov-2020	28 days	15 days	✓	16-Nov-2020	12 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
MW12-07-02	E509	31-Oct-2020	16-Nov-2020	28 days	15 days	✓	16-Nov-2020	12 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
MW12-07-01	E509	31-Oct-2020	16-Nov-2020	28 days	16 days	✓	16-Nov-2020	11 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
MW17-11-01	E509	31-Oct-2020	16-Nov-2020	28 days	16 days	✓	16-Nov-2020	11 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
MW17-11-02	E509	31-Oct-2020	16-Nov-2020	28 days	16 days	✓	16-Nov-2020	11 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
MW17-11-03	E509	31-Oct-2020	16-Nov-2020	28 days	16 days	✓	16-Nov-2020	11 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
DUP	E421	31-Oct-2020	10-Nov-2020	180 days	10 days	✓	12-Nov-2020	169 days	2 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
F-BL	E421	31-Oct-2020	10-Nov-2020	180 days	10 days	✓	12-Nov-2020	169 days	2 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
MW12-07-01	E421	31-Oct-2020	10-Nov-2020	180 days	10 days	✓	12-Nov-2020	169 days	2 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW12-07-02	E421	31-Oct-2020	10-Nov-2020	180 days	10 days	✓	12-Nov-2020	169 days	2 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW17-11-01	E421	31-Oct-2020	10-Nov-2020	180 days	10 days	✓	12-Nov-2020	169 days	2 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW17-11-02	E421	31-Oct-2020	10-Nov-2020	180 days	10 days	✓	12-Nov-2020	169 days	2 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW17-11-03	E421	31-Oct-2020	10-Nov-2020	180 days	10 days	✓	12-Nov-2020	169 days	2 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW17-11-01	E290	31-Oct-2020	----	----	----		10-Nov-2020	14 days	10 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW17-11-02	E290	31-Oct-2020	----	----	----		10-Nov-2020	14 days	10 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW17-11-03	E290	31-Oct-2020	----	----	----		10-Nov-2020	14 days	10 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE DUP	E290	31-Oct-2020	----	----	----		10-Nov-2020	14 days	9 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE F-BL	E290	31-Oct-2020	----	----	----		10-Nov-2020	14 days	9 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE MW12-07-01	E290	31-Oct-2020	----	----	----		10-Nov-2020	14 days	9 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW12-07-02	E290	31-Oct-2020	----	----	----		10-Nov-2020	14 days	9 days	✓
Physical Tests : Conductivity in Water										
HDPE MW17-11-01	E100	31-Oct-2020	----	----	----		10-Nov-2020	28 days	10 days	✓
Physical Tests : Conductivity in Water										
HDPE MW17-11-02	E100	31-Oct-2020	----	----	----		10-Nov-2020	28 days	10 days	✓
Physical Tests : Conductivity in Water										
HDPE MW17-11-03	E100	31-Oct-2020	----	----	----		10-Nov-2020	28 days	10 days	✓
Physical Tests : Conductivity in Water										
HDPE DUP	E100	31-Oct-2020	----	----	----		10-Nov-2020	28 days	9 days	✓
Physical Tests : Conductivity in Water										
HDPE F-BL	E100	31-Oct-2020	----	----	----		10-Nov-2020	28 days	9 days	✓
Physical Tests : Conductivity in Water										
HDPE MW12-07-01	E100	31-Oct-2020	----	----	----		10-Nov-2020	28 days	9 days	✓
Physical Tests : Conductivity in Water										
HDPE MW12-07-02	E100	31-Oct-2020	----	----	----		10-Nov-2020	28 days	9 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : pH by Meter										
HDPE DUP	E108	31-Oct-2020	----	----	----		10-Nov-2020	0.25 hrs	236 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE F-BL	E108	31-Oct-2020	----	----	----		10-Nov-2020	0.25 hrs	237 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW12-07-02	E108	31-Oct-2020	----	----	----		10-Nov-2020	0.25 hrs	237 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW12-07-01	E108	31-Oct-2020	----	----	----		10-Nov-2020	0.25 hrs	238 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW17-11-03	E108	31-Oct-2020	----	----	----		10-Nov-2020	0.25 hrs	240 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW17-11-01	E108	31-Oct-2020	----	----	----		10-Nov-2020	0.25 hrs	241 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW17-11-02	E108	31-Oct-2020	----	----	----		10-Nov-2020	0.25 hrs	241 hrs	× EHTR-FM
Physical Tests : TSS by Gravimetry										
HDPE DUP	E160-H	31-Oct-2020	----	----	----		09-Nov-2020	7 days	8 days	× EHT
Physical Tests : TSS by Gravimetry										
HDPE F-BL	E160-H	31-Oct-2020	----	----	----		09-Nov-2020	7 days	8 days	× EHT

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TSS by Gravimetry										
HDPE MW12-07-02	E160-H	31-Oct-2020	----	----	----		09-Nov-2020	7 days	8 days	× EHT
Physical Tests : TSS by Gravimetry										
HDPE MW12-07-01	E160-H	31-Oct-2020	----	----	----		09-Nov-2020	7 days	9 days	× EHT
Physical Tests : TSS by Gravimetry										
HDPE MW17-11-01	E160-H	31-Oct-2020	----	----	----		09-Nov-2020	7 days	9 days	× EHT
Physical Tests : TSS by Gravimetry										
HDPE MW17-11-02	E160-H	31-Oct-2020	----	----	----		09-Nov-2020	7 days	9 days	× EHT
Physical Tests : TSS by Gravimetry										
HDPE MW17-11-03	E160-H	31-Oct-2020	----	----	----		09-Nov-2020	7 days	9 days	× EHT

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	115221	1	13	7.6	5.0	✓
Ammonia by Fluorescence	E298	116567	1	20	5.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	115215	1	13	7.6	5.0	✓
Conductivity in Water	E100	115220	1	13	7.6	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	115751	1	19	5.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	117813	1	8	12.5	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	115752	1	19	5.2	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	115216	1	13	7.6	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	115217	1	13	7.6	5.0	✓
pH by Meter	E108	115219	1	13	7.6	5.0	✓
Sulfate in Water by IC	E235.SO4	115218	1	13	7.6	5.0	✓
TSS by Gravimetry	E160-H	115234	1	20	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	115221	1	13	7.6	5.0	✓
Ammonia by Fluorescence	E298	116567	1	20	5.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	115215	1	13	7.6	5.0	✓
Conductivity in Water	E100	115220	1	13	7.6	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	115751	1	19	5.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	117813	1	8	12.5	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	115752	1	19	5.2	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	115216	1	13	7.6	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	115217	1	13	7.6	5.0	✓
pH by Meter	E108	115219	1	13	7.6	5.0	✓
Sulfate in Water by IC	E235.SO4	115218	1	13	7.6	5.0	✓
TSS by Gravimetry	E160-H	115234	1	20	5.0	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	115221	1	13	7.6	5.0	✓
Ammonia by Fluorescence	E298	116567	1	20	5.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	115215	1	13	7.6	5.0	✓
Conductivity in Water	E100	115220	1	13	7.6	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	115751	1	19	5.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	117813	1	8	12.5	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	115752	1	19	5.2	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	115216	1	13	7.6	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	115217	1	13	7.6	5.0	✓
Sulfate in Water by IC	E235.SO4	115218	1	13	7.6	5.0	✓
TSS by Gravimetry	E160-H	115234	1	20	5.0	5.0	✓

Matrix: **Water**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	116567	1	20	5.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	115215	1	13	7.6	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	115751	1	19	5.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	117813	1	8	12.5	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	115752	1	19	5.2	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	115216	1	13	7.6	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	115217	1	13	7.6	5.0	✓
Sulfate in Water by IC	E235.SO4	115218	1	13	7.6	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
TSS by Gravimetry	E160-H Vancouver - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
Chloride in Water by IC (Low Level)	E235.Cl-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Vancouver - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Ion Balance using Dissolved Metals	EC101 Vancouver - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
TDS in Water (Calculation)	EC103 Vancouver - Environmental	Water	APHA 1030E (mod)	Total Dissolved Solids is calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present.
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N Vancouver - Environmental	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **WR2001184**	Page	: 1 of 10
Client	: Minto Explorations Ltd.	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 05-Nov-2020 16:20
PO	: 232818	Date Analysis Commenced	: 09-Nov-2020
C-O-C number	: 2020-11-05 B	Issue Date	: 24-Nov-2020 14:20
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 7		
No. of samples analysed	: 7		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Clarie Tejano		Metals, Burnaby, British Columbia
Gloria Chan	Lab Analyst	Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics, Burnaby, British Columbia
Kinny Wu	Lab Analyst	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Inorganics, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 115219)											
WR2001183-001	Anonymous	pH	----	E108	0.10	pH units	8.34	8.34	0.00%	4%	----
Physical Tests (QC Lot: 115220)											
WR2001183-001	Anonymous	conductivity	----	E100	2.0	µS/cm	562	565	0.532%	10%	----
Physical Tests (QC Lot: 115221)											
WR2001183-001	Anonymous	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	227	228	0.440%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	12.8	13.0	1.55%	20%	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L	6.4	6.5	0.1	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	240	241	0.500%	20%	----
Physical Tests (QC Lot: 115234)											
VA20C0325-001	Anonymous	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	5.7	5.5	0.2	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 115215)											
WR2001183-001	Anonymous	chloride	16887-00-6	E235.Cl-L	0.10	mg/L	5.30	5.36	0.983%	20%	----
Anions and Nutrients (QC Lot: 115216)											
WR2001183-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.123	0.118	4.01%	20%	----
Anions and Nutrients (QC Lot: 115217)											
WR2001183-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	0.0029	0.0019	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 115218)											
WR2001183-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	62.9	63.8	1.46%	20%	----
Anions and Nutrients (QC Lot: 116567)											
VA20C0186-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0346	0.0342	0.0005	Diff <2x LOR	----
Dissolved Metals (QC Lot: 115751)											
VA20C0329-003	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 115752)											
VA20C0329-003	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0033	0.0026	0.0007	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00164	0.00155	5.47%	20%	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00016	0.00015	0.000003	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0617	0.0558	10.1%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	0.034	0.034	0.00001	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 115752) - continued											
VA20C0329-003	Anonymous	cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	0.000322	0.000280	13.8%	20%	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	74.5	73.6	1.22%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	0.0465	0.0438	5.99%	20%	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00079	0.00069	0.00010	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	0.612	0.592	3.18%	20%	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0040	0.0039	0.00010	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	83.6	75.4	10.3%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	2.48	2.26	9.21%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00110	0.000992	10.5%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.136	0.128	5.82%	20%	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	3.26	3.09	5.34%	20%	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.000385	0.000289	0.000096	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	2.23	2.06	7.99%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E421	0.050	mg/L	9.59	8.83	8.26%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.351	0.328	6.82%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	152	144	5.00%	20%	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	0.000021	0.000020	0.000001	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00267	0.00249	6.96%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0487	0.0457	6.37%	20%	----
		zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 117813)											
WR2001184-001	MW17-11-01	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 115220)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 115221)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 115234)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Anions and Nutrients (QCLot: 115215)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 115216)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 115217)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 115218)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 116567)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Dissolved Metals (QCLot: 115751)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 115752)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 115752) - continued						
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----
Dissolved Metals (QCLot: 117813)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 115219)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 115220)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	101	90.0	110	----
Physical Tests (QCLot: 115221)									
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	229 mg/L	102	75.0	125	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	98.8	85.0	115	----
Physical Tests (QCLot: 115234)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	95.2	85.0	115	----
Anions and Nutrients (QCLot: 115215)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	105	90.0	110	----
Anions and Nutrients (QCLot: 115216)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	105	90.0	110	----
Anions and Nutrients (QCLot: 115217)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 115218)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	106	90.0	110	----
Anions and Nutrients (QCLot: 116567)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.12 mg/L	101	85.0	115	----
Dissolved Metals (QCLot: 115751)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	98.0	80.0	120	----
Dissolved Metals (QCLot: 115752)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	98.9	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	105	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	97.4	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	99.8	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	98.3	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	109	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	108	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	100	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	99.7	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	100	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	98.3	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 115752) - continued									
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	98.2	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	103	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	95.9	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	99.0	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	100	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	107	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	98.4	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	113	70.0	130	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	99.7	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	100	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	98.5	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	106	80.0	120	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	100	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	104	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	86.4	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	106	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	102	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	98.7	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	107	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	101	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	94.3	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	100	80.0	120	----
Dissolved Metals (QCLot: 117813)									
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	94.4	80.0	120	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 115215)										
WR2001183-002	Anonymous	chloride	16887-00-6	E235.Cl-L	105 mg/L	100 mg/L	105	75.0	125	----
Anions and Nutrients (QCLot: 115216)										
WR2001183-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.63 mg/L	2.5 mg/L	105	75.0	125	----
Anions and Nutrients (QCLot: 115217)										
WR2001183-002	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.497 mg/L	0.5 mg/L	99.3	75.0	125	----
Anions and Nutrients (QCLot: 115218)										
WR2001183-002	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	102 mg/L	100 mg/L	102	75.0	125	----
Anions and Nutrients (QCLot: 116567)										
VA20C0186-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.195 mg/L	0.2 mg/L	97.5	75.0	125	----
Dissolved Metals (QCLot: 115751)										
VA20C0329-004	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.0396 mg/L	0.04 mg/L	98.9	70.0	130	----
Dissolved Metals (QCLot: 115752)										
VA20C0329-004	Anonymous	aluminum, dissolved	7429-90-5	E421	0.198 mg/L	0.2 mg/L	99.0	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0213 mg/L	0.02 mg/L	106	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0202 mg/L	0.02 mg/L	101	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0371 mg/L	0.04 mg/L	92.8	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00910 mg/L	0.01 mg/L	91.0	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.092 mg/L	0.1 mg/L	92.3	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00408 mg/L	0.004 mg/L	102	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0192 mg/L	0.02 mg/L	96.1	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0189 mg/L	0.02 mg/L	94.5	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.97 mg/L	2 mg/L	98.6	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0188 mg/L	0.02 mg/L	94.1	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0889 mg/L	0.1 mg/L	88.9	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0218 mg/L	0.02 mg/L	109	70.0	130	----
		nickel, dissolved	7440-02-0	E421	ND mg/L	0.04 mg/L	ND	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 115752) - continued										
VA20C0329-004	Anonymous	phosphorus, dissolved	7723-14-0	E421	11.3 mg/L	10 mg/L	113	70.0	130	----
		potassium, dissolved	7440-09-7	E421	3.82 mg/L	4 mg/L	95.4	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0434 mg/L	0.04 mg/L	108	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.52 mg/L	10 mg/L	95.2	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00414 mg/L	0.004 mg/L	103	70.0	130	----
		sodium, dissolved	17341-25-2	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	ND mg/L	20 mg/L	ND	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00366 mg/L	0.004 mg/L	91.4	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0207 mg/L	0.02 mg/L	104	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0403 mg/L	0.04 mg/L	101	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00398 mg/L	0.004 mg/L	99.6	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.103 mg/L	0.1 mg/L	103	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.376 mg/L	0.4 mg/L	94.0	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0432 mg/L	0.04 mg/L	108	70.0	130	----
Dissolved Metals (QCLot: 117813)										
WR2001184-002	MW17-11-02	mercury, dissolved	7439-97-6	E509	0.0000906 mg/L	0.0001 mg/L	90.6	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number: 2020-11-05 B

Environmental Division
Whitehorse
Work Order Reference
WR2001184

Telephone : +1 867 668 6889

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Ruth Cayetano

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax mintoenvironment@mintomine.com
Email 2
Email 3

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax ap@mintomine.com
Email 2

Project Information

ALS Account # / Quote #:
Job #:
PO / AFE: 232818 (GW)
LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#
Major/Minor Code: Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only)

ALS Contact: Sampler:

Select Service Level Below - Please confirm all E&P TATs wi

Regular [R] ☑ Standard TAT if receiv

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐ | EMERGENCY

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service

Analysis

Indicate Filtered (F), Preserved (P) or Filtere

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals(TM)	Disolved Metals (DM)	Total Mercury, Hardness	Dissolved Mercury	Ammonia (Total Nutrients)	Dissolved Organic Carbon (DOC)	pH, Cond., TSS, TDS, Alkalinity, Anions	Dissolved Bromide (Br-D)	Number of Containers
					P	F/P	P	F/P	P	F/P			
	MW17-11-01	31-Oct-20	10:00	Water		R		R	R		R		4
	MW17-11-02	31-Oct-20	10:35	Water		R		R	R		R		4
	MW17-11-03	31-Oct-20	11:15	Water		R		R	R		R		4
	MW12-07-01	31-Oct-20	13:35	Water		R		R	R		R		4
	MW12-07-02	31-Oct-20	14:05	Water		R		R	R		R		4
	DUP	31-Oct-20		Water		R		R	R		R		4
	F-BL	31-Oct-20	14:05	Water		R		R	R		R		4

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO

Are samples for human drinking water use? ☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☑ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
5°	6°		1.4		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Ian Smith	Date: 2020-11-05	Time:	Received by:	Date: NOV 5/20	Time: 16:20	Received by: D.C.	Date: NOV 7	Time: 3:35

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2001286**	Page	: 1 of 4
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 04-Dec-2020 13:45
PO	: 232818	Date Analysis Commenced	: 06-Dec-2020
C-O-C number	: 2020-12-03 B	Issue Date	: 15-Dec-2020 16:22
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Gloria Chan	Lab Analyst	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Monica Ko	Lab Assistant	Metals, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW09-03-01	MW09-03-02	DUP	----	----
					Client sampling date / time	27-Nov-2020 15:00	27-Nov-2020 15:25	27-Nov-2020	----	----
						WR2001286-001	WR2001286-002	WR2001286-003	--------	--------
						Result	Result	Result	----	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		136	108	106	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		7.2	<1.0	<1.0	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	----	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		3.6	<1.0	<1.0	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		144	108	106	----	----
conductivity	----	E100	2.0	µS/cm		272	307	308	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		149	167	162	----	----
pH	----	E108	0.10	pH units		8.35	8.22	8.21	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		182	225	222	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	<3.0	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0309	<0.0050	<0.0050	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.31	2.30	2.18	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.0059	15.8	15.8	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		0.0210	15.8	15.8	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0150	0.0028	0.0031	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		17.8	5.34	5.27	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		3.25	3.46	3.42	----	----
cation sum	----	EC101	0.10	meq/L		3.41	3.60	3.51	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		2.40	1.98	1.30	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0077	<0.0010	0.0014	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00087	<0.00010	<0.00010	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0659	0.0169	0.0170	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.080	0.057	0.056	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000617	0.000139	0.000145	----	----

Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	MW09-03-01	MW09-03-02	DUP	----	----
					Client sampling date / time	27-Nov-2020 15:00	27-Nov-2020 15:25	27-Nov-2020	----	----
Analyte	CAS Number	Method	LOR	Unit		WR2001286-001	WR2001286-002	WR2001286-003	--------	--------
						Result	Result	Result	----	----
Dissolved Metals										
calcium, dissolved	7440-70-2	E421	0.050	mg/L		42.2	56.0	54.3	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00023	0.00140	0.00146	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.347	<0.010	<0.010	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0040	0.0014	0.0014	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		10.6	6.56	6.57	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0873	0.00213	0.00197	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00453	0.00339	0.00336	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00051	<0.00050	<0.00050	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		2.08	2.32	2.25	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000079	0.000384	0.000450	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		5.18	4.98	5.00	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L		8.31	4.68	4.70	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		1.05	0.390	0.389	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		6.01	1.54	1.66	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		0.00092	<0.00030	<0.00030	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000963	0.00141	0.00150	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0250	0.0287	0.0281	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WR2001286**	Page	: 1 of 11
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 04-Dec-2020 13:45
PO	: 232818	Issue Date	: 15-Dec-2020 16:22
C-O-C number	: 2020-12-03 B		
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (lab preserved) DUP	E298	27-Nov-2020	----	----	----		06-Dec-2020	3 days	8 days	× EHTR
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (lab preserved) MW09-03-01	E298	27-Nov-2020	----	----	----		06-Dec-2020	3 days	8 days	× EHTR
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (lab preserved) MW09-03-02	E298	27-Nov-2020	----	----	----		06-Dec-2020	3 days	8 days	× EHTR
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE DUP	E235.Cl-L	27-Nov-2020	----	----	----		06-Dec-2020	28 days	8 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW09-03-01	E235.Cl-L	27-Nov-2020	----	----	----		06-Dec-2020	28 days	8 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MW09-03-02	E235.Cl-L	27-Nov-2020	----	----	----		06-Dec-2020	28 days	8 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE DUP	E235.NO3-L	27-Nov-2020	----	----	----		06-Dec-2020	3 days	8 days	× EHTR

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW09-03-01	E235.NO3-L	27-Nov-2020	----	----	----		06-Dec-2020	3 days	8 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW09-03-02	E235.NO3-L	27-Nov-2020	----	----	----		06-Dec-2020	3 days	8 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE DUP	E235.NO2-L	27-Nov-2020	----	----	----		06-Dec-2020	3 days	8 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW09-03-01	E235.NO2-L	27-Nov-2020	----	----	----		06-Dec-2020	3 days	8 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW09-03-02	E235.NO2-L	27-Nov-2020	----	----	----		06-Dec-2020	3 days	8 days	× EHTR
Anions and Nutrients : Sulfate in Water by IC										
HDPE DUP	E235.SO4	27-Nov-2020	----	----	----		06-Dec-2020	28 days	8 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW09-03-01	E235.SO4	27-Nov-2020	----	----	----		06-Dec-2020	28 days	8 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW09-03-02	E235.SO4	27-Nov-2020	----	----	----		06-Dec-2020	28 days	8 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) DUP	E421.Cr-L	27-Nov-2020	08-Dec-2020	180 days	11 days	✓	09-Dec-2020	168 days	0 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MW09-03-01	E421.Cr-L	27-Nov-2020	08-Dec-2020	180 days	11 days	✓	09-Dec-2020	168 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MW09-03-02	E421.Cr-L	27-Nov-2020	08-Dec-2020	180 days	11 days	✓	09-Dec-2020	168 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) DUP	E509	27-Nov-2020	09-Dec-2020	28 days	12 days	✓	09-Dec-2020	15 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW09-03-01	E509	27-Nov-2020	09-Dec-2020	28 days	12 days	✓	09-Dec-2020	15 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW09-03-02	E509	27-Nov-2020	09-Dec-2020	28 days	12 days	✓	09-Dec-2020	15 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) DUP	E421	27-Nov-2020	08-Dec-2020	180 days	11 days	✓	09-Dec-2020	168 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW09-03-01	E421	27-Nov-2020	08-Dec-2020	180 days	11 days	✓	09-Dec-2020	168 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW09-03-02	E421	27-Nov-2020	08-Dec-2020	180 days	11 days	✓	09-Dec-2020	168 days	0 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE DUP	E290	27-Nov-2020	----	----	----		08-Dec-2020	14 days	10 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE MW09-03-01	E290	27-Nov-2020	----	----	----		08-Dec-2020	14 days	10 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW09-03-02	E290	27-Nov-2020	----	----	----		08-Dec-2020	14 days	10 days	✓
Physical Tests : Conductivity in Water										
HDPE DUP	E100	27-Nov-2020	----	----	----		08-Dec-2020	28 days	10 days	✓
Physical Tests : Conductivity in Water										
HDPE MW09-03-01	E100	27-Nov-2020	----	----	----		08-Dec-2020	28 days	10 days	✓
Physical Tests : Conductivity in Water										
HDPE MW09-03-02	E100	27-Nov-2020	----	----	----		08-Dec-2020	28 days	10 days	✓
Physical Tests : pH by Meter										
HDPE DUP	E108	27-Nov-2020	----	----	----		08-Dec-2020	0.25 hrs	258 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW09-03-01	E108	27-Nov-2020	----	----	----		08-Dec-2020	0.25 hrs	258 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW09-03-02	E108	27-Nov-2020	----	----	----		08-Dec-2020	0.25 hrs	258 hrs	× EHTR-FM
Physical Tests : TSS by Gravimetry										
HDPE DUP	E160-H	27-Nov-2020	----	----	----		06-Dec-2020	7 days	8 days	× EHTL

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TSS by Gravimetry										
HDPE										
MW09-03-01	E160-H	27-Nov-2020	----	----	----		06-Dec-2020	7 days	8 days	× EHTL
Physical Tests : TSS by Gravimetry										
HDPE										
MW09-03-02	E160-H	27-Nov-2020	----	----	----		06-Dec-2020	7 days	8 days	× EHTL

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	127037	1	12	8.3	5.0	✓
Ammonia by Fluorescence	E298	126866	1	7	14.2	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	126841	1	3	33.3	5.0	✓
Conductivity in Water	E100	127039	1	9	11.1	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	127744	1	18	5.5	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	128372	1	11	9.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	127743	1	18	5.5	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	126839	1	4	25.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	126840	1	4	25.0	5.0	✓
pH by Meter	E108	127038	1	10	10.0	5.0	✓
Sulfate in Water by IC	E235.SO4	126838	1	4	25.0	5.0	✓
TSS by Gravimetry	E160-H	126797	1	3	33.3	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	127037	1	12	8.3	5.0	✓
Ammonia by Fluorescence	E298	126866	1	7	14.2	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	126841	1	3	33.3	5.0	✓
Conductivity in Water	E100	127039	1	9	11.1	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	127744	1	18	5.5	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	128372	1	11	9.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	127743	1	18	5.5	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	126839	1	4	25.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	126840	1	4	25.0	5.0	✓
pH by Meter	E108	127038	1	10	10.0	5.0	✓
Sulfate in Water by IC	E235.SO4	126838	1	4	25.0	5.0	✓
TSS by Gravimetry	E160-H	126797	1	3	33.3	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	127037	1	12	8.3	5.0	✓
Ammonia by Fluorescence	E298	126866	1	7	14.2	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	126841	1	3	33.3	5.0	✓
Conductivity in Water	E100	127039	1	9	11.1	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	127744	1	18	5.5	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	128372	1	11	9.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	127743	1	18	5.5	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	126839	1	4	25.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	126840	1	4	25.0	5.0	✓
Sulfate in Water by IC	E235.SO4	126838	1	4	25.0	5.0	✓
TSS by Gravimetry	E160-H	126797	1	3	33.3	5.0	✓

Matrix: **Water**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	126866	1	7	14.2	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	126841	1	3	33.3	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	127744	1	18	5.5	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	128372	1	11	9.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	127743	1	18	5.5	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	126839	1	4	25.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	126840	1	4	25.0	5.0	✓
Sulfate in Water by IC	E235.SO4	126838	1	4	25.0	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
TSS by Gravimetry	E160-H Vancouver - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
Chloride in Water by IC (Low Level)	E235.Cl-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Vancouver - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Ion Balance using Dissolved Metals	EC101 Vancouver - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
TDS in Water (Calculation)	EC103 Vancouver - Environmental	Water	APHA 1030E (mod)	Total Dissolved Solids is calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present.
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N Vancouver - Environmental	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **WR2001286**	Page	: 1 of 10
Client	: Minto Explorations Ltd.	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 04-Dec-2020 13:45
PO	: 232818	Date Analysis Commenced	: 06-Dec-2020
C-O-C number	: 2020-12-03 B	Issue Date	: 15-Dec-2020 16:22
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Gloria Chan	Lab Analyst	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Monica Ko	Lab Assistant	Metals, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 126797)											
WR2001286-001	MW09-03-01	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	<3.0	<3.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 127037)											
WR2001282-001	Anonymous	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	165	166	0.663%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	11.6	11.0	5.31%	20%	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L	5.8	5.5	0.3	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	177	178	0.282%	20%	----
Physical Tests (QC Lot: 127038)											
WR2001282-001	Anonymous	pH	----	E108	0.10	pH units	8.42	8.42	0.00%	4%	----
Physical Tests (QC Lot: 127039)											
WR2001282-001	Anonymous	conductivity	----	E100	2.0	µS/cm	426	422	0.943%	10%	----
Anions and Nutrients (QC Lot: 126838)											
WR2001286-001	MW09-03-01	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	17.8	17.8	0.0732%	20%	----
Anions and Nutrients (QC Lot: 126839)											
WR2001286-001	MW09-03-01	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.0059	<0.0050	0.0009	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 126840)											
WR2001286-001	MW09-03-01	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	0.0150	0.0145	3.64%	20%	----
Anions and Nutrients (QC Lot: 126841)											
WR2001286-001	MW09-03-01	chloride	16887-00-6	E235.Cl-L	0.10	mg/L	0.31	0.30	0.002	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 126866)											
FJ2000089-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 127743)											
KS2002787-002	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0021	0.0013	0.0008	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00036	0.00036	0.000002	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00108	0.00110	1.07%	20%	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0174	0.0177	1.29%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	0.176	0.173	2.10%	20%	----
		cadmium, dissolved	7440-43-9	E421	0.0000400	mg/L	<0.0000400	<0.0000400	0	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	60.8	60.4	0.632%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 127743) - continued											
KS2002787-002	Anonymous	cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	0.00048	0.00049	0.000008	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00050	0.00046	0.00004	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	0.033	0.034	0.0004	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0360	0.0351	2.43%	20%	----
		magnesium, dissolved	7439-95-4	E421	0.100	mg/L	58.7	60.0	2.11%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.104	0.106	2.44%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.0704	0.0717	1.96%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00491	0.00488	0.00003	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.100	mg/L	20.1	20.6	2.52%	20%	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.000144	0.000121	0.000023	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	5.93	6.04	1.83%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E421	0.050	mg/L	190	194	1.59%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	1.03	1.08	4.71%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	181	184	1.54%	20%	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	0.000026	0.000024	0.000002	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	0.00033	0.00033	0.000002	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.0106	0.0103	3.41%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0019	0.0017	0.0001	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 127744)											
KS2002787-002	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 128372)											
CG2000075-001	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 126797)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Physical Tests (QCLot: 127037)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 127039)						
conductivity	----	E100	1	µS/cm	<1.0	----
Anions and Nutrients (QCLot: 126838)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 126839)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 126840)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 126841)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 126866)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Dissolved Metals (QCLot: 127743)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 127743) - continued						
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----
Dissolved Metals (QCLot: 127744)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 128372)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 126797)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	93.7	85.0	115	----
Physical Tests (QCLot: 127037)									
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	229 mg/L	93.8	75.0	125	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	99.6	85.0	115	----
Physical Tests (QCLot: 127038)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 127039)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	100	90.0	110	----
Anions and Nutrients (QCLot: 126838)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 126839)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 126840)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 126841)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 126866)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.12 mg/L	96.9	85.0	115	----
Dissolved Metals (QCLot: 127743)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	108	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	98.5	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	98.3	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	95.1	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	95.1	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	100	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	99.8	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	102	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	95.4	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	99.3	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	93.1	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	98.7	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 127743) - continued									
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	97.0	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	96.5	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	101	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	97.7	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	115	70.0	130	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	102	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	98.9	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	105	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	95.4	80.0	120	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	105	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	102	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	104	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	103	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	96.1	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	98.0	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	106	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	104	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	102	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	93.3	80.0	120	----
Dissolved Metals (QCLot: 127744)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	99.7	80.0	120	----
Dissolved Metals (QCLot: 128372)									
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	89.8	80.0	120	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 126838)										
WR2001286-002	MW09-03-02	sulfate (as SO4)	14808-79-8	E235.SO4	114 mg/L	100 mg/L	114	75.0	125	----
Anions and Nutrients (QCLot: 126839)										
WR2001286-002	MW09-03-02	nitrate (as N)	14797-55-8	E235.NO3-L	ND mg/L	2.5 mg/L	ND	75.0	125	----
Anions and Nutrients (QCLot: 126840)										
WR2001286-002	MW09-03-02	nitrite (as N)	14797-65-0	E235.NO2-L	0.560 mg/L	0.5 mg/L	112	75.0	125	----
Anions and Nutrients (QCLot: 126841)										
WR2001286-002	MW09-03-02	chloride	16887-00-6	E235.Cl-L	112 mg/L	100 mg/L	112	75.0	125	----
Anions and Nutrients (QCLot: 126866)										
FJ2000089-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.193 mg/L	0.2 mg/L	96.3	75.0	125	----
Dissolved Metals (QCLot: 127743)										
KS2002787-003	Anonymous	aluminum, dissolved	7429-90-5	E421	0.206 mg/L	0.2 mg/L	103	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0199 mg/L	0.02 mg/L	99.7	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0197 mg/L	0.02 mg/L	98.4	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0405 mg/L	0.04 mg/L	101	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00837 mg/L	0.01 mg/L	83.7	70.0	130	----
		boron, dissolved	7440-42-8	E421	ND mg/L	0.1 mg/L	ND	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00393 mg/L	0.004 mg/L	98.2	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0189 mg/L	0.02 mg/L	94.4	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0178 mg/L	0.02 mg/L	89.2	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.92 mg/L	2 mg/L	96.1	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0187 mg/L	0.02 mg/L	93.5	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.108 mg/L	0.1 mg/L	108	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0360 mg/L	0.04 mg/L	90.0	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	10.6 mg/L	10 mg/L	106	70.0	130	----
		potassium, dissolved	7440-09-7	E421	ND mg/L	4 mg/L	ND	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 127743) - continued										
KS2002787-003	Anonymous	selenium, dissolved	7782-49-2	E421	0.0427 mg/L	0.04 mg/L	107	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.62 mg/L	10 mg/L	96.2	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00369 mg/L	0.004 mg/L	92.3	70.0	130	----
		sodium, dissolved	17341-25-2	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	ND mg/L	20 mg/L	ND	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00367 mg/L	0.004 mg/L	91.9	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0198 mg/L	0.02 mg/L	99.0	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0389 mg/L	0.04 mg/L	97.3	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00426 mg/L	0.004 mg/L	106	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.103 mg/L	0.1 mg/L	103	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.387 mg/L	0.4 mg/L	96.8	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0444 mg/L	0.04 mg/L	111	70.0	130	----
Dissolved Metals (QCLot: 127744)										
KS2002787-003	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.0387 mg/L	0.04 mg/L	96.8	70.0	130	----
Dissolved Metals (QCLot: 128372)										
VA20C2669-001	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000950 mg/L	0.0001 mg/L	95.0	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

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Affix ALS barcode label here (lab use only)

COC Number: 2020-12-03 B

Environmental Division Whitehorse
Work Order Reference
WR2001286

Telephone : +1 867 668 6689

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Ruth Cayetano

Report Format / Distribution	
Select Report Format:	☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
	☑ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	mintoenvironment@mintomine.com
Email 2	
Email 3	

Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	ap@mintomine.com
Email 2	

Project Information	
ALS Account # / Quote #:	
Job #:	
PO / AFE:	232818 (GW)
LSD:	
ALS Lab Work Order # (lab use only)	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact:	Sampler:

Select Service Level Below - Please confirm all E&P T

Regular [R] ☑ Standard TAT if

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐

EMERGENCY

Date and Time Required for all E&P TA

For tests that can not be performed according to the

An

Indicate Filtered (F), Preserved (P) or

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	P	F/P	P	F/P	P	F/P								Number of Containers
					Total Metals(TM)	Dissolved Metals (DM)	Total Mercury, Hardness	Dissolved Mercury	Ammonia (Total Nutrients)	Dissolved Organic Carbon (DOC)	pH, Cond., TSS, TDS, Alkalinity, Anions	Dissolved Bromide (Br-D)						
	MW09-03-01	27-Nov-20	15:00	Water		R		R	R		R							4
	MW09-03-02	27-Nov-20	15:25	Water		R		R	R		R							4
	DUP	27-Nov-20		Water		R		R	R		R							4

1/4 cooler

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☑ NO	
Are samples for human drinking water use? ☐ YES ☑ NO	

SAMPLE CONDITION AS F

Frozen ☐ SIF Obse

Ice Packs ☑ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
3.1°			5.5°C		

SHIPMENT RELEASE (client use)		
Released by: Ian Smith	Date: 2020-12-03	Time:

INITIAL SHIPMENT RECEPTION (lab use only)		
Received by:	Date: DEC 4/20	Time: 13:45

FINAL SHIPMENT RECEPTION (lab use only)		
Received by: JG	Date: 5 Dec	Time: 3:25 PM

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2001316**	Page	: 1 of 4
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: 232818 (GW)	Date Samples Received	: 11-Dec-2020 15:15
PO	: ----	Date Analysis Commenced	: 13-Dec-2020
C-O-C number	: 2020-12-10B	Issue Date	: 21-Dec-2020 16:28
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Angelo Salandanan	Lab Assistant	Metals, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Monica Ko	Lab Assistant	Metals, Burnaby, British Columbia
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
µS/cm	Microsiemens per centimetre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW09-03-01	MW09-03-02	DUP	----	----
					Client sampling date / time	05-Dec-2020 10:45	05-Dec-2020 11:15	05-Dec-2020	----	----
						WR2001316-001	WR2001316-002	WR2001316-003	--------	--------
						Result	Result	Result	----	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		144	107	106	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	----	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		144	107	106	----	----
conductivity	----	E100	2.0	µS/cm		275	308	313	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		137	146	147	----	----
pH	----	E108	0.10	pH units		8.11	7.98	8.01	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		177	214	214	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	<3.0	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0259	<0.0050	<0.0050	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.34	2.22	2.22	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		<0.0050	15.3	15.3	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		0.0178	15.3	15.3	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0134	0.0026	0.0038	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		17.3	5.24	5.39	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0016	<0.0010	<0.0010	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00095	<0.00010	<0.00010	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0718	0.0176	0.0179	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.089	0.048	0.048	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000442	0.0000579	0.0000587	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		37.0	48.0	48.3	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		<0.00020	0.00113	0.00109	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW09-03-01	MW09-03-02	DUP	----	----
					Client sampling date / time	05-Dec-2020 10:45	05-Dec-2020 11:15	05-Dec-2020	----	----
						WR2001316-001	WR2001316-002	WR2001316-003	--------	--------
						Result	Result	Result	----	----
Dissolved Metals										
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.352	<0.010	<0.010	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0035	0.0013	0.0013	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		10.9	6.23	6.35	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0818	0.00138	0.00146	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00454	0.00342	0.00335	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		2.05	2.20	2.19	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		<0.000050	0.000366	0.000350	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		5.47	5.14	5.17	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L		7.90	4.31	4.34	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.965	0.358	0.359	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		6.36	1.83	1.80	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000893	0.00134	0.00136	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0190	0.0220	0.0211	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WR2001316**	Page	: 1 of 12
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: 232818 (GW)	Date Samples Received	: 11-Dec-2020 15:15
PO	: ----	Issue Date	: 21-Dec-2020 16:28
C-O-C number	: 2020-12-10B		
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- Method Blank value outliers occur - please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **Water**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Method Blank (MB) Values								
Physical Tests	QC-MRG2-1304130 01	----	alkalinity, total (as CaCO3)	----	E290	2.5 mg/L [B]	1.5 mg/L	Blank result exceeds permitted value
Physical Tests	QC-MRG2-1304130 01	----	alkalinity, bicarbonate (as CaCO3)	----	E290	2.5 mg/L [B]	1.5 mg/L	Blank result exceeds permitted value

Result Qualifiers

Qualifier	*Description*
B	*Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.*

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW09-03-01	E298	05-Dec-2020	----	----	----		19-Dec-2020	28 days	13 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW09-03-02	E298	05-Dec-2020	----	----	----		19-Dec-2020	28 days	13 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
DUP	E298	05-Dec-2020	----	----	----		19-Dec-2020	28 days	14 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
DUP	E235.Cl-L	05-Dec-2020	----	----	----		13-Dec-2020	28 days	8 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
MW09-03-01	E235.Cl-L	05-Dec-2020	----	----	----		13-Dec-2020	28 days	8 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
MW09-03-02	E235.Cl-L	05-Dec-2020	----	----	----		13-Dec-2020	28 days	8 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE										
DUP	E235.NO3-L	05-Dec-2020	----	----	----		13-Dec-2020	3 days	8 days	× EHTR

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE										
MW09-03-01	E235.NO3-L	05-Dec-2020	----	----	----		13-Dec-2020	3 days	8 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE										
MW09-03-02	E235.NO3-L	05-Dec-2020	----	----	----		13-Dec-2020	3 days	8 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
DUP	E235.NO2-L	05-Dec-2020	----	----	----		13-Dec-2020	3 days	8 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
MW09-03-01	E235.NO2-L	05-Dec-2020	----	----	----		13-Dec-2020	3 days	8 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
MW09-03-02	E235.NO2-L	05-Dec-2020	----	----	----		13-Dec-2020	3 days	8 days	× EHTR
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
DUP	E235.SO4	05-Dec-2020	----	----	----		13-Dec-2020	28 days	8 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW09-03-01	E235.SO4	05-Dec-2020	----	----	----		13-Dec-2020	28 days	8 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW09-03-02	E235.SO4	05-Dec-2020	----	----	----		13-Dec-2020	28 days	8 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
DUP	E421.Cr-L	05-Dec-2020	15-Dec-2020	180 days	10 days	✓	15-Dec-2020	169 days	0 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MW09-03-01	E421.Cr-L	05-Dec-2020	15-Dec-2020	180 days	9 days	✓	15-Dec-2020	170 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MW09-03-02	E421.Cr-L	05-Dec-2020	15-Dec-2020	180 days	9 days	✓	15-Dec-2020	170 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) DUP	E509	05-Dec-2020	15-Dec-2020	28 days	10 days	✓	15-Dec-2020	17 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW09-03-01	E509	05-Dec-2020	15-Dec-2020	28 days	9 days	✓	15-Dec-2020	18 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW09-03-02	E509	05-Dec-2020	15-Dec-2020	28 days	9 days	✓	15-Dec-2020	18 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) DUP	E421	05-Dec-2020	15-Dec-2020	180 days	10 days	✓	15-Dec-2020	169 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW09-03-01	E421	05-Dec-2020	15-Dec-2020	180 days	9 days	✓	15-Dec-2020	170 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW09-03-02	E421	05-Dec-2020	15-Dec-2020	180 days	9 days	✓	15-Dec-2020	170 days	0 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE DUP	E290	05-Dec-2020	----	----	----		14-Dec-2020	14 days	9 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE MW09-03-01	E290	05-Dec-2020	----	----	----		14-Dec-2020	14 days	9 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW09-03-02	E290	05-Dec-2020	----	----	----		14-Dec-2020	14 days	9 days	✓
Physical Tests : Conductivity in Water										
HDPE DUP	E100	05-Dec-2020	----	----	----		14-Dec-2020	28 days	9 days	✓
Physical Tests : Conductivity in Water										
HDPE MW09-03-01	E100	05-Dec-2020	----	----	----		14-Dec-2020	28 days	9 days	✓
Physical Tests : Conductivity in Water										
HDPE MW09-03-02	E100	05-Dec-2020	----	----	----		14-Dec-2020	28 days	9 days	✓
Physical Tests : pH by Meter										
HDPE MW09-03-02	E108	05-Dec-2020	----	----	----		14-Dec-2020	0.25 hrs	219 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW09-03-01	E108	05-Dec-2020	----	----	----		14-Dec-2020	0.25 hrs	220 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE DUP	E108	05-Dec-2020	----	----	----		14-Dec-2020	0.25 hrs	230 hrs	× EHTR-FM
Physical Tests : TSS by Gravimetry										
HDPE MW09-03-01	E160-H	05-Dec-2020	----	----	----		13-Dec-2020	7 days	7 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TSS by Gravimetry										
HDPE										
MW09-03-02	E160-H	05-Dec-2020	----	----	----		13-Dec-2020	7 days	7 days	✓
Physical Tests : TSS by Gravimetry										
HDPE										
DUP	E160-H	05-Dec-2020	----	----	----		13-Dec-2020	7 days	8 days	× EHTL

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	130413	1	16	6.2	5.0	✓
Ammonia by Fluorescence	E298	133196	1	16	6.2	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	130139	1	4	25.0	5.0	✓
Conductivity in Water	E100	130414	1	16	6.2	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	130763	1	4	25.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	130865	1	8	12.5	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	130762	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	130137	1	4	25.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	130138	1	4	25.0	5.0	✓
pH by Meter	E108	130412	1	18	5.5	5.0	✓
Sulfate in Water by IC	E235.SO4	130136	1	4	25.0	5.0	✓
TSS by Gravimetry	E160-H	130080	1	20	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	130413	1	16	6.2	5.0	✓
Ammonia by Fluorescence	E298	133196	1	16	6.2	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	130139	1	4	25.0	5.0	✓
Conductivity in Water	E100	130414	1	16	6.2	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	130763	1	4	25.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	130865	1	8	12.5	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	130762	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	130137	1	4	25.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	130138	1	4	25.0	5.0	✓
pH by Meter	E108	130412	1	18	5.5	5.0	✓
Sulfate in Water by IC	E235.SO4	130136	1	4	25.0	5.0	✓
TSS by Gravimetry	E160-H	130080	1	20	5.0	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	130413	1	16	6.2	5.0	✓
Ammonia by Fluorescence	E298	133196	1	16	6.2	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	130139	1	4	25.0	5.0	✓
Conductivity in Water	E100	130414	1	16	6.2	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	130763	1	4	25.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	130865	1	8	12.5	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	130762	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	130137	1	4	25.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	130138	1	4	25.0	5.0	✓
Sulfate in Water by IC	E235.SO4	130136	1	4	25.0	5.0	✓
TSS by Gravimetry	E160-H	130080	1	20	5.0	5.0	✓

Matrix: **Water**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	133196	1	16	6.2	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	130139	1	4	25.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	130763	1	4	25.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	130865	1	8	12.5	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	130762	2	20	10.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	130137	1	4	25.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	130138	1	4	25.0	5.0	✓
Sulfate in Water by IC	E235.SO4	130136	1	4	25.0	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
TSS by Gravimetry	E160-H Vancouver - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
Chloride in Water by IC (Low Level)	E235.Cl-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Vancouver - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
TDS in Water (Calculation)	EC103 Vancouver - Environmental	Water	APHA 1030E (mod)	Total Dissolved Solids is calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present.
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N Vancouver - Environmental	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

QUALITY CONTROL REPORT

Work Order	: **WR2001316**	Page	: 1 of 10
Client	: Minto Explorations Ltd.	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: 232818 (GW)	Date Samples Received	: 11-Dec-2020 15:15
PO	: ----	Date Analysis Commenced	: 13-Dec-2020
C-O-C number	: 2020-12-10B	Issue Date	: 21-Dec-2020 16:28
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Angelo Salandanan	Lab Assistant	Metals, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Monica Ko	Lab Assistant	Metals, Burnaby, British Columbia
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 130080)											
FJ2000116-001	Anonymous	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	<3.0	<3.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 130412)											
FJ2000121-001	Anonymous	pH	----	E108	0.10	pH units	8.26	8.27	0.121%	4%	----
Physical Tests (QC Lot: 130413)											
FJ2000121-001	Anonymous	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	147	147	0.0681%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	147	147	0.0681%	20%	----
Physical Tests (QC Lot: 130414)											
FJ2000121-001	Anonymous	conductivity	----	E100	2.0	µS/cm	261	254	2.72%	10%	----
Anions and Nutrients (QC Lot: 130136)											
WR2001315-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	6.00	mg/L	21.4	21.0	0.34	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 130137)											
WR2001315-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.100	mg/L	43.6	43.0	1.18%	20%	----
Anions and Nutrients (QC Lot: 130138)											
WR2001315-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0200	mg/L	2.06	2.06	0.0770%	20%	----
Anions and Nutrients (QC Lot: 130139)											
WR2001315-001	Anonymous	chloride	16887-00-6	E235.Cl-L	2.00	mg/L	601	594	1.13%	20%	----
Anions and Nutrients (QC Lot: 133196)											
VA20C3236-004	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 130762)											
WR2001315-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0130	0.0122	6.09%	20%	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00028	0.00026	0.00002	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00030	0.00033	0.00003	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0282	0.0275	2.50%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	0.023	0.023	0.0002	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	0.0000371	0.0000315	0.0000056	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	79.4	78.1	1.65%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 130762) - continued											
WR2001315-001	Anonymous	cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	0.00041	0.00039	0.00001	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.0208	0.0198	4.87%	20%	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	0.065	0.062	0.003	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0025	0.0025	0.00004	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.100	mg/L	12.4	11.8	5.34%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.0407	0.0397	2.47%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00109	0.00102	6.16%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00470	0.00447	0.00023	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	5.31	5.18	2.60%	20%	----
		potassium, dissolved	7440-09-7	E421	0.100	mg/L	17.3	16.6	4.32%	20%	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.000246	0.000247	0.000001	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	7.10	7.22	1.58%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E421	0.050	mg/L	354	337	4.88%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.551	0.535	2.94%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	9.35	9.19	1.73%	20%	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	0.00019	0.00018	0.00001	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.000011	0.000010	0.0000009	Diff <2x LOR	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	0.00063	0.00060	0.00003	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0391	0.0365	6.91%	20%	----
		zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 130763)											
WR2001315-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	0.00310	0.00288	7.45%	20%	----
Dissolved Metals (QC Lot: 130865)											
WR2001314-004	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 130080)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Physical Tests (QCLot: 130413)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	# 2.5	B
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	# 2.5	B
Physical Tests (QCLot: 130414)						
conductivity	----	E100	1	µS/cm	<1.0	----
Anions and Nutrients (QCLot: 130136)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 130137)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 130138)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 130139)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 133196)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Dissolved Metals (QCLot: 130762)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 130762) - continued						
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----
Dissolved Metals (QCLot: 130763)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 130865)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----

Qualifiers

Qualifier	Description
B	*Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.*

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 130080)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	97.0	85.0	115	----
Physical Tests (QCLot: 130412)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 130413)									
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	229 mg/L	96.6	75.0	125	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	99.6	85.0	115	----
Physical Tests (QCLot: 130414)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	103	90.0	110	----
Anions and Nutrients (QCLot: 130136)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	95.4	90.0	110	----
Anions and Nutrients (QCLot: 130137)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	95.2	90.0	110	----
Anions and Nutrients (QCLot: 130138)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	94.1	90.0	110	----
Anions and Nutrients (QCLot: 130139)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	94.5	90.0	110	----
Anions and Nutrients (QCLot: 133196)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.12 mg/L	99.3	85.0	115	----
Dissolved Metals (QCLot: 130762)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	102	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	97.9	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	100	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	100	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	97.2	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	96.8	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	97.8	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	106	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	96.5	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	102	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	106	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	99.3	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 130762) - continued									
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	91.8	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	95.5	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	99.6	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	102	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	98.7	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	101	70.0	130	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	102	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	106	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	99.4	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	98.1	80.0	120	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	102	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	101	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	100	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	97.2	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	99.8	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	94.7	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	98.4	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	103	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	102	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	97.5	80.0	120	----
Dissolved Metals (QCLot: 130763)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	98.6	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	98.6	80.0	120	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 130136)										
WR2001316-001	MW09-03-01	sulfate (as SO4)	14808-79-8	E235.SO4	103 mg/L	100 mg/L	103	75.0	125	----
Anions and Nutrients (QCLot: 130137)										
WR2001316-001	MW09-03-01	nitrate (as N)	14797-55-8	E235.NO3-L	2.61 mg/L	2.5 mg/L	104	75.0	125	----
Anions and Nutrients (QCLot: 130138)										
WR2001316-001	MW09-03-01	nitrite (as N)	14797-65-0	E235.NO2-L	0.512 mg/L	0.5 mg/L	102	75.0	125	----
Anions and Nutrients (QCLot: 130139)										
WR2001316-001	MW09-03-01	chloride	16887-00-6	E235.Cl-L	104 mg/L	100 mg/L	104	75.0	125	----
Anions and Nutrients (QCLot: 133196)										
VA20C3236-005	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.195 mg/L	0.2 mg/L	97.5	75.0	125	----
Dissolved Metals (QCLot: 130762)										
WR2001316-001	MW09-03-01	boron, dissolved	7440-42-8	E421	0.096 mg/L	0.1 mg/L	96.3	70.0	130	----
WR2001316-001	MW09-03-01	aluminum, dissolved	7429-90-5	E421	0.198 mg/L	0.2 mg/L	98.9	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0195 mg/L	0.02 mg/L	97.4	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0200 mg/L	0.02 mg/L	99.8	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0388 mg/L	0.04 mg/L	97.1	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00873 mg/L	0.01 mg/L	87.3	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00416 mg/L	0.004 mg/L	104	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0191 mg/L	0.02 mg/L	95.3	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0189 mg/L	0.02 mg/L	94.6	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.89 mg/L	2 mg/L	94.7	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0185 mg/L	0.02 mg/L	92.7	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0924 mg/L	0.1 mg/L	92.4	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0198 mg/L	0.02 mg/L	99.1	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0375 mg/L	0.04 mg/L	93.7	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	10.3 mg/L	10 mg/L	103	70.0	130	----
		potassium, dissolved	7440-09-7	E421	3.98 mg/L	4 mg/L	99.4	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 130762) - continued										
WR2001316-001	MW09-03-01	selenium, dissolved	7782-49-2	E421	0.0412 mg/L	0.04 mg/L	103	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.09 mg/L	10 mg/L	90.9	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00373 mg/L	0.004 mg/L	93.3	70.0	130	----
		sodium, dissolved	17341-25-2	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	21.2 mg/L	20 mg/L	106	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00369 mg/L	0.004 mg/L	92.3	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0195 mg/L	0.02 mg/L	97.7	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0371 mg/L	0.04 mg/L	92.7	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00370 mg/L	0.004 mg/L	92.6	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.102 mg/L	0.1 mg/L	102	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.398 mg/L	0.4 mg/L	99.5	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0389 mg/L	0.04 mg/L	97.3	70.0	130	----
Dissolved Metals (QCLot: 130763)										
WR2001316-001	MW09-03-01	chromium, dissolved	7440-47-3	E421.Cr-L	0.0385 mg/L	0.04 mg/L	96.2	70.0	130	----
Dissolved Metals (QCLot: 130865)										
WR2001314-005	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000969 mg/L	0.0001 mg/L	96.9	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number: 2020-12-10 B

Page 1 of 1

Environmental Division Whitehorse
Work Order Reference
WR2001316

Telephone : +1 867 668 6689

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Ruth Cayetano

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax mintoenvironment@mintomine.com
Email 2
Email 3

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax ap@mintomine.com
Email 2

Select Service Level Below - Please confirm all Ea

Regular [R] ☑ Standard TA

PRIORITY (Business Days)
4 day [P4] ☐
3 day [P3] ☐
2 day [P2] ☐

Date and Time Required for all E&P

For tests that can not be performed according to

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:		Major/Minor Code:	Routing Code:
PO / AFE:	232818 (GW)	Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)		ALS Contact:	Sampler:

Indicate Filtered (F), Preserved (P,

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals(TM)	Dissolved Metals (DM)	Total Mercury, Hardness	Dissolved Mercury	Ammonia (Total Nutrients)	Dissolved Organic Carbon (DOC)	pH, Cond., TSS, TDS, Alkalinity, Anions	Dissolved Bromide (Br-D)	Number of Containers
					P	F/P	P	F/P	P	F/P			
	MW09-03-01	5-Dec-20	10:45	Water		R		R	R		R		4
	MW09-03-02	5-Dec-20	11:15	Water		R		R	R		R		4
	DUP	5-Dec-20		Water		R		R	R		R		4

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?
☐ YES ☑ NO

Are samples for human drinking water use?
☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☑ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
7°			7 (av of 7)		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Ian Smith	Date: 2020-12-10	Time:	Received by:	Date: DEC 11/20	Time: 14:15	Received by: DG	Date: Dec 12	Time: 14:30

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **VA20A8033**	Page	: 1 of 10
Client	: **Minto Explorations Ltd.**	Laboratory	: Vancouver - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: 8081 Lougheed Highway Burnaby BC Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: Minto Mine Monitoring	Date Samples Received	: 10-Jun-2020 16:08
PO	: 232824 (Seepage)	Date Analysis Commenced	: 11-Jun-2020
C-O-C number	: 2020-06-09 B	Issue Date	: 19-Jun-2020 10:29
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 17		
No. of samples analysed	: 17		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Aaron Yu	Laboratory Analyst	Metals, Burnaby, British Columbia
Bruna Botti	Analyst	Inorganics - Water Quality, Burnaby, British Columbia
Clarie Tejano		Metals, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia

Appendix D – Seepage Monitoring Program Laboratory Results

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Qualifiers

Qualifier	*Description*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	SS66	SS50	SS49	SS64	SS48
					Client sampling date / time	06-Jun-2020 08:25	06-Jun-2020 08:45	06-Jun-2020 09:00	06-Jun-2020 09:20	06-Jun-2020 09:40
						VA20A8033-001	VA20A8033-002	VA20A8033-003	VA20A8033-004	VA20A8033-005
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		65.6	191	86.8	217	106
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		65.6	191	86.8	217	106
conductivity	----	E100	2.0	µS/cm		166	611	501	483	306
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		75.0	218	208	220	139
pH	----	E108	0.10	pH units		8.00	7.82	8.15	7.97	7.92
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		90.9	360	329	282	193
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		4.4	<3.0	3.2	<3.0	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.220	<0.0050	0.0214	0.0467	<0.0050
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.52	0.53	4.89	0.77	2.77
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.580	0.136	0.0061	0.0336	<0.0050
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		0.602	0.138	<0.0500	<0.0500	<0.0500
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0225	0.0012	<0.0010	<0.0010	<0.0010
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		12.2	131	153	43.8	49.5
Ion Balance										
anion sum	----	EC101	0.10	meq/L		1.62	6.57	5.06	5.26	3.22
cation sum	----	EC101	0.10	meq/L		1.73	5.56	5.29	5.42	3.28
ion balance (cation-anion difference)	----	EC101	0.010	%		3.28	8.33	2.22	1.50	0.923
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0077	0.0021	0.0036	0.0019	0.0029
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00046	0.00048	0.00070	0.00118	0.00102
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0540	0.0452	0.0709	0.0920	0.0512
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.021	0.111	0.088	0.098	0.029
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000200 DLM	<0.0000600 DLM	<0.0000250 DLM	<0.0000350 DLM	<0.0000300 DLM

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	SS66	SS50	SS49	SS64	SS48
					Client sampling date / time	06-Jun-2020 08:25	06-Jun-2020 08:45	06-Jun-2020 09:00	06-Jun-2020 09:20	06-Jun-2020 09:40
						VA20A8033-001	VA20A8033-002	VA20A8033-003	VA20A8033-004	VA20A8033-005
						Result	Result	Result	Result	Result
Dissolved Metals										
calcium, dissolved	7440-70-2	E421	0.050	mg/L		18.2	54.7	51.9	56.3	34.9
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	0.00012
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00017	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.0144	0.0146	0.0338	0.00428	0.0171
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	<0.010	0.015	0.162	0.067
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0015	0.0053	0.0041	0.0041	0.0012
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		7.16	19.7	19.1	19.2	12.5
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0143	0.0105	0.00686	0.408	0.0178
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	0.0000056	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00835	0.0472	0.0133	0.0236	0.00695
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	0.00057	<0.00050
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		0.210	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		3.00	7.02	9.86	6.29	4.28
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.00358	0.0151	0.00440	0.00276	0.000848
silicon, dissolved	7440-21-3	E421	0.050	mg/L		1.54	3.21	6.53	2.15	5.85
silver, dissolved	7440-22-4	E421	0.000010	mg/L		0.000012	0.000011	0.000014	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		3.23	23.4	20.1	19.5	9.18
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.626	1.40	1.41	1.28	0.510
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		4.18	37.8	54.2	16.4	17.2
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		0.00044	<0.00030	<0.00030	<0.00030	<0.00030
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00109	0.00329	0.00215	0.00185	0.000494
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00096	0.00068	0.00076	<0.00050	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		<0.0010	0.0192	<0.0010	<0.0010	0.0012
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	SS39	SS1	SS31	SS4	SS57
					Client sampling date / time	06-Jun-2020 10:10	06-Jun-2020 14:10	06-Jun-2020 15:15	06-Jun-2020 15:35	06-Jun-2020 15:50
						VA20A8033-006	VA20A8033-007	VA20A8033-008	VA20A8033-009	VA20A8033-010
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		208	281	298	296	312
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		208	281	298	296	312
conductivity	----	E100	2.0	µS/cm		788	946	1190	1180	1220
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		386	492	638	633	658
pH	----	E108	0.10	pH units		8.02	8.01	7.87	7.82	7.89
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		515	640	834	835	873
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	8.6	11.6	6.2	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0062	0.0093	0.0116	0.0110	<0.0050
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		2.20	2.89	2.97	2.95	3.25
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		13.1	13.2	33.0	34.1	32.9
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		13.1	13.2	33.0	34.1	32.9
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0050 DLDS	0.0258	0.0191	0.0167	<0.0050 DLDS
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		160	193	235	234	258
Ion Balance										
anion sum	----	EC101	0.10	meq/L		8.50	10.6	13.3	13.3	14.0
cation sum	----	EC101	0.10	meq/L		8.60	11.0	13.6	13.5	14.1
ion balance (cation-anion difference)	----	EC101	0.010	%		0.585	1.85	1.12	0.746	0.356
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0028	0.0029	0.0014	0.0017	0.0022
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00034	0.00031	0.00024	0.00030	0.00024
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.137	0.0681	0.0728	0.0585	0.0757
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.022	0.030	0.020	0.020	0.020
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000250 DLM	<0.0000350 DLM	0.0000501	<0.0000150 DLM	<0.0000200 DLM
calcium, dissolved	7440-70-2	E421	0.050	mg/L		106	136	191	189	193

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	SS39	SS1	SS31	SS4	SS57
					Client sampling date / time	06-Jun-2020 10:10	06-Jun-2020 14:10	06-Jun-2020 15:15	06-Jun-2020 15:35	06-Jun-2020 15:50
						VA20A8033-006	VA20A8033-007	VA20A8033-008	VA20A8033-009	VA20A8033-010
						Result	Result	Result	Result	Result
Dissolved Metals										
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00010	<0.00010	<0.00010	<0.00010	<0.00010
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	0.00013	<0.00010	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.0369	0.0242	0.0706	0.0208	0.0190
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.034	<0.010	0.032	<0.010	<0.010
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0026	0.0032	0.0022	0.0024	0.0028
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		29.4	36.9	39.0	39.0	42.9
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0233	0.0278	0.161	0.0107	0.00453
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	0.0000060	0.0000054	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00637	0.00794	0.00402	0.00484	0.00630
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		4.18	5.83	5.87	6.44	6.62
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.00952	0.00474	0.0226	0.0230	0.0234
silicon, dissolved	7440-21-3	E421	0.050	mg/L		4.52	5.70	6.73	6.63	7.33
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	0.000015	0.000014	<0.000010	0.000016
sodium, dissolved	7440-23-5	E421	0.050	mg/L		18.2	22.6	16.6	16.5	17.9
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		1.60	2.32	1.16	1.17	1.55
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		58.6	70.5	87.6	86.4	92.1
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00303	0.00337	0.00591	0.00608	0.00529
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		<0.0010	0.0024	0.0016	<0.0010	<0.0010
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	SS29	SS21	SS56	SS28	SS53
					Client sampling date / time	06-Jun-2020 16:05	06-Jun-2020 16:25	06-Jun-2020 16:40	06-Jun-2020 16:55	07-Jun-2020 17:30
						VA20A8033-011	VA20A8033-012	VA20A8033-013	VA20A8033-014	VA20A8033-015
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		279	274	263	239	139
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	6.3
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	3.2
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		279	274	263	239	145
conductivity	----	E100	2.0	µS/cm		1270	1240	1230	1000	584
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		680	665	652	521	301
pH	----	E108	0.10	pH units		8.05	7.90	8.02	7.98	8.38
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		930	910	892	703	370
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	20.2	<3.0	16.6	13.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		<0.0050	0.0075	<0.0050	0.0704	0.0157
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		3.07	2.94	2.90	2.75	2.80
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		26.7	28.0	27.2	11.0	0.275
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		26.7	28.0	27.2	11.0	0.280
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0050 DLDS	<0.0050 DLDS	0.0051	0.0254	0.0046
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		348	330	328	277	163
Ion Balance										
anion sum	----	EC101	0.10	meq/L		14.8	14.4	14.1	11.4	6.40
cation sum	----	EC101	0.10	meq/L		15.0	14.7	14.4	11.7	6.53
ion balance (cation-anion difference)	----	EC101	0.010	%		0.671	1.03	1.05	1.30	1.00
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0017	0.0015	0.0032	0.0111	0.0082
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	0.00062
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00022	0.00017	0.00020	0.00035	0.00118
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0745	0.0557	0.0560	0.0584	0.0633
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.044	0.041	0.037	0.024	0.021
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000600 DLM	<0.0000250 DLM	<0.0000150 DLM	<0.0000200 DLM	<0.0000150 DLM
calcium, dissolved	7440-70-2	E421	0.050	mg/L		193	188	184	144	74.8

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	SS29	SS21	SS56	SS28	SS53
					Client sampling date / time	06-Jun-2020 16:05	06-Jun-2020 16:25	06-Jun-2020 16:40	06-Jun-2020 16:55	07-Jun-2020 17:30
						VA20A8033-011	VA20A8033-012	VA20A8033-013	VA20A8033-014	VA20A8033-015
						Result	Result	Result	Result	Result
Dissolved Metals										
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00013	0.00016
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00020	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.0383	0.0195	0.00312	0.0107	0.0402
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.035	<0.010	<0.010	0.015	0.017
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0034	0.0032	0.0031	0.0022	0.0026
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		47.8	47.5	46.8	38.9	27.8
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0182	0.00103	0.00068	0.0499	0.00409
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.0133	0.00956	0.0100	0.00535	0.00656
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	0.00073	0.00146
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		6.20	5.54	5.62	4.96	1.95
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.0225	0.0180	0.0178	0.00806	0.00439
silicon, dissolved	7440-21-3	E421	0.050	mg/L		6.28	6.67	6.53	5.88	0.244
silver, dissolved	7440-22-4	E421	0.000010	mg/L		0.000011	0.000016	<0.000010	<0.000010	0.000012
sodium, dissolved	7440-23-5	E421	0.050	mg/L		28.6	29.3	29.3	26.6	10.6
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		2.78	2.58	2.56	1.97	1.19
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		129	122	122	100	58.5
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	0.00039	0.00046
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00482	0.00432	0.00437	0.00188	0.00290
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	0.00097
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		<0.0010	<0.0010	<0.0010	0.0012	<0.0010
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	DUP	SS7	----	----	----
					Client sampling date / time	06-Jun-2020	05-Jun-2020 07:30	----	----	----
						VA20A8033-016	VA20A8033-017	--------	--------	--------
						Result	Result	----	----	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		219	189	----	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		219	189	----	----	----
conductivity	----	E100	2.0	µS/cm		483	1710	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		224	909	----	----	----
pH	----	E108	0.10	pH units		7.95	8.04	----	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		285	1340	----	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	12.4	----	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0460	0.0388	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.78	14.1	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.0240	46.2	----	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		<0.0500	46.2	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	0.0556	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		43.6	615	----	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		5.32	20.3	----	----	----
cation sum	----	EC101	0.10	meq/L		5.50	20.4	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		1.66	0.246	----	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0241	0.0041	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00119	0.00030	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0925	0.0479	----	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.097	0.065	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000400 DLM	0.000220	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		57.6	266	----	----	----

Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	DUP	SS7	----	----	----
					Client sampling date / time	06-Jun-2020	05-Jun-2020 07:30	----	----	----
Analyte	CAS Number	Method	LOR	Unit		VA20A8033-016	VA20A8033-017	--------	--------	--------
						Result	Result	----	----	----
Dissolved Metals										
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	----	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00020	0.00032	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00534	0.295	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.190	<0.010	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0041	0.0071	----	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		19.5	59.3	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.418	0.124	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.0232	0.00700	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00058	<0.00050	----	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	----	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		6.38	8.30	----	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.00286	0.0557	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		2.13	6.06	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	----	----	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		19.0	46.4	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		1.32	5.00	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		15.5	219	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		0.00093	<0.00060 DLM	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00189	0.00583	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		<0.0010	0.0045	----	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	----	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	----	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000243**	Page	: 1 of 4
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 26-May-2020 16:50
PO	: 232824	Date Analysis Commenced	: 29-May-2020
C-O-C number	: 2020-05-26 C	Issue Date	: 12-Jun-2020 09:49
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Bruna Botti	Analyst	Inorganics - Water Quality, Burnaby, British Columbia
Clarie Tejano		Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Shaneel Dayal	Metal Analyst	Metals, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Qualifiers

Qualifier	*Description*
RRV	*Reported result verified by repeat analysis.*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	SS101	----	----	----	----
					Client sampling date / time	25-May-2020 13:10	----	----	----	----
						WR2000243-001	--------	--------	--------	--------
						Result	----	----	----	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		35.3	----	----	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	----	----	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	----	----	----	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	----	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		35.3	----	----	----	----
conductivity	----	E100	2.0	µS/cm		105	----	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		43.0	----	----	----	----
pH	----	E108	0.10	pH units		7.32	----	----	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		64.4	----	----	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	----	----	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0056 RRV	----	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.57	----	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		1.88	----	----	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		1.92	----	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0400	----	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		9.44	----	----	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		1.05	----	----	----	----
cation sum	----	EC101	0.10	meq/L		1.01	----	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		1.94	----	----	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0223	----	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	----	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00029	----	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0227	----	----	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	----	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	----	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		<0.010	----	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000050	----	----	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	SS101	----	----	----	----
					Client sampling date / time	25-May-2020 13:10	----	----	----	----
						WR2000243-001	--------	--------	--------	--------
						Result	----	----	----	----
Dissolved Metals										
calcium, dissolved	7440-70-2	E421	0.050	mg/L		13.5	----	----	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	----	----	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	----	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00883	----	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.017	----	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	----	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		<0.0010	----	----	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		2.27	----	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.00365	----	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	----	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00298	----	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	----	----	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	----	----	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		1.52	----	----	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000157	----	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		1.82	----	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	----	----	----	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		2.56	----	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.0821	----	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		3.43	----	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	----	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	----	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		0.00154	----	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000238	----	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	----	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		<0.0010	----	----	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	----	----	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	----	----	----	----
dissolved metals filtration location	----	EP421	-	-		Field	----	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000263**	Page	: 1 of 6
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: ----	Date Samples Received	: 02-Jun-2020 14:40
PO	: 232824	Date Analysis Commenced	: 04-Jun-2020
C-O-C number	: 2020-06-02 C	Issue Date	: 16-Jun-2020 14:12
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 9		
No. of samples analysed	: 9		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Clarie Tejano		Metals, Burnaby, British Columbia
Dee Lee	Analsyt	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Inorganics - Water Quality, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Workorder Comments

Water sample SS22 for mercury analysis was not submitted in glass or PTFE container with HCl preservative. Results may be biased low.

Qualifiers

Qualifier	*Description*
DLA	*Detection Limit adjusted for required dilution.*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	SS51	SS52	SS44	SS22	SS13
					Client sampling date / time	30-May-2020 14:50	30-May-2020 15:05	30-May-2020 15:25	30-May-2020 15:35	30-May-2020 16:00
						WR2000263-001	WR2000263-002	WR2000263-003	WR2000263-004	WR2000263-005
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		91.3	137	146	257	264
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		91.3	137	146	257	264
conductivity	----	E100	2.0	µS/cm		414	491	469	823	989
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		209	259	229	434	543
pH	----	E108	0.10	pH units		7.25	7.48	7.55	7.71	7.90
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		268	320	300	565	698
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		51.3	3.5	6.9	120	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0209	0.0526	0.0676	0.0059	0.0696
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.56	1.09	1.04	0.60	2.16
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.0142	1.38	0.0276	<0.0050	20.0
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		<0.0500	1.44	<0.0500	<0.0500	20.1
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0027	0.0527	0.0013	0.0018	0.0926
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		112	118	108	214	209
Ion Balance										
anion sum	----	EC101	0.10	meq/L		4.18	5.32	5.19	9.62	11.1
cation sum	----	EC101	0.10	meq/L		4.76	5.69	5.23	9.69	11.8
ion balance (cation-anion difference)	----	EC101	0.010	%		6.49	3.36	0.384	0.362	3.06
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0106	0.0070	0.0085	0.0106	0.0017
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00077	0.00032	0.00032	0.00041	0.00031
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0749	0.0746	0.0566	0.0769	0.0652
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	0.026
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000576	0.0000059	0.0000212	0.000131	0.000107

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	SS51	SS52	SS44	SS22	SS13
					Client sampling date / time	30-May-2020 14:50	30-May-2020 15:05	30-May-2020 15:25	30-May-2020 15:35	30-May-2020 16:00
						WR2000263-001	WR2000263-002	WR2000263-003	WR2000263-004	WR2000263-005
						Result	Result	Result	Result	Result
Dissolved Metals										
calcium, dissolved	7440-70-2	E421	0.050	mg/L		56.0	71.2	56.3	121	160
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00032	<0.00010	<0.00010	<0.00010	<0.00010
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00069	0.00038	0.00011	0.00013	0.00073
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.0111	0.00814	0.00458	0.137	0.219
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.803	0.048	0.066	0.019	0.010
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		<0.0010	0.0015	0.0027	0.0041	0.0041
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		16.9	19.7	21.5	32.0	35.0
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.355	0.247	0.302	0.192	0.619
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00159	0.00165	0.00106	0.00190	0.0180
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00078	<0.00050	<0.00050	<0.00050	0.00060
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		0.088	0.053	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		2.57	3.56	3.70	7.52	12.5
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.00112	0.00206	0.00202	0.000684	0.0162
silicon, dissolved	7440-21-3	E421	0.050	mg/L		4.90	3.22	3.26	6.02	5.91
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	0.000027	0.000035
sodium, dissolved	7440-23-5	E421	0.050	mg/L		10.4	9.46	12.2	18.6	15.0
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.507	0.614	0.815	2.75	3.00
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		43.2	44.0	39.0	78.2	76.2
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		0.00084	<0.00030	0.00037	0.00164	<0.00030
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000061	0.000172	0.000059	0.000214	0.00446
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00067	<0.00050	<0.00050	<0.00050	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0020	<0.0010	<0.0010	0.0028	0.0049
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	DUP	LP1	LP2	DUP	----
					Client sampling date / time	30-May-2020	01-Jun-2020 14:00	01-Jun-2020 14:20	01-Jun-2020	----
						WR2000263-006	WR2000263-007	WR2000263-008	WR2000263-009	--------
						Result	Result	Result	Result	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		263	45.0	41.7	44.8	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		263	45.0	41.7	44.8	----
conductivity	----	E100	2.0	µS/cm		991	2270	661	2300	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		538	1340	346	1340	----
pH	----	E108	0.10	pH units		7.88	7.42	7.24	7.46	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		696	1970	443	1980	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	<3.0	<3.0	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0694	0.0084	0.0529	<0.0050	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		2.17	5.07	0.33	5.04	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		20.0	33.1	4.53	33.5	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		20.1	33.2	4.55	33.6	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0909	0.0377	0.0184	0.0338	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		210	1240	271	1250	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		11.1	29.2	6.80	29.5	----
cation sum	----	EC101	0.10	meq/L		11.8	28.8	7.40	28.6	----
ion balance (cation-anion difference)	----	EC101	0.010	%		3.06	0.690	4.22	1.55	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0012	0.0036	0.0042	0.0077	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	0.00027	0.00016	0.00026	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00030	0.00040	0.00032	0.00037	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0659	0.0235	0.0175	0.0237	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000040 DLA	<0.000020	<0.000040 DLA	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000100 DLA	<0.000050	<0.000100 DLA	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.026	0.055	0.089	0.055	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000931	<0.0000450 DLM	0.0000542	<0.0000450 DLM	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		158	408	69.4	406	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	DUP	LP1	LP2	DUP	----
					Client sampling date / time	30-May-2020	01-Jun-2020 14:00	01-Jun-2020 14:20	01-Jun-2020	----
						WR2000263-006	WR2000263-007	WR2000263-008	WR2000263-009	--------
						Result	Result	Result	Result	----
Dissolved Metals										
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00020 DLA	<0.00010	<0.00020 DLA	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00073	<0.00020 DLA	<0.00010	<0.00020 DLA	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.225	0.0222	0.0209	0.0228	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.010	<0.020 DLA	<0.010	<0.020 DLA	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000100 DLA	0.000057	<0.000100 DLA	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0041	0.0050	0.0094	0.0049	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		34.7	79.6	41.8	78.8	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.607	0.00204	0.0404	0.00246	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.0179	0.0453	0.0142	0.0460	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00060	<0.00100 DLA	<0.00050	<0.00100 DLA	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.100 DLA	<0.050	<0.100 DLA	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		12.6	13.1	4.63	13.1	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.0159	0.248	0.0719	0.246	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		5.85	5.76	1.09	5.58	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		0.000035	<0.000020 DLA	<0.000010	<0.000020 DLA	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		14.8	35.5	8.29	35.2	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		3.03	3.75	2.05	3.79	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		75.2	477	102	476	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000020 DLA	<0.000010	<0.000020 DLA	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00020 DLA	<0.00010	<0.00020 DLA	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00060 DLA	<0.00030	<0.00060 DLA	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00443	0.00276	0.000128	0.00269	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00100 DLA	<0.00050	<0.00100 DLA	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0049	0.0033	0.0362	0.0065	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00040 DLA	<0.00020	<0.00040 DLA	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000280**	Page	: 1 of 4
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 05-Jun-2020 12:25
PO	: 232824	Date Analysis Commenced	: 09-Jun-2020
C-O-C number	: 2020-05-05 A	Issue Date	: 16-Jun-2020 14:17
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 4		
No. of samples analysed	: 4		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Bruna Botti	Analyst	Inorganics - Water Quality, Burnaby, British Columbia
Clarie Tejano		Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	SS32	SS105	SS5	SS6	----
					Client sampling date / time	03-Jun-2020 09:40	04-Jun-2020 08:20	04-Jun-2020 09:10	04-Jun-2020 10:45	----
						WR2000280-001	WR2000280-002	WR2000280-003	WR2000280-004	--------
						Result	Result	Result	Result	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		98.2	267	264	168	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		98.2	267	264	168	----
conductivity	----	E100	2.0	µS/cm		202	1670	1670	1610	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		96.0	889	903	868	----
pH	----	E108	0.10	pH units		7.73	7.70	7.68	8.09	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		123	1290	1300	1260	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	57.4	16.0	51.8	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		<0.0050	0.206	0.169	0.0576	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.32	13.8	13.9	12.9	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.334	54.1	53.9	47.9	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		0.334	54.3	54.2	47.9	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	0.276	0.233	0.0540	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		5.91	487	486	556	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		2.12	19.7	19.6	18.7	----
cation sum	----	EC101	0.10	meq/L		2.10	20.2	20.6	19.4	----
ion balance (cation-anion difference)	----	EC101	0.010	%		0.474	1.25	2.49	1.84	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0018	0.0030	0.0052	0.0041	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00012	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00015	0.00029	0.00030	0.00029	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0177	0.106	0.0882	0.0499	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	0.000021	<0.000020	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		<0.010	0.084	0.087	0.053	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000090	0.000557	0.000472	0.000110	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	SS32	SS105	SS5	SS6	----
					Client sampling date / time	03-Jun-2020 09:40	04-Jun-2020 08:20	04-Jun-2020 09:10	04-Jun-2020 10:45	----
						WR2000280-001	WR2000280-002	WR2000280-003	WR2000280-004	--------
						Result	Result	Result	Result	----
Dissolved Metals										
calcium, dissolved	7440-70-2	E421	0.050	mg/L		30.2	258	259	257	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	0.00016	<0.00010	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	0.00019	0.00014	0.00017	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00077	0.186	0.192	0.168	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	0.012	0.026	<0.010	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		<0.0010	0.0054	0.0056	0.0066	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		4.99	59.5	62.2	55.1	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.00023	0.655	0.609	0.0930	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00264	0.0117	0.0120	0.00783	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	0.00055	0.00053	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		1.21	7.34	7.65	7.60	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000208	0.0421	0.0422	0.0550	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		6.27	5.86	5.83	6.04	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	0.000049	0.000041	<0.000010	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		3.36	50.3	52.2	41.4	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.150	6.00	6.05	3.97	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		1.47	169	169	203	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	0.00039	0.00038	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000374	0.00618	0.00625	0.00905	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		<0.0010	0.0036	0.0136	0.0034	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000349**	Page	: 1 of 4
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 16-Jun-2020 14:15
PO	: ----	Date Analysis Commenced	: 18-Jun-2020
C-O-C number	: 6/16/2020-D	Issue Date	: 28-Jun-2020 15:47
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 2		
No. of samples analysed	: 2		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Aaron Yu	Laboratory Analyst	Metals, Burnaby, British Columbia
Clarie Tejano		Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Kinny Wu	Laboratory Analyst	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Qualifiers

Qualifier	*Description*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	SS106	SS105	----	----	----
					Client sampling date / time	12-Jun-2020 11:40	12-Jun-2020 17:00	----	----	----
						WR2000349-001	WR2000349-002	--------	--------	--------
						Result	Result	----	----	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		105	130	----	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		105	130	----	----	----
conductivity	----	E100	2.0	µS/cm		371	599	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		155	293	----	----	----
pH	----	E108	0.10	pH units		7.95	7.68	----	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		226	389	----	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		7.3	17.5	----	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0598	0.128	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		1.78	4.30	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		5.27	9.47	----	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		5.69	9.82	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.413	0.349	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		61.0	138	----	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		3.83	6.30	----	----	----
cation sum	----	EC101	0.10	meq/L		3.67	6.66	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		2.13	2.78	----	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0065	0.0346	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00034	0.00084	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0733	0.116	----	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.026	0.011	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000250 DLM	0.0000337	----	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	SS106	SS105	----	----	----
					Client sampling date / time	12-Jun-2020 11:40	12-Jun-2020 17:00	----	----	----
						WR2000349-001	WR2000349-002	--------	--------	--------
						Result	Result	----	----	----
Dissolved Metals										
calcium, dissolved	7440-70-2	E421	0.050	mg/L		33.8	59.9	----	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00012	0.00046	----	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	0.00046	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.0317	0.105	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	0.091	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0028	0.0026	----	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		17.1	34.9	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0424	0.178	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		0.0000053	<0.0000050	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.0209	0.0214	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	0.00152	----	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	----	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		3.72	7.05	----	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.0124	0.0147	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		3.62	3.59	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	0.000036	----	----	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		10.8	13.4	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.536	0.591	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		17.9	45.4	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	0.00166	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00126	0.00174	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00067	0.00090	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0016	0.0024	----	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	0.00055	----	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	----	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000833**	Page	: 1 of 6
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 08-Sep-2020 16:10
PO	: 232824 (Seepage)	Date Analysis Commenced	: 11-Sep-2020
C-O-C number	: 2020-08-09 B	Issue Date	: 17-Sep-2020 13:20
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 10		
No. of samples analysed	: 10		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Angelo Salandanan	Lab Assistant	Metals, Burnaby, British Columbia
Bruna Botti	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Cristina Alexandre	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Qualifiers

Qualifier	*Description*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	SS32	SS105	SS5	SS33	SS8
					Client sampling date / time	03-Sep-2020 09:06	03-Sep-2020 10:10	03-Sep-2020 11:00	03-Sep-2020 11:30	04-Sep-2020 09:10
						WR2000833-001	WR2000833-002	WR2000833-003	WR2000833-004	WR2000833-005
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		106	342	236	229	204
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		106	342	236	229	204
conductivity	----	E100	2.0	µS/cm		214	1950	1670	1670	1880
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		98.4	1030	805	835	971
pH	----	E108	0.10	pH units		7.99	8.16	7.74	7.83	7.93
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		131	1500	1210	1220	1430
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	8.6	<3.0	244	8.6
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		<0.0050	0.0890	0.123	0.127	<0.0050
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.43	23.4	30.8	31.5	36.7
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.351	60.5	50.2	49.3	51.6
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		0.351	60.6	50.4	49.4	51.6
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	0.118	0.162	0.162	<0.0050 DLDS
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		6.49	553	456	459	620
Ion Balance										
anion sum	----	EC101	0.10	meq/L		2.30	23.4	18.7	18.5	21.7
cation sum	----	EC101	0.10	meq/L		2.16	23.1	18.4	19.2	21.8
ion balance (cation-anion difference)	----	EC101	0.010	%		3.14	0.645	0.809	1.86	0.230
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		<0.0010	0.0018	0.0032	0.0059	0.0028
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00013	0.00041	0.00031	0.00037	0.00027
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0174	0.107	0.109	0.117	0.0441
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		<0.010	0.080	0.094	0.098	0.107
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000071	0.000636	0.000522	0.000522	0.0000900

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	SS32	SS105	SS5	SS33	SS8
					Client sampling date / time	03-Sep-2020 09:06	03-Sep-2020 10:10	03-Sep-2020 11:00	03-Sep-2020 11:30	04-Sep-2020 09:10
						WR2000833-001	WR2000833-002	WR2000833-003	WR2000833-004	WR2000833-005
						Result	Result	Result	Result	Result
Dissolved Metals										
calcium, dissolved	7440-70-2	E421	0.050	mg/L		31.1	302	233	239	290
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	0.00012	<0.00010	0.00012	0.00013
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	0.00026	0.00012	0.00012	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00078	0.227	0.158	0.168	0.0666
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	0.041	0.010	<0.010	<0.010
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		<0.0010	0.0065	0.0075	0.0078	0.0079
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		5.05	67.1	54.3	58.1	59.9
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.00043	0.964	0.350	0.360	0.00264
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	0.0000113	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00310	0.0108	0.0118	0.0123	0.00583
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	0.00092	0.00060	0.00060	<0.00050
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		1.25	8.95	7.81	7.86	8.38
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000193	0.108	0.0476	0.0468	0.0600
silicon, dissolved	7440-21-3	E421	0.050	mg/L		6.45	6.74	5.66	5.77	5.99
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	0.000111	0.000014	0.000017	0.000013
sodium, dissolved	7440-23-5	E421	0.050	mg/L		3.63	50.6	48.6	51.5	50.1
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.162	5.72	6.06	6.26	5.56
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		2.10	220	177	182	246
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	0.00042	0.00038	<0.00030
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000409	0.0102	0.00524	0.00518	0.00521
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00059	0.00062	<0.00050	<0.00050	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0010	0.0037	0.0032	0.0026	0.0019
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	SS106	SS44	SS13	SS31	DUP
					Client sampling date / time	04-Sep-2020 10:30	05-Sep-2020 11:30	05-Sep-2020 12:00	05-Sep-2020 12:20	05-Sep-2020
						WR2000833-006	WR2000833-007	WR2000833-008	WR2000833-009	WR2000833-010
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		250	117	328	313	118
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		250	117	328	313	118
conductivity	----	E100	2.0	µS/cm		602	771	1270	1200	788
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		291	373	734	682	376
pH	----	E108	0.10	pH units		7.86	7.48	7.89	7.92	7.44
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		372	535	975	881	549
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	<3.0	<3.0	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0169	0.0060	0.217	0.0120	<0.0050
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.46	0.76	1.74	2.50	0.83
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		<0.0050	0.188	0.442	26.2	0.209
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		<0.0051	0.189	0.478	26.3	0.220
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	<0.0050 DLDS	0.0363	0.0305	0.0110
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		80.6	298	447	287	310
Ion Balance										
anion sum	----	EC101	0.10	meq/L		6.69	8.58	16.0	14.2	8.86
cation sum	----	EC101	0.10	meq/L		6.88	8.49	16.0	14.4	8.55
ion balance (cation-anion difference)	----	EC101	0.010	%		1.40	0.527	<0.010	0.699	1.78
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		<0.0010	0.0071	0.0040	0.0052	0.0076
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		0.00017	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00026	0.00013	0.00059	0.00019	0.00015
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.132	0.0636	0.179	0.100	0.0687
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.110	0.012	0.024	0.019	<0.010
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000200 DLM	0.0000090	0.000244	0.0000544	0.0000206
calcium, dissolved	7440-70-2	E421	0.050	mg/L		76.9	91.4	222	203	91.2

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	SS106	SS44	SS13	SS31	DUP
					Client sampling date / time	04-Sep-2020 10:30	05-Sep-2020 11:30	05-Sep-2020 12:00	05-Sep-2020 12:20	05-Sep-2020
						WR2000833-006	WR2000833-007	WR2000833-008	WR2000833-009	WR2000833-010
						Result	Result	Result	Result	Result
Dissolved Metals										
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00010	<0.00010
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	0.00869	0.00011	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.0151	0.00206	0.200	0.0669	0.00262
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	<0.010	0.314	0.041	<0.010
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0052	0.0034	0.0034	0.0020	0.0034
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		24.0	35.3	43.5	42.1	35.9
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0299	0.0327	5.25	0.180	0.0379
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.0167	0.000258	0.0182	0.00328	0.000244
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	<0.00050	0.00132	<0.00050	<0.00050
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		6.96	3.96	10.2	5.58	4.05
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.00217	0.00580	0.00499	0.0188	0.00526
silicon, dissolved	7440-21-3	E421	0.050	mg/L		4.60	4.92	9.37	7.33	5.02
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	0.000083	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		20.4	21.2	20.3	15.8	21.4
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		1.23	1.44	2.50	1.16	1.50
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		31.0	114	173	112	114
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	0.00031	0.00059	0.00031
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00446	0.000036	0.00413	0.00612	0.000035
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00062	<0.00050	0.00075	<0.00050	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		<0.0010	<0.0010	0.0063	0.0025	0.0022
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WR2000833**	Page	: 1 of 21
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 08-Sep-2020 16:10
PO	: 232824 (Seepage)	Issue Date	: 17-Sep-2020 13:20
C-O-C number	: 2020-08-09 B		
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 10		
No. of samples analysed	: 10		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Matrix Spike outliers occur.
- Laboratory Control Sample (LCS) outliers occur - please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **Water**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Laboratory Control Sample (LCS) Recoveries								
Physical Tests	QC-85668-002	----	alkalinity, phenolphthalein (as CaCO3)	----	E290	129 % LCS-H	75.0-125%	Recovery greater than upper control limit

Result Qualifiers

Qualifier	Description
LCS-H	*Lab Control Sample recovery was above ALS DQO. Non-detected sample results are considered reliable. Other results, if reported, have been qualified.*

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
DUP	E298	05-Sep-2020	----	----	----		15-Sep-2020	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
SS13	E298	05-Sep-2020	----	----	----		15-Sep-2020	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
SS31	E298	05-Sep-2020	----	----	----		15-Sep-2020	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
SS44	E298	05-Sep-2020	----	----	----		15-Sep-2020	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
SS106	E298	04-Sep-2020	----	----	----		15-Sep-2020	28 days	11 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
SS8	E298	04-Sep-2020	----	----	----		15-Sep-2020	28 days	11 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
SS105	E298	03-Sep-2020	----	----	----		15-Sep-2020	28 days	12 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) SS32	E298	03-Sep-2020	----	----	----		15-Sep-2020	28 days	12 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) SS33	E298	03-Sep-2020	----	----	----		15-Sep-2020	28 days	12 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) SS5	E298	03-Sep-2020	----	----	----		15-Sep-2020	28 days	12 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE SS8	E235.Cl-L	04-Sep-2020	----	----	----		15-Sep-2020	28 days	10 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE SS105	E235.Cl-L	03-Sep-2020	----	----	----		15-Sep-2020	28 days	11 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE SS32	E235.Cl-L	03-Sep-2020	----	----	----		15-Sep-2020	28 days	11 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE SS33	E235.Cl-L	03-Sep-2020	----	----	----		15-Sep-2020	28 days	11 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE SS5	E235.Cl-L	03-Sep-2020	----	----	----		15-Sep-2020	28 days	11 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE DUP	E235.Cl-L	05-Sep-2020	----	----	----		11-Sep-2020	28 days	5 days	✓

Matrix: **Water**

Evaluation: ✖ = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE SS13	E235.Cl-L	05-Sep-2020	----	----	----		11-Sep-2020	28 days	5 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE SS31	E235.Cl-L	05-Sep-2020	----	----	----		11-Sep-2020	28 days	5 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE SS44	E235.Cl-L	05-Sep-2020	----	----	----		11-Sep-2020	28 days	5 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE SS106	E235.Cl-L	04-Sep-2020	----	----	----		11-Sep-2020	28 days	6 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE SS8	E235.NO3-L	04-Sep-2020	----	----	----		15-Sep-2020	3 days	10 days	✖ EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE SS105	E235.NO3-L	03-Sep-2020	----	----	----		15-Sep-2020	3 days	11 days	✖ EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE SS32	E235.NO3-L	03-Sep-2020	----	----	----		15-Sep-2020	3 days	11 days	✖ EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE SS33	E235.NO3-L	03-Sep-2020	----	----	----		15-Sep-2020	3 days	11 days	✖ EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE SS5	E235.NO3-L	03-Sep-2020	----	----	----		15-Sep-2020	3 days	11 days	✖ EHTR

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE DUP	E235.NO3-L	05-Sep-2020	----	----	----		11-Sep-2020	3 days	5 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE SS13	E235.NO3-L	05-Sep-2020	----	----	----		11-Sep-2020	3 days	5 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE SS31	E235.NO3-L	05-Sep-2020	----	----	----		11-Sep-2020	3 days	5 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE SS44	E235.NO3-L	05-Sep-2020	----	----	----		11-Sep-2020	3 days	5 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE SS106	E235.NO3-L	04-Sep-2020	----	----	----		11-Sep-2020	3 days	6 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE SS8	E235.NO2-L	04-Sep-2020	----	----	----		15-Sep-2020	3 days	10 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE SS105	E235.NO2-L	03-Sep-2020	----	----	----		15-Sep-2020	3 days	11 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE SS32	E235.NO2-L	03-Sep-2020	----	----	----		15-Sep-2020	3 days	11 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE SS33	E235.NO2-L	03-Sep-2020	----	----	----		15-Sep-2020	3 days	11 days	× EHTR

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE SS5	E235.NO2-L	03-Sep-2020	----	----	----		15-Sep-2020	3 days	11 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE DUP	E235.NO2-L	05-Sep-2020	----	----	----		11-Sep-2020	3 days	5 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE SS13	E235.NO2-L	05-Sep-2020	----	----	----		11-Sep-2020	3 days	5 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE SS31	E235.NO2-L	05-Sep-2020	----	----	----		11-Sep-2020	3 days	5 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE SS44	E235.NO2-L	05-Sep-2020	----	----	----		11-Sep-2020	3 days	5 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE SS106	E235.NO2-L	04-Sep-2020	----	----	----		11-Sep-2020	3 days	6 days	× EHTR
Anions and Nutrients : Sulfate in Water by IC										
HDPE SS8	E235.SO4	04-Sep-2020	----	----	----		15-Sep-2020	28 days	10 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE SS105	E235.SO4	03-Sep-2020	----	----	----		15-Sep-2020	28 days	11 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE SS32	E235.SO4	03-Sep-2020	----	----	----		15-Sep-2020	28 days	11 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
SS33	E235.SO4	03-Sep-2020	----	----	----		15-Sep-2020	28 days	11 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
SS5	E235.SO4	03-Sep-2020	----	----	----		15-Sep-2020	28 days	11 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
DUP	E235.SO4	05-Sep-2020	----	----	----		11-Sep-2020	28 days	5 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
SS13	E235.SO4	05-Sep-2020	----	----	----		11-Sep-2020	28 days	5 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
SS31	E235.SO4	05-Sep-2020	----	----	----		11-Sep-2020	28 days	5 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
SS44	E235.SO4	05-Sep-2020	----	----	----		11-Sep-2020	28 days	5 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
SS106	E235.SO4	04-Sep-2020	----	----	----		11-Sep-2020	28 days	6 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
SS106	E421.Cr-L	04-Sep-2020	15-Sep-2020	180 days	10 days	✓	15-Sep-2020	169 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
SS8	E421.Cr-L	04-Sep-2020	15-Sep-2020	180 days	10 days	✓	15-Sep-2020	169 days	0 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) SS105	E421.Cr-L	03-Sep-2020	15-Sep-2020	180 days	11 days	✓	15-Sep-2020	168 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) SS32	E421.Cr-L	03-Sep-2020	15-Sep-2020	180 days	11 days	✓	15-Sep-2020	168 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) SS33	E421.Cr-L	03-Sep-2020	15-Sep-2020	180 days	11 days	✓	15-Sep-2020	168 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) SS5	E421.Cr-L	03-Sep-2020	15-Sep-2020	180 days	11 days	✓	15-Sep-2020	168 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) DUP	E421.Cr-L	05-Sep-2020	15-Sep-2020	180 days	9 days	✓	15-Sep-2020	170 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) SS13	E421.Cr-L	05-Sep-2020	15-Sep-2020	180 days	9 days	✓	15-Sep-2020	170 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) SS31	E421.Cr-L	05-Sep-2020	15-Sep-2020	180 days	9 days	✓	15-Sep-2020	170 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) SS44	E421.Cr-L	05-Sep-2020	15-Sep-2020	180 days	9 days	✓	15-Sep-2020	170 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) SS13	E509	05-Sep-2020	15-Sep-2020	28 days	10 days	✓	15-Sep-2020	17 days	0 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) SS44	E509	05-Sep-2020	15-Sep-2020	28 days	10 days	✓	15-Sep-2020	17 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) SS106	E509	04-Sep-2020	15-Sep-2020	28 days	11 days	✓	15-Sep-2020	16 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) SS8	E509	04-Sep-2020	15-Sep-2020	28 days	11 days	✓	15-Sep-2020	16 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) SS105	E509	03-Sep-2020	15-Sep-2020	28 days	12 days	✓	15-Sep-2020	15 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) SS32	E509	03-Sep-2020	15-Sep-2020	28 days	12 days	✓	15-Sep-2020	15 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) SS33	E509	03-Sep-2020	15-Sep-2020	28 days	12 days	✓	15-Sep-2020	15 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) SS5	E509	03-Sep-2020	15-Sep-2020	28 days	12 days	✓	15-Sep-2020	15 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) DUP	E509	05-Sep-2020	15-Sep-2020	28 days	9 days	✓	15-Sep-2020	18 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) SS31	E509	05-Sep-2020	15-Sep-2020	28 days	9 days	✓	15-Sep-2020	18 days	0 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) SS106	E421	04-Sep-2020	15-Sep-2020	180 days	10 days	✓	15-Sep-2020	169 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) SS8	E421	04-Sep-2020	15-Sep-2020	180 days	10 days	✓	15-Sep-2020	169 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) SS105	E421	03-Sep-2020	15-Sep-2020	180 days	11 days	✓	15-Sep-2020	168 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) SS32	E421	03-Sep-2020	15-Sep-2020	180 days	11 days	✓	15-Sep-2020	168 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) SS33	E421	03-Sep-2020	15-Sep-2020	180 days	11 days	✓	15-Sep-2020	168 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) SS5	E421	03-Sep-2020	15-Sep-2020	180 days	11 days	✓	15-Sep-2020	168 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) DUP	E421	05-Sep-2020	15-Sep-2020	180 days	9 days	✓	15-Sep-2020	170 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) SS13	E421	05-Sep-2020	15-Sep-2020	180 days	9 days	✓	15-Sep-2020	170 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) SS31	E421	05-Sep-2020	15-Sep-2020	180 days	9 days	✓	15-Sep-2020	170 days	0 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) SS44	E421	05-Sep-2020	15-Sep-2020	180 days	9 days	✓	15-Sep-2020	170 days	0 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE SS8	E290	04-Sep-2020	----	----	----		15-Sep-2020	14 days	10 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE SS105	E290	03-Sep-2020	----	----	----		15-Sep-2020	14 days	11 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE SS32	E290	03-Sep-2020	----	----	----		15-Sep-2020	14 days	11 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE SS33	E290	03-Sep-2020	----	----	----		15-Sep-2020	14 days	11 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE SS5	E290	03-Sep-2020	----	----	----		15-Sep-2020	14 days	11 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE DUP	E290	05-Sep-2020	----	----	----		11-Sep-2020	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE SS13	E290	05-Sep-2020	----	----	----		11-Sep-2020	14 days	6 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE SS31	E290	05-Sep-2020	----	----	----		11-Sep-2020	14 days	6 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE SS44	E290	05-Sep-2020	----	----	----		11-Sep-2020	14 days	6 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE SS106	E290	04-Sep-2020	----	----	----		11-Sep-2020	14 days	7 days	✓
Physical Tests : Conductivity in Water										
HDPE SS8	E100	04-Sep-2020	----	----	----		15-Sep-2020	28 days	10 days	✓
Physical Tests : Conductivity in Water										
HDPE SS105	E100	03-Sep-2020	----	----	----		15-Sep-2020	28 days	11 days	✓
Physical Tests : Conductivity in Water										
HDPE SS32	E100	03-Sep-2020	----	----	----		15-Sep-2020	28 days	11 days	✓
Physical Tests : Conductivity in Water										
HDPE SS33	E100	03-Sep-2020	----	----	----		15-Sep-2020	28 days	11 days	✓
Physical Tests : Conductivity in Water										
HDPE SS5	E100	03-Sep-2020	----	----	----		15-Sep-2020	28 days	11 days	✓
Physical Tests : Conductivity in Water										
HDPE DUP	E100	05-Sep-2020	----	----	----		11-Sep-2020	28 days	5 days	✓
Physical Tests : Conductivity in Water										
HDPE SS13	E100	05-Sep-2020	----	----	----		11-Sep-2020	28 days	6 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Conductivity in Water										
HDPE SS31	E100	05-Sep-2020	----	----	----		11-Sep-2020	28 days	6 days	✓
Physical Tests : Conductivity in Water										
HDPE SS44	E100	05-Sep-2020	----	----	----		11-Sep-2020	28 days	6 days	✓
Physical Tests : Conductivity in Water										
HDPE SS106	E100	04-Sep-2020	----	----	----		11-Sep-2020	28 days	7 days	✓
Physical Tests : pH by Meter										
HDPE DUP	E108	05-Sep-2020	----	----	----		11-Sep-2020	0.25 hrs	141 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE SS13	E108	05-Sep-2020	----	----	----		11-Sep-2020	0.25 hrs	144 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE SS31	E108	05-Sep-2020	----	----	----		11-Sep-2020	0.25 hrs	144 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE SS44	E108	05-Sep-2020	----	----	----		11-Sep-2020	0.25 hrs	145 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE SS106	E108	04-Sep-2020	----	----	----		11-Sep-2020	0.25 hrs	170 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE SS8	E108	04-Sep-2020	----	----	----		15-Sep-2020	0.25 hrs	262 hrs	× EHTR-FM

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : pH by Meter										
HDPE SS33	E108	03-Sep-2020	----	----	----		15-Sep-2020	0.25 hrs	284 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE SS105	E108	03-Sep-2020	----	----	----		15-Sep-2020	0.25 hrs	285 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE SS5	E108	03-Sep-2020	----	----	----		15-Sep-2020	0.25 hrs	285 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE SS32	E108	03-Sep-2020	----	----	----		15-Sep-2020	0.25 hrs	287 hrs	× EHTR-FM
Physical Tests : TSS by Gravimetry										
HDPE DUP	E160-H	05-Sep-2020	----	----	----		11-Sep-2020	7 days	5 days	✓
Physical Tests : TSS by Gravimetry										
HDPE SS13	E160-H	05-Sep-2020	----	----	----		11-Sep-2020	7 days	5 days	✓
Physical Tests : TSS by Gravimetry										
HDPE SS31	E160-H	05-Sep-2020	----	----	----		11-Sep-2020	7 days	5 days	✓
Physical Tests : TSS by Gravimetry										
HDPE SS44	E160-H	05-Sep-2020	----	----	----		11-Sep-2020	7 days	5 days	✓
Physical Tests : TSS by Gravimetry										
HDPE SS106	E160-H	04-Sep-2020	----	----	----		11-Sep-2020	7 days	6 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TSS by Gravimetry										
HDPE SS8	E160-H	04-Sep-2020	----	----	----		11-Sep-2020	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE SS105	E160-H	03-Sep-2020	----	----	----		11-Sep-2020	7 days	7 days	✓
Physical Tests : TSS by Gravimetry										
HDPE SS32	E160-H	03-Sep-2020	----	----	----		11-Sep-2020	7 days	7 days	✓
Physical Tests : TSS by Gravimetry										
HDPE SS33	E160-H	03-Sep-2020	----	----	----		11-Sep-2020	7 days	7 days	✓
Physical Tests : TSS by Gravimetry										
HDPE SS5	E160-H	03-Sep-2020	----	----	----		11-Sep-2020	7 days	7 days	✓

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	84453	2	12	16.6	5.0	✓
Ammonia by Fluorescence	E298	86154	1	15	6.6	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	84447	2	12	16.6	5.0	✓
Conductivity in Water	E100	84455	2	12	16.6	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	85786	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	85970	2	35	5.7	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	85787	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	84445	2	22	9.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	84446	2	22	9.0	5.0	✓
pH by Meter	E108	84454	2	12	16.6	5.0	✓
Sulfate in Water by IC	E235.SO4	84444	2	20	10.0	5.0	✓
TSS by Gravimetry	E160-H	84376	1	20	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	84453	2	12	16.6	5.0	✓
Ammonia by Fluorescence	E298	86154	1	15	6.6	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	84447	2	12	16.6	5.0	✓
Conductivity in Water	E100	84455	2	12	16.6	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	85786	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	85970	2	35	5.7	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	85787	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	84445	2	22	9.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	84446	2	22	9.0	5.0	✓
pH by Meter	E108	84454	2	12	16.6	5.0	✓
Sulfate in Water by IC	E235.SO4	84444	2	20	10.0	5.0	✓
TSS by Gravimetry	E160-H	84376	1	20	5.0	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	84453	2	12	16.6	5.0	✓
Ammonia by Fluorescence	E298	86154	1	15	6.6	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	84447	2	12	16.6	5.0	✓
Conductivity in Water	E100	84455	2	12	16.6	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	85786	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	85970	2	35	5.7	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	85787	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	84445	2	22	9.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	84446	2	22	9.0	5.0	✓
Sulfate in Water by IC	E235.SO4	84444	2	20	10.0	5.0	✓
TSS by Gravimetry	E160-H	84376	1	20	5.0	5.0	✓

Matrix: **Water**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	86154	1	15	6.6	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	84447	2	12	16.6	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	85786	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	85970	2	35	5.7	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	85787	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	84445	2	22	9.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	84446	2	22	9.0	5.0	✓
Sulfate in Water by IC	E235.SO4	84444	2	20	10.0	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
TSS by Gravimetry	E160-H Vancouver - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
Chloride in Water by IC (Low Level)	E235.Cl-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Vancouver - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Ion Balance using Dissolved Metals	EC101 Vancouver - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
TDS in Water (Calculation)	EC103 Vancouver - Environmental	Water	APHA 1030E (mod)	Total Dissolved Solids is calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present.
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N Vancouver - Environmental	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

QUALITY CONTROL REPORT

Work Order	: **WR2000833**	Page	: 1 of 13
Client	: Minto Explorations Ltd.	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 08-Sep-2020 16:10
PO	: 232824 (Seepage)	Date Analysis Commenced	: 11-Sep-2020
C-O-C number	: 2020-08-09 B	Issue Date	: 17-Sep-2020 13:20
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 10		
No. of samples analysed	: 10		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Angelo Salandanan	Lab Assistant	Metals, Burnaby, British Columbia
Bruna Botti	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Cristina Alexandre	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 84376)											
VA20B4840-001	Anonymous	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	<3.0	<3.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 84453)											
WR2000833-008	SS13	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	328	338	2.79%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	328	338	2.79%	20%	----
Physical Tests (QC Lot: 84454)											
WR2000833-008	SS13	pH	----	E108	0.10	pH units	7.89	7.88	0.127%	4%	----
Physical Tests (QC Lot: 84455)											
WR2000833-008	SS13	conductivity	----	E100	2.0	µS/cm	1270	1280	0.470%	10%	----
Physical Tests (QC Lot: 85666)											
WR2000833-001	SS32	conductivity	----	E100	2.0	µS/cm	214	212	0.939%	10%	----
Physical Tests (QC Lot: 85667)											
WR2000833-001	SS32	pH	----	E108	0.10	pH units	7.99	7.98	0.125%	4%	----
Physical Tests (QC Lot: 85668)											
WR2000833-003	SS5	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	236	231	2.40%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	236	231	2.40%	20%	----
Anions and Nutrients (QC Lot: 84444)											
WR2000833-006	SS106	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	80.6	80.6	0.00940%	20%	----
Anions and Nutrients (QC Lot: 84445)											
WR2000833-006	SS106	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 84446)											
WR2000833-006	SS106	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 84447)											
WR2000833-006	SS106	chloride	16887-00-6	E235.Cl-L	0.10	mg/L	0.46	0.45	0.008	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 85662)											

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Anions and Nutrients (QC Lot: 85662) - continued											
VA20B4494-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.450	0.450	0.0104%	20%	----
Anions and Nutrients (QC Lot: 85663)											
VA20B4494-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	0.0022	0.0026	0.0005	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 85664)											
VA20B4494-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	28.4	28.4	0.0114%	20%	----
Anions and Nutrients (QC Lot: 85665)											
WR2000833-001	SS32	chloride	16887-00-6	E235.Cl-L	0.10	mg/L	0.43	0.43	0.004	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 86154)											
WR2000833-001	SS32	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 85786)											
VA20B4715-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 85787)											
VA20B4715-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0014	0.0012	0.0002	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00327	0.00334	1.88%	20%	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.00968	0.0101	4.12%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	0.066	0.067	0.0007	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	8.93	8.96	0.256%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	0.015	0.014	0.0005	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	3.92	3.72	5.06%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.0456	0.0450	1.23%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00301	0.00291	3.43%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	0.520	0.541	4.06%	20%	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	3.41	3.37	1.13%	20%	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	12.7	12.4	1.93%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 85787) - continued											
VA20B4715-001	Anonymous	sodium, dissolved	7440-23-5	E421	0.050	mg/L	31.5	30.1	4.53%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.0534	0.0519	2.88%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	0.63	0.67	0.04	Diff <2x LOR	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 85970)											
VA20B4901-004	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 85971)											
WR2000833-003	SS5	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 84376)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Physical Tests (QCLot: 84453)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 84455)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 85666)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 85668)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Anions and Nutrients (QCLot: 84444)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 84445)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 84446)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 84447)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 85662)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 85663)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 85664)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 85665)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Anions and Nutrients (QCLot: 86154)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Dissolved Metals (QCLot: 85786)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 85787)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 85787) - continued						
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----
Dissolved Metals (QCLot: 85970)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 85971)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 84376)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	97.7	85.0	115	----
Physical Tests (QCLot: 84453)									
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	229 mg/L	90.6	75.0	125	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	96.8	85.0	115	----
Physical Tests (QCLot: 84454)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 84455)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	99.8	90.0	110	----
Physical Tests (QCLot: 85666)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	102	90.0	110	----
Physical Tests (QCLot: 85667)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 85668)									
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	229 mg/L	# 129	75.0	125	LCS-H
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	99.8	85.0	115	----
Anions and Nutrients (QCLot: 84444)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	103	90.0	110	----
Anions and Nutrients (QCLot: 84445)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	103	90.0	110	----
Anions and Nutrients (QCLot: 84446)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 84447)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 85662)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 85663)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	98.0	90.0	110	----
Anions and Nutrients (QCLot: 85664)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 85665)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 86154)									

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Anions and Nutrients (QCLot: 86154) - continued									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.12 mg/L	97.9	85.0	115	----
Dissolved Metals (QCLot: 85786)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
Dissolved Metals (QCLot: 85787)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	108	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	106	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	105	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	105	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	103	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	102	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	98.6	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	106	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	103	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	103	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	104	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	97.5	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	105	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	98.0	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	103	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	105	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	108	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	103	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	103	70.0	130	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	107	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	106	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	105	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	106	80.0	120	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	104	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	108	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	95.4	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	105	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	104	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	100	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	102	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	104	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	107	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 85787) - continued									
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	99.9	80.0	120	----
Dissolved Metals (QCLot: 85970)									
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	97.1	80.0	120	----
Dissolved Metals (QCLot: 85971)									
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	95.7	80.0	120	----

Qualifiers

Qualifier	Description
LCS-H	*Lab Control Sample recovery was above ALS DQO. Non-detected sample results are considered reliable. Other results, if reported, have been qualified.*

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 84444)										
WR2000833-007	SS44	sulfate (as SO4)	14808-79-8	E235.SO4	ND mg/L	100 mg/L	ND	75.0	125	----
Anions and Nutrients (QCLot: 84445)										
WR2000833-007	SS44	nitrate (as N)	14797-55-8	E235.NO3-L	13.0 mg/L	12.5 mg/L	104	75.0	125	----
Anions and Nutrients (QCLot: 84446)										
WR2000833-007	SS44	nitrite (as N)	14797-65-0	E235.NO2-L	2.50 mg/L	2.5 mg/L	99.9	75.0	125	----
Anions and Nutrients (QCLot: 84447)										
WR2000833-007	SS44	chloride	16887-00-6	E235.Cl-L	512 mg/L	500 mg/L	102	75.0	125	----
Anions and Nutrients (QCLot: 85662)										
VA20B4494-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.41 mg/L	2.5 mg/L	96.5	75.0	125	----
Anions and Nutrients (QCLot: 85663)										
VA20B4494-002	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.460 mg/L	0.5 mg/L	92.1	75.0	125	----
Anions and Nutrients (QCLot: 85664)										
VA20B4494-002	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	95.1 mg/L	100 mg/L	95.1	75.0	125	----
Anions and Nutrients (QCLot: 85665)										
WR2000833-002	SS105	chloride	16887-00-6	E235.Cl-L	528 mg/L	500 mg/L	106	75.0	125	----
Anions and Nutrients (QCLot: 86154)										
WR2000833-002	SS105	ammonia, total (as N)	7664-41-7	E298	0.200 mg/L	0.2 mg/L	100	75.0	125	----
Dissolved Metals (QCLot: 85786)										
WR2000830-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.0404 mg/L	0.04 mg/L	101	70.0	130	----
Dissolved Metals (QCLot: 85787)										
WR2000830-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.207 mg/L	0.2 mg/L	104	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0202 mg/L	0.02 mg/L	101	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0206 mg/L	0.02 mg/L	103	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0406 mg/L	0.04 mg/L	102	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00956 mg/L	0.01 mg/L	95.6	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.094 mg/L	0.1 mg/L	94.4	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00409 mg/L	0.004 mg/L	102	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 85787) - continued										
WR2000830-001	Anonymous	calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0198 mg/L	0.02 mg/L	99.3	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0194 mg/L	0.02 mg/L	97.0	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.92 mg/L	2 mg/L	96.0	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0197 mg/L	0.02 mg/L	98.5	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0952 mg/L	0.1 mg/L	95.2	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0203 mg/L	0.02 mg/L	101	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0389 mg/L	0.04 mg/L	97.2	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	10.7 mg/L	10 mg/L	107	70.0	130	----
		potassium, dissolved	7440-09-7	E421	4.08 mg/L	4 mg/L	102	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0417 mg/L	0.04 mg/L	104	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.53 mg/L	10 mg/L	95.3	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00393 mg/L	0.004 mg/L	98.2	70.0	130	----
		sodium, dissolved	7440-23-5	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	21.7 mg/L	20 mg/L	108	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00402 mg/L	0.004 mg/L	100	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0194 mg/L	0.02 mg/L	97.1	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0410 mg/L	0.04 mg/L	102	70.0	130	----
		uranium, dissolved	7440-61-1	E421	ND mg/L	0.004 mg/L	ND	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.104 mg/L	0.1 mg/L	104	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.401 mg/L	0.4 mg/L	100	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0392 mg/L	0.04 mg/L	98.1	70.0	130	----
Dissolved Metals (QCLot: 85970)										
VA20B4904-001	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000963 mg/L	0.0001 mg/L	96.3	70.0	130	----
Dissolved Metals (QCLot: 85971)										
WR2000833-004	SS33	mercury, dissolved	7439-97-6	E509	0.0000943 mg/L	0.0001 mg/L	94.3	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number: 2020-08-09 B

Page 1 of 1

Environmental Division
Whitehorse
Work Order Reference
WR2000833

Telephone : +1 867 668 6689

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Ruth Cayetano

Report Format / Distribution	
Select Report Format:	☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	mintoenvironment@mintomine.com
Email 2	
Email 3	
Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	ap@mintomine.com
Email 2	

Select Service Level Below - Please confirm all E&P TATs v

Regular [R] ☑ Standard TAT if recei

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐ | EMERGENCY

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:		Major/Minor Code:	Routing Code:
PO / AFE:	232824 (Seepage)	Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)		ALS Contact:	Sampler:

Analysis

Indicate Filtered (F), Preserved (P) or Filtered

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	P	F/P	P	F/P	P	F/P								Number of Containers
					Total Metals(TM)	Disolved Metals (DM)	Total Mercury, Hardness	Dissolved Mercury	Ammonia (Total Nutrients)	Dissolved Organic Carbon (DOC)	pH, Cond., TSS, TDS, Alkalinity, Anions							
	SS32 ✓	3-Sep-20	9:06	Water		R		R	R		R							4
	SS105 ✓	3-Sep-20	10:10	Water		R		R	R		R							4
	SS5 ✓	3-Sep-20	11:00	Water		R		R	R		R							4
	SS33 ✓	3-Sep-20	11:30	Water		R		R	R		R							4
	SS8 ✓	4-Sep-20	9:10	Water		R		R	R		R							4
	SS106 ✓	4-Sep-20	10:30	Water		R		R	R		R							4
	SS44 ✓	5-Sep-20	11:30	Water		R		R	R		R							4
	SS13 ✓	5-Sep-20	12:00	Water		R		R	R		R							4
	SS31 ✓	5-Sep-20	12:20	Water		R		R	R		R							4
	DUP ✓	5-Sep-20		Water		R		R	R		R							4
				Water														
				Water														

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?
☐ YES ☑ NO

Are samples for human drinking water use?
☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
5					

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Ian Smith	Date: 2020-09-08	Time:	Received by:	Date: Sept 8/20	Time: 16:10	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000873**	Page	: 1 of 4
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 15-Sep-2020 14:20
PO	: 232824 (Seepage)	Date Analysis Commenced	: 18-Sep-2020
C-O-C number	: 2020-09-15 B	Issue Date	: 24-Sep-2020 16:52
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Bruna Botti	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Clarie Tejano		Metals, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	SS109	----	----	----	----
					Client sampling date / time	08-Sep-2020 16:35	----	----	----	----
						WR2000873-001	--------	--------	--------	--------
						Result	----	----	----	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		142	----	----	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	----	----	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	----	----	----	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	----	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		142	----	----	----	----
conductivity	----	E100	2.0	µS/cm		303	----	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		704	----	----	----	----
pH	----	E108	0.10	pH units		8.24	----	----	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		1040	----	----	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	----	----	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0312	----	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		1.66	----	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		22.7	----	----	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		22.7	----	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0075	----	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		546	----	----	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		15.9	----	----	----	----
cation sum	----	EC101	0.10	meq/L		16.0	----	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		0.313	----	----	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0029	----	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	----	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00013	----	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0511	----	----	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	----	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	----	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.097	----	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.000248	----	----	----	----

Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	SS109	----	----	----	----
					Client sampling date / time	08-Sep-2020 16:35	----	----	----	----
Analyte	CAS Number	Method	LOR	Unit		WR2000873-001	--------	--------	--------	--------
						Result	----	----	----	----
Dissolved Metals										
calcium, dissolved	7440-70-2	E421	0.050	mg/L		198	----	----	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00011	----	----	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00013	----	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.185	----	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	----	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	----	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0043	----	----	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		51.1	----	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0432	----	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	----	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.0171	----	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	----	----	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	----	----	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		7.92	----	----	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.0564	----	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		4.01	----	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		0.000014	----	----	----	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		39.1	----	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		7.11	----	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		189	----	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		0.000011	----	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	----	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	----	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00296	----	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	----	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0034	----	----	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	----	----	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	----	----	----	----
dissolved metals filtration location	----	EP421	-	-		Field	----	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WR2000873**	Page	: 1 of 8
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 15-Sep-2020 14:20
PO	: 232824 (Seepage)	Issue Date	: 24-Sep-2020 16:52
C-O-C number	: 2020-09-15 B		
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) SS109	E298	08-Sep-2020	----	----	----		22-Sep-2020	28 days	14 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE SS109	E235.Cl-L	08-Sep-2020	----	----	----		19-Sep-2020	28 days	10 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE SS109	E235.NO3-L	08-Sep-2020	----	----	----		19-Sep-2020	3 days	10 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE SS109	E235.NO2-L	08-Sep-2020	----	----	----		19-Sep-2020	3 days	10 days	× EHTR
Anions and Nutrients : Sulfate in Water by IC										
HDPE SS109	E235.SO4	08-Sep-2020	----	----	----		19-Sep-2020	28 days	10 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) SS109	E421.Cr-L	08-Sep-2020	21-Sep-2020	180 days	12 days	✓	21-Sep-2020	167 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) SS109	E509	08-Sep-2020	21-Sep-2020	28 days	12 days	✓	21-Sep-2020	15 days	0 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) SS109	E421	08-Sep-2020	21-Sep-2020	180 days	12 days	✓	21-Sep-2020	167 days	0 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE SS109	E290	08-Sep-2020	----	----	----		19-Sep-2020	14 days	10 days	✓
Physical Tests : Conductivity in Water										
HDPE SS109	E100	08-Sep-2020	----	----	----		19-Sep-2020	28 days	10 days	✓
Physical Tests : pH by Meter										
HDPE SS109	E108	08-Sep-2020	----	----	----		19-Sep-2020	0.25 hrs	255 hrs	× EHTR-FM
Physical Tests : TSS by Gravimetry										
HDPE SS109	E160-H	08-Sep-2020	----	----	----		18-Sep-2020	7 days	9 days	× EHTL

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	88094	1	5	20.0	5.0	✓
Ammonia by Fluorescence	E298	89745	1	15	6.6	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	88092	1	2	50.0	5.0	✓
Conductivity in Water	E100	88095	1	5	20.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	89094	1	14	7.1	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	89132	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	89093	1	19	5.2	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	88087	1	19	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	88089	1	10	10.0	5.0	✓
pH by Meter	E108	88093	1	9	11.1	5.0	✓
Sulfate in Water by IC	E235.SO4	88088	1	14	7.1	5.0	✓
TSS by Gravimetry	E160-H	88008	1	16	6.2	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	88094	1	5	20.0	5.0	✓
Ammonia by Fluorescence	E298	89745	1	15	6.6	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	88092	1	2	50.0	5.0	✓
Conductivity in Water	E100	88095	1	5	20.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	89094	1	14	7.1	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	89132	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	89093	1	19	5.2	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	88087	1	19	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	88089	1	10	10.0	5.0	✓
pH by Meter	E108	88093	1	9	11.1	5.0	✓
Sulfate in Water by IC	E235.SO4	88088	1	14	7.1	5.0	✓
TSS by Gravimetry	E160-H	88008	1	16	6.2	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	88094	1	5	20.0	5.0	✓
Ammonia by Fluorescence	E298	89745	1	15	6.6	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	88092	1	2	50.0	5.0	✓
Conductivity in Water	E100	88095	1	5	20.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	89094	1	14	7.1	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	89132	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	89093	1	19	5.2	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	88087	1	19	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	88089	1	10	10.0	5.0	✓
Sulfate in Water by IC	E235.SO4	88088	1	14	7.1	5.0	✓
TSS by Gravimetry	E160-H	88008	1	16	6.2	5.0	✓

Matrix: **Water**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	89745	1	15	6.6	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	88092	1	2	50.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	89094	1	14	7.1	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	89132	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	89093	1	19	5.2	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	88087	1	19	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	88089	1	10	10.0	5.0	✓
Sulfate in Water by IC	E235.SO4	88088	1	14	7.1	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
TSS by Gravimetry	E160-H Vancouver - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
Chloride in Water by IC (Low Level)	E235.Cl-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Vancouver - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Ion Balance using Dissolved Metals	EC101 Vancouver - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
TDS in Water (Calculation)	EC103 Vancouver - Environmental	Water	APHA 1030E (mod)	Total Dissolved Solids is calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present.
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N Vancouver - Environmental	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

QUALITY CONTROL REPORT

Work Order	: **WR2000873**	Page	: 1 of 10
Client	: Minto Explorations Ltd.	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 15-Sep-2020 14:20
PO	: 232824 (Seepage)	Date Analysis Commenced	: 18-Sep-2020
C-O-C number	: 2020-09-15 B	Issue Date	: 24-Sep-2020 16:52
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Bruna Botti	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Clarie Tejano		Metals, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 88008)											
VA20B5182-001	Anonymous	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	35.3	41.5	16.1%	20%	----
Physical Tests (QC Lot: 88093)											
VA20B5593-003	Anonymous	pH	----	E108	0.10	pH units	7.96	7.95	0.126%	4%	----
Physical Tests (QC Lot: 88094)											
VA20B5593-003	Anonymous	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	128	129	0.934%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	2.0	mg/L	128	129	0.934%	20%	----
Physical Tests (QC Lot: 88095)											
VA20B5593-003	Anonymous	conductivity	----	E100	2.0	µS/cm	367	368	0.272%	10%	----
Anions and Nutrients (QC Lot: 88087)											
VA20B5593-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 88088)											
VA20B5593-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	36.8	36.8	0.188%	20%	----
Anions and Nutrients (QC Lot: 88089)											
VA20B5593-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 88092)											
WR2000873-001	SS109	chloride	16887-00-6	E235.Cl-L	0.50	mg/L	1.66	1.69	0.03	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 89745)											
WR2000873-001	SS109	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0312	0.0322	0.0010	Diff <2x LOR	----
Dissolved Metals (QC Lot: 89093)											
VA20B5354-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0102	0.0101	0.866%	20%	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00474	0.00467	1.46%	20%	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.0298	0.0294	1.11%	20%	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0380	0.0378	0.502%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	0.0000298	0.0000282	0.0000016	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	46.2	46.2	0.00423%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 89093) - continued											
VA20B5354-001	Anonymous	cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	0.00013	0.00013	0.000005	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00171	0.00170	0.00002	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	0.015	0.016	0.0009	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	0.000058	0.000008	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0159	0.0157	1.27%	20%	----
		magnesium, dissolved	7439-95-4	E421	0.100	mg/L	13.4	13.3	0.962%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00946	0.00934	1.30%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00184	0.00187	1.20%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00144	0.00146	0.00002	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.100	mg/L	3.17	3.11	1.99%	20%	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.000462	0.000448	0.000014	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	3.46	3.47	0.231%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	7440-23-5	E421	0.050	mg/L	3.66	3.58	2.33%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.230	0.229	0.460%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	25.8	25.9	0.130%	20%	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00334	0.00337	0.988%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 89094)											
VA20B5354-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 89132)											
WR2000872-003	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 88008)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Physical Tests (QCLot: 88094)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 88095)						
conductivity	----	E100	1	µS/cm	<1.0	----
Anions and Nutrients (QCLot: 88087)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 88088)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 88089)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 88092)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 89745)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Dissolved Metals (QCLot: 89093)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 89093) - continued						
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----
Dissolved Metals (QCLot: 89094)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 89132)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 88008)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	90.5	85.0	115	----
Physical Tests (QCLot: 88093)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 88094)									
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	229 mg/L	106	75.0	125	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	97.7	85.0	115	----
Physical Tests (QCLot: 88095)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	99.1	90.0	110	----
Anions and Nutrients (QCLot: 88087)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 88088)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 88089)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 88092)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 89745)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.12 mg/L	98.5	85.0	115	----
Dissolved Metals (QCLot: 89093)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	104	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	101	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	103	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	105	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	98.6	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	102	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	120	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	105	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	101	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	101	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	102	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	103	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 89093) - continued									
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	98.8	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	108	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	105	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	103	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	101	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	105	70.0	130	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	104	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	102	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	100	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	98.9	80.0	120	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	108	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	109	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	102	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	102	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	99.5	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	99.6	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	102	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	103	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	101	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	100.0	80.0	120	----
Dissolved Metals (QCLot: 89094)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	105	80.0	120	----
Dissolved Metals (QCLot: 89132)									
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	103	80.0	120	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 88087)										
VA20B5593-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.65 mg/L	2.5 mg/L	106	75.0	125	----
Anions and Nutrients (QCLot: 88088)										
VA20B5593-002	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	104 mg/L	100 mg/L	104	75.0	125	----
Anions and Nutrients (QCLot: 88089)										
VA20B5593-002	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.516 mg/L	0.5 mg/L	103	75.0	125	----
Anions and Nutrients (QCLot: 88092)										
WR2000877-001	Anonymous	chloride	16887-00-6	E235.Cl-L	97.9 mg/L	100 mg/L	97.9	75.0	125	----
Anions and Nutrients (QCLot: 89745)										
WR2000875-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.193 mg/L	0.2 mg/L	96.5	75.0	125	----
Dissolved Metals (QCLot: 89093)										
VA20B5376-001	Anonymous	aluminum, dissolved	7429-90-5	E421	2.30 mg/L	2 mg/L	115	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.205 mg/L	0.2 mg/L	102	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.202 mg/L	0.2 mg/L	101	70.0	130	----
		barium, dissolved	7440-39-3	E421	0.205 mg/L	0.2 mg/L	103	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.0879 mg/L	0.1 mg/L	87.9	70.0	130	----
		boron, dissolved	7440-42-8	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.0384 mg/L	0.04 mg/L	95.9	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	40 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.187 mg/L	0.2 mg/L	93.4	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.174 mg/L	0.2 mg/L	86.9	70.0	130	----
		iron, dissolved	7439-89-6	E421	19.2 mg/L	20 mg/L	96.0	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.187 mg/L	0.2 mg/L	93.6	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	10 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	0.203 mg/L	0.2 mg/L	102	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.204 mg/L	0.2 mg/L	102	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.354 mg/L	0.4 mg/L	88.6	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	121 mg/L	100 mg/L	121	70.0	130	----
		potassium, dissolved	7440-09-7	E421	ND mg/L	40 mg/L	ND	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.392 mg/L	0.4 mg/L	98.0	70.0	130	----
		silicon, dissolved	7440-21-3	E421	96.4 mg/L	100 mg/L	96.4	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 89093) - continued										
VA20B5376-001	Anonymous	silver, dissolved	7440-22-4	E421	0.0387 mg/L	0.04 mg/L	96.8	70.0	130	----
		sodium, dissolved	7440-23-5	E421	ND mg/L	20 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.2 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	ND mg/L	200 mg/L	ND	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.0368 mg/L	0.04 mg/L	91.9	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.201 mg/L	0.2 mg/L	100	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.418 mg/L	0.4 mg/L	104	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.0389 mg/L	0.04 mg/L	97.3	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	1.04 mg/L	1 mg/L	104	70.0	130	----
		zinc, dissolved	7440-66-6	E421	3.80 mg/L	4 mg/L	94.9	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.425 mg/L	0.4 mg/L	106	70.0	130	----
Dissolved Metals (QCLot: 89094)										
VA20B5376-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.396 mg/L	0.4 mg/L	99.0	70.0	130	----
Dissolved Metals (QCLot: 89132)										
WR2000872-004	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000982 mg/L	0.0001 mg/L	98.2	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number: 2020-09-15 B

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Ruth Cayetano

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax mintoenvironment@mintomine.com
Email 2
Email 3

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax ap@mintomine.com
Email 2

Project Information

ALS Account # / Quote #:	
Job #:	
PO / AFE:	232824 (Seepage)
LSD:	

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only)

ALS Contact: **Sampler:**

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐
EMERGENCY: 1 Business day [E1] ☐

Date and Time Required for all E&P TATs

For tests that can not be performed according to the se

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Indicate Filtered (F), Preserved (P) or Fil

Environmental Division
Whitehorse
Work Order Reference
WR2000873

Telephone : +1 867 668 6689

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals(TM)	Disolved Metals (DM)	Total Mercury, Hardness	Dissolved Mercury	Ammonia (Total Nutrients)	Dissolved Organic Carbon (DOC)	pH, Cond., TSS, TDS, Alkalinity, Anions							Numbe
					P	F/P	P	F/P	P	F/P								
	SS109	8-Sep-20	16:35	Water		R		R	R		R							4
				Water														
				Water														
				Water														
				Water														
				Water														
				Water														
				Water														
				Water														
				Water														
				Water														
				Water														
				Water														

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?
☐ YES ☑ NO

Are samples for human drinking water use?
☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C	
7	14	14.8	19.5	13.7	8

SHIPMENT RELEASE (client use)		
Released by: Ian Smith	Date: 2020-09-15	Time:

INITIAL SHIPMENT RECEPTION (lab use only)		
Received by: DD	Date: Sept 15/20	Time: 14:20

FINAL SHIPMENT RECEPTION (lab use only)		
Received by:	Date:	Time:

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

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Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 2020-09-15 B

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Ruth Cayetano

Report Format / Distribution	
Select Report Format:	☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	mintoenvironment@mintomine.com
Email 2	
Email 3	

Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	ap@mintomine.com
Email 2	

Project Information	
ALS Account # / Quote #:	
Job #:	
PO / AFE:	232824 (Seepage)
LSD:	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#:
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only)	ALS Contact:	Sampler:

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐

EMERGENCY: 1 Business day [E1] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the s

Anal

Indicate Filtered (F), Preserved (P) or Fil

Environmental Division
Whitehorse
Work Order Reference
WR2000873

Telephone : +1 867 668 6689

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals(TM)	Dissolved Metals (DM)	Total Mercury, Hardness	Dissolved Mercury	Ammonia (Total Nutrients)	Dissolved Organic Carbon (DOC)	pH, Cond., TSS, TDS, Alkalinity, Anions							Number
					P	F/P	P	F/P	P	F/P								
	SS109	8-Sep-20	16:35	Water		R		R	R		R							4
				Water														
				Water														
				Water														
				Water														
				Water														
				Water														
				Water														
				Water														
				Water														
				Water														
				Water														
				Water														

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☑ NO	
Are samples for human drinking water use? ☐ YES ☑ NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C	FINAL COOLER TEMPERATURES °C
7 / 14 / 18 / 19 / 5 / 3 / 7 / 8	

SHIPMENT RELEASE (client use)		
Released by: Ian Smith	Date: 2020-09-15	Time:

INITIAL SHIPMENT RECEPTION (lab use only)		
Received by:	Date: Sept 15/20	Time: 14:20

FINAL SHIPMENT RECEPTION (lab use only)		
Received by: TC ice pack JC	Date: SEP 16 2020	Time: 2pm

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

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(lab use only)

COC Number: 2020-09-15 B

Page 1 of 1

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Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
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Select Report Format:	☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	mintoenvironment@mintomine.com
Email 2	
Email 3	
Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	ap@mintomine.com
Email 2	

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐

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Date and Time Required for all E&P TATs

For tests that can not be performed according to the s

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Environmental Division
Whitehorse
Work Order Reference
WR2000873

Telephone : +1 867 668 6689

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:		Major/Minor Code:	Routing Code:
PO / AFE:	232824 (Seepage)	Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)		ALS Contact:	Sampler:

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals(TM)	Disolved Metals (DM)	Total Mercury, Hardness	Dissolved Mercury	Ammonia (Total Nutrients)	Dissolved Organic Carbon (DOC)	pH, Cond., TSS, TDS, Alkalinity, Anions						Number
					P	F/P	P	F/P	P	F/P							
	SS109	8-Sep-20	16:35	Water		R		R	R		R						4
				Water													
				Water													
				Water													
				Water													
				Water													
				Water													
				Water													
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				Water													

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☑ NO	
Are samples for human drinking water use? ☐ YES ☑ NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
7	14	4.8	19.5	13.7	8		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Ian Smith	Date: 2020-09-15	Time:	Received by:	Date: Sept 15/20	Time: 14:20	Received by: TC JC ice pack	Date: SEP 16 2020	Time: 2pm

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

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1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000985**	Page	: 1 of 4
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 29-Sep-2020 14:15
PO	: 232818	Date Analysis Commenced	: 01-Oct-2020
C-O-C number	: 2020-09-29 F	Issue Date	: 08-Oct-2020 15:48
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Monica Ko	Lab Assistant	Metals, Burnaby, British Columbia
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics - Water Quality, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Sample Comments

Sample	Client Id	*Comment*
WR2000985-001	SS103	Water sample for dissolved mercury analysis was not submitted in glass or PTFE container with HCl preservative. Results may be biased low.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	SS103	----	----	----	----
					Client sampling date / time	26-Sep-2020 13:30	----	----	----	----
						WR2000985-001	--------	--------	--------	--------
						Result	----	----	----	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		108	----	----	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	----	----	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	----	----	----	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	----	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		108	----	----	----	----
conductivity	----	E100	2.0	µS/cm		437	----	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		195	----	----	----	----
pH	----	E108	0.10	pH units		7.71	----	----	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		280	----	----	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	----	----	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0785	----	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		2.31	----	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		14.4	----	----	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		14.5	----	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0713	----	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		54.6	----	----	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		4.40	----	----	----	----
cation sum	----	EC101	0.10	meq/L		4.37	----	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		0.342	----	----	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0196	----	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	----	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00042	----	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0630	----	----	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	----	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	----	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.015	----	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000183	----	----	----	----

Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	SS103	----	----	----	----
					Client sampling date / time	26-Sep-2020 13:30	----	----	----	----
Analyte	CAS Number	Method	LOR	Unit		WR2000985-001	--------	--------	--------	--------
						Result	----	----	----	----
Dissolved Metals										
calcium, dissolved	7440-70-2	E421	0.050	mg/L		47.6	----	----	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00044	----	----	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00029	----	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.0506	----	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.078	----	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	----	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0011	----	----	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		18.5	----	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.106	----	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	----	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00184	----	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00110	----	----	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	----	----	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		1.38	----	----	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000511	----	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		5.91	----	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	----	----	----	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L		9.71	----	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.580	----	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		18.1	----	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	----	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	----	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		0.00061	----	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000305	----	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	----	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0010	----	----	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		0.00035	----	----	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	----	----	----	----
dissolved metals filtration location	----	EP421	-	-		Field	----	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WR2000985**	Page	: 1 of 8
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 29-Sep-2020 14:15
PO	: 232818	Issue Date	: 08-Oct-2020 15:48
C-O-C number	: 2020-09-29 F		
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (lab preserved) SS103	E298	26-Sep-2020	----	----	----		07-Oct-2020	3 days	10 days	× EHTR
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE SS103	E235.Cl-L	26-Sep-2020	----	----	----		07-Oct-2020	28 days	10 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE SS103	E235.NO3-L	26-Sep-2020	----	----	----		07-Oct-2020	3 days	10 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE SS103	E235.NO2-L	26-Sep-2020	----	----	----		07-Oct-2020	3 days	10 days	× EHTR
Anions and Nutrients : Sulfate in Water by IC										
HDPE SS103	E235.SO4	26-Sep-2020	----	----	----		07-Oct-2020	28 days	10 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) SS103	E421.Cr-L	26-Sep-2020	04-Oct-2020	180 days	8 days	✓	06-Oct-2020	171 days	1 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
HDPE dissolved (nitric acid) SS103	E509	26-Sep-2020	08-Oct-2020	28 days	11 days	✓	08-Oct-2020	16 days	0 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) SS103	E421	26-Sep-2020	04-Oct-2020	180 days	8 days	✓	06-Oct-2020	171 days	1 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE SS103	E290	26-Sep-2020	----	----	----		07-Oct-2020	14 days	10 days	✓
Physical Tests : Conductivity in Water										
HDPE SS103	E100	26-Sep-2020	----	----	----		07-Oct-2020	28 days	10 days	✓
Physical Tests : pH by Meter										
HDPE SS103	E108	26-Sep-2020	----	----	----		07-Oct-2020	0.25 hrs	259 hrs	× EHTR-FM
Physical Tests : TSS by Gravimetry										
HDPE SS103	E160-H	26-Sep-2020	----	----	----		01-Oct-2020	7 days	5 days	✓

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	98401	1	18	5.5	5.0	✓
Ammonia by Fluorescence	E298	96888	1	6	16.6	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	98398	1	8	12.5	5.0	✓
Conductivity in Water	E100	98400	1	16	6.2	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	97107	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	99148	1	11	9.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	97108	2	20	10.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	98396	1	8	12.5	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	98397	1	8	12.5	5.0	✓
pH by Meter	E108	98399	1	17	5.8	5.0	✓
Sulfate in Water by IC	E235.SO4	98395	1	19	5.2	5.0	✓
TSS by Gravimetry	E160-H	95747	1	20	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	98401	1	18	5.5	5.0	✓
Ammonia by Fluorescence	E298	96888	1	6	16.6	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	98398	1	8	12.5	5.0	✓
Conductivity in Water	E100	98400	1	16	6.2	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	97107	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	99148	1	11	9.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	97108	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	98396	1	8	12.5	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	98397	1	8	12.5	5.0	✓
pH by Meter	E108	98399	1	17	5.8	5.0	✓
Sulfate in Water by IC	E235.SO4	98395	1	19	5.2	5.0	✓
TSS by Gravimetry	E160-H	95747	1	20	5.0	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	98401	1	18	5.5	5.0	✓
Ammonia by Fluorescence	E298	96888	1	6	16.6	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	98398	1	8	12.5	5.0	✓
Conductivity in Water	E100	98400	1	16	6.2	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	97107	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	99148	1	11	9.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	97108	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	98396	1	8	12.5	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	98397	1	8	12.5	5.0	✓
Sulfate in Water by IC	E235.SO4	98395	1	19	5.2	5.0	✓
TSS by Gravimetry	E160-H	95747	1	20	5.0	5.0	✓

Matrix: **Water**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	96888	1	6	16.6	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	98398	1	8	12.5	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	97107	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	99148	1	11	9.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	97108	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	98396	1	8	12.5	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	98397	1	8	12.5	5.0	✓
Sulfate in Water by IC	E235.SO4	98395	1	19	5.2	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
TSS by Gravimetry	E160-H Vancouver - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
Chloride in Water by IC (Low Level)	E235.Cl-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Vancouver - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Ion Balance using Dissolved Metals	EC101 Vancouver - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
TDS in Water (Calculation)	EC103 Vancouver - Environmental	Water	APHA 1030E (mod)	Total Dissolved Solids is calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present.
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N Vancouver - Environmental	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

QUALITY CONTROL REPORT

Work Order	: **WR2000985**	Page	: 1 of 10
Client	: Minto Explorations Ltd.	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 29-Sep-2020 14:15
PO	: 232818	Date Analysis Commenced	: 01-Oct-2020
C-O-C number	: 2020-09-29 F	Issue Date	: 08-Oct-2020 15:48
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Monica Ko	Lab Assistant	Metals, Burnaby, British Columbia
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics - Water Quality, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 95747)											
VA20B6855-001	Anonymous	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	26.1	24.9	1.2	Diff <2x LOR	----
Physical Tests (QC Lot: 98399)											
VA20B7313-003	Anonymous	pH	----	E108	0.10	pH units	7.57	7.57	0.00%	4%	----
Physical Tests (QC Lot: 98400)											
VA20B7313-003	Anonymous	conductivity	----	E100	2.0	µS/cm	1310	1310	0.0765%	10%	----
Physical Tests (QC Lot: 98401)											
VA20B7313-003	Anonymous	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	279	272	2.50%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	279	272	2.50%	20%	----
Anions and Nutrients (QC Lot: 96888)											
VA20B6929-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0123	0.0130	0.0006	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 98395)											
VA20B7109-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	2.19	2.19	0.002	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 98396)											
WR2000981-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.490	0.490	0.100%	20%	----
Anions and Nutrients (QC Lot: 98397)											
WR2000981-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	0.0025	0.0027	0.0002	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 98398)											
WR2000981-001	Anonymous	chloride	16887-00-6	E235.Cl-L	0.10	mg/L	0.48	0.50	0.02	Diff <2x LOR	----
Dissolved Metals (QC Lot: 97107)											
KS2001981-003	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	0.00012	0.00011	0.000010	Diff <2x LOR	----
Dissolved Metals (QC Lot: 97108)											
KS2001981-003	Anonymous	copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00314	0.00314	0.145%	20%	----
KS2001981-003	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0331	0.0336	1.40%	20%	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0247	0.0249	0.896%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 97108) - continued											
KS2001981-003	Anonymous	boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	4.84	4.92	1.48%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	0.073	0.073	0.0006	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	0.000099	0.000105	0.000006	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	0.812	0.832	2.38%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.0189	0.0195	2.89%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.000197	0.000177	0.000020	Diff <2x LOR	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	2.00	2.06	2.89%	20%	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	4.14	4.10	1.14%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E421	0.050	mg/L	35.4	35.8	1.000%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.0525	0.0532	1.32%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	0.56	0.66	0.10	Diff <2x LOR	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	0.00064	0.00058	0.00006	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.000091	0.000096	0.000005	Diff <2x LOR	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0023	0.0024	0.00006	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 99148)											
WR2000977-016	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 95747)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Physical Tests (QCLot: 98400)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 98401)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Anions and Nutrients (QCLot: 96888)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 98395)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 98396)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 98397)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 98398)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Dissolved Metals (QCLot: 97107)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 97108)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 97108) - continued						
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----
Dissolved Metals (QCLot: 99148)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 95747)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	101	85.0	115	----
Physical Tests (QCLot: 98399)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 98400)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	99.7	90.0	110	----
Physical Tests (QCLot: 98401)									
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	229 mg/L	102	75.0	125	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	97.8	85.0	115	----
Anions and Nutrients (QCLot: 96888)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.12 mg/L	94.4	85.0	115	----
Anions and Nutrients (QCLot: 98395)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	104	90.0	110	----
Anions and Nutrients (QCLot: 98396)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	103	90.0	110	----
Anions and Nutrients (QCLot: 98397)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	103	90.0	110	----
Anions and Nutrients (QCLot: 98398)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	104	90.0	110	----
Dissolved Metals (QCLot: 97107)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
Dissolved Metals (QCLot: 97108)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	104	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	100	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	101	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	105	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	99.6	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	98.1	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	95.6	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	104	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	98.0	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	100	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	102	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 97108) - continued									
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	101	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	100	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	93.7	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	102	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	105	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	99.6	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	105	70.0	130	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	103	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	96.3	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	102	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	101	80.0	120	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	102	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	101	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	101	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	96.7	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	100	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	94.4	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	104	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	104	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	102	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	99.8	80.0	120	----
Dissolved Metals (QCLot: 99148)									
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	106	80.0	120	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 96888)										
VA20B7011-040	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.196 mg/L	0.2 mg/L	98.3	75.0	125	----
Anions and Nutrients (QCLot: 98395)										
WR2000981-002	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	105 mg/L	100 mg/L	105	75.0	125	----
Anions and Nutrients (QCLot: 98396)										
WR2000981-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.63 mg/L	2.5 mg/L	105	75.0	125	----
Anions and Nutrients (QCLot: 98397)										
WR2000981-002	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.524 mg/L	0.5 mg/L	105	75.0	125	----
Anions and Nutrients (QCLot: 98398)										
WR2000981-002	Anonymous	chloride	16887-00-6	E235.Cl-L	106 mg/L	100 mg/L	106	75.0	125	----
Dissolved Metals (QCLot: 97107)										
KS2001981-004	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.0407 mg/L	0.04 mg/L	102	70.0	130	----
Dissolved Metals (QCLot: 97108)										
KS2001981-004	Anonymous	aluminum, dissolved	7429-90-5	E421	0.200 mg/L	0.2 mg/L	99.9	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0206 mg/L	0.02 mg/L	103	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0206 mg/L	0.02 mg/L	103	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0420 mg/L	0.04 mg/L	105	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00942 mg/L	0.01 mg/L	94.2	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.098 mg/L	0.1 mg/L	97.7	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00418 mg/L	0.004 mg/L	104	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0199 mg/L	0.02 mg/L	99.7	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0195 mg/L	0.02 mg/L	97.4	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.93 mg/L	2 mg/L	96.3	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0201 mg/L	0.02 mg/L	100	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0959 mg/L	0.1 mg/L	95.9	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	0.987 mg/L	1 mg/L	98.7	70.0	130	----
		manganese, dissolved	7439-96-5	E421	0.0202 mg/L	0.02 mg/L	101	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0210 mg/L	0.02 mg/L	105	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0389 mg/L	0.04 mg/L	97.2	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 97108) - continued										
KS2001981-004	Anonymous	phosphorus, dissolved	7723-14-0	E421	10.8 mg/L	10 mg/L	108	70.0	130	----
		potassium, dissolved	7440-09-7	E421	3.93 mg/L	4 mg/L	98.3	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0415 mg/L	0.04 mg/L	104	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.50 mg/L	10 mg/L	95.0	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00401 mg/L	0.004 mg/L	100	70.0	130	----
		sodium, dissolved	17341-25-2	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	21.9 mg/L	20 mg/L	109	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00383 mg/L	0.004 mg/L	95.8	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0203 mg/L	0.02 mg/L	102	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0392 mg/L	0.04 mg/L	98.0	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00411 mg/L	0.004 mg/L	103	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.106 mg/L	0.1 mg/L	106	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.422 mg/L	0.4 mg/L	106	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0412 mg/L	0.04 mg/L	103	70.0	130	----
Dissolved Metals (QCLot: 99148)										
WR2000977-017	Anonymous	mercury, dissolved	7439-97-6	E509	0.000104 mg/L	0.0001 mg/L	104	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number: 2020-09-29 F

Environmental Division
Whitehorse
Work Order Reference
WR2000985

Telephone : +1 867 668 6689

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Ruth Cayetano

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: mintoenvironment@mintomine.com
Email 2:
Email 3:

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: ap@mintomine.com
Email 2:

Project Information

ALS Account # / Quote #:	
Job #:	
PO / AFE:	232818 (GW)
LSD:	

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#:
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only):
ALS Contact:
Sampler:

Select Service Level Below - Please confirm all E&P TATs

Regular [R] ☑ Standard TAT if recei

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐
EMERGENCY

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the servic

Analysis

Indicate Filtered (F), Preserved (P) or Filtered

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals(TM)	Disolved Metals (DM)	Total Mercury, Hardness	Dissolved Mercury	Ammonia (Total Nutrients)	Dissolved Organic Carbon (DOC)	pH, Cond., TSS, TDS, Alkalinity, Anions	Dissolved Bromide (Br-D)						Number of Containers
					P	F/P	P	F/P	P	F/P								
	SS103	26-Sep-20	13:30	Water		R			R		R							3

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?
☐ YES ☑ NO

Are samples for human drinking water use?
☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
2°	1°				

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Chris Wall	Date: 2020-09-29	Time:	Received by:	Date: Sept 29/20	Time: 14:15	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

COC Number: 2020-09-29 F

Affix ALS barcode label here
(lab use only)

Environmental Division
Whitehorse
Work Order Reference
WR2000985

Telephone : +1 867 668 6689

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Ruth Cayetano

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: mintoenvironment@mintomine.com
Email 2:
Email 3:

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: ap@mintomine.com
Email 2:

Project Information

ALS Account # / Quote #:
Job #:
PO / AFE: 232818 (GW)
LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center:
PO#:
Major/Minor Code:
Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only)

ALS Contact:

Sampler:

Select Service Level Below - Please confirm all E&P TATs v

Regular [R] ☑ Standard TAT if recei

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐ — EMERGENCY

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service

Analysis

Indicate Filtered (F), Preserved (P) or Filtered

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals(TM)	Disolved Metals (DM)	Total Mercury, Hardness	Dissolved Mercury	Ammonia (Total Nutrients)	Dissolved Organic Carbon (DOC)	pH, Cond., TSS, TDS, Alkalinity, Anions	Dissolved Bromide (Br-D)	Number of Containers
					P	F/P	P	F/P	P	F/P			
	SS103	26-Sep-20	13:30	Water		R			R		R		3

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?
☐ YES ☑ NO

Are samples for human drinking water use?
☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☑ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
2°	1°		10		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Chris Wall	Date: 2020-09-29	Time:	Received by:	Date: Sept 29/20	Time: 14:15	Received by:	Date: SEP 30 2020	Time: 3:15

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Appendix E – Seepage Survey Documentation

1. Seepage Site GPS Coordinates

ID	Coordinates		Spring 2020	Fall 2020
	Northing	Easting		
Southwest Dump				
SS1	N62° 36.872'	W137° 15.589'		
SS13	N62° 36.539'	W137° 15.840'	x	x
SS21	N62° 36.775'	W137° 15.747'	x	
SS22	N62° 36.480'	W137° 15.801'	x	
SS28	N62° 36.802'	W137° 15.695'	x	
SS29	N62° 36.758'	W137° 15.764'	x	
SS30	N62° 36.625'	W137° 15.836'		
SS31	N62° 36.570'	W137° 15.858'	x	x
SS43	N62° 36.592'	W137° 15.857'		
SS44	N62° 36.421'	W137° 15.818'	x	
SS51	N62° 36.463'	W137° 15.793'	x	
SS52	N62° 36.395'	W137° 15.818'	x	
SS54	N62° 36.857'	W137° 15.607'		
SS56	N62° 36.789'	W137° 15.719'		
SS57	N62° 36.637'	W137° 15.830'	x	
SS65	N62° 36.818'	W137° 15.658'		
Ice-Rich Overburden Dump (Pelly)				
SS39	N62° 36.976'	W137° 15.886'	x	
SS48	N62° 36.953'	W137° 16.005'	x	
SS49	N62° 36.912'	W137° 16.000'	x	
SS50	N62° 36.890'	W137° 15.900'	x	
SS63	N62° 36.937'	W137° 16.014'		
SS64	N62° 36.921'	W137° 16.017'	x	
SS66	N62° 61.397'	W137° 26.418'	x	
SS67	N62° 61.685'	W137° 26.739'	x	
SS106	N62° 61.4999'	W137° 26.588'		x
Main Waste Dump				
SS12	N62° 62.0683'	W137° 26.179'		
SS102	N62° 37.010’	W137° 15.597		
Main Pit and SAT Dump				
SS107	N62° 36.511'	W137° 15.131'	x	
SS109	N62° 37.382'	W137° 15.221'		x
Minto North				
SS101	N62° 37.598’	W137° 15.710'	x	
Pit Walls				

SS62 (A2S3 Pit)	N62° 36.878'	W137° 14.656'		
Ridgetop Road				
SS19	N62° 61.1397'	W137° 23.3326'		
SS47	N62° 60.9532'	W137° 23.4804'		
SS58	N62° 36.597'	W137° 14.048'		
SS103	N62° 36.345'	W137° 14.180'	x	x
W33s	N62° 36.344'	W137° 14.235'	x	x
Ore Stockpile				
SS5	N62° 37.034'	W137° 14.133'	x	x
SS6	N62° 37.025'	W137° 14.122'	x	
SS7	N62° 36.999'	W137° 14.108'	x	
SS8	N62° 36.985'	W137° 14.101'		x
SS33	N62° 37.034'	W137° 14.147'		x
SS59	N62° 36.967'	W137° 14.099'		
SS105	N62° 61.7453'	W137° 23.6029'	x	x
Dry Stack Tailings Facility				
SS17	N62° 36.525	W137° 13.311		
SS18	N62° 61.4836'	W137° 22.4870'		
SS45	N62° 36.512	W137° 13.379		
SS53	N62° 61.3521'	W137° 23.0815'	x	
SS104	N62° 61.5639'	W137° 22.2569'		
Mill Valley Fill Extension				
SS9	N62° 37.007'	W137° 13.296'		
SS10	N62° 37.025'	W137° 13.315'		
SS34	N62° 61.9503'	W137° 22.5610'		
SS35	N62° 61.9221'	W137° 22.5257'		
SS36	N62° 37.040'	W137° 13.313'		
SS60	N62° 37.088'	W137° 13.432'		
SS61	N62° 37.202'	W137° 13.266'		
SS62	N62° 22.1651'	W137° 61.6620'		
SS100	N62° 37.225’	W137° 13.305’		
W8A	N62° 37.089'	W137° 13.650'		
W62	N62° 37.223'	W137° 13.279'	x	x
Water Storage Pond Dam				
W17	N62° 37.454'	W137° 12.551'	x	x
Camp				
SS32	N62° 37.302'	W137° 14.032'	x	x

2. Seepage Site Photos

2.1 Southwest Dump

2.1.1 SS13



Figure 2-1 : SS13 Sampling Site (Spring 2020)



Figure 2-2 : SS13 Upstream (Spring 2020)

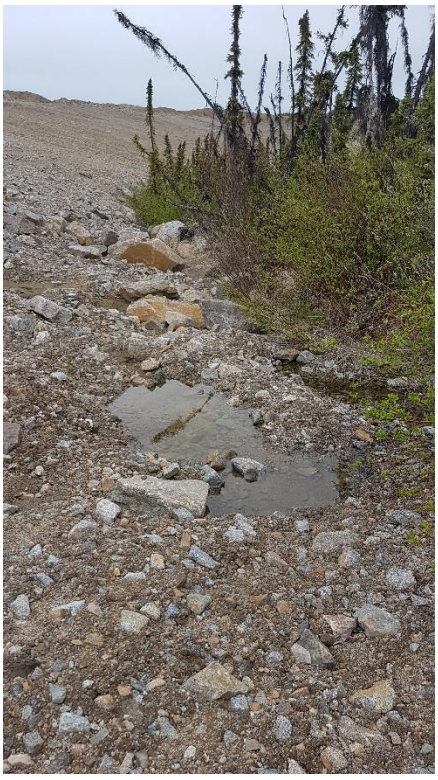


Figure 2-3 : SS13 Downstream (Spring 2020)



Figure 2-4 : SS13 Sampling Site (Fall 2020)



Figure 2-5 : SS13 Upstream (Fall 2020)



Figure 2-6 : SS13 Downstream (Fall 2020)

2.1.2 SS21



Figure 2-7 : SS21 Sampling Site (Spring 2020)



Figure 2-8 : SS21 Upstream (Spring 2020)



Figure 2-9 : SS21 Downstream (Spring 2020)

2.1.3 SS22



Figure 2-10 : SS22 Sampling Site (Spring 2020)



Figure 2-11 : SS22 Upstream (Spring 2020)



Figure 2-12 : SS22 Downstream (Spring 2020)

2.1.4 SS28



Figure 2-13 : SS28 Sampling Site (Spring 2020)



Figure 2-14 : SS28 Upstream (Spring 2020)



Figure 2-15 : SS28 Downstream (Spring 2020)

2.1.5 SS31



Figure 2-16 : SS31 Sampling Site (Spring 2020)



Figure 2-17 : SS31 Upstream (Spring 2020)



Figure 2-18 : SS31 Downstream (Spring 2020)



Figure 2-19 : SS31 Sampling Site (Fall 2020)



Figure 2-20 : SS31 Upstream (Fall 2020)



Figure 2-21 : SS31 Downstream (Fall 2020)

2.1.6 SS51



Figure 2-22 : SS51 Sampling Site (Spring 2020)



Figure 2-23 : SS51 Upstream (Spring 2020)

2.1.7 SS52



Figure 2-24 : SS52 Sampling Site (Spring 2020)



Figure 2-25 : SS52 Upstream (Spring 2020)

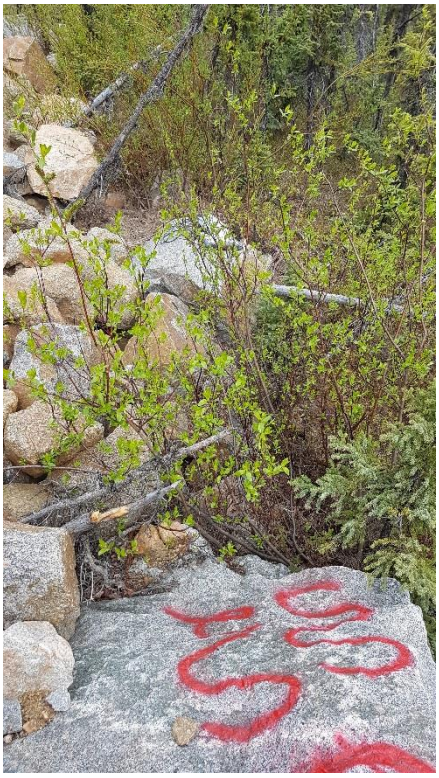


Figure 2-26 : SS52 Downstream (Spring 2020)

2.1.8 SS57



Figure 2-27 : SS57 Sampling Site (Spring 2020)



Figure 2-28 : SS57 Upstream (Spring 2020)



Figure 2-29 : SS57 Downstream (Spring 2020)

2.2 Ice-Rich Overburden Dump

2.2.1 SS39

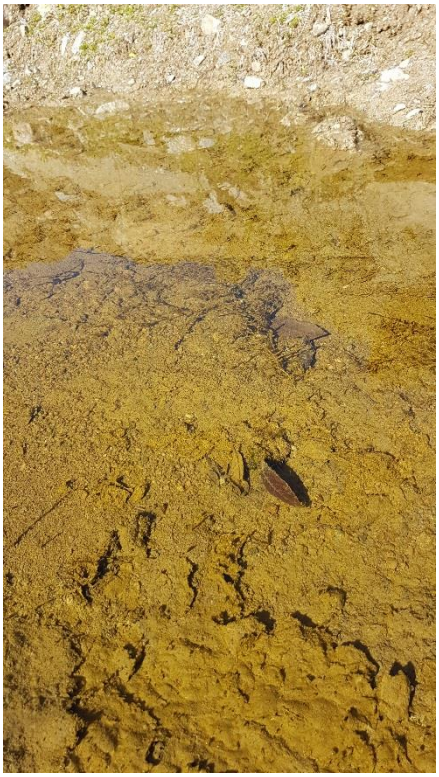


Figure 2-30 : SS39 Sampling Site (Spring 2020)



Figure 2-31 : SS39 Upstream (Spring 2020)



Figure 2-32 : SS39 Downstream (Spring 2020)

2.2.2 SS48



Figure 2-33 : SS48 Sampling Site (Spring 2020)



Figure 2-34 : SS48 Upstream (Spring 2020)



Figure 2-35 : SS48 Downstream (Spring 2020)

2.2.3 SS49

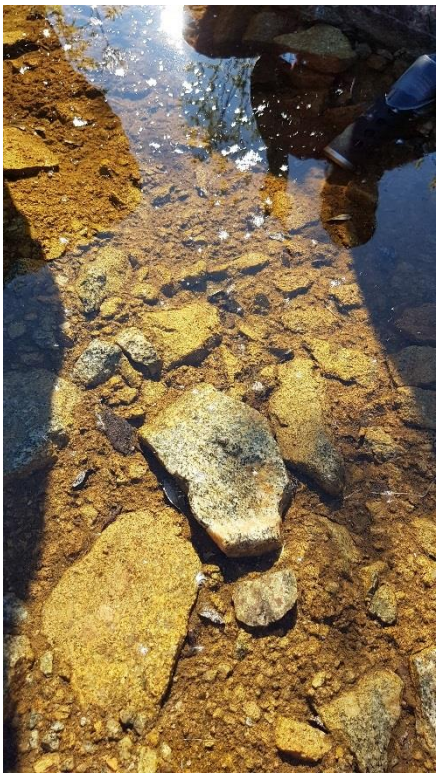


Figure 2-36 : SS49 Sampling Site (Spring 2020)



Figure 2-37 : SS49 Upstream (Spring 2020)



Figure 2-38 : SS49 Downstream (Spring 2020)

2.2.4 SS50



Figure 2-39 : SS50 Sampling Site (Spring 2020)



Figure 2-40 : SS50 Upstream (Spring 2020)



Figure 2-41 : SS50 Downstream (Spring 2020)

2.2.5 SS66



Figure 2-42 : SS66 Sampling Site (Spring 2020)



Figure 2-43 : SS66 Upstream (Spring 2020)



Figure 2-44 : SS66 Downstream (Spring 2020)

2.2.7 SS106



Figure 2-45 : SS106 Sampling Site (Fall 2020)



Figure 2-46 : SS106 Upstream (Fall 2020)



Figure 2-47 : SS106 Downstream (Fall 2020)

2.3 Main Pit and SAT Dump

2.3.1 SS107



Figure 2-48 : SS107 Sampling Site (Spring 2020)



Figure 2-49 : SS107 Upstream (Spring 2020)



Figure 2-50 : SS107 Downstream (Spring 2020)

2.3.2 SS109



Figure 2-51 : SS109 Sampling Site (Fall 2020)



Figure 2-52 : SS109 Upstream (Fall 2020)



Figure 2-53 : SS109 Downstream (Fall 2020)

2.4 Minto North

2.4.1 SS101



Figure 2-54 : SS101 Sampling Site (Spring 2020)



Figure 2-55 : SS101 Upstream (Spring 2020)

2.5 Ridgetop Road

2.5.1 SS103



Figure 2-56 : SS103 Sampling Site (Fall 2020)



Figure 2-57 : SS103 Downstream (Fall 2020)

2.5.2 W33s



Figure 2-58 : W33s Sampling Site (Spring 2020)

2.6 Ore Stockpile

2.6.1 SS5



Figure 2-59 : SS5 Sampling Site (Fall 2020)



Figure 2-60 : SS5 Upstream (Fall 2020)

2.6.2 SS33



Figure 2-61 : SS33 Sampling Site (Fall 2020)

2.6.6 SS105



Figure 2-62 : SS105 Sampling Site (Fall 2020)



Figure 2-63 : SS105 Upstream (Fall 2020)



Figure 2-64 : SS105 Downstream (Fall 2020)

2.7 Dry Stack Tailings Facility

2.7.1 SS53



Figure 2-65 : SS53 Sampling Site (Spring 2020)

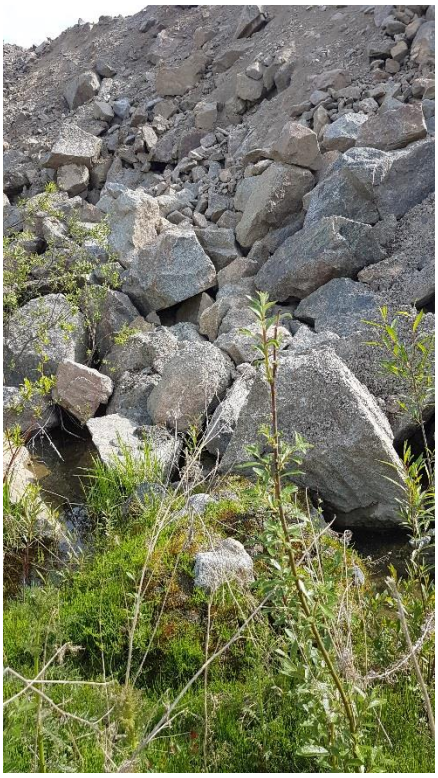


Figure 2-66 : SS53 Upstream (Spring 2020)



Figure 2-67 : SS53 Downstream (Spring 2020)

2.8 Camp

2.10.1 SS32



Figure 2-68 : SS32 Sampling Site (Fall 2020)



Figure 2-69 : SS32 Upstream (Fall 2020)



Figure 2-70 : SS32 Downstream (Fall 2020)

3. Field Sheets

3.1 Spring Seepage Survey

Seepage Water Quality Field Sheets

1. Sample Site:	Date:	Time:	Sampler(s):
SS51	5/30/2020	14:50	DS/DS

Sky: Clear / P.Cloudy / O/cast / Fog / Haze / Other — Temp: 15 — Precip: Nil / Light / Mod / Strong / Rain / Snow / Other — Wind: Calm / Light / Mod / Strong / N / E / S / W / Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
13.5	59.7	6.18	418.3	327.1	6.98	31.1	

QA/QC? Y / (N)

Note: 1 every 10 samples must be dumped

New Sample ? Y / N IF Yes, Record GPS Coordinates

Photos: Close-up ☑ Upstream ☑ Downstream ☑

Water Colour? Turbidity, Precipitates? Description of Sampling Conditions: light brown, greenish tint. Milky, oily iridescent sheen.

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120 ml	D-Hg (40 ml)	Colour of Sediment on filter:
✓	✓	✓	✓	# of Filters Used: 6

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (initials): IS — Data entry reviewed (initials):

1. Sample Site:	Date:	Time:	Sampler(s):
SS52	5/30/2020	15:05	IS

Sky: Clear / (P.Cloudy) / O/cast / Fog / Haze / Other — Temp: 15 — Precip: (Nil) / Light / Mod / Strong / Rain / Snow / Other — Wind: Calm / (Light) / Mod / Strong / (N) / E / S / W / Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
2.4	31.0	4.24	525.8	298.8	7.06	104.8	

QA/QC? Y / (N)

Note: 1 every 10 samples must be dumped

New Sample ? Y / (N) IF Yes, Record GPS Coordinates

Photos: Close-up ☑ Upstream ☑ Downstream ☑

Water Colour? Turbidity, Precipitates? Description of Sampling Conditions: Clear

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120 ml	D-Hg (40 ml)	Colour of Sediment on filter: none
✓	✓	✓	✓	# of Filters Used: 1

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (initials): IS — Data entry reviewed (initials):

Seepage Water Quality Field Sheets

1. Sample Site:	Date:	Time:	Sampler(s):
SS44	5/30/2020	15:25	DJ / IS

Sky: (O/cast) Clear P.Cloudy Fog Haze Other — Temp: 15 — Precip: (Nil) Light Mod Strong Rain Snow Other — Wind: Calm Light Mod Strong N E S (W) Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
10.1	63.3	7.10	475.0	339.4	7.12	105.0	

QA/QC? Y / (N)

Photos: Close-up ☑ Upstream ☑ Downstream ☑

Note: 1 every 10 samples must be dumped

New Sample ? Y / N IF Yes, Record GPS Coordinates

Water Colour? Turbidity, Precipitates? Description of Sampling Conditions

slight brown tint. LOTS of mosquito larvae

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120ml	D-Hg (40ml)	Colour of Sediment on filter: none
✓	✓	✓	✓	# of Filters Used: 1

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (Initials): IS

Data entry reviewed (Initials):

1. Sample Site:	Date:	Time:	Sampler(s):
SS22	5/30/2020	15:35	DJ / IS

Sky: (O/cast) Clear P.Cloudy Fog Haze Other — Temp: 15 — Precip: (Nil) Light Mod Strong Rain Snow Other — Wind: (Calm) Light Mod Strong N E S W Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
8.8	34.4	4.02	828	572	6.99	154.9	

QA/QC? Y / (N)

Photos: Close-up ☑ Upstream ☑ Downstream ☑

Note: 1 every 10 samples must be dumped

New Sample ? Y / (N) IF Yes, Record GPS Coordinates

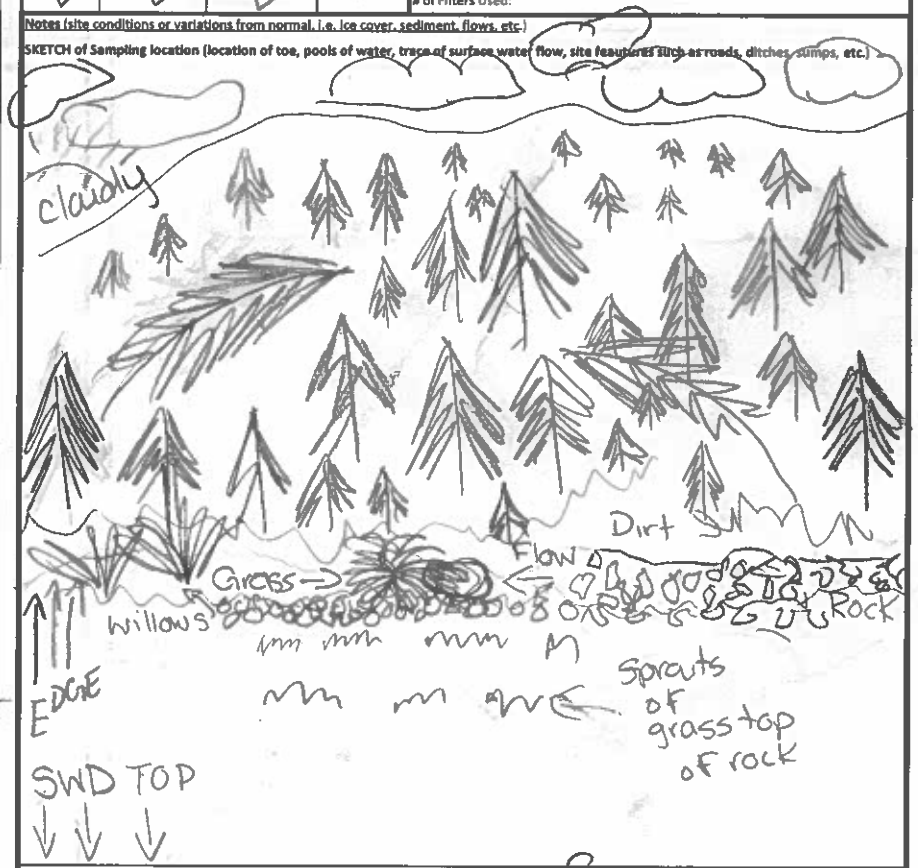
Water Colour? Turbidity, Precipitates? Description of Sampling Conditions

Lots of Sediment NO MERCURY SAMPLE x5 filters

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120ml	D-Hg (40ml)	Colour of Sediment on filter: DARK GRAY
✓	✓	✓		# of Filters Used:

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (Initials): IS

Data entry reviewed (Initials):

Seepage Water Quality Field Sheets

1. Sample Site: SS13	Date: 5/30/2018	Time: 16:00	Sampler(s): DS/IS
Sky: Clear P.Cloudy O/cast Fog Haze Other	Temp: 15	Precip: Nil Light Mod Strong Rain Snow Other	Wind: Calm Light Mod Strong N E S W Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
6.9	21.6	2.67	1039	659	7.07	150.1	

QA/QC? Y / N — Note: 1 every 10 samples must be ~~dumped~~ dupped

New Sample ? Y / N IF Yes, Record GPS Coordinates

Photos: Close-up ☑ Upstream ☑ Downstream ☑

Water Colour? Turbidity, Precipitates? Description of Sampling Conditions

very clear. 1 filter / NO color

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120 ml	D-Hg (40 ml)	Colour of Sediment on filter:
✓	✓	✓	✓	# of Filters Used:

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (initials): IS

Data entry reviewed (initials):

1. Sample Site:	Date:	Time:	Sampler(s):
Sky: Clear P.Cloudy O/cast Fog Haze Other	Temp:	Precip: Nil Light Mod Strong Rain Snow Other	Wind: Calm Light Mod Strong N E S W Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU

QA/QC? Y / N — Note: 1 every 10 samples must be dumped

New Sample ? Y / N IF Yes, Record GPS Coordinates

Photos: Close-up ☐ Upstream ☐ Downstream ☐

Water Colour? Turbidity, Precipitates? Description of Sampling Conditions

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120 ml	D-Hg (40 ml)	Colour of Sediment on filter:
				# of Filters Used:

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)

Data entered (initials):

Data entry reviewed (initials):

Seepage Water Quality Field Sheets

1. Sample Site:	Date:	Time:	Sampler(s):
SS32	June 3/20	9:40	DS

Sky: Clear / P.Cloudy / O/cast / Fog / Haze / Other — Temp: 2 — Precip: Nil / Light / Mod / Strong / Rain / Snow / Other — Wind: Calm / Light / Mod / Strong / N / E / S / W / Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
3.8	85.2	11.23	205.1	122.0	7.90	135.0	

QA/QC? Y / N — Note: 1 every 10 samples must be dumped

New Sample ? Y / N IF Yes, Record GPS Coordinates

Photos: Close-up ☑ Upstream ☑ Downstream ☑

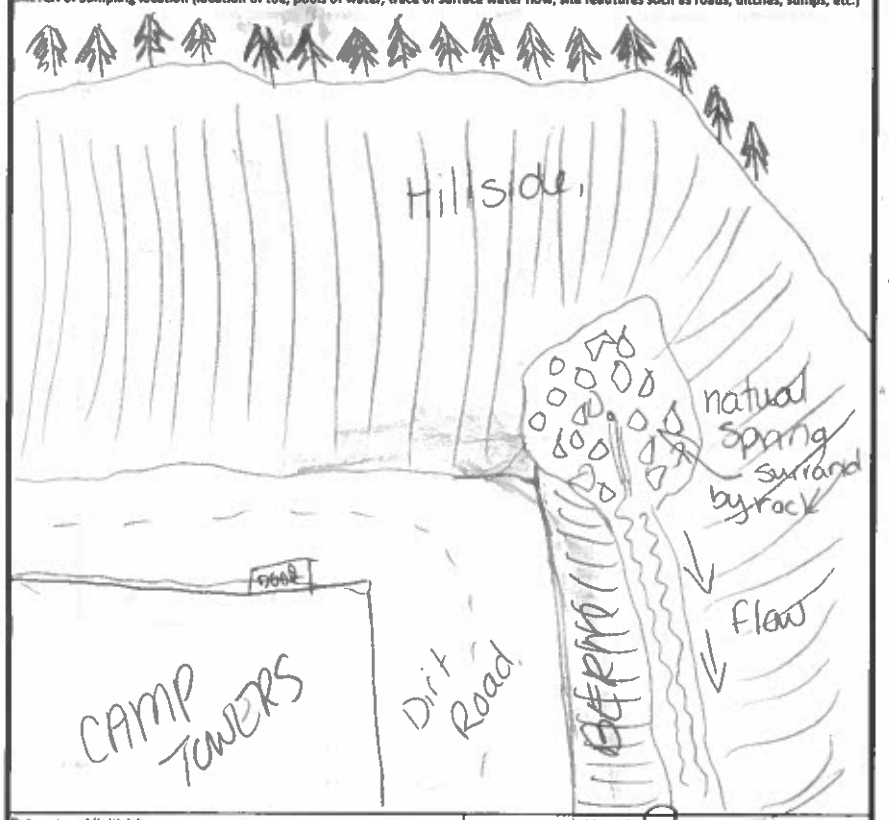
Water Colour? Turbidity, Precipitates? Description of Sampling Conditions

clear, clean

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120ml	D-Hg (40ml)	Colour of Sediment on filter:
✓	✓	✓	✓	# of Filters Used: clear 1 filter

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (initials): IS — Data entry reviewed (initials):

1. Sample Site:	Date:	Time:	Sampler(s):
NEW SS105	June 4/20	8:20	DJ

Sky: Clear / P.Cloudy / O/cast / Fog / Haze / Other — Temp: 7 — Precip: Nil / Light / Mod / Strong / Rain / Snow / Other — Wind: Calm / Light / Mod / Strong / N / E / S / W / Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
2.1	53.8	7.34	1756	987	7.23	193.3	

QA/QC? Y / N — Note: 1 every 10 samples must be dumped

New Sample ? Y / N IF Yes, Record GPS Coordinates

Photos: Close-up ☑ Upstream ☑ Downstream ☑

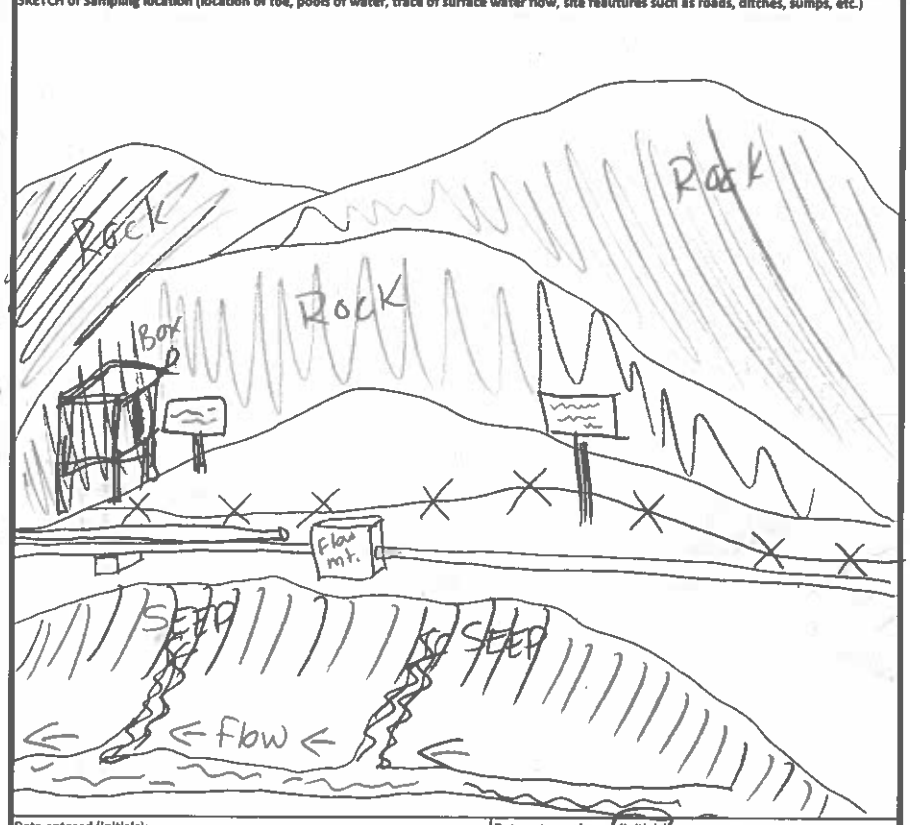
Water Colour? Turbidity, Precipitates? Description of Sampling Conditions

clear, very low medium flow muddy underneath

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120ml	D-Hg (40ml)	Colour of Sediment on filter:
✓	✓	✓	✓	# of Filters Used: 1 filter clear

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (initials): IS — Data entry reviewed (initials):

Seepage Water Quality Field Sheets

1. Sample Site:	Date:	Time:	Sampler(s):
SS9	June 4/20	9:10	DJ

Sky: Clear / P.Cloudy / O/cast / Fog / Haze / Other — Temp: 2 — Precip: Nil / Light / Mod / Strong / Rain / Snow / Other — Wind: Calm / Light / Mod / Strong / N / E / S / W / Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
2.7	45.5	6.13	1731	996	7.36	1859	

QA/QC? Y / (N)

Photos: Close-up ☑ Upstream ☑ Downstream ☑

Note: 1 every 10 samples must be dumped

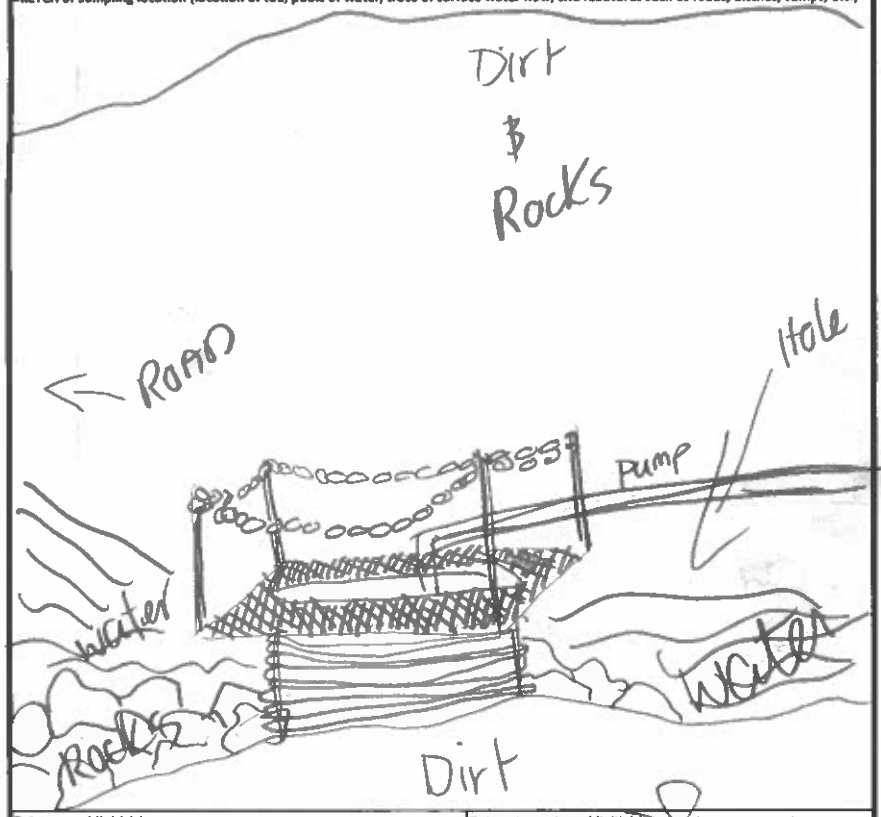
New Sample ? Y / (N) IF Yes, Record GPS Coordinates

Water Colour? Turbidity, Precipitates? Description of Sampling Conditions: clear, light slick layer over top, airidescent

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120 ml	D-Hg (40 ml)	Colour of Sediment on filter:
✓	✓	✓	✓	# of Filters Used: 1 filter clear

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (initials): IS — Data entry reviewed (initials):

1. Sample Site:	Date:	Time:	Sampler(s):
SS6	June 4/20	10:45	DJ

Sky: Clear / P.Cloudy / O/cast / Fog / Haze / Other — Temp: 7 — Precip: (Nil) / Light / Mod / Strong / Rain / Snow / Other — Wind: Calm / (Light) / Mod / Strong / N / E / S / W / Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
10.1	69.5	7.79	1635	1169	7.72	157.9	

QA/QC? Y / (N)

Photos: Close-up ☐ Upstream ☐ Downstream ☐

Note: 1 every 10 samples must be dumped

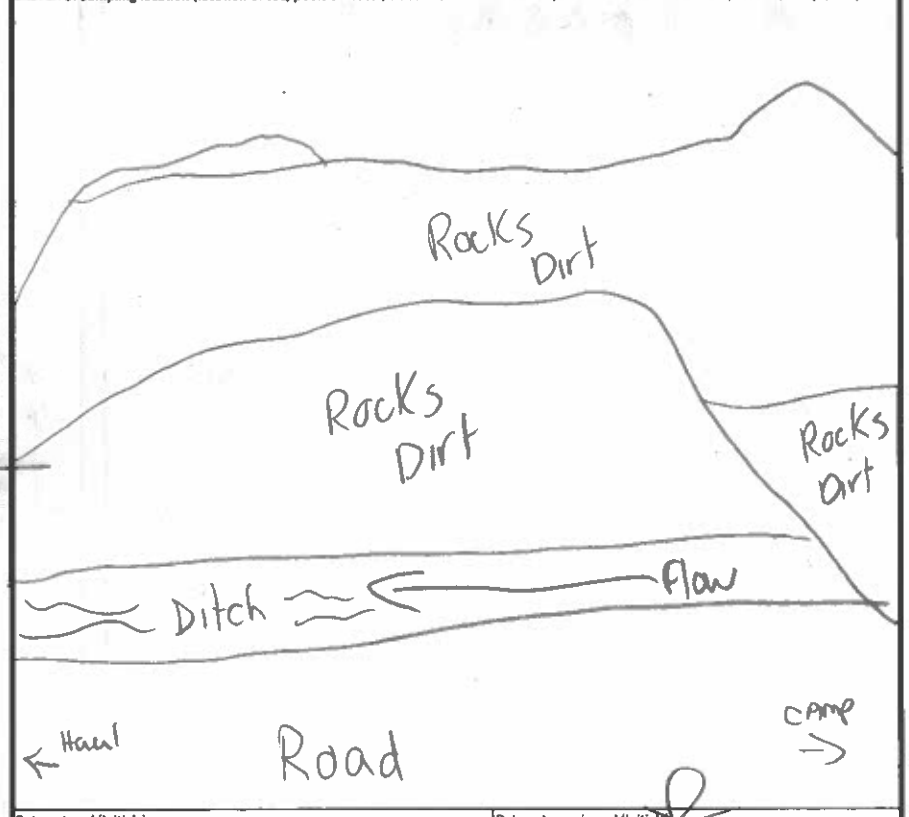
New Sample ? Y / (N) IF Yes, Record GPS Coordinates

Water Colour? Turbidity, Precipitates? Description of Sampling Conditions: murky ish Kinda clear muddy sluggy @ bottom

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120 ml	D-Hg (40 ml)	Colour of Sediment on filter:
✓	✓	✓	✓	# of Filters Used: 2 light tan brown

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (initials): IS — Data entry reviewed (initials):

Seepage Water Quality Field Sheets

1. Sample Site:	Date:	Time:	Sampler(s):
SS07	June 5	7:30	DJ

Sky: Clear / P.Cloudy / O/cast / Fog / Haze / Other — Temp: — Precip: Nil / Light / Mod / Strong / Rain / Snow / Other — Wind: Calm / Light / Mod / Strong / N / E / S / W / Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
7.4	84.1	2.88	1178	1141	7.60	200.7	

QA/QC? Y / N — Photos: Close-up ☑ Upstream ☑ Downstream ☑

Note: 1 every 10 samples must be dumped

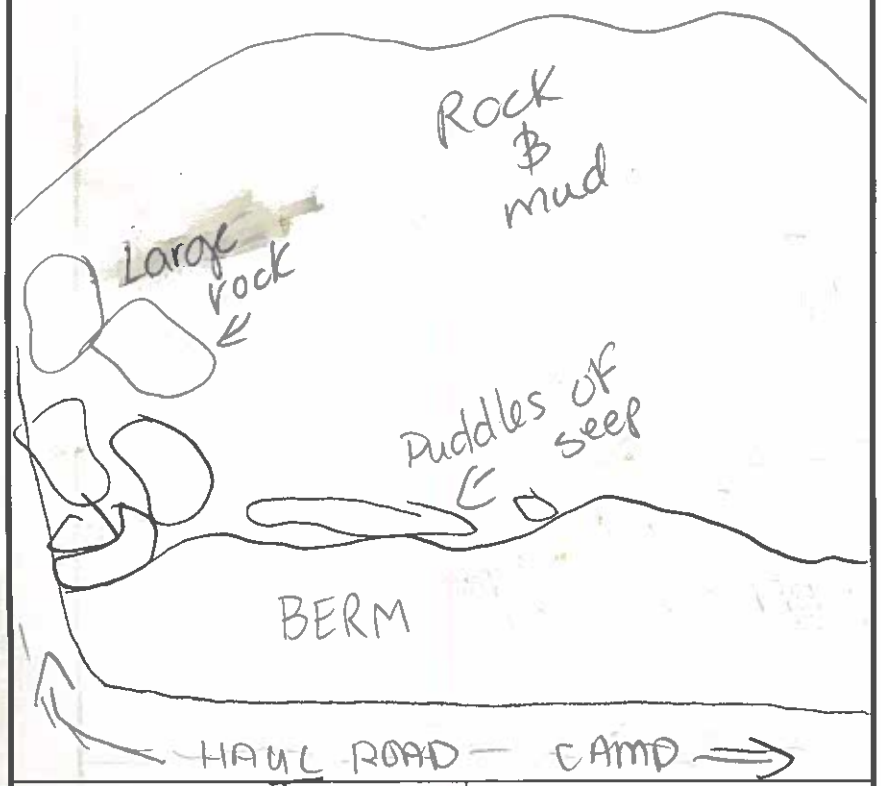
New Sample ? Y / N — IF Yes, Record GPS Coordinates

Water Colour? Turbidity, Precipitates? Description of Sampling Conditions: clear, mud was very very soft would shake up with smallest movement

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120 ml	D-Hg (40 ml)	Colour of Sediment on filter:
✓	✓	✓	✓	# of Filters Used: 1 very light tan

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (initials): DJ — Data entry reviewed (initials): IS

1. Sample Site:	Date:	Time:	Sampler(s):

Sky: Clear / P.Cloudy / O/cast / Fog / Haze / Other — Temp: — Precip: Nil / Light / Mod / Strong / Rain / Snow / Other — Wind: Calm / Light / Mod / Strong / N / E / S / W / Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU

QA/QC? Y / N — Photos: Close-up ☐ Upstream ☐ Downstream ☐

Note: 1 every 10 samples must be dumped

New Sample ? Y / N — IF Yes, Record GPS Coordinates

Water Colour? Turbidity, Precipitates? Description of Sampling Conditions

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120 ml	D-Hg (40 ml)	Colour of Sediment on filter:
				# of Filters Used:

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)

Data entered (initials): — Data entry reviewed (initials):

Seepage Water Quality Field Sheets

1. Sample Site:	Date:	Time:	Sampler(s):
SS	June 6	8:25	DJ/IS

Sky: (Clear) P.Cloudy / O/cast / Fog / Haze / Other

Temp:

Precip: (Nil) / Strong Rain / Light Snow / Mod Other

Wind: (Calm) / Strong N E S W / Light Mod Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
5.3	72.7	9.10	177.8	110.9	8.22	212.8	

QA/QC? Y / (N)

Note: 1 every 10 samples must be dumped

New Sample ? (Y) N IF Yes, Record GPS Coordinates

Photos: Close-up ☑ Upstream ☑ Downstream ☑

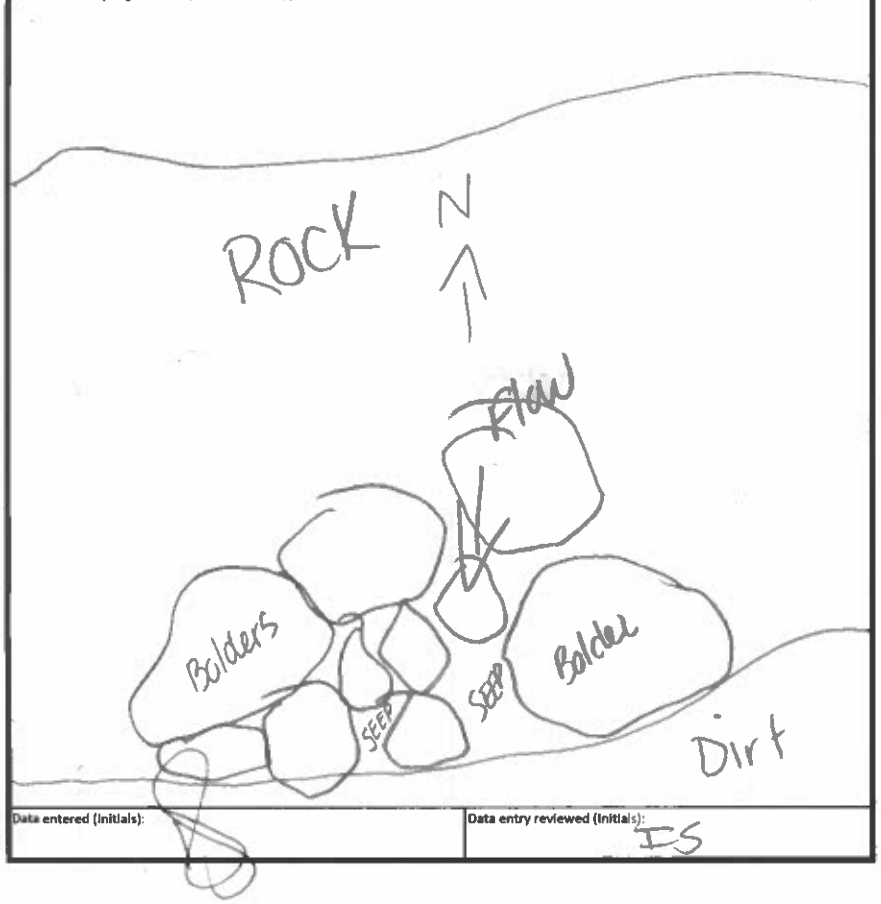
Water Colour? Turbidity, Precipitates? Description of Sampling Conditions:

clear / slightly murky

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120 ml	D-Hg (40 ml)	Colour of Sediment on filter:
✓	✓	✓	✓	# of Filters Used: 1 clear

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (initials):

Data entry reviewed (initials): IS

1. Sample Site:	Date:	Time:	Sampler(s):
SS50	June 6	8:45	DJ/IS

Sky: (Clear) P.Cloudy / O/cast / Fog / Haze / Other

Temp:

Precip: (Nil) / Strong Rain / Light Snow / Mod Other

Wind: (Calm) / Strong N E S W / Light Mod Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
4.5	69.6	8.90	502.7	306.8	7.89	217.9	

QA/QC? Y / (N)

Note: 1 every 10 samples must be dumped

New Sample ? Y (N) IF Yes, Record GPS Coordinates

Photos: Close-up ☑ Upstream ☑ Downstream ☑

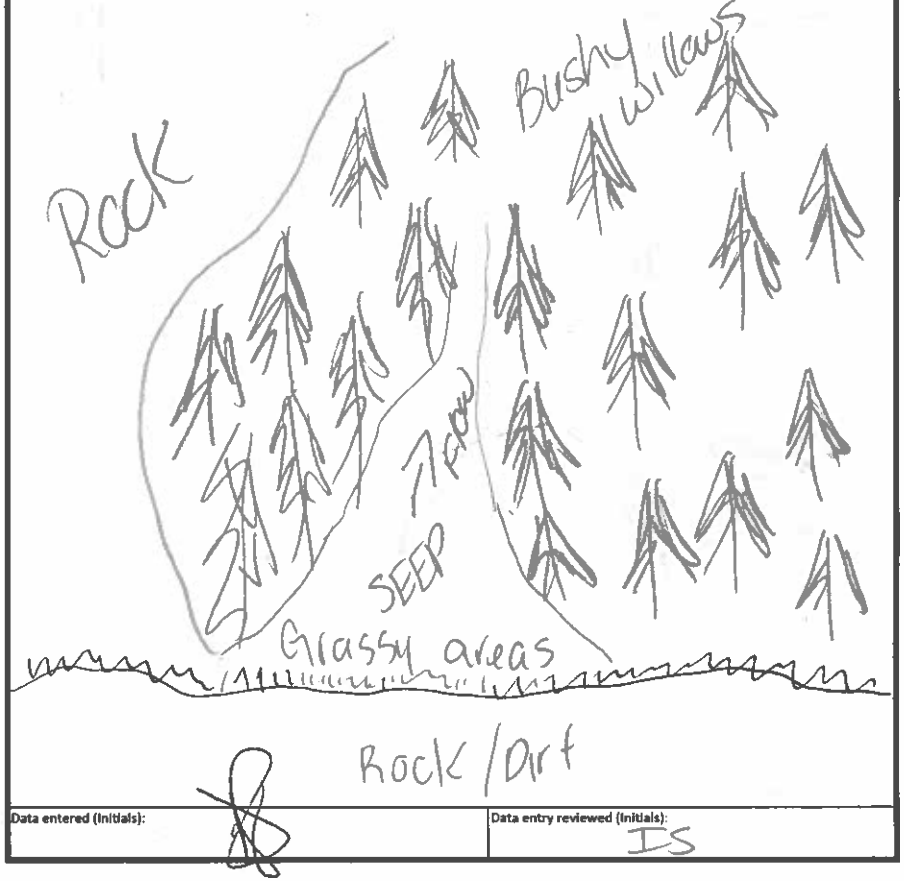
Water Colour? Turbidity, Precipitates? Description of Sampling Conditions:

clear / lots of dead plant matter on top.

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120 ml	D-Hg (40 ml)	Colour of Sediment on filter:
✓	✓	✓	✓	# of Filters Used: 1 clear

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (initials):

Data entry reviewed (initials): IS

Seepage Water Quality Field Sheets

1. Sample Site:	Date:	Time:	Sampler(s):
SS49	June 6	9:00	DJ / IS

Sky: (Clear) P.Cloudy O/cast Fog Haze Other

Temp:

Precip: (Nil) Light Mod Strong Rain Snow Other

Wind: (Calm) Light Mod Strong N E S W Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
7.9	57.9	6.81	508.7	342.3	8.15	198.2	

QA/QC? Y / (N)

Note: 1 every 10 samples must be dumped

New Sample ? Y (N) IF Yes, Record GPS Coordinates

Photos: Close-up ☑ Upstream ☑ Downstream ☑

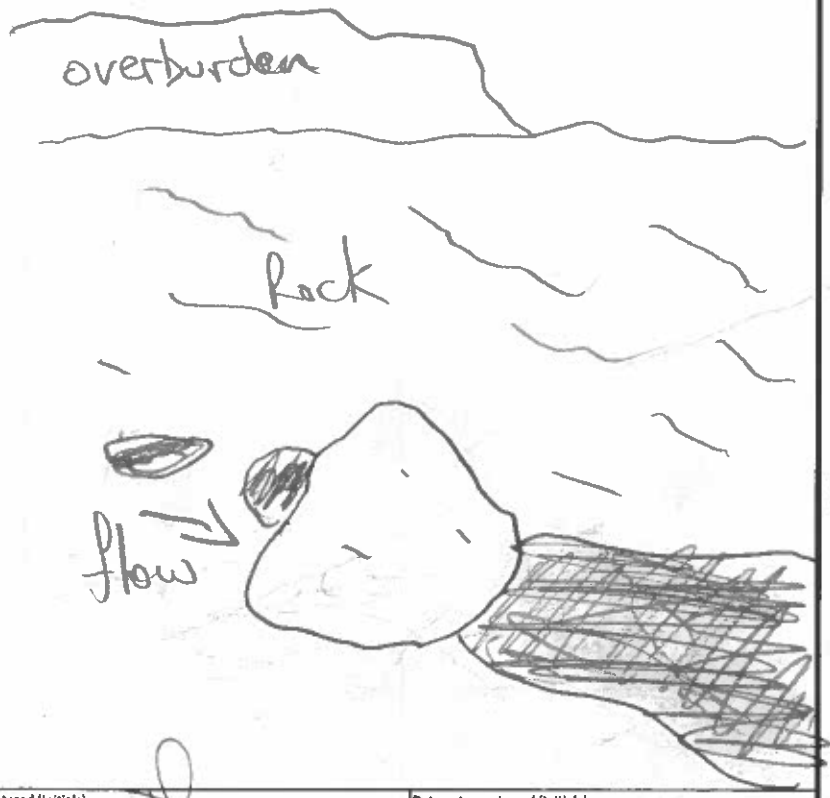
Water Colour? Turbidity, Precipitates? Description of Sampling Conditions:

clear lots of bug larva

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120ml	D-Hg (40ml)	Colour of Sediment on filter:
✓	✓	✓	✓	# of Filters Used: 1 clear

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (initials): IS

Data entry reviewed (initials): IS

1. Sample Site:	Date:	Time:	Sampler(s):
SS64	June 6	9:20	DJ / IS

Sky: (Clear) P.Cloudy O/cast Fog Haze Other

Temp:

Precip: (Nil) Light Mod Strong Rain Snow Other

Wind: (Calm) Light Mod Strong N E S W Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
9.3	32.6	3.72	488.1	342.9	7.67	214.7	

QA/QC? (Y) / N

Note: 1 every 10 samples must be dumped

New Sample ? Y / (N) IF Yes, Record GPS Coordinates

Photos: Close-up ☑ Upstream ☑ Downstream ☑

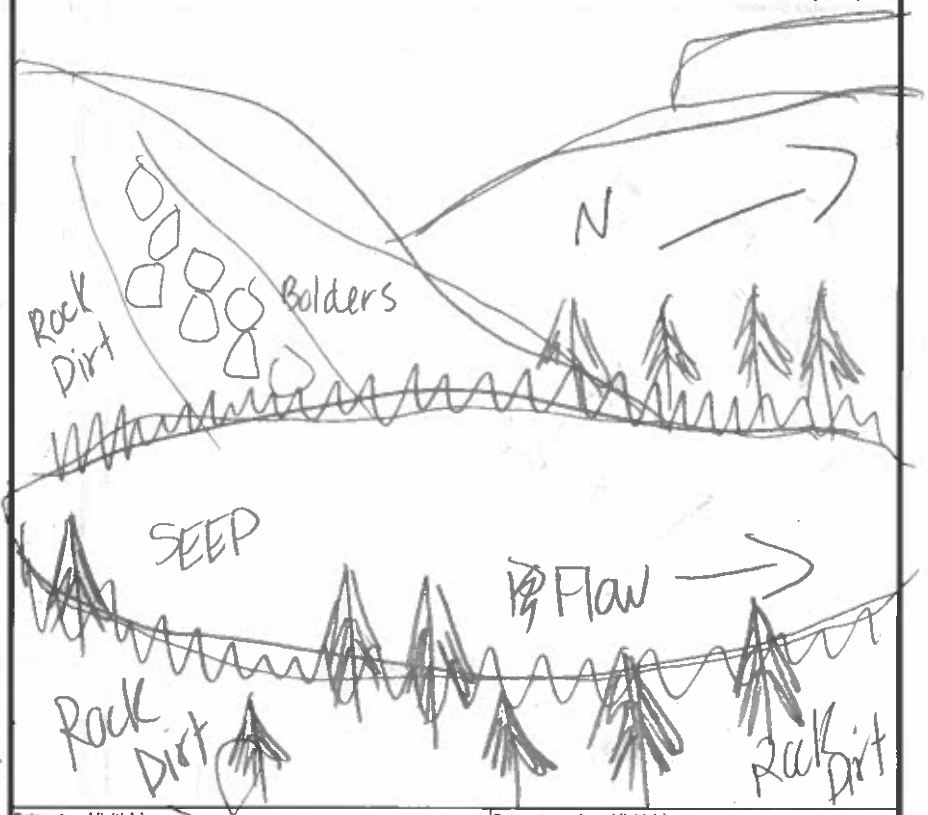
Water Colour? Turbidity, Precipitates? Description of Sampling Conditions:

clear lots of bug larva

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120ml	D-Hg (40ml)	Colour of Sediment on filter:
✓	✓	✓	✓	# of Filters Used: 1 & slightly green

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (initials):

Data entry reviewed (initials): IS

Seepage Water Quality Field Sheets

1. Sample Site:	Date:	Time:	Sampler(s):
SS48	June 6	9:40	DJ / IS

Sky: (Clear) P.Cloudy O/cast Fog Haze Other

Temp:

Precip: (Nil) Light Mod Strong Rain Snow Other

Wind: (Calm) Light Mod Strong N E S W Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
9.4	57.0	6.50	301.6	2120	7.78	206	

QA/QC? Y / (N)

Note: 1 every 10 samples must be dumped

New Sample ? (Y) N ?, IF Yes, Record GPS Coordinates

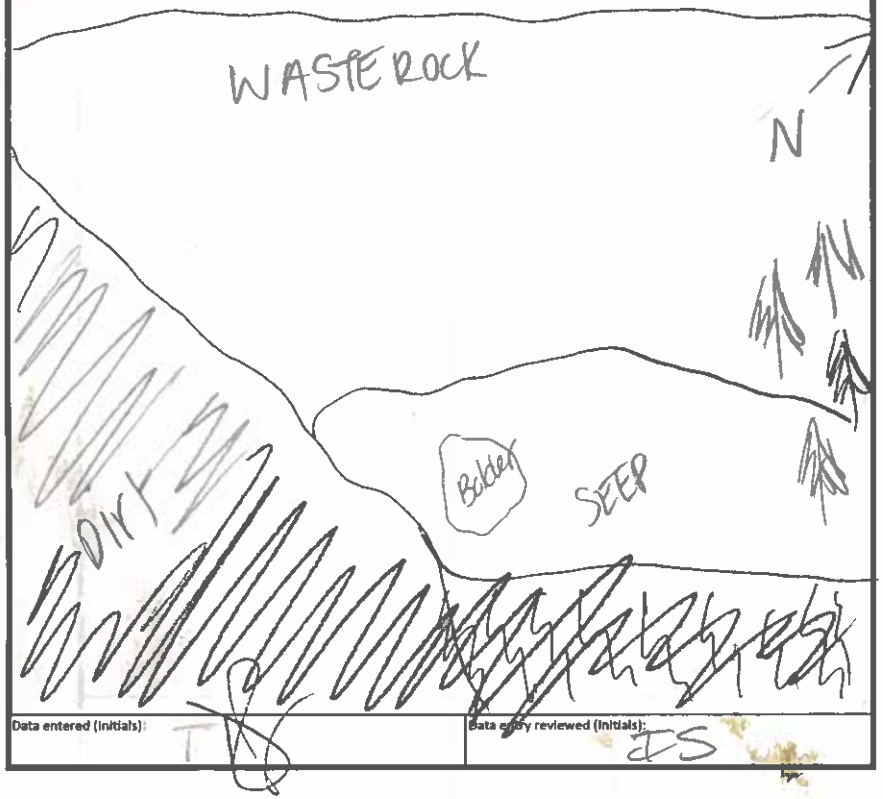
Photos: Close-up ☑ Upstream ☑ Downstream ☑

Water Colour? Turbidity, Precipitates? Description of Sampling Conditions

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120 ml	D-Hg (40 ml)	Colour of Sediment on filter:
✓	✓	✓	✓	# of Filters Used: 1 clear

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (initials): T

Data entry reviewed (initials): JS

1. Sample Site:	Date:	Time:	Sampler(s):
SS39	June 6	10:10	DJ / IS

Sky: (Clear) P.Cloudy O/cast Fog Haze Other

Temp:

Precip: (Nil) Light Mod Strong Rain Snow Other

Wind: Calm (Light) Mod Strong N E S W Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
5.7	86.4	10.83	795	502	7.55	212	

QA/QC? Y / (N)

Note: 1 every 10 samples must be dumped

New Sample ? Y (N) IF Yes, Record GPS Coordinates

Photos: Close-up ☑ Upstream ☑ Downstream ☑

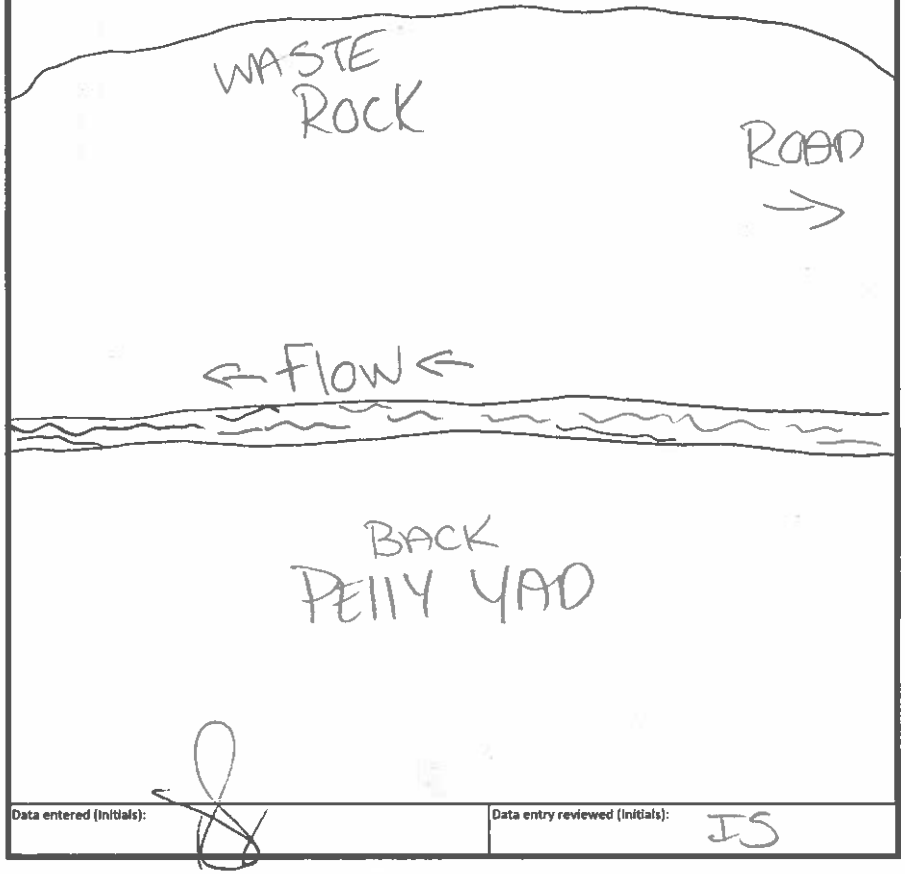
Water Colour? Turbidity, Precipitates? Description of Sampling Conditions

clear

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120 ml	D-Hg (40 ml)	Colour of Sediment on filter:
✓	✓	✓	✓	# of Filters Used: 1 clear

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (initials):

Data entry reviewed (initials): JS

Seepage Water Quality Field Sheets

1. Sample Site:	Date:	Time:	Sampler(s):
SS1	6/6/20	14:10	IS

Sky: Clear / O/cast / Fog / P.Cloudy / Haze / Other

Temp:

Precip: Nil / Light / Mod / Strong / Rain / Snow / Other

Wind: Calm / Light / Mod / Strong / N / E / S / W / Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
2.7	50.9	6.93	991	566	7.35	242.6	

QA/QC? Y / N

Note: 1 every 10 samples must be dumped

New Sample ? Y / N IF Yes, Record GPS Coordinates

Photos: Close-up ☑ Upstream ☑ Downstream ☑

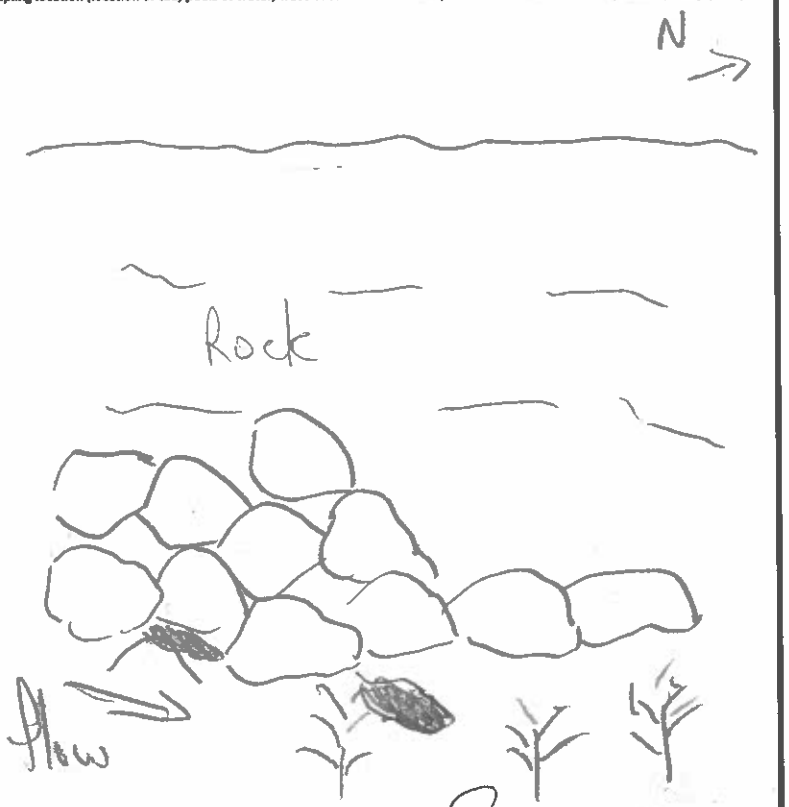
Water Colour? Turbidity, Precipitates? Description of Sampling Conditions:

clear, white-ish precipitate on bottom

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120ml	D-Hg (40ml)	Colour of Sediment on filter: none
✓	✓	✓	✓	# of Filters Used: 1

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (initials): IS

Data entry reviewed (initials):

1. Sample Site:	Date:	Time:	Sampler(s):
SS31	6/6/2020	15:15	IS

Sky: Clear / O/cast / Fog / P.Cloudy / Haze / Other

Temp:

Precip: Nil / Light / Mod / Strong / Rain / Snow / Other

Wind: Calm / Light / Mod / Strong / N / E / S / W / Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
3.1	66.4	9.20	1219	708	7.48	231.6	

QA/QC? Y / N

Note: 1 every 10 samples must be dumped

New Sample ? Y / N IF Yes, Record GPS Coordinates

Photos: Close-up ☑ Upstream ☑ Downstream ☑

Water Colour? Turbidity, Precipitates? Description of Sampling Conditions:

clear, muddy bottom

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120ml	D-Hg (40ml)	Colour of Sediment on filter: clear
✓	✓	✓	✓	# of Filters Used: 1

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (initials): IS

Data entry reviewed (initials):

Seepage Water Quality Field Sheets

1. Sample Site:	Date:	Time:	Sampler(s):
SS4	6/6/2020	15:35	JS

Sky: Clear / O/cast / Fog / P.Cloudy / Haze / Other — Temp: 13 — Precip: Nil / Strong / Rain / Light / Mod / Snow / Other — Wind: Calm / Light / Mod / Strong / N / E / S / W / Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
3.7	55.4	7.26	1214	722	7.45	234.5	

QA/QC? Y / (N)

Note: 1 every 10 samples must be dumped

New Sample ? Y / N IF Yes, Record GPS Coordinates

Photos: Close-up ☑ Upstream ☑ Downstream ☐

Water Colour? Turbidity, Precipitates? Description of Sampling Conditions: clear, muddy bottom

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120 ml	D-Hg (40 ml)	Colour of Sediment on filter: clear
✓	✓	✓	✓	# of Filters Used: 1

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (initials): IS

Data entry reviewed (initials):

1. Sample Site:	Date:	Time:	Sampler(s):
SS5T	6/6/2020	15:50	JS

Sky: Clear / O/cast / Fog / P.Cloudy / Haze / Other — Temp: 13 — Precip: Nil / Strong / Rain / Light / Mod / Snow / Other — Wind: Calm / Light / Mod / Strong / N / E / S / W / Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
7.8	43.2	5.13	1282	849	7.39	222.7	

QA/QC? Y / (N)

Note: 1 every 10 samples must be dumped

New Sample ? Y / (N) IF Yes, Record GPS Coordinates

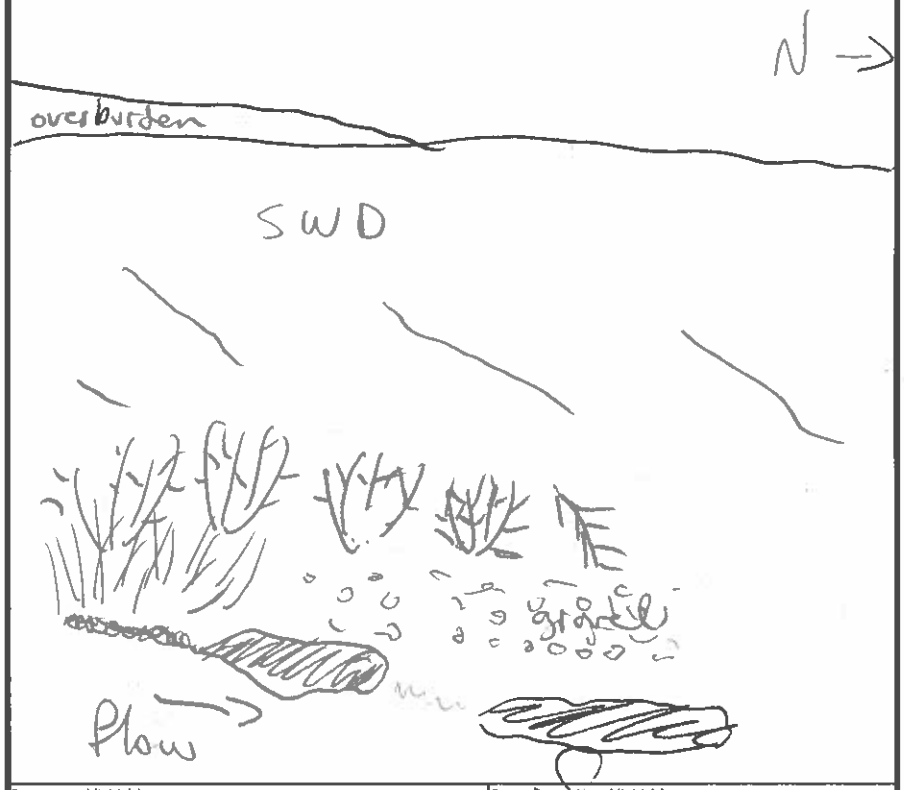
Photos: Close-up ☑ Upstream ☑ Downstream ☑

Water Colour? Turbidity, Precipitates? Description of Sampling Conditions: clear, lots of dead horsetails on bottom

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120 ml	D-Hg (40 ml)	Colour of Sediment on filter: grey
✓	✓	✓		# of Filters Used: 1

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (initials): JS

Data entry reviewed (initials):

Seepage Water Quality Field Sheets

1. Sample Site:	Date:	Time:	Sampler(s):
SS29	6/6/2020	16:05	IS

Sky: Clear / P.Cloudy / O/cast / Fog / Haze / Other — Temp: — Precip: Nil / Light / Mod / Strong / Rain / Snow / Other — Wind: Calm / Light / Mod / Strong / N / E / S / W / Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
1.2	60.6	8.54	1324	721	7.56	217.3	

QA/QC? Y / N — Note: 1 every 10 samples must be dumped

Photos: Close-up ☑ Upstream ☑ Downstream ☑

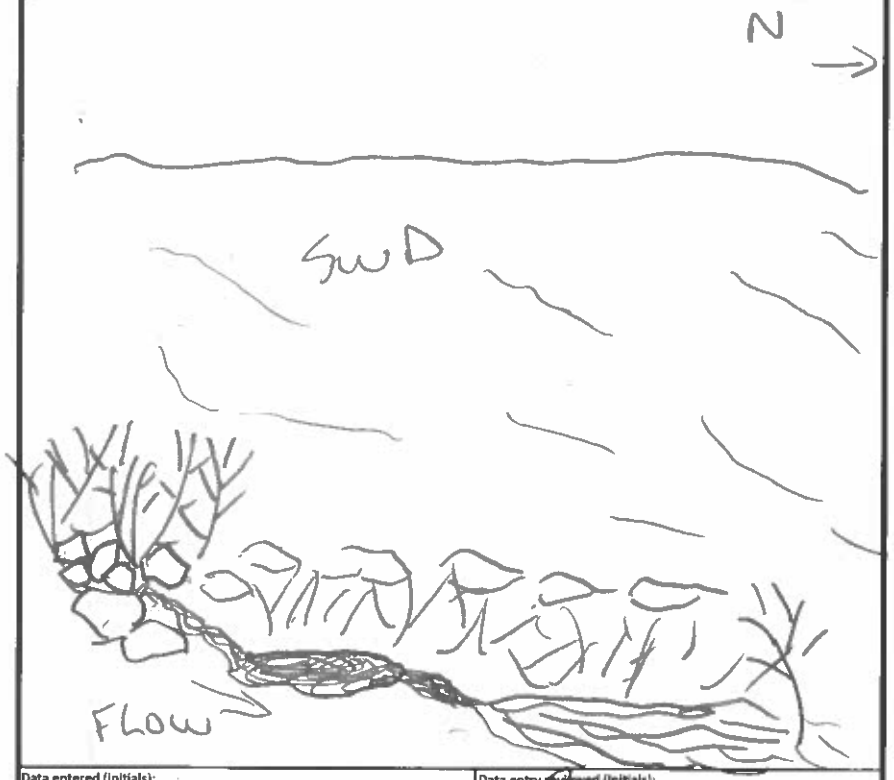
New Sample ? Y / N — IF Yes, Record GPS Coordinates

Water Colour? Turbidity, Precipitates? Description of Sampling Conditions: clear

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120ml	D-Hg (40ml)	Colour of Sediment on filter: none
✓	✓	✓	✓	# of Filters Used: 1

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (initials): IS — Data entry reviewed (initials):

1. Sample Site:	Date:	Time:	Sampler(s):
SS21	6/6/2020	16:25	IS

Sky: Clear / P.Cloudy / O/cast / Fog / Haze / Other — Temp: — Precip: Nil / Light / Mod / Strong / Rain / Snow / Other — Wind: Calm / Light / Mod / Strong / N / E / S / W / Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
0.8	40.5	5.77	1301	700	7.62	226.8	

QA/QC? Y / N — Note: 1 every 10 samples must be dumped

Photos: Close-up ☑ Upstream ☑ Downstream ☑

New Sample ? Y / N — IF Yes, Record GPS Coordinates

Water Colour? Turbidity, Precipitates? Description of Sampling Conditions: clear, greenish tint

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120ml	D-Hg (40ml)	Colour of Sediment on filter: green/grey
✓	✓	✓		# of Filters Used: 1

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (initials): IS — Data entry reviewed (initials):

Seepage Water Quality Field Sheets

1. Sample Site:	Date:	Time:	Sampler(s):
SS56	6/6/2020	16:40	IS

Sky: Clear / P.Cloudy / O/cast / Fog / Haze / Other

Temp:

Precip: Nil / Light / Mod / Strong / Rain / Snow / Other

Wind: Calm / Light / Mod / Strong / N / E / S / W / Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
2.5	56.6	7.71	1271	722	7.57	226.1	

QA/QC? Y / N

Note: 1 every 10 samples must be dumped

New Sample ? Y / N IF Yes, Record GPS Coordinates

Photos: Close-up ☑ Upstream ☑ Downstream ☑

Water Colour? Turbidity, Precipitates? Description of Sampling Conditions:

Clear, lots of moss and organics on bottom

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120 ml	D-Hg (40 ml)	Colour of Sediment on filter: none
✓	✓	✓	✓	# of Filters Used:

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (Initials): IS

Data entry reviewed (Initials):

1. Sample Site:	Date:	Time:	Sampler(s):
SS28	6/6/2020	16:55	IS

Sky: Clear / P.Cloudy / O/cast / Fog / Haze / Other

Temp:

Precip: Nil / Light / Mod / Strong / Rain / Snow / Other

Wind: Calm / Light / Mod / Strong / N / E / S / W / Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
6.2	68.5	8.44	1110	711	7.49	230.4	

QA/QC? Y / N

Note: 1 every 10 samples must be dumped

New Sample ? Y / N IF Yes, Record GPS Coordinates

Photos: Close-up ☑ Upstream ☑ Downstream ☑

Water Colour? Turbidity, Precipitates? Description of Sampling Conditions:

Clear, light coloured sediment, lots of organics + insect activity

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120 ml	D-Hg (40 ml)	Colour of Sediment on filter: grey
✓	✓	✓		# of Filters Used:

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (Initials): IS

Data entry reviewed (Initials):

Seepage Water Quality Field Sheets

1. Sample Site:	Date:	Time:	Sampler(s):
SS53	6/7/2020	17:30	IS

Sky: Clear / P.Cloudy / O/cast / Fog / Haze / Other — Temp: 17 — Precip: (Nil) / Light / Mod / Strong / Rain / Snow / Other — Wind: (Calm) / Light / Mod / Strong / N / E / S / W / Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
1.9	44.3	8.88	733.1	410.4	7.50	196.8	

QA/QC? Y / (N)

Note: 1 every 10 samples must be dumped

New Sample ? Y / N IF Yes, Record GPS Coordinates

Photos: Close-up ☑ Upstream ☑ Downstream ☑

Water Colour? Turbidity, Precipitates? Description of Sampling Conditions:

clear to greenish. transitions from out at rock into wetland

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120ml	D-Hg (40ml)	Colour of Sediment on filter: slight green
✓	✓	✓	✓	# of Filters Used: 1

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (initials): IS

Data entry reviewed (initials):

1. Sample Site:	Date:	Time:	Sampler(s):

Sky: Clear / P.Cloudy / O/cast / Fog / Haze / Other — Temp: — Precip: Nil / Light / Mod / Strong / Rain / Snow / Other — Wind: Calm / Light / Mod / Strong / N / E / S / W / Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU

QA/QC? Y / N

Note: 1 every 10 samples must be dumped

New Sample ? Y / N IF Yes, Record GPS Coordinates

Photos: Close-up ☐ Upstream ☐ Downstream ☐

Water Colour? Turbidity, Precipitates? Description of Sampling Conditions:

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120ml	D-Hg (40ml)	Colour of Sediment on filter:
				# of Filters Used:

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)

Data entered (initials):

Data entry reviewed (initials):

3.2 Fall Seepage Survey

Seepage Water Quality Field Sheets

1. Sample Site:	Date:	Time:	Sampler(s):
SS32	03/09/20	9:06	DJ

Sky: Clear / O/cast (Fog) / P.Cloudy / Haze / Other

Temp: 4

Precip: (Nil) / Light / Mod / Strong / Rain / Snow / Other

Wind: (Calm) / Light / Mod / Strong / N / E / S / W / Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
2.6	91.0	12.62	2203	125.7	7.66	191.4	

QA/QC? Y / (N)

Note: 1 every 10 samples must be dumped

New Sample ? Y / (N) IF Yes, Record GPS Coordinates

Photos: Close-up ☐ Upstream ☑ Downstream ☑

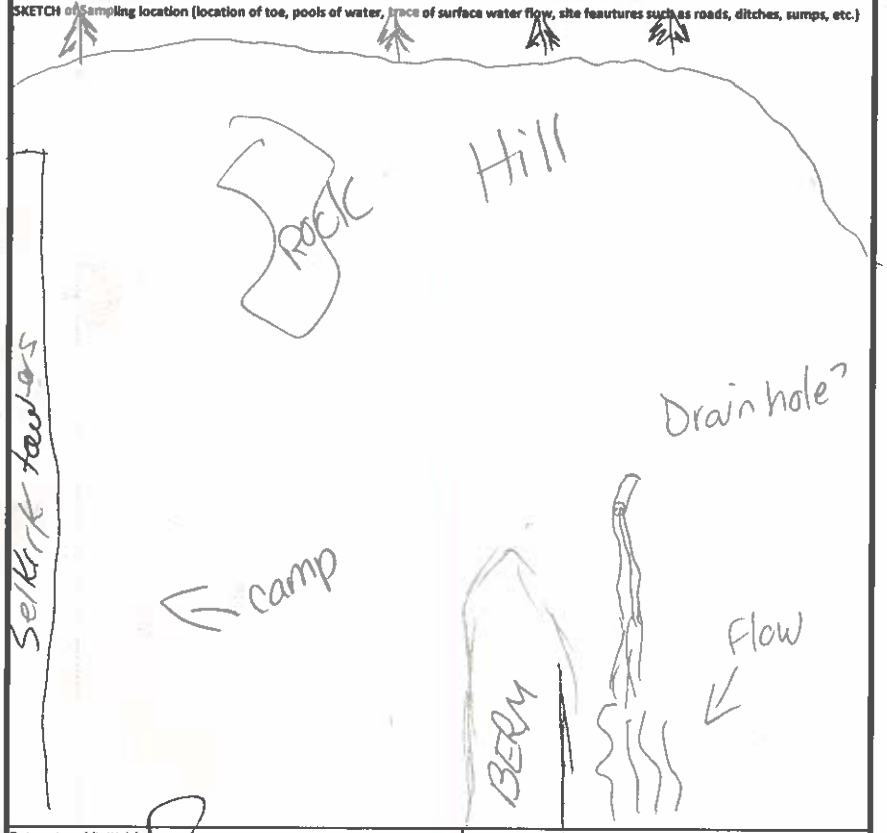
Water Colour? Turbidity, Precipitates? Description of Sampling Conditions

clear

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120ml	D-Hg (40ml)	Colour of Sediment on filter: clear
✓	✓	✓	✓	# of Filters Used: one

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (initials): [signature]

Data entry reviewed (initials): IS

1. Sample Site:	Date:	Time:	Sampler(s):
SS 105	03/09/20	10:10	DT

Sky: Clear / O/cast (Fog) / P.Cloudy / Haze / Other

Temp: 7

Precip: (Nil) / Light / Mod / Strong / Rain / Snow / Other

Wind: (Calm) / Light / Mod / Strong / N / E / S / W / Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
7.1	76.3	9.19	1959	1285	7.58	213.6	

QA/QC? Y / (N)

Note: 1 every 10 samples must be dumped

New Sample ? Y / (N) IF Yes, Record GPS Coordinates

Photos: Close-up ☐ Upstream ☑ Downstream ☑

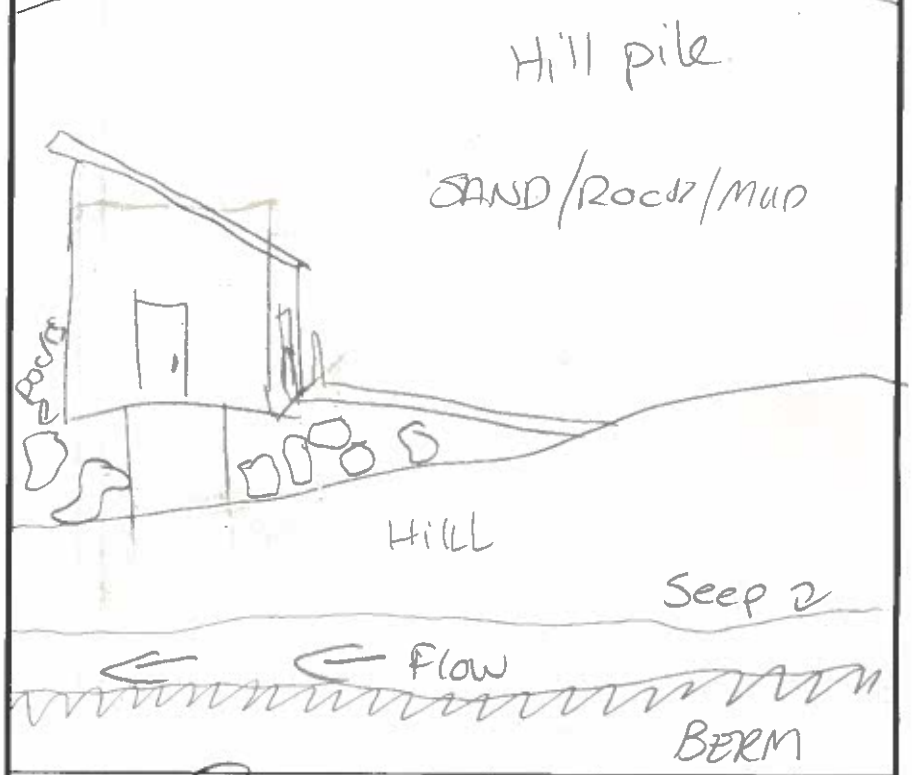
Water Colour? Turbidity, Precipitates? Description of Sampling Conditions

clear, soft bottom (very)

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120ml	D-Hg (40ml)	Colour of Sediment on filter: light brown
—	—	—	—	# of Filters Used: one

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (initials): [signature]

Data entry reviewed (initials): IS

Seepage Water Quality Field Sheets

1. Sample Site:	Date:	Time:	Sampler(s):
SS53	03/09/20	11:00	DJ

Sky: Clear / P.Cloudy / O/cast / Fog / Haze / Other — Temp: 4 — Precip: Nil / Light / Mod / Strong / Rain / Snow / Other — Wind: Calm / Light / Mod / Strong / N / E / S / W / Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
1.1	45.8	6.47	1697	921	7.79	218.8	

QA/QC? Y / (N)

Photos: Close-up ☐ Upstream ☑ Downstream ☑

Note: 1 every 10 samples must be dumped

New Sample ? Y / N IF Yes, Record GPS Coordinates

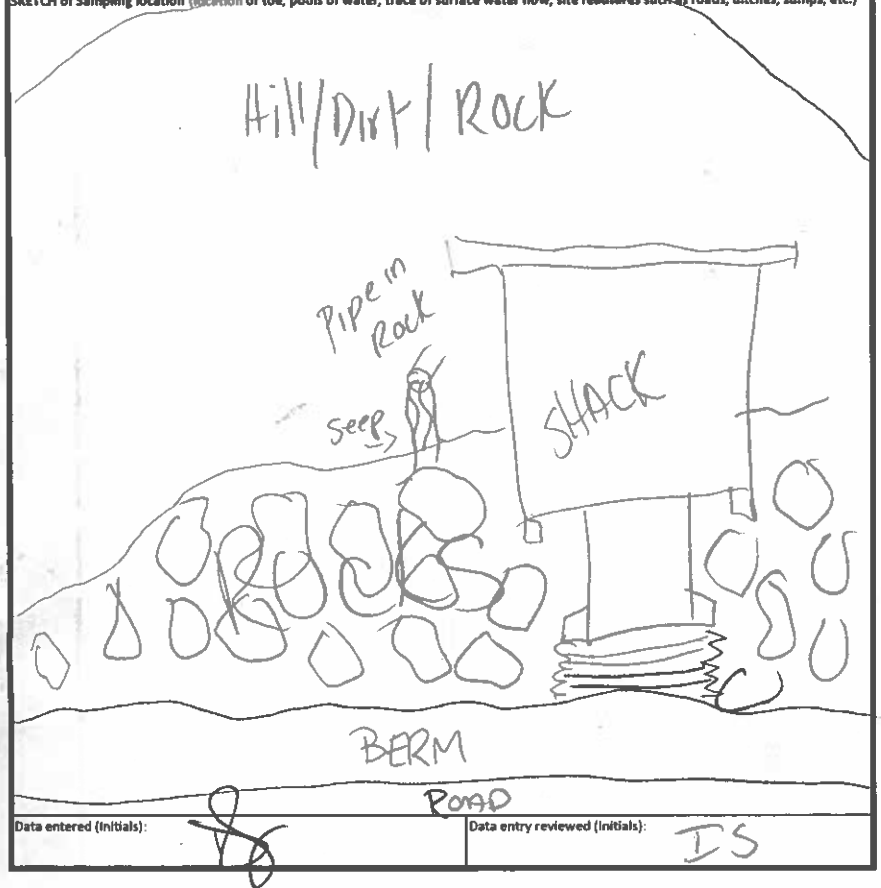
Water Colour? Turbidity, Precipitates? Description of Sampling Conditions

clear/muddy was under rock and mud very soft each movement mud would fall.

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120 ml	D-Hg (40 ml)	Colour of Sediment on filter: DARK BROWN
—	—	—	—	# of Filters Used: FOUR

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (initials): [illegible] Data entry reviewed (initials): IS

PIC IS SS33

1. Sample Site:	Date:	Time:	Sampler(s):
SS33	03/09/20	11:30	DJ

Sky: (O/cast) / Clear / P.Cloudy / Fog / Haze / Other — Temp: 4 — Precip: Nil / Light / Mod / Strong / Rain / Snow / Other — Wind: Calm / Light / Mod / Strong / N / E / S / W / Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
4.0	20.5	2.68	1665	995	7.45	229.6	

QA/QC? Y / (N)

Photos: Close-up ☐ Upstream ☑ Downstream ☑

Note: 1 every 10 samples must be dumped

New Sample ? Y / N Yes, Record GPS Coordinates

Water Colour? Turbidity, Precipitates? Description of Sampling Conditions

clear, came from black pipe.

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120 ml	D-Hg (40 ml)	Colour of Sediment on filter: clear
—	—	—	—	# of Filters Used: one

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (initials): [illegible] Data entry reviewed (initials): IS

PIC IS SS05

Seepage Water Quality Field Sheets

1. Sample Site:	Date:	Time:	Sampler(s):
SS08	04/09/20	9:10	TB

Sky: Clear / P.Cloudy / O/cast / Fog / Haze / Other — Temp: 3

Precip: (Nil) / Light / Mod / Strong / Rain / Snow / Other — Wind: (Calm) / Light / Mod / Strong / N / E / S / W / Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
3.1	41.8	5.44	1909	1133	7.26	213.5	

QA/QC? Y / (N)

Note: 1 every 10 samples must be dumped

New Sample ? Y (N) IF Yes, Record GPS Coordinates

Photos: Close-up ☑ Upstream ☑ Downstream ☑

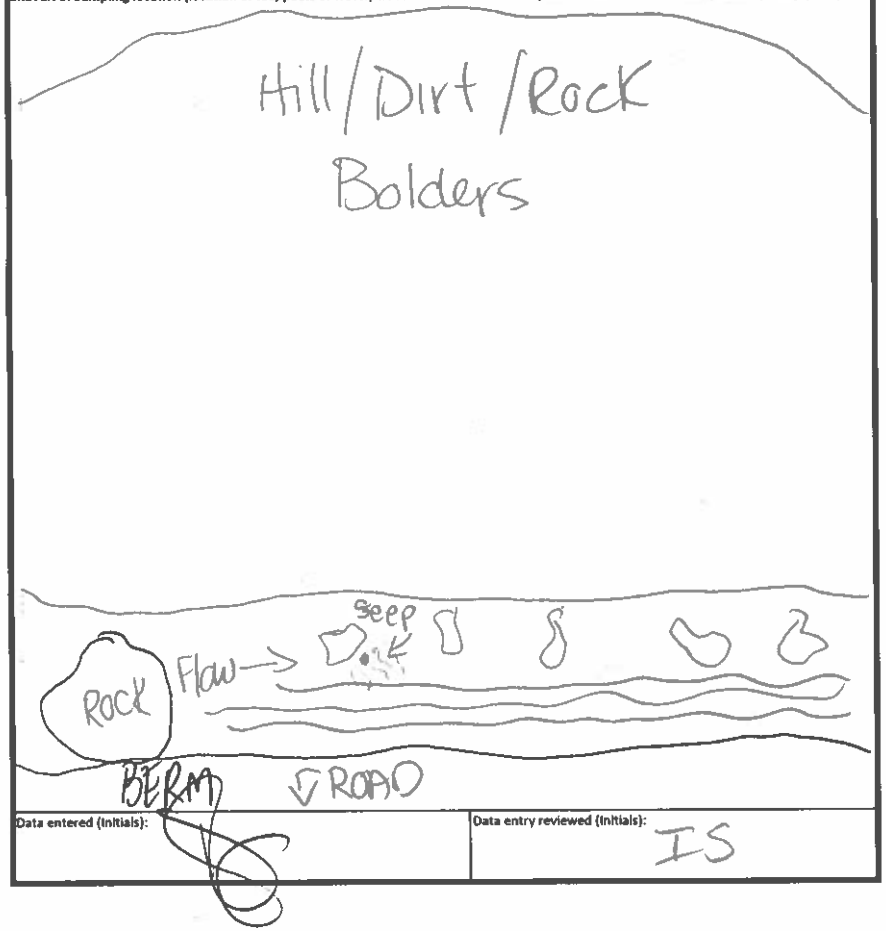
Water Colour? Turbidity, Precipitates? Description of Sampling Conditions:

clear

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120ml	D-Hg (40ml)	Colour of Sediment on filter: Light brown
—	—	—	—	# of Filters Used: ONE

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (initials):

Data entry reviewed (initials): IS

1. Sample Site:	Date:	Time:	Sampler(s):

Sky: Clear / P.Cloudy / O/cast / Fog / Haze / Other — Temp:

Precip: Nil / Light / Mod / Strong / Rain / Snow / Other — Wind: Calm / Light / Mod / Strong / N / E / S / W / Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU

QA/QC? Y / N

Note: 1 every 10 samples must be dumped

New Sample ? Y / N IF Yes, Record GPS Coordinates

Photos: Close-up ☐ Upstream ☐ Downstream ☐

Water Colour? Turbidity, Precipitates? Description of Sampling Conditions:

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120ml	D-Hg (40ml)	Colour of Sediment on filter:
				# of Filters Used:

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)

Data entered (initials):

Data entry reviewed (initials):

Seepage Water Quality Field Sheets

1. Sample Site:	Date:	Time:	Sampler(s):
SS112	9/4/2020	10:30	IS/SM

Sky: Clear / P.Cloudy / O/cast / Fog / Haze / Other — Temp: — Precip: (Nil) / Light / Mod / Strong / Rain / Snow / Other — Wind: (Calm) / Light / Mod / Strong / N / E / S / W / Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
7.0	14.6	1.78	653.9	427.6	6.48	5.6	

QA/QC? Y / (N)

Note: 1 every 10 samples must be dumped

New Sample ? (Y) N IF Yes, Record GPS Coordinates

Photos: Close-up ☐ Upstream ☐ Downstream ☐

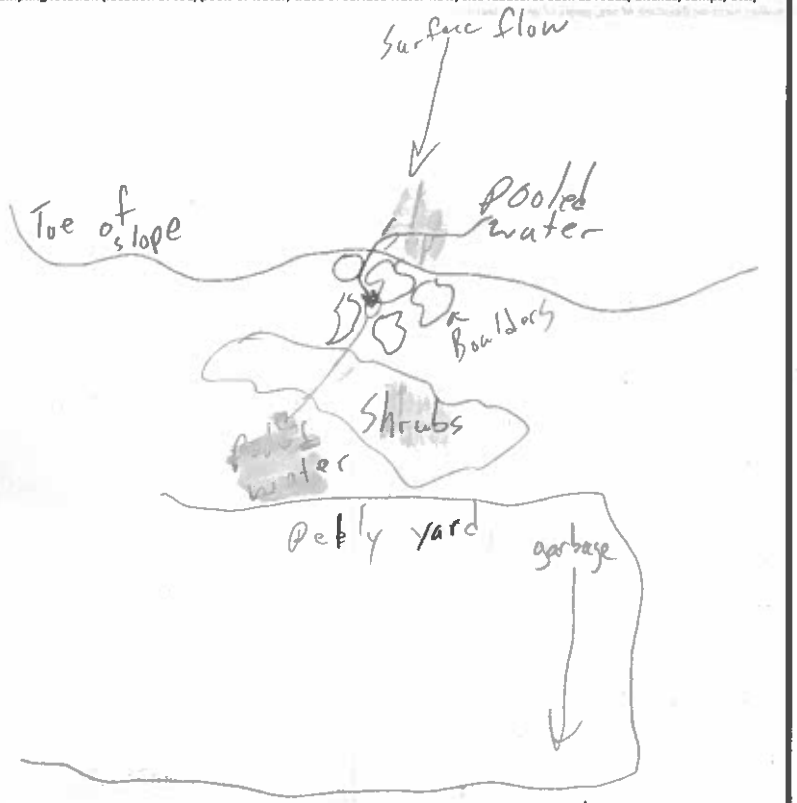
Water Colour? Turbidity, Precipitates? Description of Sampling Conditions:

clear

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120ml	D-Hg (40ml)	Colour of Sediment on filter:	# of Filters Used:
✓	✓	✓	✓	none	one

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (initials): IS

Data entry reviewed (initials):

1. Sample Site:	Date:	Time:	Sampler(s):

Sky: Clear / P.Cloudy / O/cast / Fog / Haze / Other — Temp: — Precip: Nil / Light / Mod / Strong / Rain / Snow / Other — Wind: Calm / Light / Mod / Strong / N / E / S / W / Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU

QA/QC? Y / N

Note: 1 every 10 samples must be dumped

New Sample ? Y / N IF Yes, Record GPS Coordinates

Photos: Close-up ☐ Upstream ☐ Downstream ☐

Water Colour? Turbidity, Precipitates? Description of Sampling Conditions:

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120ml	D-Hg (40ml)	Colour of Sediment on filter:	# of Filters Used:

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)

Data entered (initials):

Data entry reviewed (initials):

Seepage Water Quality Field Sheets

1. Sample Site:	Date:	Time:	Sampler(s):
SS44	9/5/2020	11:30	IS

Sky: Clear / P.Cloudy / O/cast / Fog / Haze / Other — Temp: 10 — Precip: Nil / Light / Mod / Strong / Rain / Snow / Other — Wind: Calm / Light / Mod / Strong / N / E / S / W / Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
5.0	61.6	7.84	734.5	454.2	6.88	159.3	

QA/QC? Y / N

Note: 1 every 10 samples must be dumped

New Sample ? Y / N IF Yes, Record GPS Coordinates

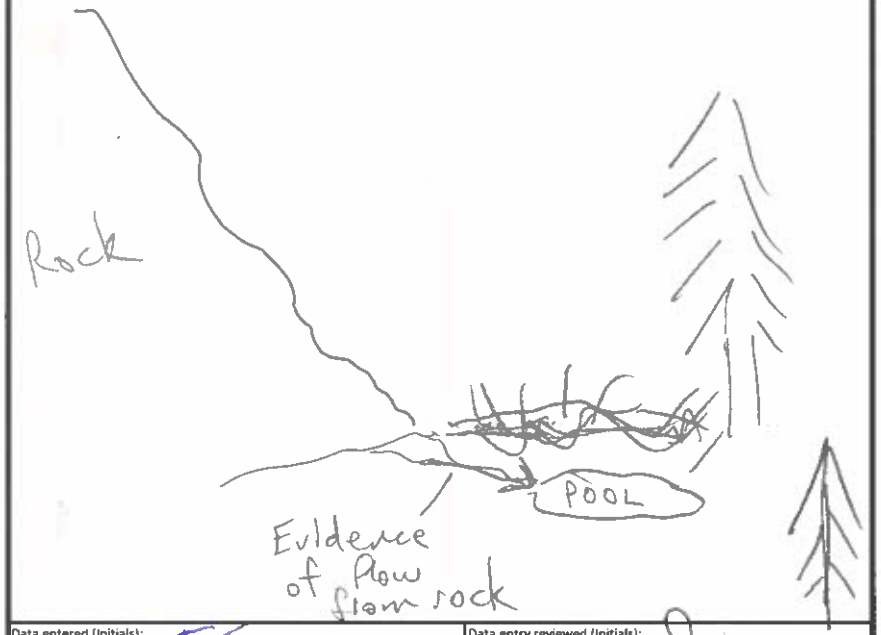
Photos: Close-up ☑ Upstream ☑ Downstream ☑

Water Colour? Turbidity, Precipitates? Description of Sampling Conditions:

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120 ml	D-Hg (40 ml)	Colour of Sediment on filter: none
✓	✓	✓	✓	# of Filters Used: 1

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (Initials): IS — Data entry reviewed (Initials):

1. Sample Site:	Date:	Time:	Sampler(s):
SS13	9/5/2020	12:00	IS

Sky: Clear / P.Cloudy / O/cast / Fog / Haze / Other — Temp: 10 — Precip: Nil / Light / Mod / Strong / Rain / Snow / Other — Wind: Calm / Light / Mod / Strong / N / E / S / W / Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
4.8	40.2	5.13	1336	820	6.97	116.5	

QA/QC? Y / N

Note: 1 every 10 samples must be dumped

New Sample ? Y / N IF Yes, Record GPS Coordinates

Photos: Close-up ☑ Upstream ☑ Downstream ☑

Water Colour? Turbidity, Precipitates? Description of Sampling Conditions:
clear with oily sheen on surface. No observable flow

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120 ml	D-Hg (40 ml)	Colour of Sediment on filter: clear
✓	✓	✓	✓	# of Filters Used: 2

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (Initials): IS — Data entry reviewed (Initials):

Seepage Water Quality Field Sheets

1. Sample Site:	Date:	Time:	Sampler(s):
SS3	9/5/2020	12:20	IS

Sky: Clear / P.Cloudy / O/cast / Fog / Haze / Other	Temp:	Precip: Nil / Light / Mod / Strong / Rain / Snow / Other	Wind: Calm / Light / Mod / Strong / N / E / S / W / Var
	5		

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
0.1	82.9	12.04	1233	649	7.32	136.8	

QA/QC? Y / (N)

Note: 1 every 10 samples must be dumped

New Sample ? Y / N IF Yes, Record GPS Coordinates

Photos: Close-up ☑ Upstream ☑ Downstream ☑

Water Colour? Turbidity, Precipitates? Description of Sampling Conditions:

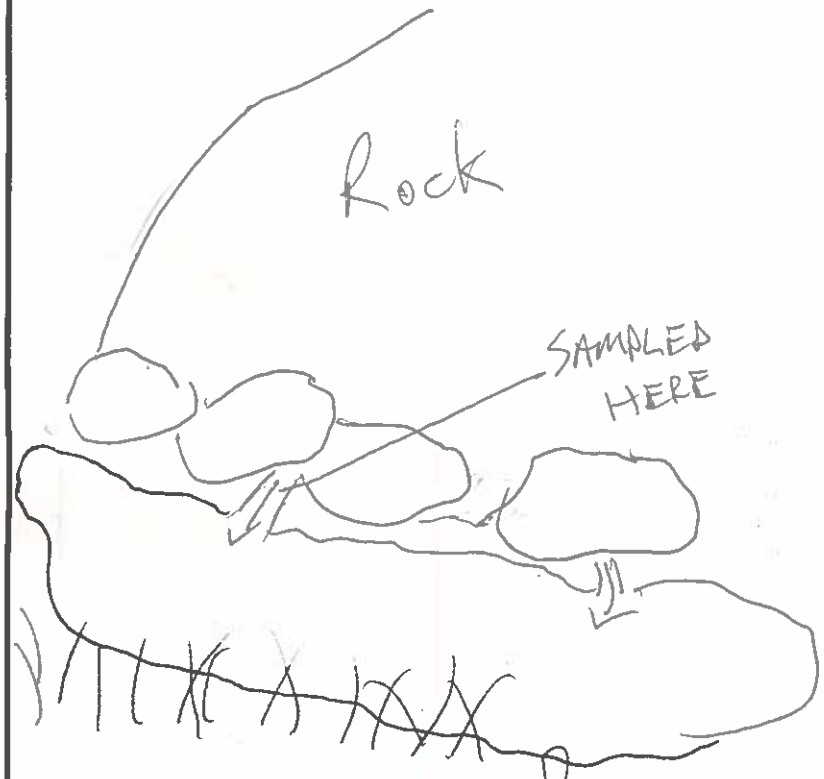
Clear, 1/2 ↓ strong flow

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120ml	D-Hg (40ml)	Colour of Sediment on filter:
✓	✓	✓	✓	none

# of Filters Used: 1

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (Initials): IS

Data entry reviewed (Initials):

1. Sample Site:	Date:	Time:	Sampler(s):

Sky: Clear / P.Cloudy / O/cast / Fog / Haze / Other	Temp:	Precip: Nil / Light / Mod / Strong / Rain / Snow / Other	Wind: Calm / Light / Mod / Strong / N / E / S / W / Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU

QA/QC? Y / N

Note: 1 every 10 samples must be dumped

New Sample ? Y / N IF Yes, Record GPS Coordinates

Photos: Close-up ☐ Upstream ☐ Downstream ☐

Water Colour? Turbidity, Precipitates? Description of Sampling Conditions:

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120ml	D-Hg (40ml)	Colour of Sediment on filter:

# of Filters Used:

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)

Data entered (Initials):

Data entry reviewed (Initials):

Seepage Water Quality Field Sheets

1. Sample Site:	Date:	Time:	Sampler(s):
SS109	8/9/2020	16:35	IS

Sky: Clear / P.Cloudy / O/cast / Fog / Haze / Other — Temp: 15 — Precip: Nil / Light / Mod / Strong / Rain / Snow / Other — Wind: Calm / Light / Mod / Strong / N / E / S / W / Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
12.8	76.4	8.06	1336	1023	7.64	199.1	

QA/QC? Y / (N) — Note: 1 every 10 samples must be dumped

New Sample ? (Y) N IF Yes, Record GPS Coordinates

Photos: Close-up ☑ Upstream ☑ Downstream ☑

Water Colour? Turbidity, Precipitates? Description of Sampling Conditions: clear — UTM 08 V0384246 6945023

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120ml	D-Hg (40ml)	Colour of Sediment on filter: none
✓	✓	✓		# of Filters Used: 1

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (Initials): DS — Data entry reviewed (Initials):

1. Sample Site:	Date:	Time:	Sampler(s):
SS108	26/9/2020	1330	AW

Sky: (Clear) / P.Cloudy / O/cast / Fog / Haze / Other — Temp: 10 — Precip: (Nil) / Light / Mod / Strong / Rain / Snow / Other — Wind: (Calm) / Light / Mod / Strong / N / E / S / W / Var

Temp C	DO %	DO mg/L	SPC µs/cm	EC µs/cm	pH	ORP mv	Turb NTU
1.3	71.4	9.97	398.7	219.0	6.05	208.7	

QA/QC? Y / (N) — Note: 1 every 10 samples must be dumped

New Sample ? Y / (N) IF Yes, Record GPS Coordinates

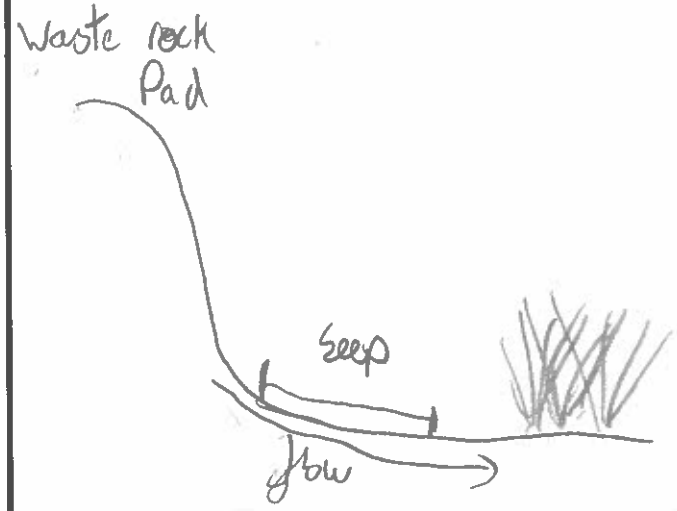
Photos: Close-up ☑ Upstream ☑ Downstream ☑

Water Colour? Turbidity, Precipitates? Description of Sampling Conditions: Clear — UTM 08 385359 6944078

DM 120 ml	GENERAL 500 ml	TOTAL Nutrients 120ml	D-Hg (40ml)	Colour of Sediment on filter: none
✓	✓	✓	X	# of Filters Used: 1

Notes (site conditions or variations from normal, i.e. ice cover, sediment, flows, etc.)

SKETCH of Sampling location (location of toe, pools of water, trace of surface water flow, site feautures such as roads, ditches, sumps, etc.)



Data entered (Initials): AW — Data entry reviewed (Initials): IS

Appendix F – 2020 Water Balance and Water Quality Model Summary

SRK Consulting (Canada) Inc.
2200–1066 West Hastings Street
Vancouver, BC V6E 3X2

T: +1.604.681.4196
F: +1.604.687.5532

vancouver@srk.com
www.srk.com

Memo

To:	Scott Morrison, Journey Paulus	**Client:**	Minto Explorations Ltd.
From:	Soren Jensen	**Project No:**	1CM002.065
Cc:	Ian Smith (Minto)	**Date:**	March 29, 2021
Subject:	2020 Water Balance and Water Quality Model Summary for the Minto Mine Site		

1 Introduction and Background

This memorandum provides a summary of the 2020 water balance and water quality model updates for the Minto Mine site. The update covers the period January 1, 2020 through December 31, 2020.

The water balance update includes a review and summary of precipitation, flow and water inventory data for the Mine site. The water quality update includes a comparison of water quality data collected in 2020 to water quality model predictions for Phase VII of the Mine development. Water quality predictions for the Main Pit Tailings Management Facility (MPTMF) and the Water Storage Pond (WSP) are provided for 2020 and for the post-closure period when predicted concentrations are the same from year to year (steady state concentrations).

The Minto Mine operated for all of 2020 after ending a period of care and maintenance in October 2019.

2 Water Balance Update

2.1 Precipitation

Table 1 shows a summary of monthly precipitation measured at the Mine site between October 2019 and December 2020 along with precipitation data from the regional station at Carmacks, YT (Climate ID: 2100301)[1], which is located 77 km Southwest of the Minto Mine. In the past, the meteorological station at Pelly Ranch (Climate ID 2100880)[1] located 25 km north of Minto was used as a regional reference station. However, the published data record from Pelly Ranch ends in March 2015 so the Carmacks Station was used instead.

Minto's Campbell Scientific meteorological station measures total precipitation using a Geonor gauge and a tipping bucket rain gauge. From October through May, the tipping bucket is equipped with a snowfall conversion adaptor, which allows it to measure snowfall as snow water equivalent. The Geonor precipitation gauge collects precipitation in a bucket and records

[1] Data obtained from Meteorological Service of Canada, Environment Canada.

precipitation by measuring the weight of the bucket. In the winter months, the bucket is partially filled with an antifreeze solution that melts any snow collected. In 2020, the total precipitation measurement collected by the Geonor gauge were functional but the analogue signal from the vibrating wire load cell was noisy and there are some uncertainty concerning the conversion of the recorded frequency measurement to precipitation depth.

Total precipitation for the year was estimated at about 292 mm for the calendar year of 2020 and about 301 mm for the hydrological year (November 2019 through October 2020) based on the tipping bucket precipitation gauge measurement. Total annual precipitation indicated by the Geonor station was about 13% higher at 330 mm for the calendar year (and December missing). Although the Geonor measurements agree reasonably well with the tipping bucket measurements it is possible that the data is somewhat less reliable. Precipitation measurements by the tipping bucket gauge is higher than the total precipitation of 230 mm measured in 2020.

Table 1: Precipitation Records for the Minto Mine Site and Carmacks

	Campbell Scientific Station (Minto) Mine)		**Carmacks Ranch Station**[A]
Month and Year	**Tipping Bucket Gauge**	**Geonor Gauge**	**(Climate ID 2100301)**
	mm/month	mm/month	mm/month
Oct 2019	14.1	n/a	n/a
Nov 2019	21	n/a	n/a
Dec 2019	20.6	n/a	n/a
Jan 2020	7.9	1.9	n/a
Feb 2020	15.2	34.6	n/a
Mar 2020	7.3	8.5	n/a
Apr 2020	14.2	20.4	n/a
May 2020	10.2	8.5	18.4
Jun 2020	29	27.3	16.8
Jul 2020	86.1	106.6	92.6
Aug 2020	50.3	66.4	47.5
Sept 2020	19.1	20.5	10.3
Oct 2020	20.3	27.6	31.5
Nov 2020	11.8	8.0	18.4
Dec 2020	20.3	n/a	19.9
SUM Calendar Year (mm/year)	292	330	n/a

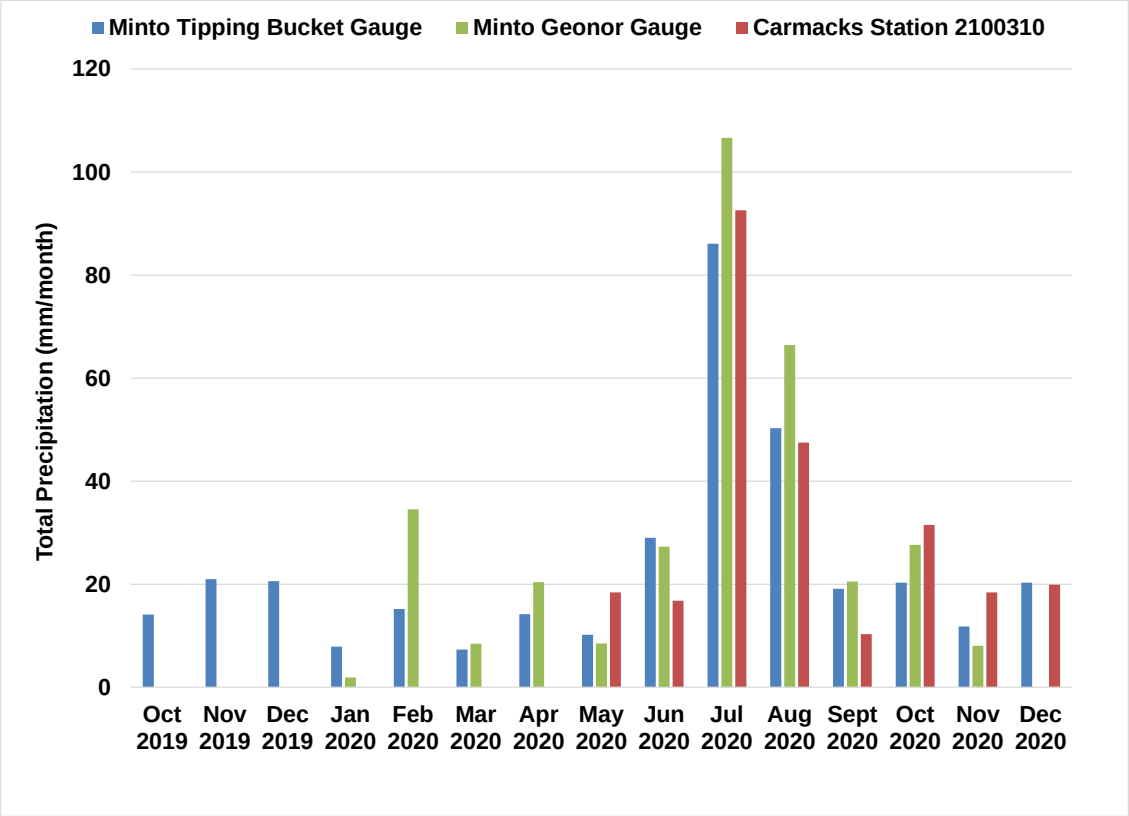
Source: Minto Site Data: \\van-svr0.van.na.srk.ad\Projects\01_SITES\Minto\1CM002.024_Water_Balance_Support\2020 Water Balance Update\2020 Met Station Data Summary Geonor Corrected Repaired.xlsx

Notes:

A: Data obtained from Meteorological Service of Canada, Environment Canada.

The roughly 300 mm of precipitation measured at the Mine site in the 2020 hydrological year is slightly below the expected annual precipitation of 329 mm and greater than total annual precipitation measured in 2019 (230 mm), 2018 (192 mm) and in 2017 (210 mm). This is the seventh year in a row that total annual precipitation at Minto has been lower than the estimated average. This could indicate that the frequency analysis for total precipitation at the mine site generally overestimates annual total precipitation intensities and a revised frequency analysis may be warranted. It could also be an indication that the climate is gradually changing in the area.

The pattern of precipitation measured by the gauges at Minto and precipitation measurement at Carmacks are generally in good agreement considering that the stations are located 77 km apart (Figure 1). Total precipitation data before May 2020 is missing for the Carmacks station. However, for the period of record (May through December) the cumulative total precipitation measured at Carmacks (235 mm) is close to the cumulative precipitation measured by the tipping bucket at Minto (247 mm).



X:\01_SITES\Minto\1CM002.024_Water_Balance_Support\2020 Water Balance Update\2020 Met Station Data Summary.xlsx

Figure 1: 2020 Total Precipitation Measurements at Minto and at Carmacks

2.2 Snow Course Data

Snow course surveys were completed at four snow survey stations at the Mine site in 2020. Table 2 shows a summary of the snow survey data (i.e. an average of the results from the four stations) from 2009 to 2020. The measured snow-pack in 2020 was the highest in about 7 years but comparable to the snow depth recorded in 2012.

Table 2: Summary of Snow Survey Data for the Minto Mine Site

Year	February	March	April
	Water Equivalent (mm)	Water Equivalent (mm)	Water Equivalent (mm)
2009	92.7	110.0	150.7
2010	107.7	120.7	56.0
2011	106.0	141.7	111.7
2012	111.0	127.0	132.7
2013	91.3	106.0	62.7
2014	84.3	99.7	67.3
2015	90.3	76.6	67.8
2016	80.3	80.7	n/a
2017	79.0	72.7	59.3
2018	60.0	69.4	101.1
2019	51.7	51.3	No Survey
2020	112	139	135

Source: X:\01_SITES\Minto\1CM002.024_Water_Balance_Support\2020 Water Balance Update\2020 Snow Survey Field Data.xlsx

2.3 Water Management

Water that can be diverted away from the active mine site and meets the Effluent Quality Standards (EQS) is conveyed to the Water Storage Pond (WSP), while water collected from active mine areas is routed to the Main Pit Tailings Management Facility (MPTMF) or the Area 2 Pit Tailings Management Facility (A2PTMF). Between November 2012 and June 2015, the MPTMF was also used for subaqueous deposition of tailings. Deposition of mine water and tailings (subaqueous) to the A2PTMF commenced in April 2015 and is ongoing.

Other water management features on the Mine site include:

- WSP: reservoir for water that meets discharge criteria and is destined for discharge to Minto Creek.
- W15 sump: collects surface runoff and seepage from:
  - The Southwest Waste Dump;
  - Part of the Main Waste Dump; and
  - Adjacent undisturbed catchments.

  In 2020, water collected at W15 was routed to the Main Pit TMF from late the beginning of June until October 15 when the pump was pulled for the season. The water never met EQS to be able to pump to WSP. If the water had met EQS, it would have been pumped to WSP.
- W35 sump: collects surface runoff from the minimally disturbed southern catchments. Water collected at W35 in 2020 was piped to the Area 2 Pit TMF from April until October when the sump dried up. The water never met EQS to be able to pump to WSP. If the water had met EQS, it would have been pumped to WSP.

- W62 sump (formerly known as W36 or W37 sump): collects surface runoff and seepage from the mill valley, including contributions from the Dry Stack Tailings Storage Facility. Water collected at the W62 sump is pumped to the MPTMF. In 2020, water was pumped from W62 to the MPTMF year-round.
- South Diversion Ditch: diverts water from (W35 Sump) minimally disturbed southern catchments to the WSP (can also be routed to the MPTMF).

2.4 2020 Water Balance

Table 3 summarizes the monthly water and tailings inventory in Minto's MPTMF and A2PTMF as well as water inventory in the WSP. The water level in the MPTMF was essentially the same at the end of the year and at the beginning of the year (within 1 cm). Therefore, the overall inventory did not change significantly. In June 2020, Minto update the level-volume curve for the MPTMF. As a result, the volume estimate for each stage of the pit changed. As a result of this change, the sum of the monthly inventory changes does not exactly add up to the overall annual change. The use of a consistent level-volume curve in 2021 will ensure that the sum of monthly changes once again will add up to the overall annual change.

Table 4 shows a summary of the 2020 water balance for the Mine site. Volume estimates were rounded to the nearest 1,000 m^3 to indicate that precision of the estimates generally is on that order of magnitude or lower. In 2020, the calculated overall site yield was approximately 386,000 m^3. This yield represents all runoff and seepage collected across the site, which must be managed by the operations. The total catchment upstream of the Water Storage Dam measures approximately 1,040 ha. Therefore, 387,000 m^3 of runoff from 1,040 ha gives a unit yield of approximately 37 mm/year.

The site-wide runoff coefficient, based on the 2020 water balance (measured flows, water inventory and total precipitation), is:

$$Annual\ Yield / Total\ Annual\ Precipitation = Runoff\ Coefficient \rightarrow \quad 37mm/301mm = \mathbf{0.12}$$

The calculated value for the annual site-wide runoff coefficient is substantially lower than values calculated in previous years as indicated on Figure 2. Based on the trend established since 2013, a total site yield between 800,000 m^3 and 1,000,000 m^3 would have been expected for a year with approximately 300 mm of total precipitation, or about twice the volume estimated for 2020. The cause of the lower-than-expected total site yield in 2020 is unknown. The total precipitation estimate of 301 mm (for the hydrological year) is likely reasonable given the good agreement with data collected at the Carmacks stations and the relatively high snow-pack so an underestimation of total precipitation is unlikely to be the cause.

A candidate explanation could be the water inventory estimate in the Area 2 Pit. In September 2020, the Stage 1/2 and the Stage 3/4 pits merged (i.e. the levels in both pits rose above the saddle between the pits). Because of this transition, the operations had to switch from the level-volume curves used historically to a new "Area 2 Pit Complex" level-volume curve. Such transitions can be relatively complex from a spatial analysis perspective and can at time cause discrepancies in the calculated outcome. The potential role of the level-volume curve transition in the lower-then-expected total site yield will be evaluated in 2021. Another potential explanation is

that a portion of the precipitation that fell in 2020 was absorbed as soil moisture or reported to depleted groundwater aquifers following the very dry year in 2019. These and other potential causes will be investigated as additional water balance information becomes available through 2021.

Table 3: 2020 Water Inventory Change and Site Yield

Month[A]	Change in MPTMF Water Inventory	Tailings Solids Deposition in MPTMF	Change in A2PTMF Water and Tailings Inventory	Change in A2 Stage 3 TMF Water Inventory	Tailings Solids Deposition in A2PTMF	Change in WSP Water Inventory	Trucked from Minto North[B]	Discharged to Minto Creek
Year	m^3/month	BCM/month	m^3/month	m^3/month	BCM/month	m^3/month	m^3/month	m^3/month
1-Jan-20	52,771	0	44,914	-83,667	35,744	-5,031	1,045	0
1-Feb-20	-84,289	0	70,995	52,055	45,754	-5,255	1,227	0
1-Mar-20	-92,632	0	26,954	71,408	31,218	-2,972	932	0
1-Apr-20	8,651	0	-59,922	206,305	55,404	35,222	0	0
1-May-20	168,369	0	3,528	53,674	78,560	15,704	1,011	0
1-Jun-20	-21,023	0	13,822	10,794	28,527	-2,130	523	0
1-Jul-20	79,123	0	3,722	-8,519	57,937	-960	0	0
1-Aug-20	33,529	0	24,161	40,140	53,543	17,125	0	0
1-Sep-20	-24,366	0	119,480	-	59,353	13,672	307	0
1-Oct-20	-33,962	0	103,942	-	58,766	2,040	0	5,432
1-Nov-20	-72,038	0	132,320	-	63,448	-131	0	0
1-Dec-20	-68,337	0	104,592	-	38,043	-5,726	0	0
1-Jan-21								
SUM	500		588,510	342,191	606,297	61,558	5,044	5,432
						Total Site Yield	**386,850**	**m^3**

Notes: **A** – on the first day of the month. **B** – used for exploration drilling or dust suppression
Source: \\van-svr0.van.na.srk.ad\Projects\01_SITES\Minto\1CM002.024_Water_Balance_Support\2020 Water Balance Update\Water Storage and Conveyance Numbers 2020.xlsx

Table 4: Water Balance Summary of the Minto Mine Site, 2020 (Rounded, Jan to Dec)

	Units	Main Pit TMF	Area 2 Pit TMF	WSP
Volume Change 2020 (water + tailings)	m^3	~500	931,000	62,000
Tailings Deposited, total	BCM	-	606,000	-
Water Volume Change 2019	m^3	500	324,000	62,000
Estimated Groundwater Inflow	m^3	-	-	-
Total Water Inventory Increase in 2019	**m^3**	387,000		
Total Water Discharged to Minto Creek	m^3	5,000		
Total Site-Wide Yield in 2019	**m^3**	**382,000**		

Source: : \\van-svr0.van.na.srk.ad\Projects\01_SITES\Minto\1CM002.024_Water_Balance_Support\2020 Water Balance Update\2020 Water Balance Update REV00 SRJ.xlsx

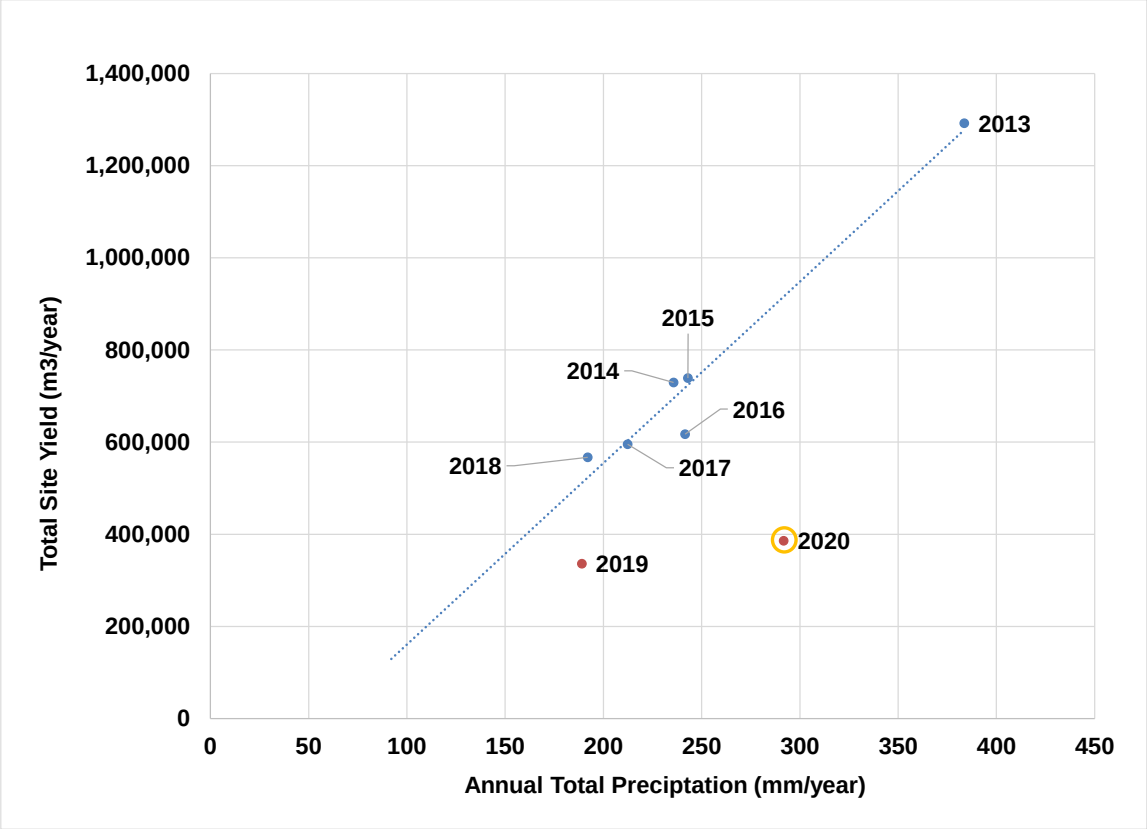


Figure 2 Total Site Yield vs. Annual Total Precipitation

3 Water Quality Model Update

3.1 Water Quality Model Source Terms

Water quality mode source terms and model results were not updated in 2020. Monitoring data collected in 2020 are compared to historical model results in the following section. An updated Site Characterization Report for the Minto Mine is scheduled to be issued in October 2021. An updated site-wide water and load balance report will be completed as part of the site characterization update.

3.2 Water Quality Model Results

Table 5 and 6 show model outputs from the water and load balance model for water quality in the Water Storage Pond (WSP) for 2020 and post-closure (best estimate and worst case) along with concentrations measured in 2020. Table 7 and 8 show revised model predictions of water quality in the MPTMF for 2020 and post-closure. Predictions for post-closure were selected to provide representative long-term indications of water quality trends. Predictions are for average precipitation conditions. The Water Use Licence (QZ14-031) effluent limits are also listed in the tables. Model runs started on 1 January 2016 and ended on 1 January 2045, at which point concentrations in the model have more or less reached steady state.

Water collected in the WSP includes clean (non-contact) runoff and effluent from Minto's water treatment plant. Median measured concentrations in the WSP in 2020 were lower than or comparable to the model predictions using best estimate source terms (Table 5), except for dissolved copper, for which the measured median concentration was 36 µg/L compared to expected median concentrations of approximately 7 µg/L for the Best Estimate model scenario, and to the predicted median concentration of 14 µg/L for the Reasonable Worse Case scenario. Revised model predictions using reasonable worst case source terms are generally higher than comparable median and maximum measured values for the WSP, except for copper (Table 6).

The MPTMF was historically the primary water reservoir on site. In the model, the free water in the MPTMF and A2PTMF are more or less considered to belong to the same reservoir due to the high rate of flow between the two reservoirs while the mill was operating. In 2020, concentrations in the MPTMF and the A2PTMF changed independently but concentrations of most parameters remained in a similar range (data not shown).

For 2020, a comparison of measured MPTMF water quality with concentrations predicted for pit water for the Phase V/VI environmental assessment provides a good measure of actual vs. expected geochemical performance of the site. The median of measured concentrations in the MPTMF are generally at or below predicted median values except for nitrite, which was about a factor of 2 greater than expected and dissolved copper, which was a factor of 3 greater than expected (Table 7). Water quality model predictions using reasonable worst-case source terms are higher than measured median concentrations (Table 8).

The overall favorable agreement in the results tables below indicates that the existing source terms are appropriate for describing the existing geochemical performance and the actual water management practices on site, although source terms for dissolved cadmium and copper may warrant some adjustment. Nitrite is unstable and is generally not well represented by mass-conservative water quality models. Although the source terms can be adjusted, nitrite is better projected by a separate assessment that looks at factors specific to nitrite such as the concentration of dissolved organic carbon end the redox environment in the pit. Best estimate source terms are intended to provide an indication of the general trend in water quality parameter concentrations but are not intended to capture maximum or outlier concentration values. Therefore, the median values of best estimate model predictions are compared to measured median values.

Table 5: WSP Water Quality Model Predictions and Measured Concentrations in 2019, Best Estimate

		WUL Effluent Limits (QZ14-031)	WSP Measured Water Quality (Station W16)	Modelling Predictions of Quality in WSP (Station W16)	
Year			2020	2020	Post-Closure
			Median	Median	Median
Ammonia	mg/L	0.75	0.048	0.053	0.23
$N\text{-}NO_2$	mg/L	0.18	0.018	0.017	0.059
$N\text{-}NO_3$	mg/L	27.3	1.3	1.3	1.2
Ag-Dissolved	Mg/L	0.0003	0.000010	0.000012	0.000049
Al-Dissolved	mg/L	0.3	0.005	0.032	0.28
As-Dissolved	mg/L	0.015	0.00048	0.00048	0.0021
Cd-Dissolved	mg/L	0.0014a	0.000015	0.00002	0.000022
Cr-Dissolved	mg/L	0.003	0.00021	0.00066	0.0019
Cu-Dissolved	mg/L	0.06/0.039b	0.036	0.0066	0.013
Fe-Dissolved	mg/L	3.3	0.06	0.31	0.59
Pb-Dissolved	mg/L	0.012	0.000050	0.00014	0.00042
Mo-Dissolved	mg/L	0.219	0.0030	0.0012	0.0097
Ni-Dissolved	mg/L	0.33	0.0010	0.0012	0.0024
Se-Dissolved	mg/L	0.006	0.00090	0.00046	0.002
Zn-Dissolved	mg/L	0.09	0.001	0.0041	0.0035

Source: SRK, C:\Users\sjensen\Desktop\2020 Water Balance Update\Model_Results_20200325_REV00_SRJ.xlsx

Notes:

Analytical data from Minto's water quality monitoring program.

a) at 50 mg/L hardness.

b) Cu effluent standard is 0.06 when [DOC] @ W2 > 10 mg/L and 0.039 when [DOC] @ W2 ≤ 10 mg/L.

Table 6: WSP Water Quality Model Predictions and Measured Concentrations in 2020, Reasonable Worst Case

		WUL Effluent Limits (QZ14-031)	WSP Measured Water Quality (Station W16)		Modelling Predictions of Quality in WSP (Station W16)			
Year			2020		2020		Post-Closure	
			Median	Max	Median	Max	Median	Max
Ammonia	mg/L	0.75	0.048	0.273	0.09	0.1	0.23	0.43
N-NO2	mg/L	0.18	0.018	0.059	0.073	0.096	0.059	0.11
N-NO3	mg/L	27.3	1.3	6.9	8.2	11	1.2	2.3
Ag-Dissolved	Mg/L	0.0003	0.000010	0.000010	0.00003	0.000037	0.000049	0.00013
Al-Dissolved	mg/L	0.3	0.005	0.069	0.064	0.072	0.28	0.57
As-Dissolved	mg/L	0.015	0.00048	0.00183	0.00059	0.00063	0.0021	0.005
Cd-Dissolved	mg/L	0.0014a	0.000015	0.000318	0.000039	0.000044	0.000022	0.000062
Cr-Dissolved	mg/L	0.003	0.00021	0.00062	0.00087	0.00099	0.0019	0.0052
Cu-Dissolved	mg/L	0.06/0.039b	0.036	0.091	0.014	0.017	0.013	0.029
Fe-Dissolved	mg/L	3.3	0.06	0.85	0.47	0.54	0.59	1.5
Pb-Dissolved	mg/L	0.012	0.000050	0.000098	0.00014	0.00015	0.00042	0.0011
Mo-Dissolved	mg/L	0.219	0.0030	0.0142	0.0022	0.0026	0.0097	0.024
Ni-Dissolved	mg/L	0.33	0.0010	0.0036	0.0016	0.0017	0.0024	0.0064
Se-Dissolved	mg/L	0.006	0.00090	0.00651	0.0018	0.0023	0.002	0.0037
Zn-Dissolved	mg/L	0.09	0.001	0.030	0.0052	0.0056	0.0035	0.0084

Source: SRK, Source: SRK, C:\Users\sjensen\Desktop\2020 Water Balance Update\Model_Results_20200325_REV00_SRJ.xlsx

Notes:

Analytical data from Minto's water quality monitoring program.

a) at 50 mg/L hardness.

b) Cu effluent standard is 0.06 when [DOC] @ W2 > 10 mg/L and 0.039 when [DOC] @ W2 ≤ 10 mg/L.

Table 7: MPTMF Water Quality Model Predictions and Measured Concentrations in 2020, Best Estimate

		WUL Effluent Limits (QZ14-031)	MPTMF Measured Water Quality (Station W12)	Modelling Predictions of Quality in MPTMF (Station W12)	
Year			2020	2020	Post-Closure
			Median	Median	Median
Ammonia	mg/L	0.75	1.9	1.4	0.079
N-NO2	mg/L	0.18	1.1	0.56	0.017
N-NO3	mg/L	27.3	10	13	0.38
Ag-Dissolved	Mg/L	0.0003	0.000010	0.000043	0.000057
Al-Dissolved	mg/L	0.3	0.003	0.17	0.26
As-Dissolved	mg/L	0.015	0.00040	0.0015	0.0021
Cd-Dissolved	mg/L	0.0014a	0.00012	0.000055	0.00006
Cr-Dissolved	mg/L	0.003	0.00010	0.0018	0.0023
Cu-Dissolved	mg/L	0.06/0.039b	**0.08**	0.031	0.035
Fe-Dissolved	mg/L	3.3	0.014	0.47	0.71
Pb-Dissolved	mg/L	0.012	0.000050	0.00041	0.00051
Mo-Dissolved	mg/L	0.219	0.031	0.033	0.011
Ni-Dissolved	mg/L	0.33	0.0024	0.0023	0.0028
Se-Dissolved	mg/L	0.006	0.0053	0.0074	0.0034
Zn-Dissolved	mg/L	0.09	0.0041	0.0094	0.012

Source: SRK, Source: SRK, C:\Users\sjensen\Desktop\2020 Water Balance Update\Model_Results_20200325_REV00_SRJ.xlsx

Notes:

Analytical data from Minto's water quality monitoring program.

a) at 50 mg/L hardness.

b) Cu effluent standard is 0.06 when [DOC] @ W2 > 10 mg/L and 0.039 when [DOC] @ W2 ≤ 10 mg/L.

Table 8: MPTMF Water Quality Model Predictions and Measured Concentrations in 2019, Reasonable Worst Case

		WUL Effluent Limits (QZ14-031)	MPTMF Measured Water Quality (Station W12)		Modelling Predictions of Quality in MPTMF (Station W12)			
Year			2020		2020		Post-Closure	
			Median	Max	Median	Max	Median	Max
Ammonia	mg/L	0.75	1.9	3.7	2.2	3	0.28	0.45
N-NO2	mg/L	0.18	1.1	2.8	1	1.3	0.037	0.057
N-NO3	mg/L	27.3	10	24	43	52	1.1	1.7
Ag-Dissolved	Mg/L	0.0003	0.000010	0.000034	0.00014	0.00016	0.000089	0.00012
Al-Dissolved	mg/L	0.3	0.003	0.013	0.42	0.46	0.53	0.83
As-Dissolved	mg/L	0.015	0.00040	0.00057	0.003	0.0034	0.0049	0.0063
Cd-Dissolved	mg/L	0.0014a	0.00012	0.00023	0.0002	0.00022	0.00031	0.00037
Cr-Dissolved	mg/L	0.003	0.00010	0.00020	0.0036	0.0041	0.0038	0.0048
Cu-Dissolved	mg/L	0.06/0.039b	0.08	0.12	0.079	0.087	0.077	0.098
Fe-Dissolved	mg/L	3.3	0.014	0.058	1.2	1.3	1.9	2.3
Pb-Dissolved	mg/L	0.012	0.000050	0.000338	0.0012	0.0013	0.0017	0.0025
Mo-Dissolved	mg/L	0.219	0.031	0.038	0.049	0.063	0.031	0.037
Ni-Dissolved	mg/L	0.33	0.0024	0.0037	0.0049	0.0055	0.0067	0.0074
Se-Dissolved	mg/L	0.006	0.0053	0.0106	0.015	0.019	0.008	0.01
Zn-Dissolved	mg/L	0.09	0.0041	0.0092	0.019	0.021	0.03	0.036

Source: SRK, Source: SRK, C:\Users\sjensen\Desktop\2019 Water Balance Update\Model_Results_20200325_REV00_SRJ.xlsx

Notes:

Analytical data from Minto's water quality monitoring program.

a) at 50 mg/L hardness.

b) Cu effluent standard is 0.06 when [DOC] @ W2 > 10 mg/L and 0.039 when [DOC] @ W2 ≤ 10 mg/L.

4 Closing

The summary of the updated water balance and water quality model for the Minto Mine was prepared in support of annual reporting. SRK would be pleased to address any questions or comments.

Appendix G – Summary of Minto and McGinty Creek Surface Hydrology 2020

Summary of Minto and McGinty Creek 2020 Surface Hydrology

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1 Introduction

In 2020, as part of the EMSRP, Minto monitored hydrological conditions at water quality stations including the following: stations within the operational mine area; stations downstream from the mine operational area that are influenced by mine effluent discharge; and reference stations downstream from the mine operational area that are not exposed to effluent. Hydrological monitoring is performed using a variety of methods including: manual discrete discharge measurements with combinations of flow meters, continuous stage measurements through the deployment of Solinst Level Loggers and Barometric Loggers and monitoring of an engineered flume.

Minto maintained and monitored 8 hydrometric stations located on Minto Creek and McGinty Creek as listed below and shown in Figure 1.

- Minto Creek
    1. W3: Flume downstream of the Water Storage Pond (WSP);
    2. MC1: Located in Minto Canyon – mid-catchment;
    3. W1: Located approximately 1 km upstream of Yukon River – lower catchment; and
    4. W7: Tributary on the south side of Minto Creek.
- McGinty Creek
    5. MN-0.5: West Tributary of McGinty Creek
    6. MN-1.5: Upper East Arm of McGinty Creek
    7. MN-2.5: East Tributary of McGinty Creek
    8. MN-4.5: McGinty Creek near the Mouth

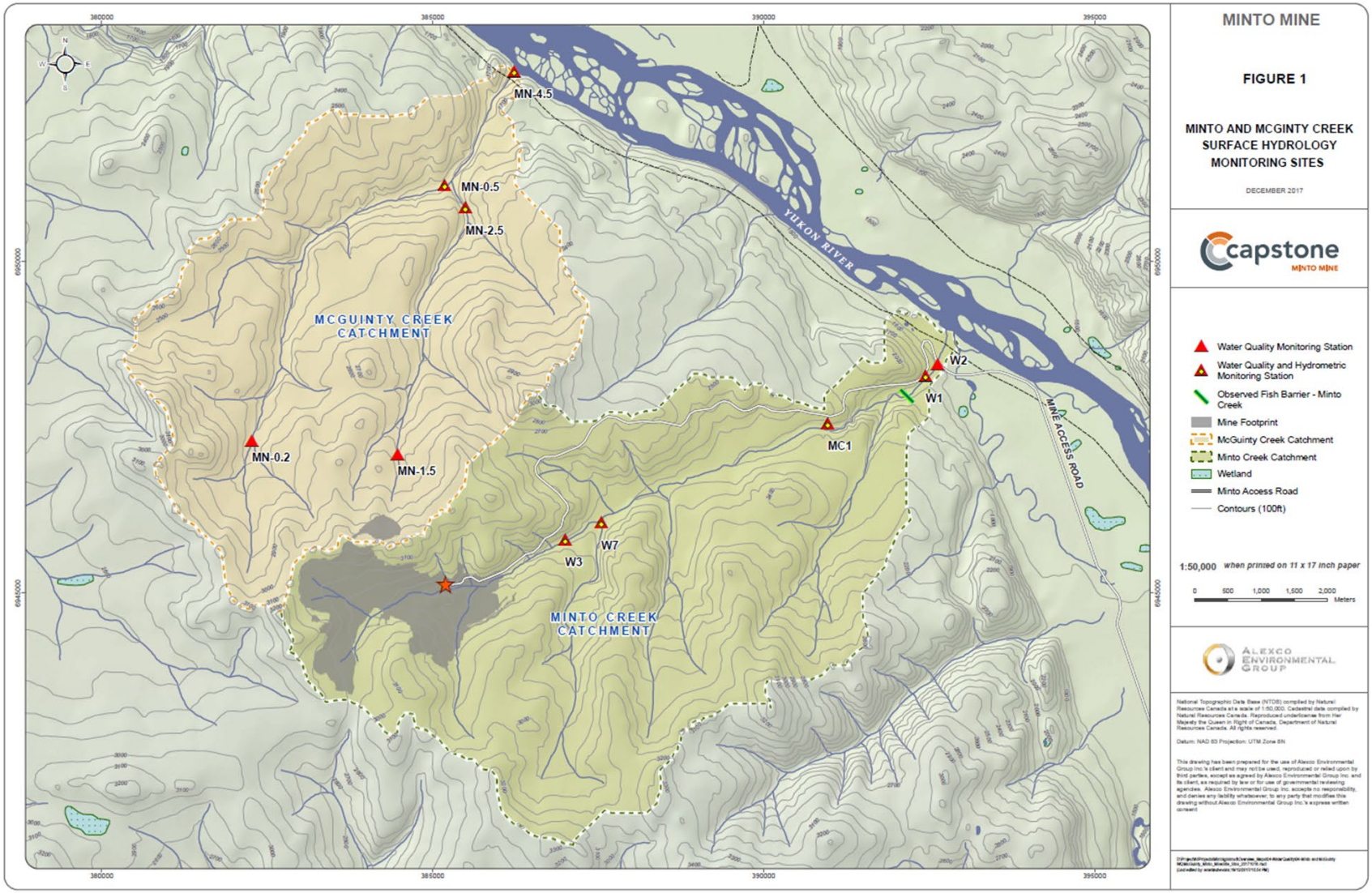


Figure 1: Minto and McGinty Creek Hydrology Surface Map

The 2020 open water season was characterized by higher than average flows sustained by regular precipitation events. A brief period of active mine discharge, from the Water Storage Pond, occurred in October.

The following sections will present the methods used to measure flow at the hydrometric program, the summary of each station's hydrometric program and recommendations for future monitoring

2 Methods

Minto personnel conduct regular discrete discharge measurements and maintenance at the stations listed below. Additionally, these stations are equipped with Solinst Level Logger and Barometric Logger for continuous measurements. Table 2-1 provides an overview of instrumentation available and discrete measurement frequency at these stations.

Table 2-1: Summary of Hydrometric Program

Station	Watershed	Years Monitored	Frequency of Discrete Measurement	Instrumentation Available
W3	Minto Creek	2012-2020	Weekly	Flume, Data Logger
MC1	Minto Creek	2012-2020	Weekly	Staff Gauge, Data Logger
W1	Minto Creek	2012-2020	Weekly	Staff Gauge, Data Logger
W7	Minto Creek	2013-2020	Monthly	Staff Gauge, Data Logger
MN-0.5	McGinty Creek	2014-2020	Monthly	Staff Gauge, Data Logger
MN-1.5	McGinty Creek	2018-2020	Monthly	Staff Gauge, Data Logger
MN-2.5	McGinty Creek	2014-2020	Monthly	Staff Gauge, Data Logger
MN-4.5	McGinty Creek	2011-2020	Monthly	Staff Gauge, Data Logger

Stream-gauge data is collected and managed throughout the open water season by the Minto personnel. Velocities are measured using a Hach FH950 handheld

electromagnetic flowmeter. Velocity and water depth measurements are converted to flows using the area-velocity relationship methods. All hydrometric data, calculated flows and the time-series of recorded water levels and temperature data from the loggers were processed by Minto personnel under AEG guidance.

Level logger data were compared to the staff gauge readings, logger records for water level may have shifted over the course of the season due to repositioning, and data were corrected to match staff gauge measurements.

Stage-discharge relationships (rating curves) were created with discrete flow measurements and staff gauge readings. Ice affected readings or readings that were far outliers that could not be confirmed by photography may have been removed from the stage-discharge curves.

3 Minto Creek

3.1 Station W3 – Flume below the Water Storage Pond Dam

W3 is located about 500 meters downstream of the water storage pond dam where Minto Creek flows through an engineered flume inside a heated structure that allows for year-round flow. Solinst loggers record water levels and atmospheric pressure every 30 minutes, and water levels at the flume are recorded weekly. Late in 2019 the flume area had begun to freeze and back-up, causing the water level within the flume to rise and make accurate flow measurement impossible. Heating systems were adjusted accordingly, and water began flowing freely in February 2020.

A summary of the level and flow data recorded at W3 are presented in Figure 2 to Figure 4. Figure 2 presents recorded water level and temperature for 2020 (February to December). This data is collected using a pressure transducer and is corrected/calibrated using the stage-discharge relationship presented in Figure 3. The stage-discharge relationship is based on discrete measurements of the staff

gauge within the engineered flume from 2013 to 2020. Figure 4 presents calculated flow rates based on transducer data and flow rates from discrete measurements of the flume staff gauge.

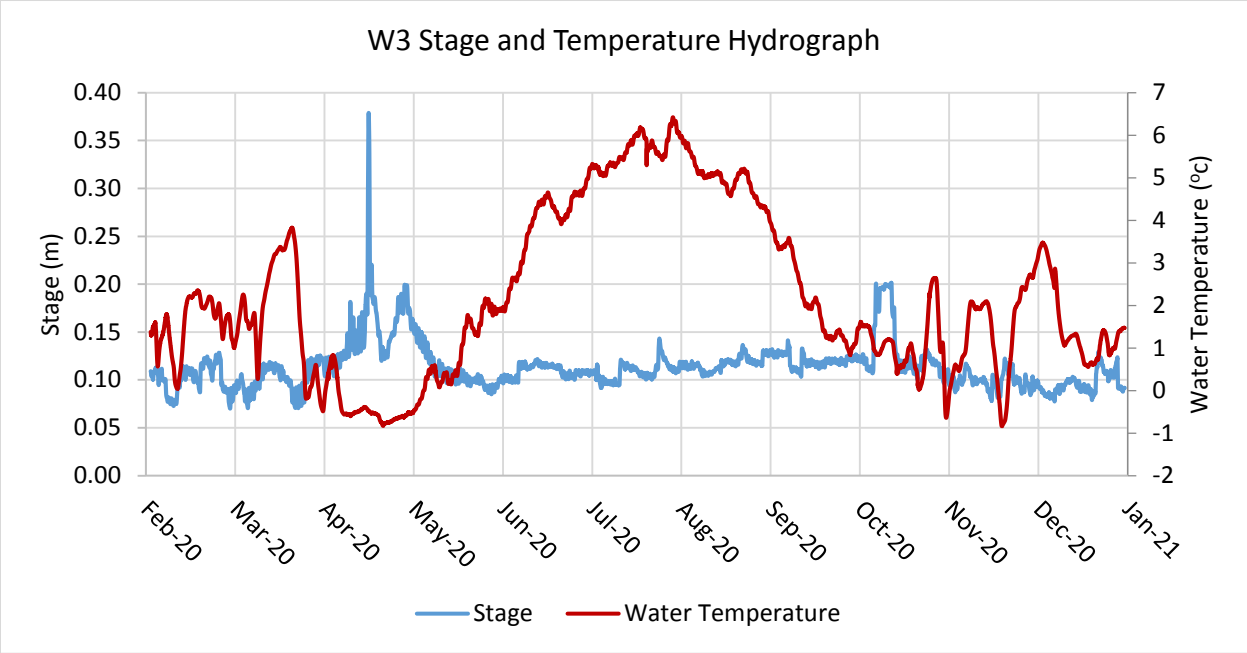


Figure 2: W3 Stage and Temperature Hydrograph, February-December 2020

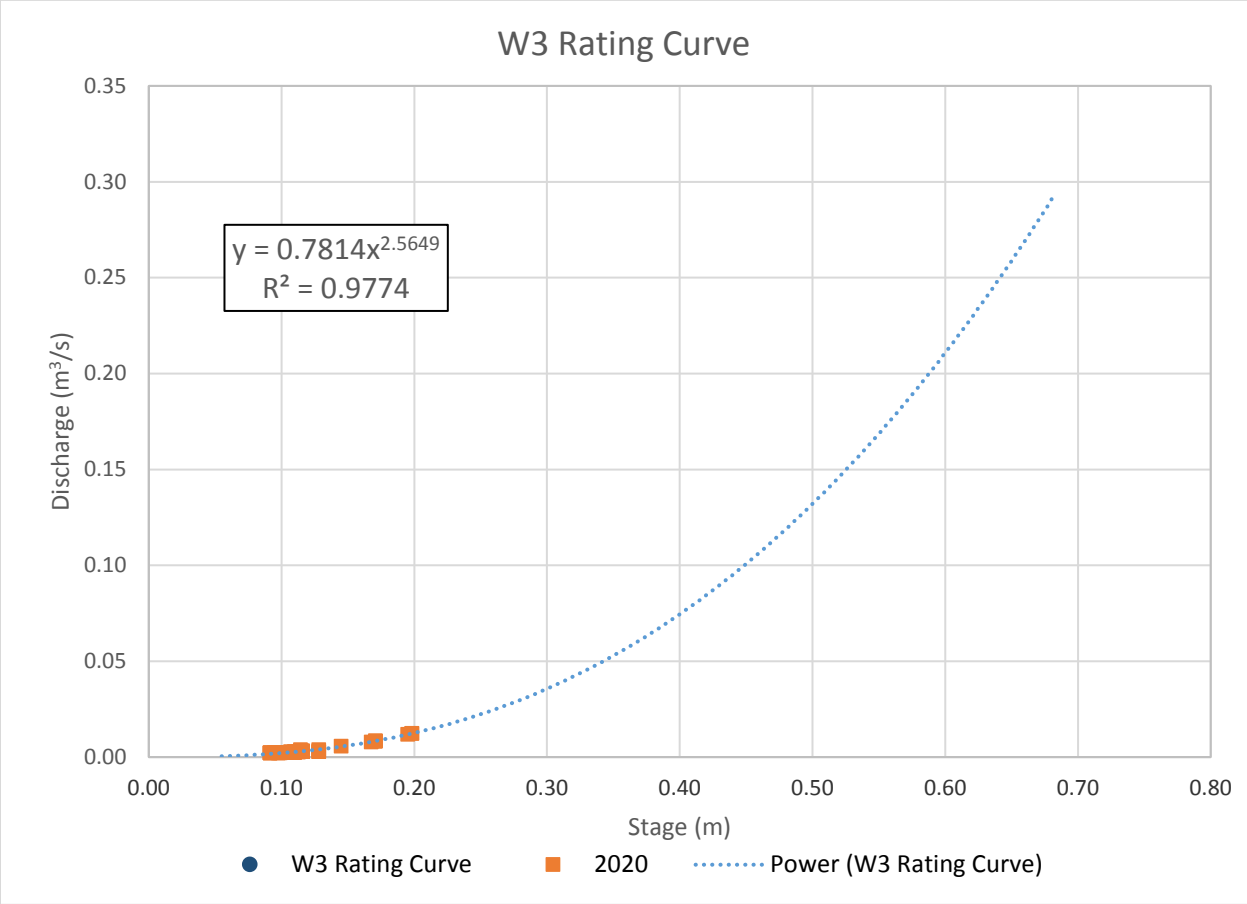


Figure 3: W3 Rating Curve

Figure 4 shows the 2020 hydrograph and discrete flow measurements conducted during the recorded dataset. W3 is directly influenced by discharge from the Water Storage Pond to Minto Creek. The resulting change in flow can be observed from October 7 to 16, 2020, when active discharge took place.

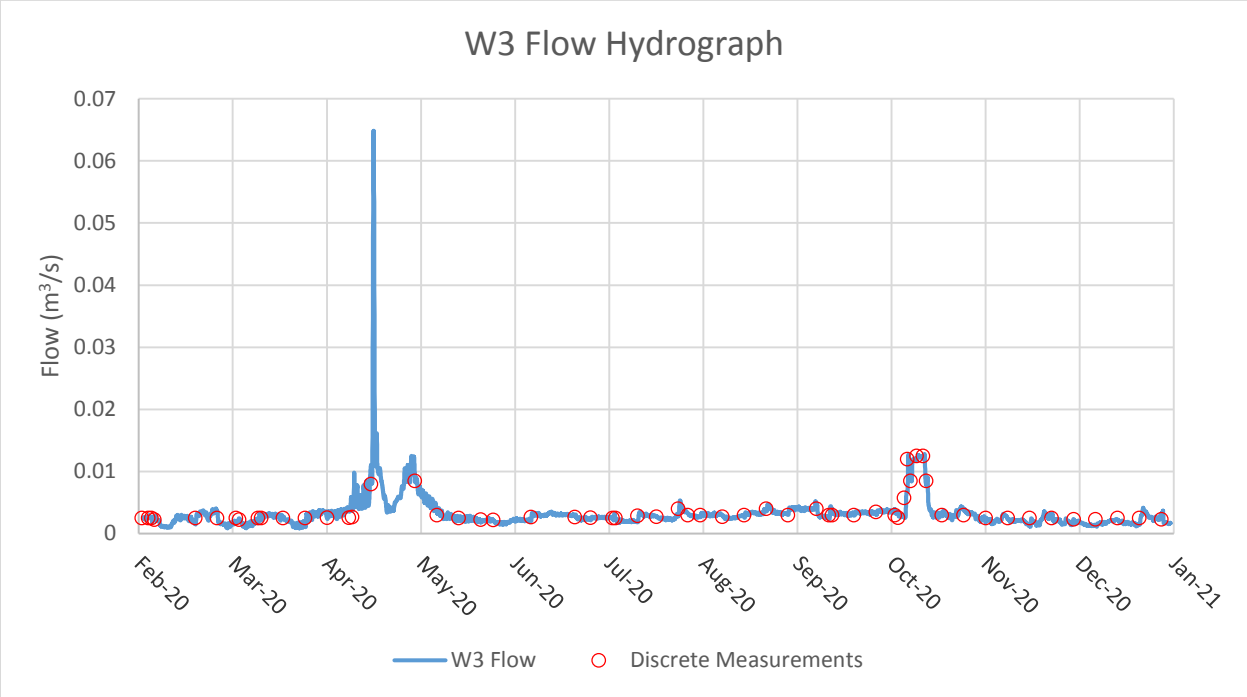


Figure 4. W3 Flow Hydrograph (with discrete measurements)

Table 3-1 provides a summary of the average water temperature, flow and total flow volume in 2020. Table 3-2 summarizes the historical mean monthly flows to previous years of the hydrometric program.

Table 3-1: W3 2020 Hydrometric Data and Temperature Summary

Month	Period of Record (Day)	Mean Water Temperature (°C)	Mean Flow (m^3/s)	Total Flow (m^3)
Jan[1]	No Reliable Data			
Feb	21	1.5328	0.0023	4243
Mar	31	2.11326	0.0021	5756
Apr	30	-0.2822	0.0059	15330
May	31	0.45925	0.0042	11341

Jun	30	3.41844	0.0027	6875
Jul	31	5.4514	0.0027	7177
Aug	31	5.19892	0.0032	8615
Sep	30	2.42472	0.0036	9338
Oct	31	1.1301	0.0050	13498
Nov	30	1.17335	0.0022	5791
Dec	31	1.60864	0.0020	5277

Shaded cells indicate incomplete months of data

1. Station iced over, not reliable logger data

Table 3-2: W3 Historical Mean Monthly Flow (m^3/s)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2012	-	-	-	-	-	0.005	0.005	0.006	0.005	-	-	-
2013	-	-	-	-	-	0.003	0.004	0.004	0.004	-	-	-
2014	-	-	-	-	-	<0.001	<0.001	0.002	0.003	0.003	0.006	0.004
2015	0.003	0.006	0.006	0.057	0.086	0.003	0.003	0.003	0.004	0.004	0.006	0.026
2016	-	-	-	0.022	0.052	0.003	0.003	0.004	0.004	0.004	0.003	0.004
2017	0.03	0.02	0.01	0.01	0.016	0.018	0.006	0.008	0.007	0.012	0.01	0.015
2018	-	-	-	-	-	0.028	0.022	0.015	0.013	0.012	-	-
2019	-	-	-	-	-	0.003	0.003	0.003	0.003	0.004	0.003	-
2020	-	0.002	0.002	0.006	0.004	0.003	0.003	0.003	0.004	0.005	0.002	0.002

Note: Shaded cells indicate incomplete months of data

1.2 MC1 - Minto Creek Mid-Catchment

The hydrometric station MC1 on Minto Creek is located downstream of the W3 Flume and immediately upstream of the canyon along Minto Creek. The pressure transducer installed at this station recorded temperature and water levels at 30 minute intervals from May 10 to September 21 (134 days). The transducer was pre-emptively removed on September 21 due to ice forming on the creek surface. Figure 5 shows water level and temperature data for Minto Creek at MC1 during the open-water season.

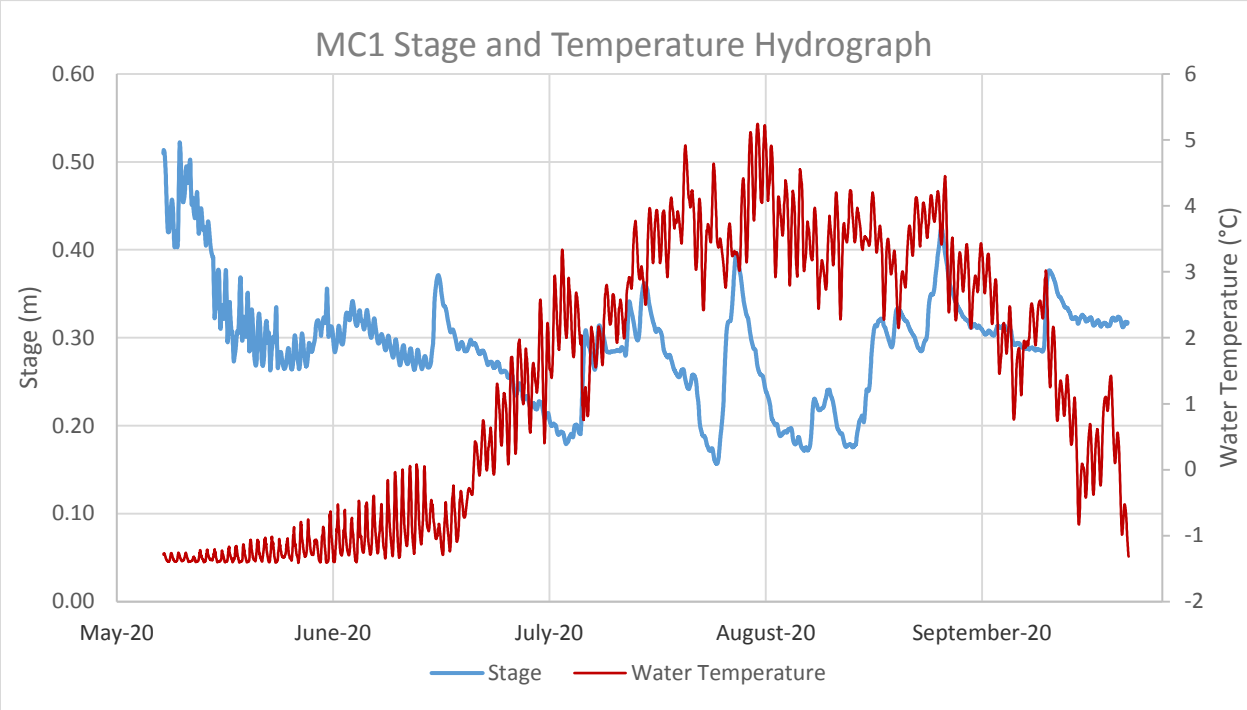


Figure 5: MC1 Stage and Temperature Hydrograph

Over the course of the hydrometric program in 2020, numerous discrete discharge measurements were recorded in conjunction with water level readings recorded by both the pressure transducer and the staff gauge. This data provides the information necessary to generate a stage-discharge relationship which enables the computation of creek discharge for the recorded stage data. The stage-discharge relationship is presented in Figure 6.

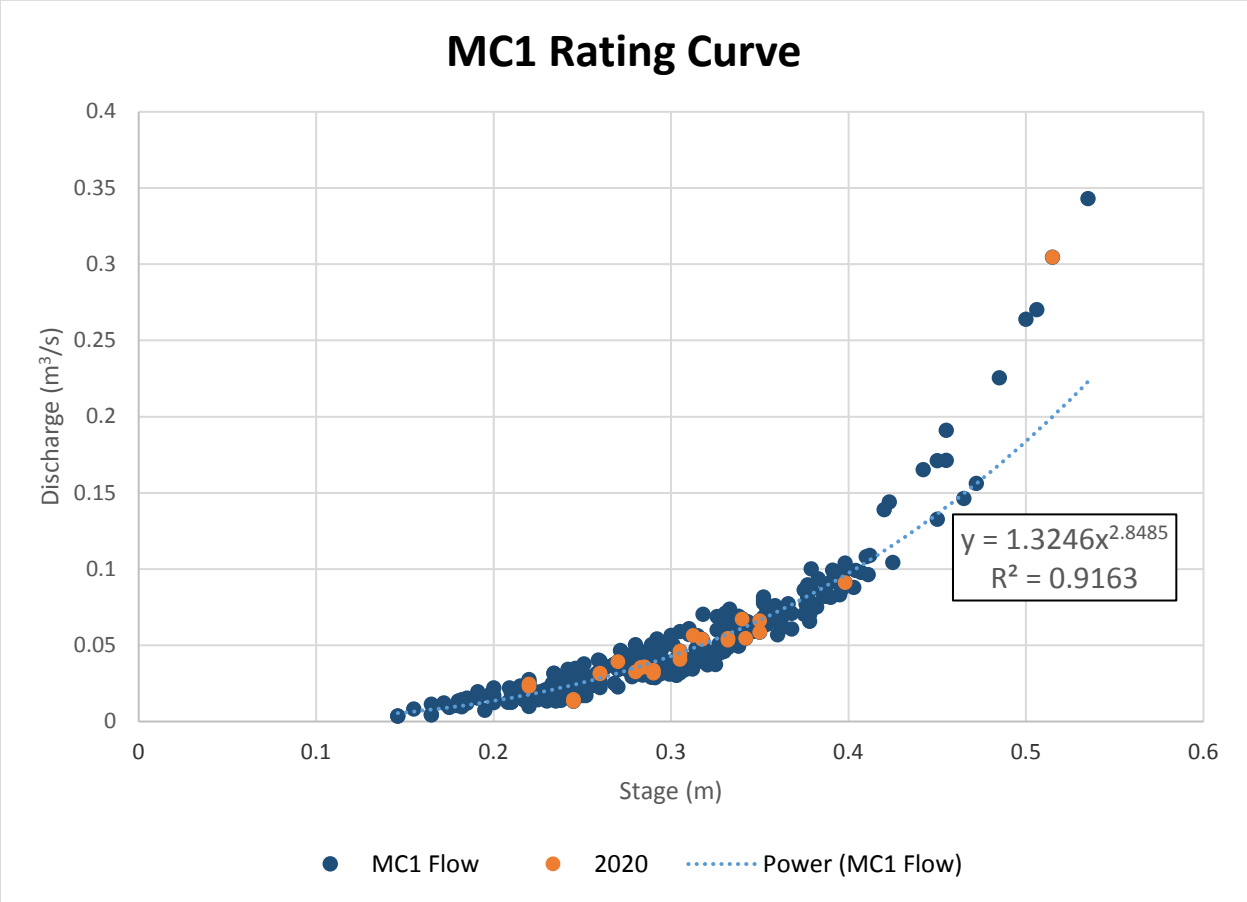


Figure 6: MC1 Rating Curve

The 2020 hydrograph and discrete measurements for MC1 are shown in Figure 7. The maximum measured flow of 0.305 m^3/s occurred on May 10, 2020 during the peak of freshet. As noted above, the pressure transducer was removed on September 21 to avoid freezing damage. However, discrete measurements continued while active discharge was ongoing until October 14.

Discrete and calculated flow measurements corresponded reasonably well in 2020, however the degree of variability suggests there may be improvements that can be made to flow measurement procedures at this station. It is likely that stream characteristics at the hydrological station have changed since installation in 2013 due to erosion, sedimentation, and water sampling activities.

It is recommended that new, more uniform stream cross-sections be identified in 2021. Flows at these new sections should be measured and compared with results from

the existing sampling site and rating curve. If a new stream section returns more consistently accurate results, it should be designated as the established measurement point going forward.

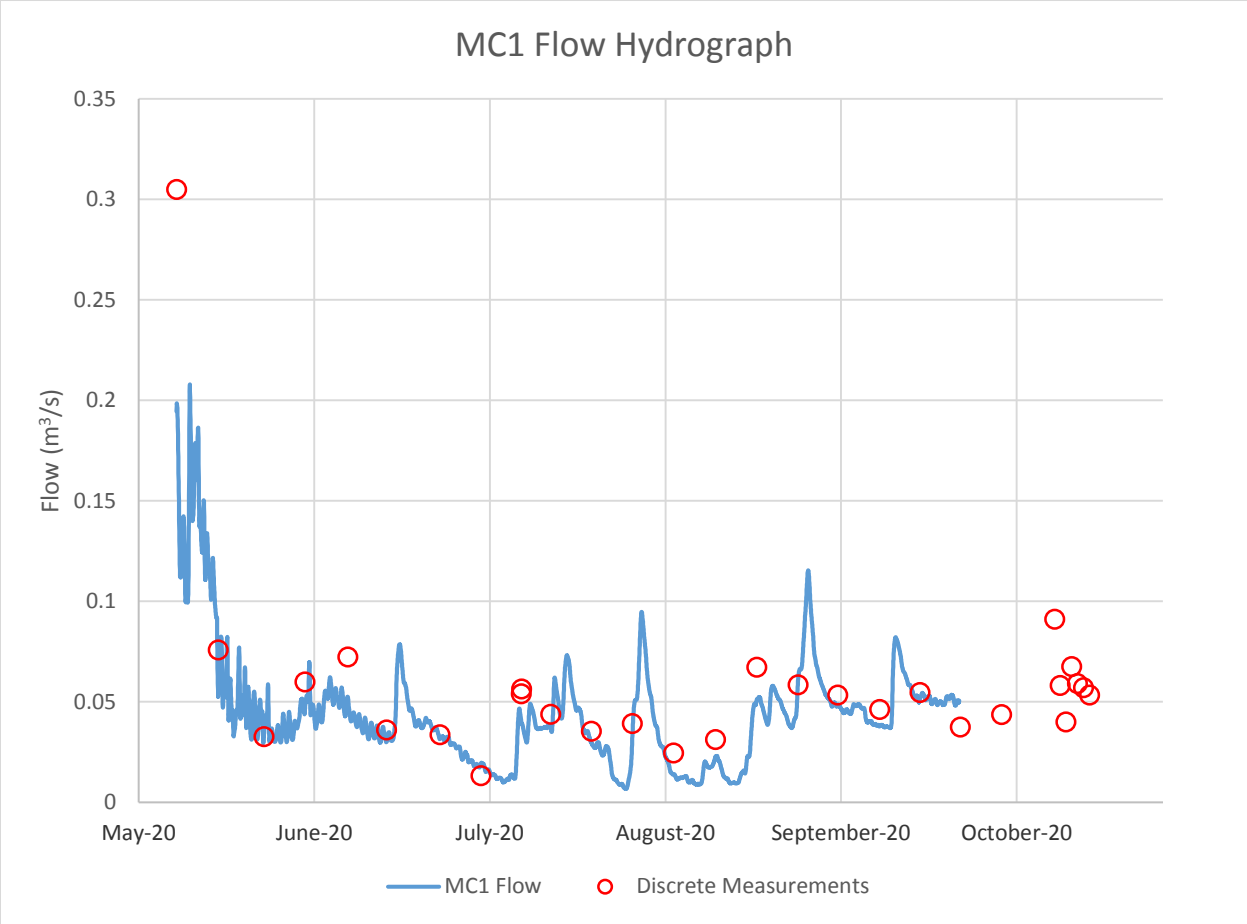


Figure 7: MC1 Discharge and Discrete Measurement Hydrograph

Table 3-3 provides a summary of the average water temperature, flow and total flow volume in 2020.

Table 3-3: MC1 2019 Hydrometric Data and Temperature Summary

Month	Period of Record (Day)	Mean Water Temperature (°C)	Mean Flow (m^3/s)	Total Flow (m3)
Jan	No Data			
Feb	No Data			
Mar	No Data			
Apr	No Data			
May	21	-1.28	0.074	135875
Jun	30	-0.40	0.040	104544
Jul	31	2.95	0.034	90719
Aug	31	3.49	0.036	95217
1-Sep	30	1.27	0.039*	100367*
1-Oct	13	No Data	0.061**	73729**
Nov	No Data			
Dec	No Data			

Note: Shaded cells indicate incomplete months of data
*Based on continuous measurements to Sept. 21 and discrete measurements thereafter
**Estimates based on discrete measurements

Table 3-4 summarizes the historical mean monthly flows to previous years of the hydrometric program.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2012	-	-	-	-	0.179	0.065	0.052	0.041	0.108	-	-	-
2013	-	-	-	-	0.358	0.085	0.103	0.44	0.089	0.064	-	-
2014	-	-	-	-	0.187	0.028	0.031	0.036	0.028	0.033	-	-
2015	-	-	-	-	0.862	0.014	0.028	0.042	0.035	0.031	-	-
2016	-	-	-	-	-	0.029	0.036	0.048	0.076	-	-	-
2017	-	-	-	-	0.102	0.074	0.018	0.01	0.028	0.029	-	-

2018	-	-	-	-	-	0.072	0.016	0.025	0.021	0.012	-	-
2019	-	-	-	-	0.029	0.027	0.009	0.007	0.0212	0.2122		
2020	-	-	-	-	0.074	0.040	0.034	0.036	0.039*	0.061**		

Table 3-4: MC1 Historical Mean Monthly Flow (m^3/s)

Note: Shaded cells indicate incomplete months of data
*Based on continuous measurements to Sept. 21 and discrete measurements thereafter
**Estimates based on discrete measurements

1.3 W1 – Lower Minto Creek above Road Crossing

W1 station is located on the lower reach of Minto Creek before flowing into the Yukon River. In 2020, water level and temperature data were continuously measured and recorded every 15 minutes by the pressure transducer/data logger. Figure 9 shows Minto Creek at W1 water level and temperature data for the 137-day record from May 7 to September 21, 2020. The station had little to no flow from July 1st to 7th but regular precipitation after this period kept it running until freeze-up on October 17. The data logger was removed on September 21 to avoid ice damage, but discrete measurements continued until October 13. The Stage and Water temperature hydrograph is presented in Figure 8, below.

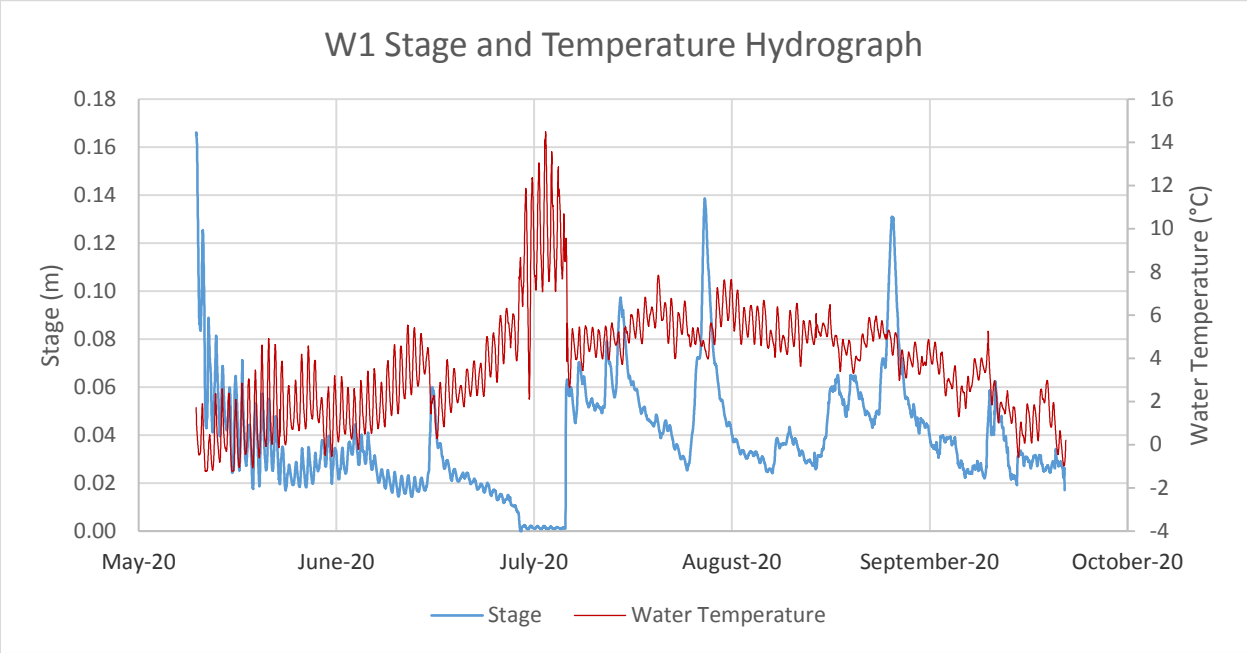


Figure 8: W1 Stage and Temperature Hydrograph

The stage-discharge relationship for W1 is presented in Figure 9. A comprehensive investigation of previous years' measurements to identify outliers and inaccurate readings resulted in a much more accurate stage curve. Prior to this analysis, the R^2 value for W1 was 0.7417. After removing outliers and including 2020 measurements the R^2 is 0.8660. Efforts will be made to ensure that future measurements continue to be accurate and representative to further refine the curve.

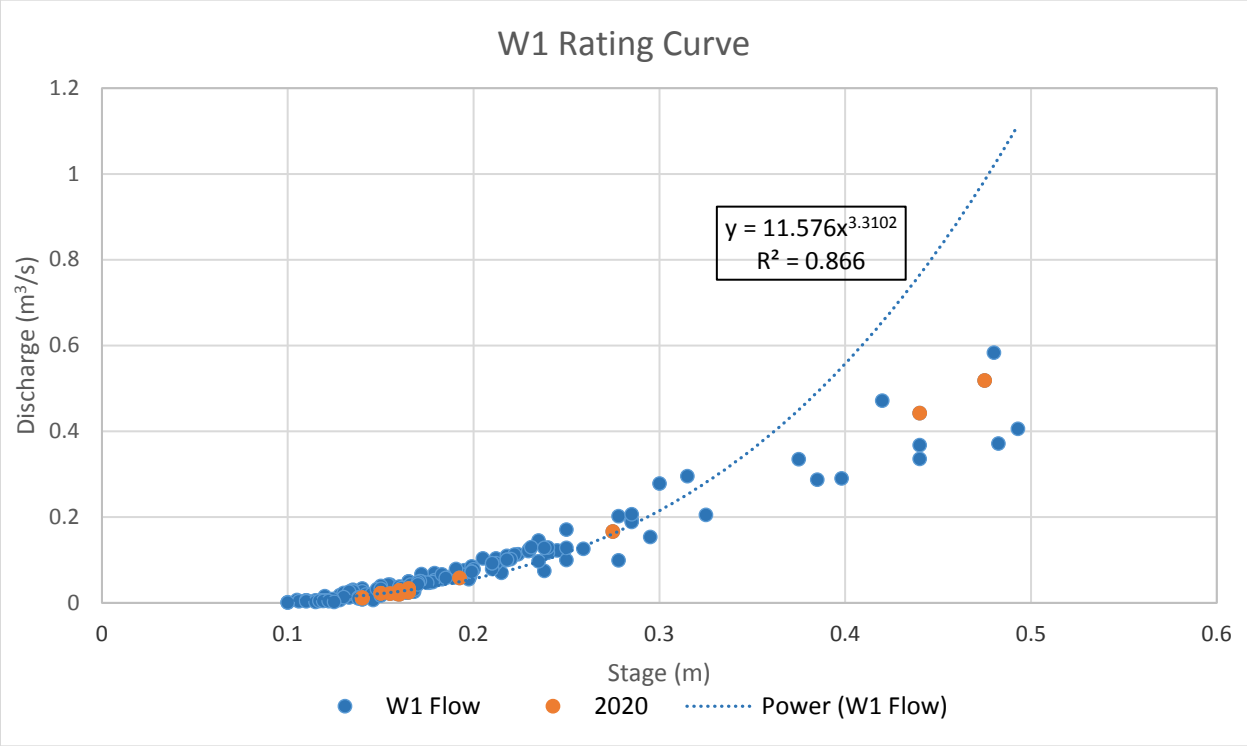


Figure 9: W1 Rating Curve

The 2020 hydrograph and discrete measurements for W1 are shown in Figure 10. Discrete measurements were not collected between June 24 and September 14 due to several grizzly bear sightings in the area during this time. The trail to the hydrology station was significantly widened in September and discrete measurements were resumed subsequently. In 2020, the maximum measured flow was 0.1667 m^3/s on May 12 during the height of freshet.

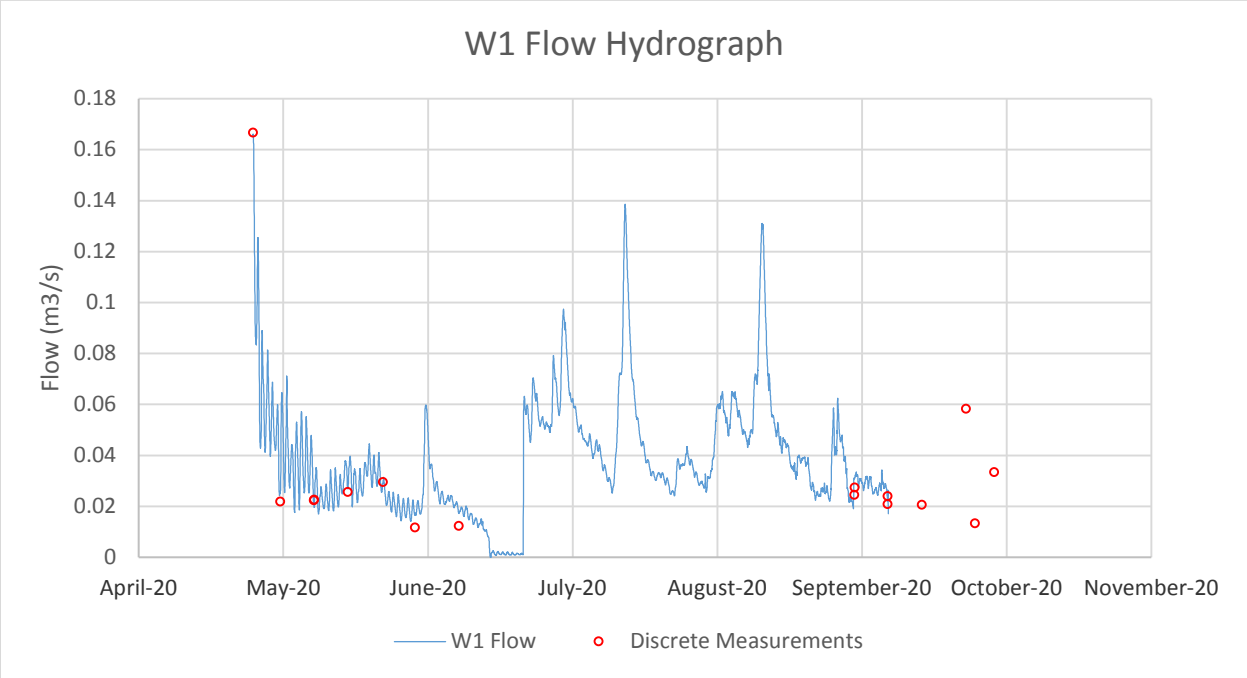


Figure 10: W1 Flow Hydrograph

Figure 11 shows W1 and MC1 flows. W1 is located downstream of MC1 and it is expected that flows would be larger because it has a larger catchment area than MC1, however flows at W1 are consistently lower than those recorded at MC1. An investigation will be conducted in 2021 to determine the precise cause of this. It is believed that some water downstream of MC1 passes through a preferential subterranean pathway and by-passes W1. The placement of the stream flow measuring point at MC1 will also be considered, as changes in the stream character may be impacting the accuracy of measurements since installation.

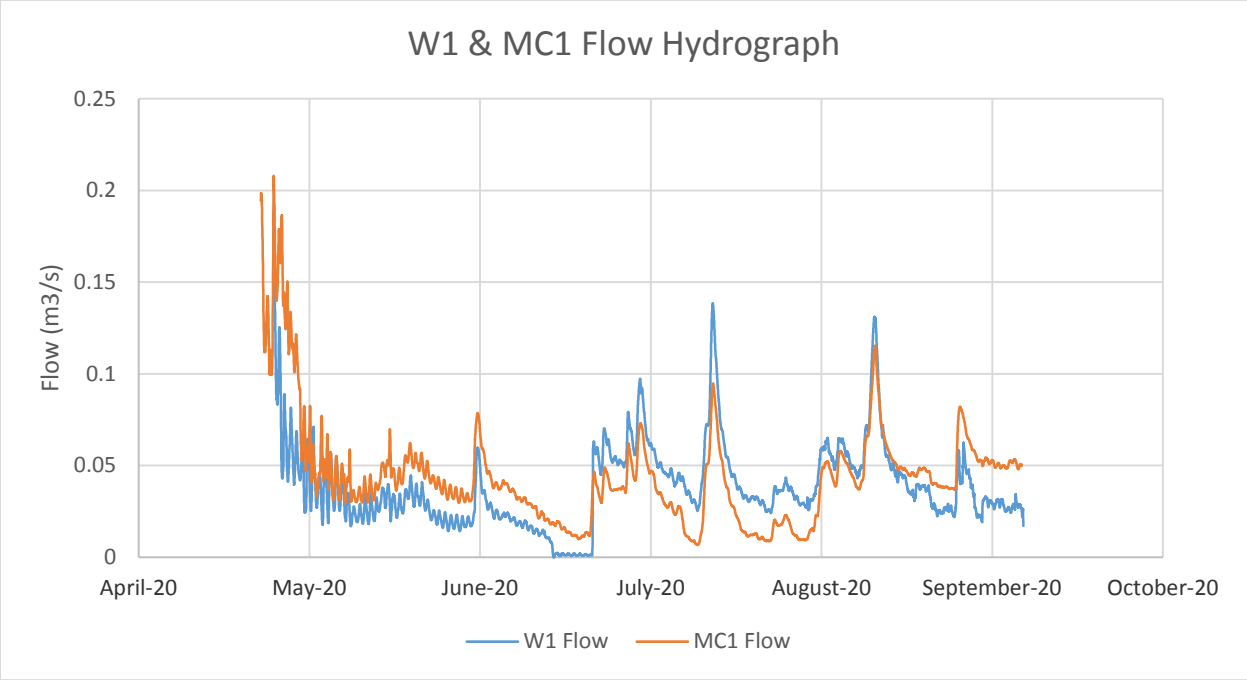


Figure 11: W1 Flow Hydrograph Comparison with MC1 Flow

Table 3-5 provides a summary of the average water temperature, flow and total flow volume in 2019. Table 3-6 summarizes the historical mean monthly flows to previous years of the hydrometric program. The history shows that freeze-up begins in October and that freshet typically occurs in April/May.

Table 3-5: W1 2020 Hydrometric Data and Temperature Summary

Month	Period of Record (Day)	Mean Water Temperature (°C)	Mean Flow (m^3/s)	Total Flow (m^3)
Jan	No Data			
Feb	No Data			
Mar	No Data			
Apr	No Data			

May	24	0.88	0.056	83605.9
Jun	30	2.79	0.021	106996
Jul	31	6.16	0.019	102098
Aug	31	4.98	0.019	104147
Sep	30	2.13	0.016*	81609*
Oct	13	No Data	0.030**	67490**
Nov	No Data			
Dec	No Data			

Note: Shaded cells indicate incomplete months of data

*Based on continuous measurements to Sept. 21 and discrete measurements thereafter

**Estimates based on discrete measurements

Table 3-6: W1 Historical Mean Monthly Flow

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2012	-	-	-	-	0.296	0.073	0.052	0.051	0.078	0.056	-	-
2013	-	-	-	-	0.485	0.064	0.065	0.044	0.85	0.059	-	-
2014	-	-	-	-	0.138	0.022	0.02	0.014	0.31	0.025	-	-
2015	-	-	-	-	0.117	0.01	0.01	0.03	0.24	0.02	-	-
2016	-	-	-	0.252	0.047	0.02	0.017	0.024	0.043	0.026	-	-
2017	-	-	-	-	0.085	0.074	0.014	0.011	0.017	0.031	-	-
2018	-	-	-	-	0.132	0.093	0.039	0.009	0.006	0.002	-	-
2019	-	-	-	-	0.042	0.034	-	-	-	-	-	-
2020	-	-	-	-	0.056	0.021	0.019	0.019	0.016*	0.030**	-	-

Note: Shaded cells indicate incomplete months of data

*Based on continuous measurements to Sept. 21 and discrete measurements thereafter

**Estimates based on discrete measurements

1.4 W7 – Tributary of Minto Creek

A staff gauge was installed at this station in the summer of 2013. Before the installation of the staff gauge, this station was regularly monitored for surface water quality. The staff gauge was damaged during the winter 2014 and repaired for the hydrometric program running in 2015. In 2016, no stage measurements were continuously recorded but several discrete discharge measurements were conducted during the open water season. In early June 2017, a staff gauge and loggers were installed at this site.

Continuous water level and water temperature were recorded from June 29 to October 12, 2020, however the pressure transducer experienced a malfunction on September 12 which caused erratic readings that unfortunately went unnoticed by staff. These readings have been removed from the dataset presented in Figure 12.

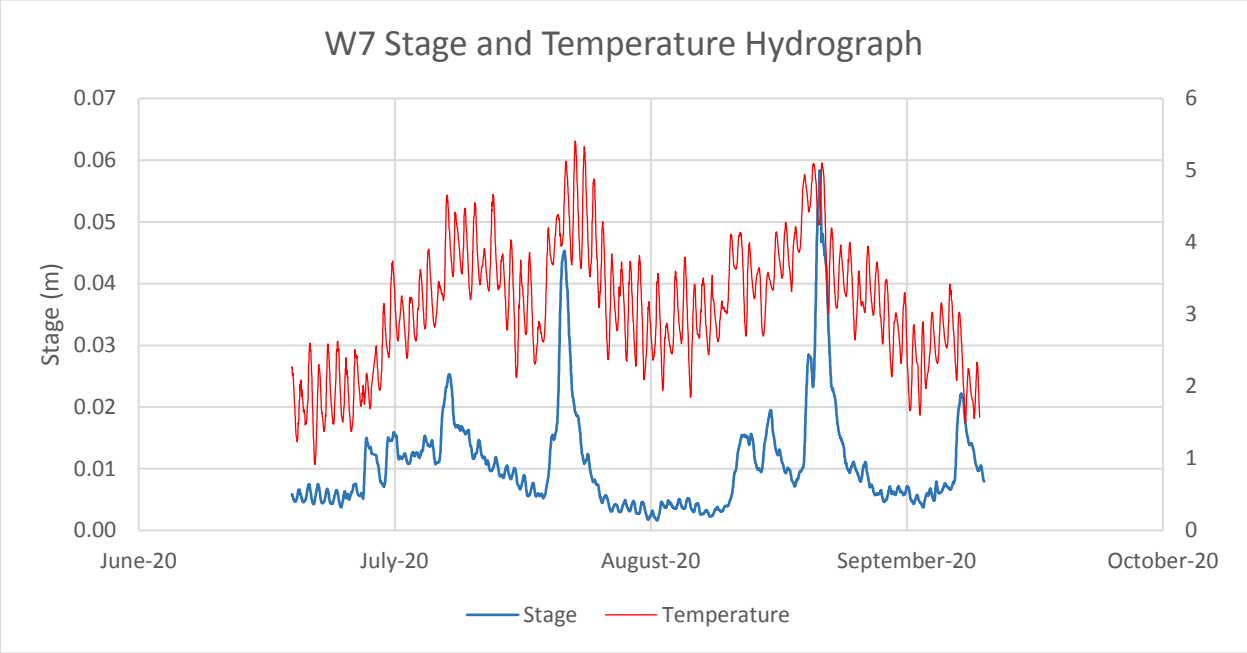


Figure 12: W7 Stage and Temperature Hydrograph

A rating curve (**Figure 13**) was initiated in the 2017 hydrometric season; with limited data points from 2017 to 2019 the curve is rudimentary but was used to determine discharge in 2020 as seen in **Figure 14**. The correlation between discrete and calculated measurements suggests that the rating curve is developing well. Discrete measurement frequency could be increased from monthly to bi-weekly in 2021 to further improve the curve.

As noted above, the logger stopped functioning correctly after September 12, hence the hydrograph shows two discrete measurements taken after the pressure transducer data ends.

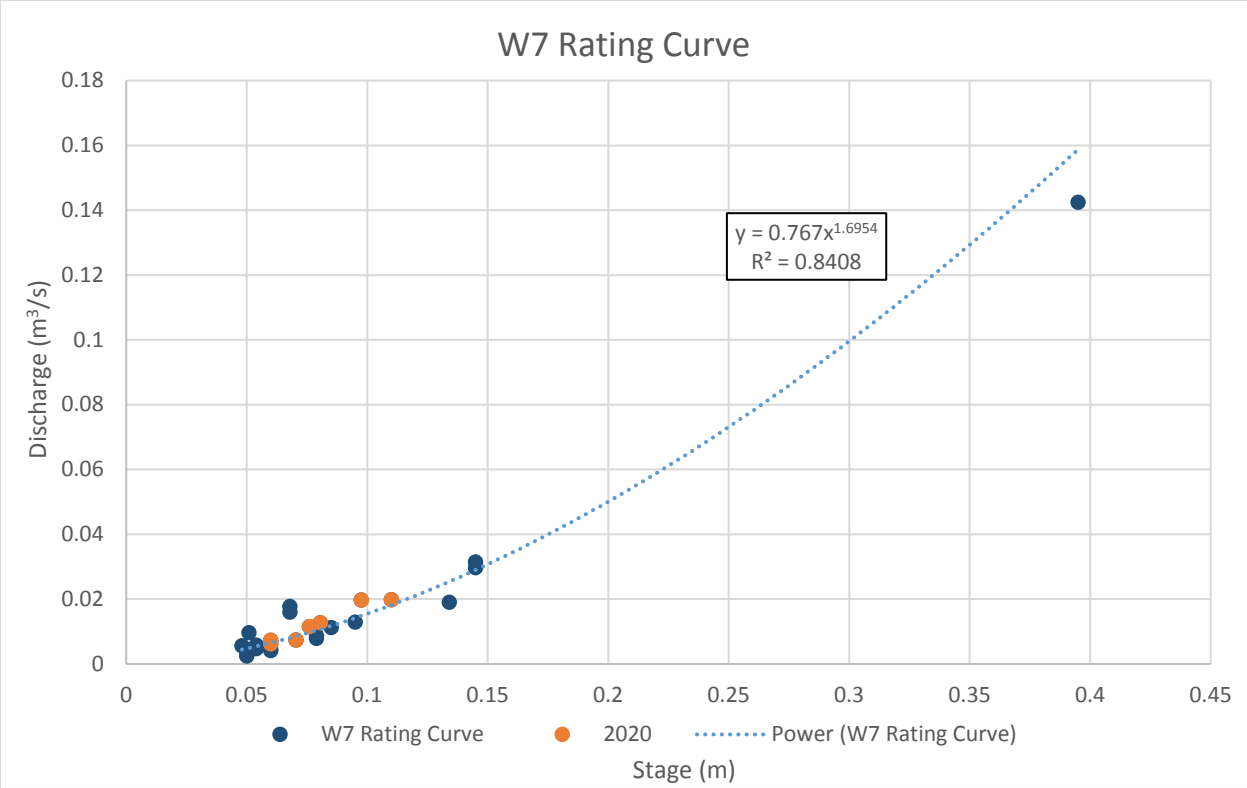


Figure 13: W7 Rating Curve

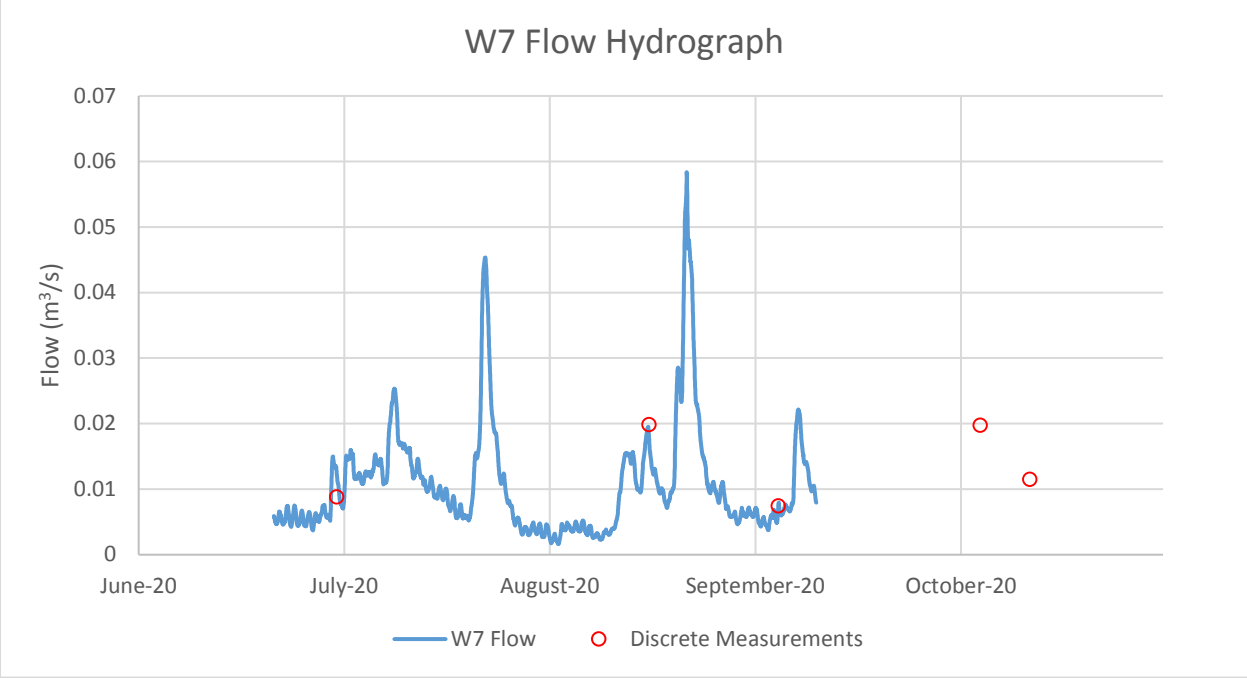


Figure 14: W7 Flow Hydrograph

Table 3-7 provides a summary of the average water temperature, flow and total flow volume in 2020. Discrete measurements were taken in October but due to the high temporal variability of flow at W7 it was not deemed reasonable to calculate estimates based on these readings.

Table 3-7: W7 2020 Hydrometric Data and Temperature Summary

Month	Period of Record (Day)	Mean Water Temperature (°C)	Mean Flow (m^3/s)	Total Flow (m^3)
Jan	No Data			
Feb	No Data			
Mar	No Data			
Apr	No Data			
May	No Data			
Jun	2	1.76	0.005	587
Jul	31	3.10	0.012	32441
Aug	31	3.42	0.010	27451
Sep	12	2.58	0.008	8526
Oct	No Data			
Nov	No Data			
Dec	No Data			

Note: Shaded cells indicate incomplete months of data

Table 3-8 presents the summary of historically measured flows at W7, based on discrete measurements before 2017, and based on continuous pressure readings for 2017 to 2020.

Table 3-8: W7 Historical Mean Monthly Flow (m3/s)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	-	-	-	-	-	-	0.013	0.031	0.019	0.006	-	-
2014	-	-	-	-	0.112	-	-	-	-	-	-	-
2015	-	-	-	-	-	0.006	0.004	0.011	0.011	0.029	-	-
2016	-	-	-	-	-	0.006	0.01	0.01	0.013	0.01	-	-
2017	-	-	-	-	-	0.002	0.003	0.003	0.004	0.004	-	-
2018	-	-	-	-	-	-	0.006	0.007	0.007	-	-	-
2019	-	-	-	-	-	0.01	0.003	0.003	0.004	0.005	-	-
2020	-	-	-	-	-	0.005	0.012	0.010	0.008	-	-	-

Note: Shaded cells indicate incomplete months of data

4 McGinty Creek Hydrology

In 2020, hydrological monitoring on McGinty Creek was conducted as per the schedule outlined in the EMSRP. Station MN-1.5 was added to the monitoring schedule with continuous measurements. During the 2029 monitoring period, Minto Mine maintained and collected data from the following four hydrometric stations along McGinty Creek: MN-0.5, MN-1.5, MN-2.5, and MN-4.5.

At the hydrometric stations, Solinst Level Loggers and Barometric Loggers were used in conjunction with staff gauge readings and manual flow measurements to produce volumetric flow rates. Manual flow measurements were conducted monthly during flow season unless otherwise noted below.

4.1 Station MN-0.5 – West Tributary of McGinty Creek

MN-0.5 station is located on the upper west stem of McGinty Creek. In 2020, water level and temperature data were continuously measured and recorded every 30 minutes by a pressure transducer/data logger. **Error! Reference source not found.** shows McGinty Creek at MN-0.5 water level and temperature data for the 105-day record from June 27 to October 10, 2020.

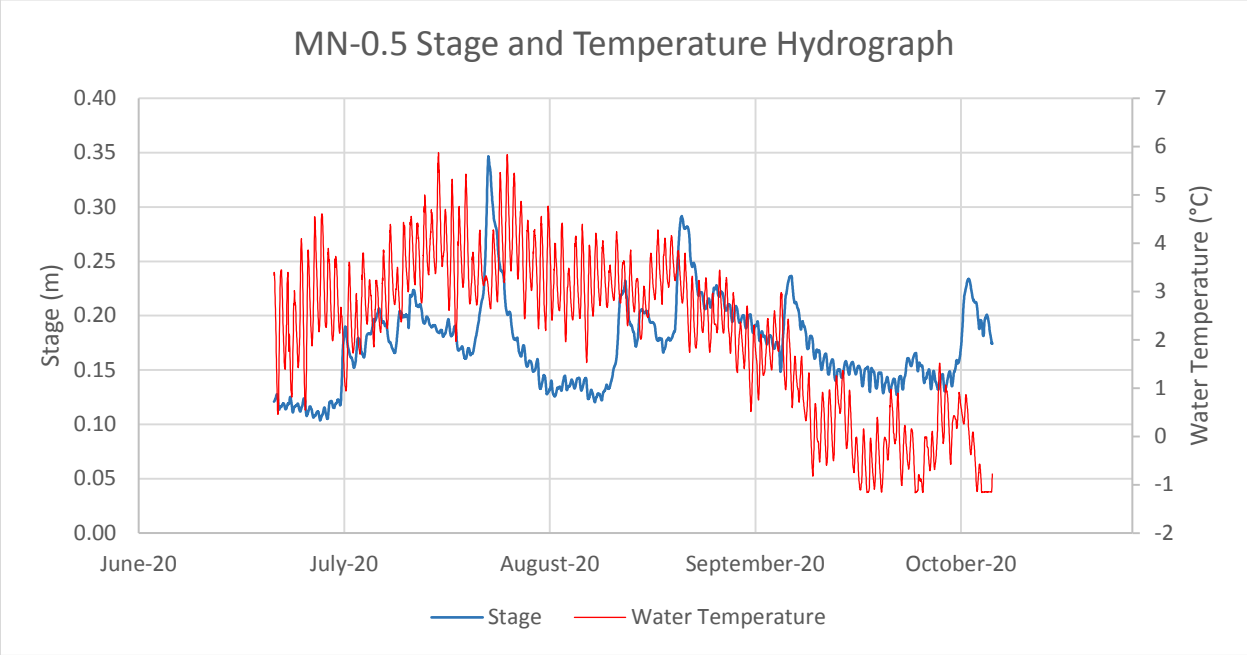


Figure 15: MN-0.5 Stage and Temperature Hydrograph

A stage-discharge relationship was established for MN-0.5 in 2015 but it had limited flow data and corresponding staff gauge readings and was therefore not very accurate. Through investigation of prior years' flow measurements, field notes, and photographs, outliers and unrepresentative readings were identified and either removed from the rating curve or adjusted to reflect changes in stream condition. The updated stage curve is now more accurate and is presented in Figure 16. Further study and continued accurate flow measurement will be required going forward to confirm the curve's accuracy.

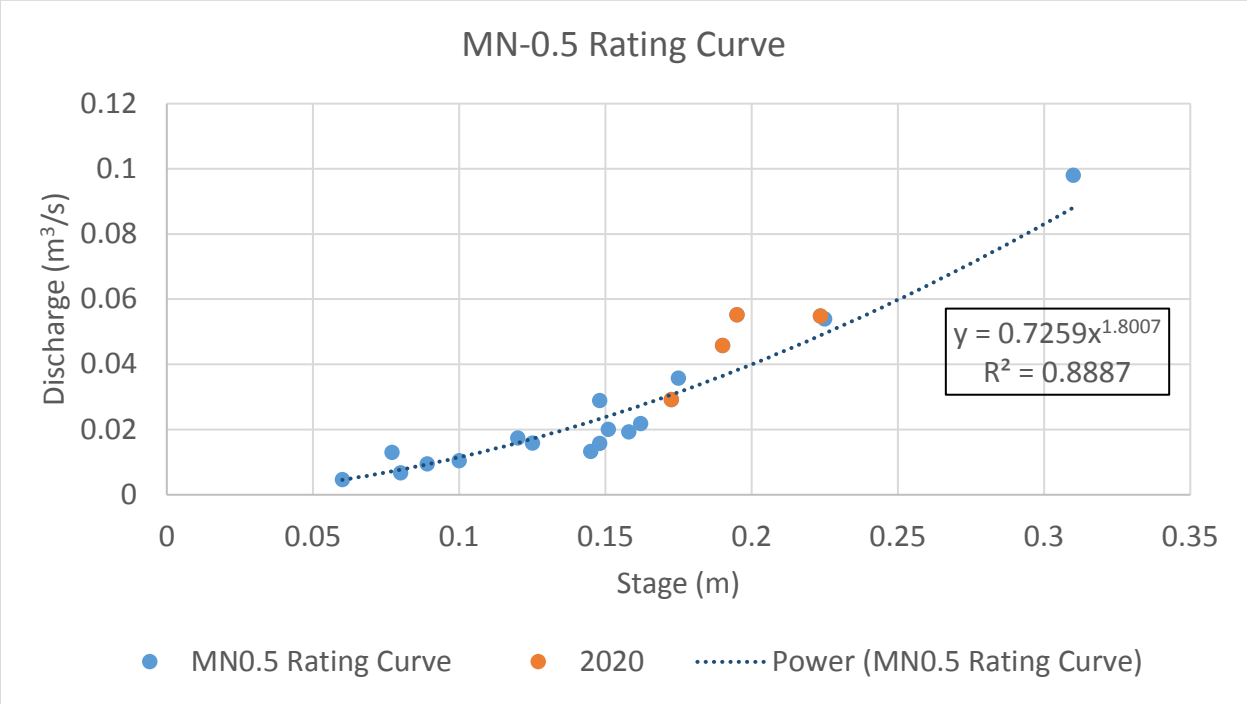


Figure 16: MN-0.5 Rating Curve

Continuous flow measurements, calculated using the above rating curve, are displayed in Figure 17 alongside discrete measurements. The discrepancy between the calculated and measured flows shows that more work is needed to improve the accuracy of this station. An investigation of staff gauge movement and cross-section placement will be conducted in 2021.

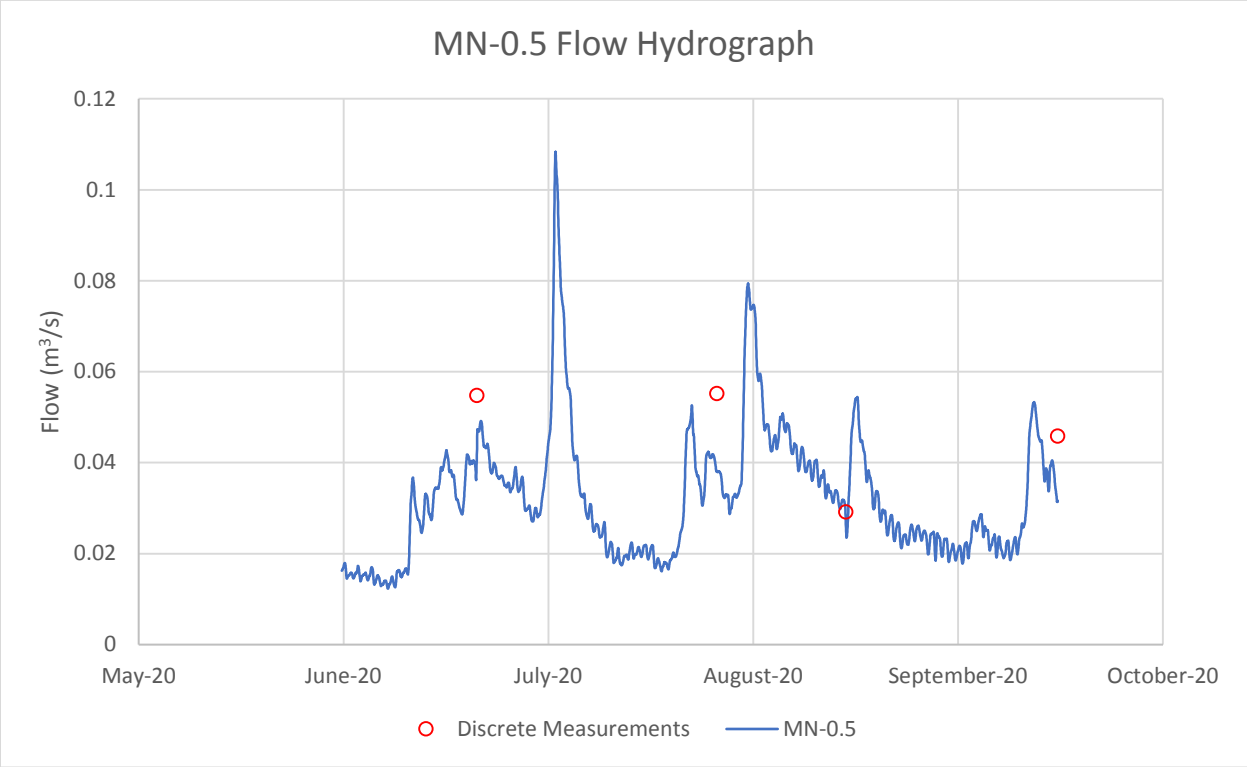


Figure 17: MN-0.5 Flow Hydrograph

Table 4-1 provides a summary of the average water temperature, flow and total flow volume in 2019 while Table 4-2 provides a summary historical measured flows at MN-0.5. Data for years prior to 2020 are based on direct measurements only.

Table 4-1: MN-0.5 2020 Hydrometric Data and Temperature Summary

Month	Period of Record (Day)	Mean Water Temperature (°C)	Mean Flow (m^3/s)	Total Flow (m^3)
Jan	No Data			
Feb	No Data			
Mar	No Data			
Apr	No Data			

May	No Data			
Jun	3	2.14	0.016	4406
Jul	31	3.24	0.035	93658
Aug	31	3.19	0.034	90551
Sep	30	0.67	0.030	78316
Oct	10	-0.11	0.032	26315
Nov	No Data			
Dec	No Data			

Note: Shaded cells indicate incomplete months of data

Table 4-2: MN-0.5 Historical Mean Monthly Flow (m^3/s)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	-	-	-	-	0.045	-	-	-	-	-	-	-
2015	-	-	-	-	0.035	0.013	0.054	0.098	0.029	0.025	-	-
2016	-	-	-	-	0.28	0.016	0.01	0.016	0.035	0.018	-	-
2017	-	-	-	-	-	0.017	0.023	0.02	0.017	0.019	-	-
2018	-	-	-	-	-	0.03	0.016	0.021	0.025	0.04	-	-
2019	-	-	-	-	-	0.018	0.008	0.007	0.008	-	-	-
2020	-	-	-	-	-	0.016	0.035	0.034	0.030	0.032	-	-

Note: Shaded cells indicate incomplete months of data

4.2 Station MN-1.5 – Upper East Tributary of McGinty Creek

MN-1.5 is marshy area with a small stream collecting water which flows into the lower stem of McGinty Creek. A staff gauge was installed on July 5, 2018. As a newly established station the rating curve had a large error. The hope was that as monitoring continued and more flow measurements were taken the stage curve would become

more accurate. Unfortunately, the stream became less consolidated and more braided over the course of 2019 and 2020. No representative flow measurements could be collected during this time. A pressure transducer/logger was installed in 2020, however changes to the stream were so severe that the staff gauge levels were no longer representative of the streams' total flow (Figure 18). As such, no accurate data was collected at MN-1.5 in 2020 and none will be presented here.



Figure 18: MN-1.5 Stream and Staff Gauge, June 27, 2020

If MN-1.5 is to be established as permanent hydrometric station the staff gauge must be re-installed in a more stable section of the stream. The stream is more consolidated both up and downstream of the current location but it is quite narrow, so a location will need to be identified where stream width is sufficient to conduct accurate flow measurements.

Crossing the marshy stream to collect samples and flow measurements, as well as it's placement along an active game trail, likely contributed to the degradation of the current location. A new site should be installed at a location where water quality sampling and flow measurement can be conducted without crossing the stream or

disturbing its banks. If a new trail is required, it should avoid existing game trails or creating new potential pathways for large animals, if possible.

Once a new station is installed, increasing flow measurement frequency to bi-weekly could be considered to help establish an accurate rating curve more quickly. MN-1.5 is the closest of the McGinty Creek sampling locations so this option is more feasible than it would be at other locations within the catchment.

4.2 Station MN-2.5 – East Tributary of McGinty Creek

MN-2.5 station is located on the lower stem of McGinty Creek. In 2020, water level and temperature data were continuously measured and recorded every 30 minutes by a pressure transducer/data logger. Figure 19 shows water level and temperature data at MN-2.5 for the 105-day record from June 27th to October 10th, 2020.

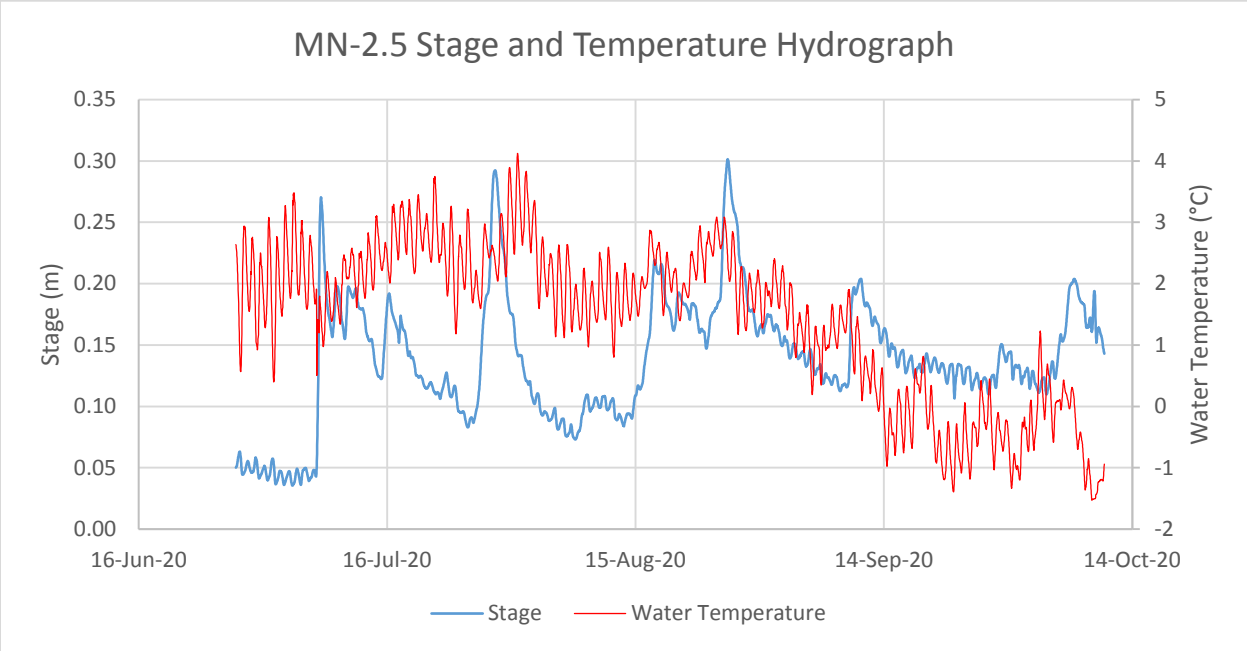


Figure 19: MN-2.5 Stage and Temperature Hydrograph

A stage-discharge relationship was established for MN-2.5 in 2015 but due to limited accurate flow data and corresponding staff gauge readings it was not reliable curve. In 2020, an audit of previous measurements was conducted to identify and remove

outliers and adjust staff gauge measurements based on photographic data. This, combined with a relatively large and precise dataset collected in 2020, has produced a more accurate curve. Figure 20 shows the rating curve for the 2020 dataset as well as the curve for all confirmed accurate measurements from 2015 to present. To reflect historic variability, the combined rating curve was used to calculate continuous flow in 2020 presented in Figure 21 alongside discrete flow measurements.

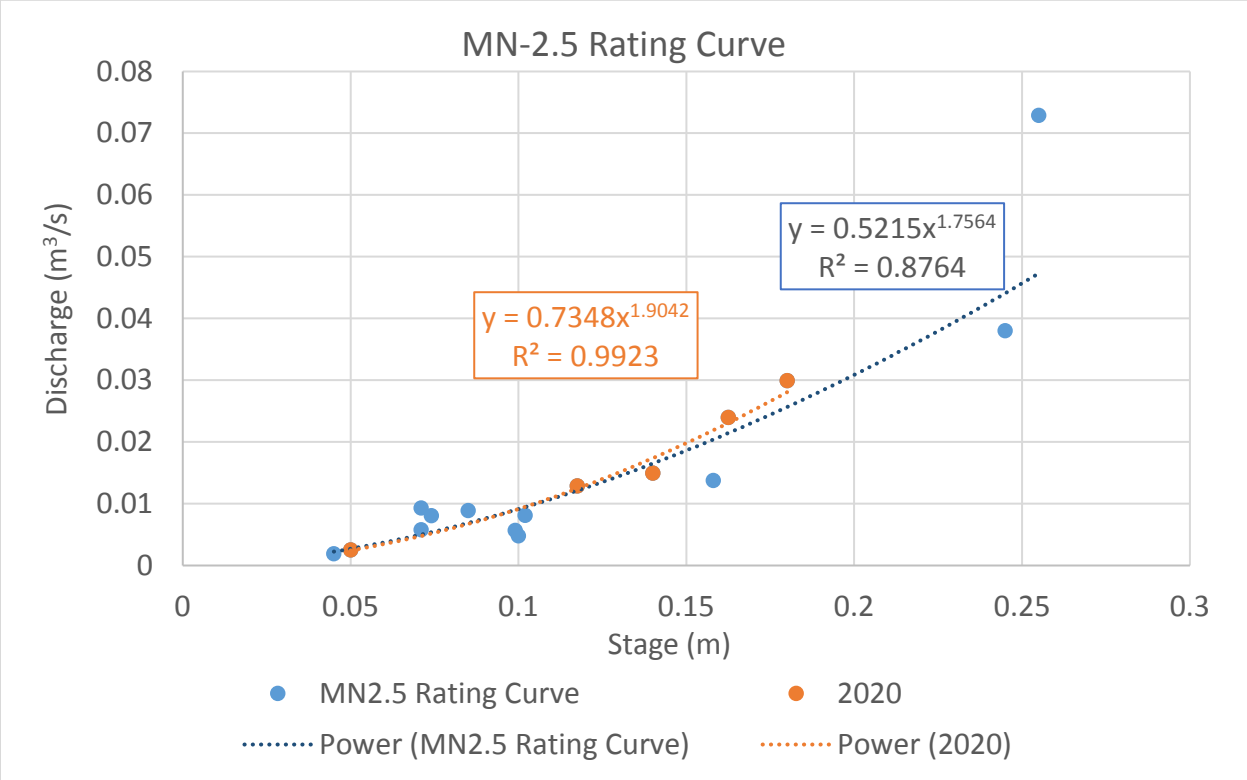


Figure 20: MN-2.5 Rating Curve

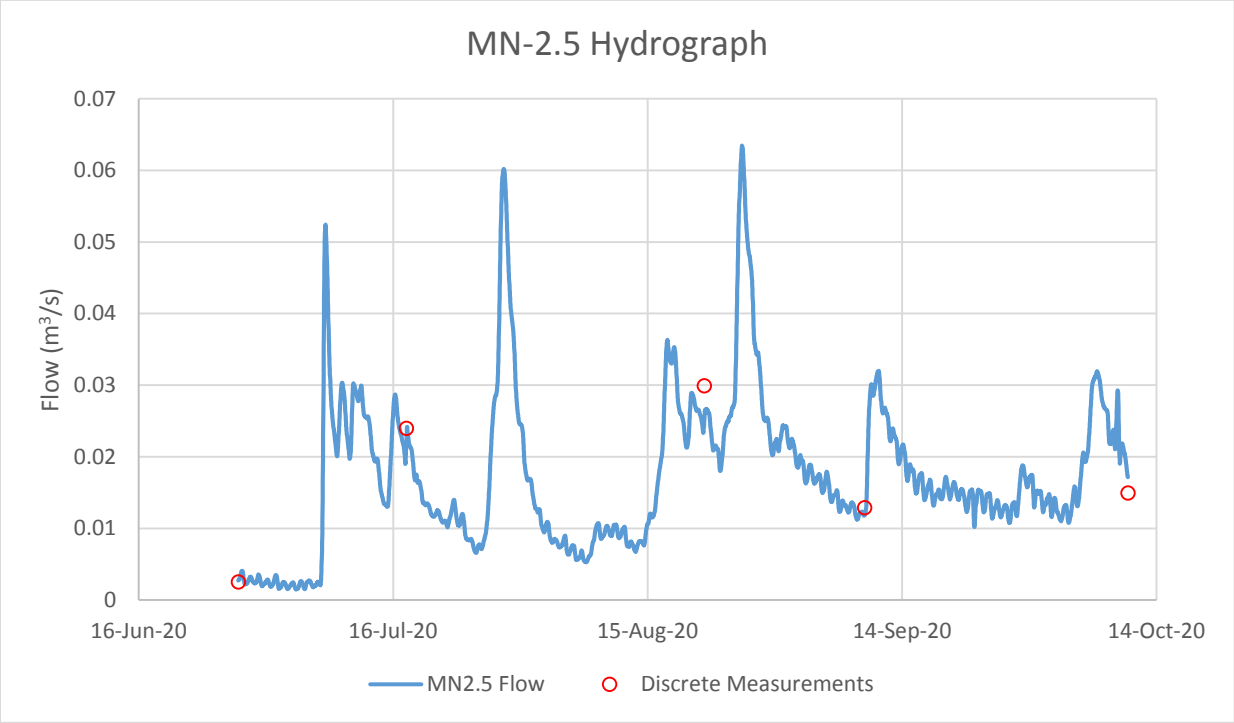


Figure 21: MN-2.5 Flow Hydrograph

Table 4-3 provides a summary of the average water temperature, flow and total flow volume in 2019. Table 4-4 provides a summary of historical measured flows at MN-2.5. These flows are based on discrete measurements until 2016, the pressure loggers were used from 2017 to 2020.

Table 4-3: MN-2.5 Hydrometric Data and Temperature Summary

Month	Period of Record (Day)	Mean Water Temperature (°C)	Mean Flow (m^3/s)	Total Flow (m^3)
Jan	No Data			
Feb	No Data			
Mar	No Data			

Apr	No Data			
May	No Data			
Jun	3	1.94	0.003	777
Jul	31	2.38	0.017	46403
Aug	31	3.19	0.030	81650
Sep	30	0.24	0.017	42869
Oct	10	-0.35	0.020	16359
Nov	No Data			
Dec	No Data			

Table 4-4: MN-2.5 Historical Mean Monthly Flow (m^3/s)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	-	-	-	-	0.032	-	-	-	-	-	-	-
2015	-	-	-	-	0.015	0.003	0.011	0.038	0.01	0.01	-	-
2016	-	-	-	0.034	0.008	-	-	0.009	0.014	0.003	-	-
2017	-	-	-	-	-	0.011	0.01	0.007	0.004	0.013	-	-
2018	-	-	-	-	-	-	0.011	0.014	0.014	0.019	-	-
2019	-	-	-	-	-	0.006	0.006	0.006	0.006	0.007	-	-
2020	-	-	-	-	-	0.003	0.017	0.030	0.017	0.020	-	-

Note: Shaded cells indicate incomplete months of data

4.3 Station MN-4.5 -McGinty Creek near the Mouth

MN-4.5 station is located on the lower reach of McGinty Creek before flowing into the Yukon River. In 2020, water level and temperature data were continuously measured and recorded every 30 minutes by a pressure transducer/data logger. Figure 22 shows McGinty Creek at MN-4.5 water level and temperature data for the 148-day record from May 15 to October 4, 2020. The drastic depth increase on July 7 corresponds to a heavy rain event and is evident, though less extreme, in MN-0.5 and MN-2.5.

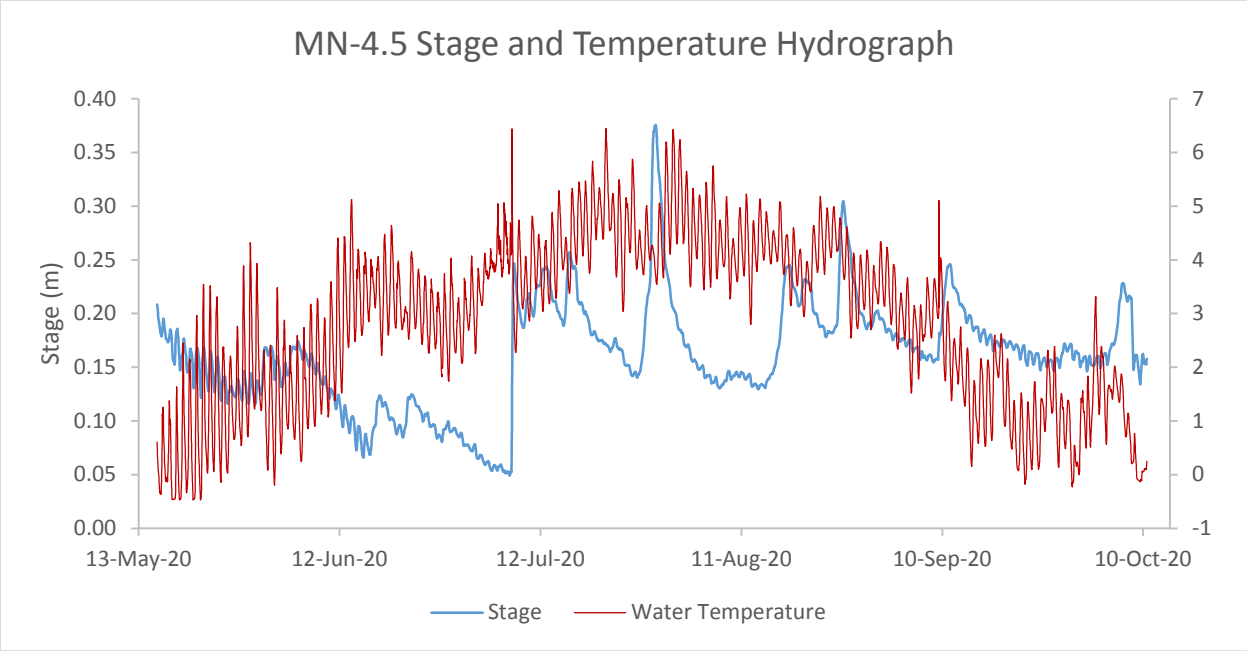


Figure 22: MN-4.5 Stage and Temperature Hydrograph

The stage-discharge relationship for MN-4.5 is presented in Figure 23. The rating curve at MN-4.5 continues to improve year over year, going from an R^2 value of 0.9051 in 2019 to 0.9214 in 2020. The 2020 hydrograph and discrete measurements for MN-4.5 are shown in Figure 24. In 2020, the maximum measured flow of 0.635 m^3/s occurred on July 29.

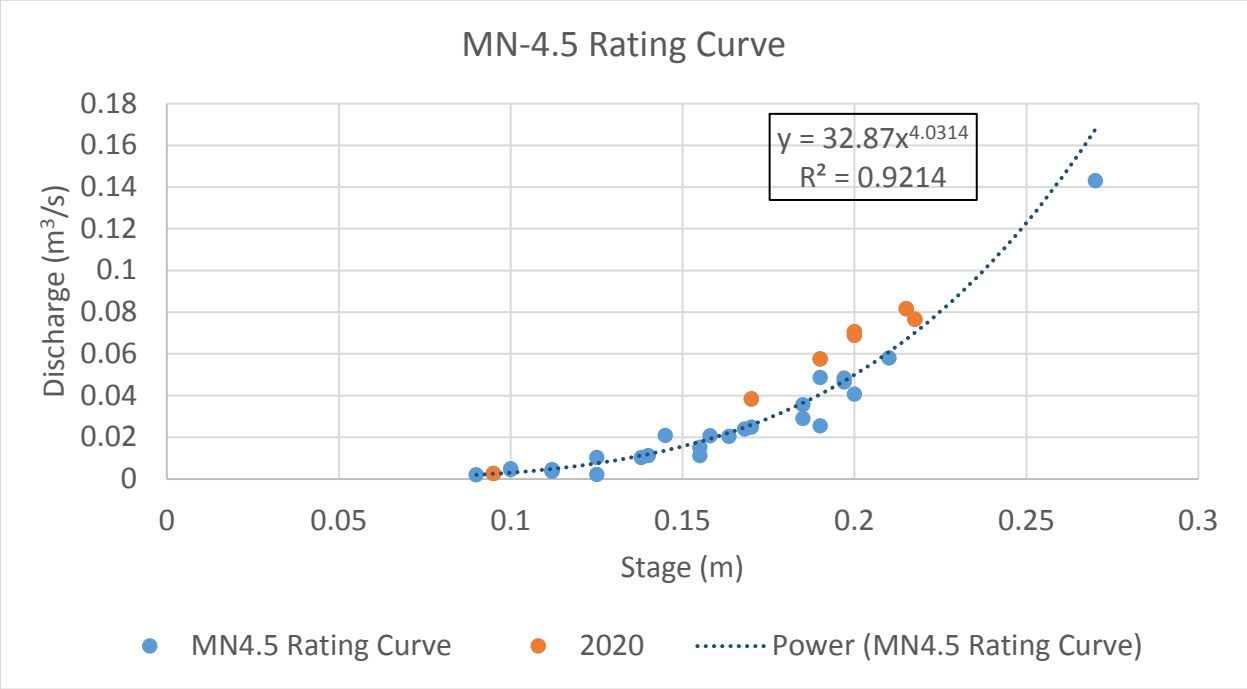


Figure 23: MN-4.5 Rating Curve

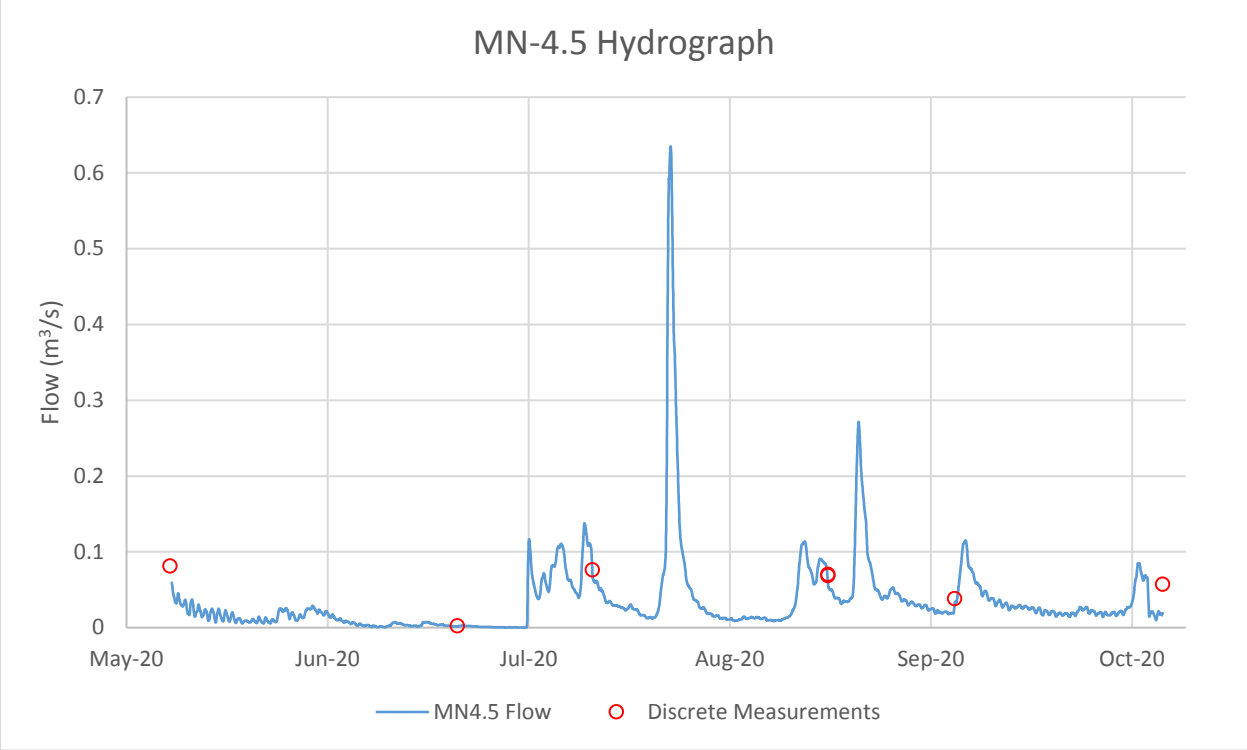


Figure 24: MN-4.5 Flow Hydrograph

Table 4-5 provides a summary of the average water temperature, flow and total flow volume in 2020. Table 4-6 summarizes the historical mean monthly flows to previous years of the hydrometric program.

Table 4-5: MN-4.5 2020 Hydrometric Data and Temperature Summary

Month	Period of Record (Day)	Mean Water Temperature (°C)	Mean Flow (m^3/s)	Total Flow (m^3)
Jan	No Data			
Feb	No Data			
Mar	No Data			
Apr	No Data			
May	16	1.10	0.017	24240
Jun	30	2.62	0.008	20493
Jul	31	4.23	0.065	174011
Aug	31	4.18	0.045	121546
Sep	30	1.82	0.032	83025
Oct	10	1.13	0.032	25017
Nov	No Data			
Dec	No Data			

Note: Shaded cells indicate incomplete months of data

Table 4-6: MN-4.5 Historical Mean Monthly Flow (m^3/s)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2011	-	-	-	-	0.444	0.093	0.125	0.134	0.068	0.045	-	-
2012	-	-	-	0.212	0.023	0.18	0.082	0.053	0.109	-	-	-
2013	-	-	-	-	-	0.054	0.103	0.093	0.116	-	-	-
2014	-	-	-	-	0.23	0.041	0.037	0.026	0.046	-	-	-

2015	-	-	-	-	-	0.013	0.046	0.049	0.029	0.029	-	-
2016	-	-	-	-	0.017	0.015	0.026	0.028	0.028	0.01	-	-
2017	-	-	-	-	0.079	0.12	0.027	0.003	0.012	0.079	-	-
2018	-	-	-	-	0.031	0.021	0.006	0.021	0.022	0.006	-	-
2019	-	-	-	-	0.025	0.064	0.013	-	-	-	-	-
2020	-	-	-	-	0.017	0.008	0.065	0.045	0.032	0.032	-	-

Note: Shaded cells indicate incomplete months of data

5 Hydrology QA/QC

Detailed procedures for hydrology monitoring at the Minto Mine are detailed in the *Minto Mine Surface Water Hydrology* SOP. In 2020, Minto environmental staff conducted a duplicate of hydrometric measurements at a random station every week, to reach a 10% QAQC target.

Appendix H – 2021 Physical Monitoring Plan

Revision 2021-1
Physical Monitoring Plan
Minto Mine, YT

Prepared by:
Minto Explorations Ltd.
Minto Mine
February 2021

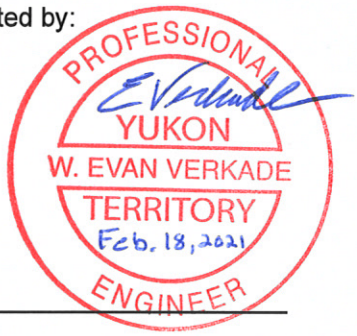
Minto Mine Physical Monitoring Plan

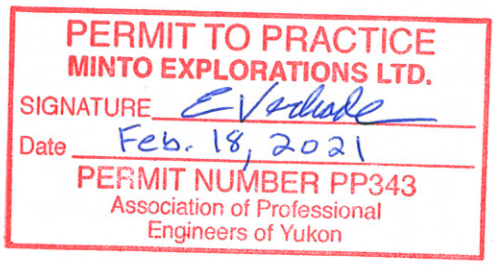
First Issue: June 2014

REVISION INFORMATION

Rev. Number	Issue Date	Description & Revisions Made
-	June, 2014	First issue
2015-1	November, 2015	Annual update of existing instrumentation and monitoring frequencies. Instruments Added: A215, A216, A217, A218, A2RAMP01, A2RAMP02, A2RAMP03, A2RAMP04, DSSH-26, DSSH-27, M82, M83, M84, M85, M86, M87, SWD06 Instruments Removed: DSI-14, DSI-21, DSSH-21, DSSH-22, DSSH-23, DSSH-25, WSP2
2016-1	December, 2016	Annual update of existing instrumentation and monitoring frequencies. Instruments Added: DSP-07, DSP-08, DSP-10, DSI-22, DSI-23, DSSH-28, DSSH-29, DSSH-30, DSSH-31, MV1, MV2, SWD-07, SWD-08, SWD-09 Instruments Replaced: DSSH-06, DSSH-10, DSSH-15, DSSH-18, DSSH-19, DSSH-20 Instruments Removed: A2RAMP01, A2RAMP02, A2RAMP03, A2RAMP04, SWD-02, SWD-02A, SWD-04A, SWD-05A, DSP-09
2017-1	November, 2017	Annual update of existing instrumentation and monitoring frequencies. Instruments Added: DSI-24, DSSH-32, M88, M89, M91, M92, M93, M94, SWD10, SWD11 Instruments Replaced: DSSH-17, DSSH-27, M82, M76, M86 Instruments Removed: DSI-23, DSSH-20, DSSH-29, M73, M75, M87
2018-1	December, 2018	Updated for care & maintenance. Inspection and monitoring frequencies revised. Instruments Added: DS1, DS3, DS4, MWDH1, MWDH2, MWDH3, MWDH4, MWDH5, MWDH6, M81, M95, M95, M97, M98, SWD12 Instruments Removed: M76, M85, M86, M91, SWD05A, SDI-3
2021-1	January, 2021	Updated for new ownership and resumption of operations. Inspection and Monitoring Frequencies revised.

Updated by:





Evan Verkade, P.Eng.

Chief Engineer

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Appendix A: Instrumentation Map
Appendix B: Data Collection and Input Manuals

1 Introduction

The following document describes the instrumentation and monitoring program currently in place at Minto to monitor the stability of mining structures including waste rock, tailings, and water storage facilities. The program consists of two main components: instrumentation to measure ground conditions and deformation, and regular geotechnical inspections. The following sections summarize inspection and data collection frequencies, instrument installation details and locations, and data collection procedures.

Mining and monitoring activities at Minto included in this plan are licensed under the following:

- Type A Water Licence QZ14-031, August, 2015
- Type B Water Licence MS15-094, July 2016
- Quartz Mining Licence QML-0001, December, 2014

Existing mine structures at Minto are shown in Figure 1-1, and described in the following section.



Figure 1-1: Minto site plan (July 2020)

2 Mine Structures

Mine structures currently being monitored at Minto are listed in Table 1.

Table 1: Description of Mine Structures at Minto

Structure	Description	Instrumentation
Area 2 Pit and Area 2 Pit Tailings Management Facility (A2PTMF)	The Area 2 Pit was completed in 2015 to the extents licensed under Phase IV (Stages 1 and 2); the pit was extended to the south as part of Phase V/VI (Stage 3 and Stage 3 Expansion), completed in 2018. Tailings deposition into Area 2 Stage 2 pit (A2S2) began in March, 2015 and the pit is now maintained as a tailings management facility. Dumping of NP:AP<3 waste rock (SAT) into the Stage 2 and Stage 3 pits, below the final water table at closure, took place in 2017 and 2018.	• Survey hubs • Inclinometer • Thermistor
Area 2 Underground	The Area 2 underground was accessed by the Minto South portal and decline south of the Area 2 and Area 118 Pits. There are no current mining activities in this zone.	None
Area 118 Pit	Mining of the Area 118 Pit was carried out in 2014. As part of Area 2 Stage 3 pit mining, overburden was dispatched to the pit, referred to as the Area 118 Backfill Dump.	None
Area 118 Backfill Dump	The Area 118 Backfill Dump is included in the Phase V/VI licence. Overburden was dispatched to the pit in 2017 as part of Area 2 pit mining.	None
Area 118 Underground	The Area 118 underground began development in 2013 and was completed in 2016. It is accessed by the Minto South portal and decline south of the Area 2 and Area 118 Pits. Production mining took place using a longhole stoping method.	None
Big Creek Bridge	Bridge on the Minto access road crossing Big Creek, located at Km 19. Licenced under Type B water licence MS15-094.	None
Barge Landings	Barge landings on the Minto access road at the Yukon river. Licensed under Type B water license MS15-094.	None
Camp	The camp consists of several connected bunkhouse buildings (Sherwood, Minto, Selkirk), a kitchen building, and several separate buildings including the gym and Site Services offices.	None
Copper Keel Underground	The Copper Keel underground is in the phase V/VI mining plan and development was started in 2018. Copper Keel development finished in 2020 and commenced long hole production. In 2021 Copper Keel is the main ore ore producer at Minto.	None
Dry Stack Tailings Storage Facility (DSTSF)	Construction of the DSTSF with filtered tailings placement was carried out from 2007 to November 2011. As part of progressive reclamation activities in 2012-2013, the DSTSF was covered with a layer of overburden approximately one to four meters thick. The DSTSF began showing deformation in 2009, interpreted as primarily horizontal sliding towards the north/northeast on an ice-rich layer in the underlying overburden, several meters above bedrock. The movement has continued since then but at a decreasing rate in response to construction of both the Mill Valley Fill waste rock buttress and the Mill Valley Fill Extension 2 waste rock buttress. Resloping and overburden cover placement took place in 2017 and 2018 as part of progressive reclamation activities.	• Survey hubs • Thermistors • Inclinometers • Piezometers

Structure	Description	Instrumentation
Ice Rich Overburden Dump (IROD)	Originally constructed as a free-standing rockfill structure to contain ice-rich overburden. The IROD is no longer active and is now entirely surrounded by the Southwest Waste Dump rockfill. The area has been reclaimed with the Southwest Waste Dump in 2017.	None
Main Pit (Area 1 Pit) and Main Pit Tailings Management Facility (MPTMF)	Mining in the Main Pit was completed in 2011. Instability in the south wall of the pit occurred in 2009 during mining of Stage 3 of the pit, and subsequently a larger failure occurred in 2011 after completion of Stage 5. Continued sloughing and creep movement of the south wall led to the design and construction of a waste rock buttress, known as the South Wall Buttress, completed in 2013. Slurry tailings deposition into the pit began in 2012 and the pit is now maintained as a tailings management facility.	• Survey hubs • Inclinometer
Main Pit Dump	The Main Pit Dump is included in the Phase V/VI licence. Construction commenced in 2017 and ceased in 2018 when the mine placed in care and maintenance. The dump is located on the southwest side of the Main Pit.	• Survey hubs
Main Waste Dump (MWD)	The Main Waste Dump stores waste rock released during the mining of the first three stages of the Main Pit. The dump is no longer active.	• Survey hubs • Inclinometer
Main Waste Dump Expansion (MWDE)	This dump is an extension of the MWD that stores waste rock released from the Minto North Pit. The dump is no longer active. Reclamation re-sloping began in 2016.	None
Main Waste Dump Wrap (MWDW)	This dump is a reclamation feature to shallow the slopes of the Main Waste Dump for reclamation purposes. The dump is no longer active.	• Survey hubs
Mill Site	The mill site consists of the mill building, crusher and crusher stockpile pad.	None
Mill Valley Fill Extension (MFVE)	A waste rock buttress to the north of the DSTSF, constructed from January 2012 to March 2013 to prevent or decrease movement of the DSTSF. Resloping and overburden cover placement were carried out as part of progressive reclamation activities in 2017 and 2018.	• Survey hubs
Mill Valley Fill Extension 2 (MVFE2)	An extension of the MVFE waste rock buttress to the northeast, constructed from November 2015 to August 2016 to further decrease movement of the DSTSF. Resloping and overburden cover placement were carried out as part of progressive reclamation activities in 2017 and 2018.	• Piezometers • Survey hubs • Inclinometers
Mill Valley Fill Extension 2 Collection Sump	A replacement sump for the Minto Creek Detention Structure (MCDS), constructed in 2016. It detains surface water considered impacted from upstream sub-catchment areas and directs it to the MPTMF or water treatment plant.	None
Minto Access Road	Road from the Yukon River barge crossing to the mine site. Licenced under Type B water licence MS15-094.	None
Minto East Underground	Accessed by the Minto South portal and decline south of the Area 2 and Area 118 Pits. Production was nearly completed in 2020 with only a few remaining stopes off the 505A level access for 2021. The Minto East ramp provides access to the Return Air Raise and underground dewatering system.	None

Structure	Description	Instrumentation
Minto North Pit	Mining of the North Pit was completed in September 2016. The pit is currently inactive and the access is barricaded.	None
Ore Stockpiles	There are two primary ore stockpiles on site – North and South stockpile. These are located south of the crusher and east of the Area 2 pit.	None
Reclamation Overburden Dump (ROD)	Received the bulk of the overburden released as part of Phase IV and earlier mining of the Main Pit. The material in the ROD is available for use in reclamation of the mine at closure.	None
South Wall Buttress (SWB)	Waste rock buttress constructed against the Main Pit south wall from 2009-2011 as a result of instability in the south wall of the pit. Now covered by the Main Pit Dump.	• Survey hubs
Southwest Waste Dump (SWD)	The Southwest Waste Dump (SWD) stores waste rock released during phase IV mining. The dump is no longer active. Resloping and overburden cover placement were carried out as part of progressive reclamation activities in 2016-2018.	• Survey hubs • Inclinometers • Thermistors • Piezometers
Tailings Diversion Ditch (TDD)	A diversion ditch located south of the DSTSF to divert unimpacted water around the tailings facility. The intake structure was extended in 2017 and 2018 to allow for the decommissioning of the South Diversion Ditch for A2S3 Expansion mining.	None
Water Storage Pond Dam (WSP)	The Water Storage Pond and Dam are located east of the mine along Minto Creek. The dam was constructed in 2006 as a clay-core water retention dam for collecting precipitation and surface water runoff at the site. Maximum depth of water at the face of the dam is approximately 15 m.	• Survey hubs • Thermistors • Piezometers

3 Design and Monitoring References

Table 2 lists the design reports for each structure and the monitoring/inspection guidance reports used to develop the inspection (Section 5) and instrumentation (Section 6) programs for each structure.

Table 2: Design Documents and Monitoring/Inspection Guidance Documents

Structure	Design Reports	Monitoring/Inspection Guidance Reports
Area 2 Pit and Area 2 Pit Tailings Management Facility (A2PTMF)	*Prefeasibility Geotechnical Evaluation, Phase IV, Minto Mine.* SRK, December 2009. *Review of Minto Area 2 West Wall Stability*. SRK, September 11, 2012. *Review of Minto Area 2 West Wall Stability-April 2013*. SRK, April 18, 2013. *Review of Minto Area 2 West Wall Stability-September 2013*. SRK, September 30, 2013. *Main Dam – Area 2 Pit Stability Assessment.* SRK Consulting Project: 1CM002.003.0701, February 2015.	*Operation, Maintenance, and Surveillance Manual - Area 2 Pit Tailings Management Facility* Revision 2015-2. Minto, December 2015. *Minto Mine Operations Adaptive Management Plan* Revision 2018-01. Minto, 2018.
Area 2 Stage 3 Pit and Area 2 Stage 3 Expansion	*Pit Slope Stability Evaluation, Minto Mine, Area 2 Pit – Stage 3.* SRK Consulting Project: 219500.190, August 2015. *Geotechnical Review of Saddle Between Area 2 Stage 2 and Area 2 Stage 4 Open Pits.* JDS Energy & Mining Inc., August 24, 2017.	*Minto Mine Ground Control Plan – Open Pit Operations.* Minto, 2017.
Area 2 Underground	*Area 2 Mining Stability Assessment Summary.* Golder Associates, June 2016. *Area 2 Mining Stability Assessment Summary.* Golder Associates, December 2016.	*Minto Mine Ground Control Plan – Underground Operations.* Minto, 2017. *Inspection of Physical Stability of Underground Workings at Minto Mine, Yukon*. Golder Associates, August 2017. *Minto Mine Geotechnical Mapping Program Memo Review.* Golder Associates, September 2017. *Independent Review of Blasting Impacting Between Minto Surface and Underground Operations*. Golder Associates, September 2017. *Inspection of Physical Stability of Underground Workings at Minto Mine*. Golder Associates, August 2018.
Area 118 Pit	*Prefeasibility Geotechnical Evaluation, Phase IV, Minto Mine.* SRK, December 2009. *Review of Final Area 118 Pit Design*. SRK Consulting, Project: 219500.070. January 2015.	-

Structure	Design Reports	Monitoring/Inspection Guidance Reports
Area 118 Backfill Dump	*Phase V/IV Ridgetop South and Area 118 Backfill Dumps Physical Stability Assessment.* SRK, October 2013.	-
Area 118 Underground	*Minto 118-Zone – FLAC3D Analysis of the Longhole Base Case Option.* Itasca, August 2014. *Geotechnical Characterization of Existing and Proposed Longhole Open Stope Mining Areas.* Golder Associates File: 1528754-002-R-Rev0-3000. July 30, 2015. *Longhole Open Stope Stability Addendum – Revised Mining Heights.* Golder Associates, File 1528754-006-TM-Rev0-3000, November 2015. *Area 118 Plunge Mining Stability Assessment Summary.* Golder Associates, File: 1528754-008-PP-Rev0-5000, December 2015	*Minto Mine Ground Control Plan – Underground Operations.* Minto, 2016. *Ground Control Management Plan Review.* Golder Associates, File 1528754-007-TM-Rev0-1000. September 2015.
Big Creek Bridge	-	-
Camp	-	-
Dry Stack Tailings Storage Facility (DSTSF)	*Geotechnical Design Report, Dry Stack Tailings Storage Facility, Minto Mine, Yukon*. EBA File: 1200173. January 2007.	*Operation, Maintenance, and Surveillance Manual, Dry Stack Tailings Storage Facility, Minto Mine, YT.* Revision 2014-1 Minto, November 2014. *Minto Mine Operations Adaptive Management Plan.* Revision 2018-01. Minto, 218.
Ice Rich Overburden Dump (IROD)	*Geotechnical Design Ice-Rich Overburden Dump, Minto Mine, Minto, YT.* EBA file: 1200173. January 2006. *Ice-Rich Overburden Dump Containment Berm Inspection Report, Minto Mine Site, Minto Yukon.* EBA File: 1200173.001. June 19, 2007.	*Geotechnical Design Ice-Rich Overburden Dump, Minto Mine, Minto, YT.* EBA file: 1200173. January 2006. EBA, 2007.
Main Pit (Area 1 Pit) and Main Pit Tailings Management Facility (MPTMF)	*Pit Slope Evaluation for Area 1 Open Pit.* SRK Consulting, Project: 2CM022.03, July 2007. *SAT Dump on Tailings.* SRK Consulting Project: 1CM002.043, March 2016.	*Operation, Maintenance, and Surveillance Manual - Main Pit Tailings Management Facility*. Revision 2015-2 Minto, December 2015. *Minto Mine Operations Adaptive Management Plan* Revision 2018-01. Minto, 2018.

Structure	Design Reports	Monitoring/Inspection Guidance Reports
Main Pit Dump	*Phase V/VI Main Pit Dump Physical Stability Assessment.* SRK Consulting Project: 1CM002.003.0701, November 2013. *Update to the Main Pit Dump Physical Stability Assessment.* SRK Consulting Project: 1CM002.003.0701. February 2015. M*ain Pit Dump (Revision 5.6) Stability Analysis*. SRK Consulting, Project 1CM002-053, July 2017.	-
Main Waste Dump (MWD)	*Geotechnical Evaluation Proposed Main Waste Dump Minto Mine, Minto, YT.* EBA. April 1998.	*Geotechnical Evaluation Proposed Main Waste Dump Minto Mine, Minto, YT.* EBA. April 1998. *Minto Mine Operations Adaptive Management Plan* Revision 2018-01. Minto, 2018.
Main Waste Dump Expansion (MWDE)	*Minto Mine Phase V/VI Expansion Waste Rock and Overburden Management Plan.* Minto. June 2014. *Phase V/VI Main Waste Dump Expansion – Physical Stability Assessment.* SRK Consulting Project: 1CM002.012.012, November 2013	*Minto Mine Operations Adaptive Management Plan* Revision 2018-01. Minto, 2018.
Main Waste Dump Wrap (MWDW)	*Main Waste Dump Stability Analysis.* SRK Consulting Project: 1CM002-049, April, 2017.	-
Mill Site	-	-
Mill Valley Fill Extension (MFVE)	*Waste Rock and Overburden Management Plan, Phase IV Development, Minto Mine YT.* EBA File: W14101068.015. September 9, 2011. *Upstream Water Management for the Mill Valley Fill Expansion and Dry Stack Tailings Storage Facility.* EBA File: W14101168.013. September 14, 2011.	*Minto Mine Operations Adaptive Management Plan* Revision 2018-01. Minto, May, 2018.
Mill Valley Fill Extension 2 (MVFE2)	*Mill Valley Fill Extension Stage 2 Preliminary Design Report.* SRK Consulting Project: 1CM002.015. March, 2014 *Minto Mine Phase V/VI Expansion Waste Rock and Overburden Management Plan.* Minto. June, 2014. *Mill Valley Fill Extension Stage 2 Final Design Report.* SRK Consulting Project: 1CM002.040. September, 2015. *Mill Valley Fill Extension Stage 2 Record of Construction.* Minto. November, 2016.	*Minto Mine Operations Adaptive Management Plan* Revision 2018-01. Minto, 2018. *Mill Valley Fill Extension Stage 2 – Expected Performance and Evaluation Criteria.* SRK Consulting Project: 1CM002.050, November, 2016. *Mill Valley Fill Extension Stage 2 Inclinometer Installations Field Report*. SRK Consulting Project: 1CM002.052. June 2017.

Structure	Design Reports	Monitoring/Inspection Guidance Reports
Mill Valley Fill Extension 2 Collection Sump	*Design for the MVFE Stage 2 Collection Sump.* SRK Consulting Project: 1CM002.020. June, 2015. *Mill Valley Fill Extension Stage 2 Colleciton Sump Record of Construction*. Minto. April, 2016.	-
Minto Access Road	-	-
Minto East Underground	*Geotechnical Characterization of Existing and Proposed Longhole Open Stope Mining Areas,* Golder Associates, Reference No. 1528754-002-R-Rev0-3000, July, 2015. *Minto East – Revised Longhole Open Stope Stability.* Golder Associates, File: 1528754-009-TM-Rev0-6000, January, 2016. *Minto East Raise Geotechnical Investigation and Hydrogeological Testing Program Study*. Golder Associates, October, 2017. *Minto East Stability Assessment Update - Draft.* Golder Associates, September 2018.	*Minto Mine Ground Control Plan – Underground Operations.* Minto, 2020. *Minto Mine Underground Ground Control Audit.* Golder Associates, January 2018. *Inspection of Physical Stability of Underground Workings at Minto Mine*. Golder Associates, November 2020. *Minto UAV Drone Inspections.* Golder Associates, January 2021.
Copper Keel Underground	*Minto Phase VI Underground Geotech Evaluation*, SRK Consulting Project: 2UC031.005, February, 2012. *Geotechnical Characterization of Existing and Proposed Longhole Open Stope Mining Areas,* Golder Associates, Reference No. 1528754-002-R-Rev0-3000, July, 2015. *Minto Mine Underground Reserve Update Geotechnical Input*, Golder Associates, Reference No. 1528754-003-R-Rev0-3000, July, 2015. *Wildfire Proposed Underground Mine Area – Geotechnical Characterization and Long Hole Open Stope Stability Assessment.* Golder Associates, September, 2016.	*Minto Mine Ground Control Plan – Underground Operations.* Minto, 2020. *Copper Keel Preliminary Stability Assessment.* July 2020. *Inspection of Physical Stability of Underground Workings at Minto Mine*. Golder Associates, November 2020. *Minto UAV Drone Inspections.* Golder Associates, January 2021.
Minto North Pit	*Minto Phase VI Preliminary Feasibility Study Technical Report.* SRK, January 2012. *Review of Minto North Wall Stability.* SRK, May, 2016. *Site Visit and Review of North Pit – South Wall.* BGC Engineering, July, 2016. *Minto North South Wall Wedge Analysis.* SRK, August, 2016.	*Minto Open Pit Ground Control Plan_Rev0.* Minto, 2016.
Ore Stockpiles	-	-

Structure	Design Reports	Monitoring/Inspection Guidance Reports
Reclamation Overburden Dump (ROD)	*Geotechnical Design Proposed Reclamation Overburden Dump, Minto Mine, Yukon.* EBA File: W14101068.004. February 2008. *Reclamation Overburden Dump Expansion Geotechnical Design Report.* EBA File: W14101068.0040. June 29, 2010.	*Reclamation Overburden Dump Expansion Geotechnical Design Report.* EBA File: W14101068.0040. June 29, 2010. *Minto Mine Operations Adaptive Management Plan* Revision 2018-01. Minto, 2018.
Ridgetop Pit (Ridgetop North Pit, Ridgetop South Pit)	*Pre-Feasibility Geotechnical Evaluation Phase IV Minto Mine,* SRK Consulting Project: 2CM022.006, December, 2009. *Ridgetop North Pit TMF Stability Assessment,* SRK Consulting Project: 1CM002.003.710, February 2015.	-
Ridgetop Waste Dump	*Phase V/VI Ridgetop Waste Dump Physical Stability Assessment.* SRK Consulting Project: 1CM002.012.0.12, November 2013.	-
South Diversion Ditch (SDD)	*Phase 1 – Preliminary Engineering, Stormwater Diversion Ditches Minto Mine, YT,* EBA File: W14101068.013	-
South Wall Buttress	*Area 1 South Wall Buttress Design Report, Minto Mine, Yukon.* EBA File: W141010668.012, July 2011.	-
Southwest Waste Dump (SWD)	*Geotechnical Design Proposed Southwest Waste Dump, Minto Mine, Yukon.* EBA File: W14101068.005. September 2008.	*Geotechnical Design Proposed Southwest Waste Dump, Minto Mine, Yukon.* EBA File: W14101068.005. September 2008. *Minto Mine Operations Adaptive Management Plan* Revision 2018-01. Minto, 2018.
Tailings Diverion Ditch (TDD)	*Preliminary Design of the Tailings Diversion Ditch Upgrade,* SRK Consulting Project: 1CM002.012.006, November 2013. *Area 2 Stage 3 Pit Expansion – Intake Strucutre and Overflow Spillway – Final Design*, SRK Consulting Project: 1CM002.056, May 2017.	-
Water Storage Pond Dam (WSP)	*Geotechnical Design Tailings/Water Dam, Minto Project, Yukon.* EBA File: 0201-95-11509. December 1995. *As-built Construction Report, Water Retention Dam, Minto Mine, Minto, YT.* EBA File: 1200173.001. April 2008.	*Operation, Maintenance and Surveillance Manual, Water Retention Dam, Minto Mine, Minto, YT.* EBA File: W14103414-01. August 2014.

4 Roles and Responsbilities

Table 3 lists the roles and responsibilites for physical monitoring on the site.

Table 3: Roles and Responsibilities

Role	Responsibilities
Surveyors	• Collect instrumentation data at specified frequencies (Survey Hubs) • Input data into monitoring spreadsheets/databases • Internal reporting of monitoring data • Maintain equipment
Environmental Monitors/Officers	• Collect instrumentation data at specified frequencies (Inclinometers, Thermistors, Piezometers) • Input data into monitoring spreadsheets/databases • Internal reporting of monitoring data • Maintain equipment
Geotechnical Engineers	• QA/QC of data collection • Ensure compliance with license requirements • Compile monthly and annual Water Licence reports • Visual inspections at specified frequencies • Communicate with consultants as required
Chief Engineer	• Review monthly and annual Water Licence reports • Review and update Physical Monitoring Plan • Ensure compliance with license requirements

5 Inspections

Table 4 lists the regular, required inspections.

Table 4: Inspections

Structure	Frequency	Description
Area 2 Pit and Area 2 Pit Tailings Management Facility (A2PTMF)	Quarterly	Visual inspection and review of monitoring data as per OMS Manual. Two of the inspections by a professional engineer.
Area 2 Underground	N/A	No longer accessible.
Area 118 Pit	N/A	No longer accessible.
Area 118 Backfill Dump	Semi-Annually – May/June post thaw, and September pre freeze-up	Included in site-wide geotechnical inspection - Inspection and data review by Professional Engineer as per QZ14-031 (Clause 100) and QML-0001 (Clause 13.2). Q2 inspection must be completed by an independent engineer by June 30 each year.
Area 118 Underground	N/A	No longer accessible.
Big Creek Bridge	Annually	Visual inspection by a professional engineer as per MS15-094.
Camp	Semi-Annually – May/June post thaw, and September pre freeze-up	Included in site-wide geotechnical inspection - Inspection and data review by Professional Engineer as per QZ14-031 (Clause 100) and QML-0001 (Clause 13.2). Q2 inspection must be completed by an independent engineer by June 30 each year.
Dry Stack Tailings Storage Facility (DSTSF)	Quarterly	Visual inspection and review of monitoring data as per OMS Manual. Two of the inspections by a professional engineer.
Main Pit (Area 1 Pit) and Main Pit Tailings Management Facility (MPTMF)	Quarterly	Visual inspection and review of monitoring data as per OMS Manual. Two of the inspections by a professional engineer.
Main Pit Dump	Quarterly	Visual inspection and review of monitoring data. Two of the inspections by a professional engineer.
Main Waste Dump (MWD)	Semi-Annually – May/June post thaw, and September pre freeze-up	Included in site-wide geotechnical inspection - Inspection and data review by Professional Engineer as per QZ14-031 (Clause 100) and QML-0001 (Clause 13.2). Q2 inspection must be completed by an independent engineer by June 30 each year.
Main Waste Dump Expansion (MWDE)	Semi-Annually – May/June post thaw, and September pre freeze-up	Included in site-wide geotechnical inspection - Inspection and data review by Professional Engineer as per QZ14-031 (Clause 100) and QML-0001 (Clause 13.2). Q2 inspection must be completed by an independent engineer by June 30 each year.

Structure	Frequency	Description
Main Waste Dump Wrap (MWDW)	Semi-Annually – May/June post thaw, and September pre freeze-up	Included in site-wide geotechnical inspection - Inspection and data review by Professional Engineer as per QZ14-031 (Clause 100) and QML-0001 (Clause 13.2). Q2 inspection must be completed by an independent engineer by June 30 each year.
Mill Site	Semi-Annually – May/June post thaw, and September pre freeze-up	Included in site-wide geotechnical inspection - Inspection and data review by Professional Engineer as per QZ14-031 (Clause 100) and QML-0001 (Clause 13.2). Q2 inspection must be completed by an independent engineer by June 30 each year.
Mill Valley Fill Extension (MFVE)	NA	Covered by MVFE2.
Mill Valley Fill Extension 2 (MVFE2)	Quarterly	Visual inspection and review of monitoring data. Two of the inspections by a professional engineer.
Mill Valley Fill Extension 2 Collection Sump	Monthly	Visual inspection. Semi-annual inspections by a professional engineer.
Minto Access Road	Annually	Visual inspection by a professional engineer as per MS15-094.
Minto East Underground	Annually	Visual inspection by a professional engineer as per Underground Ground Control Plan.
Copper Keel	Annually	Visual inspection by a professional engineer as per Underground Ground Control Plan.
Minto North Pit	Semi-Annually – May/June post thaw, and September pre freeze-up	Included in site-wide geotechnical inspection - Inspection and data review by Professional Engineer as per QZ14-031 (Clause 100) and QML-0001 (Clause 13.2). Q2 inspection must be completed by an independent engineer by June 30 each year.
Ore Stockpiles	Semi-Annually – May/June post thaw, and September pre freeze-up	Included in site-wide geotechnical inspection - Inspection and data review by Professional Engineer as per QZ14-031 (Clause 100) and QML-0001 (Clause 13.2). Q2 inspection must be completed by an independent engineer by June 30 each year.
Reclamation Overburden Dump (ROD)	Semi-Annually – May/June post thaw, and September pre freeze-up	Included in site-wide geotechnical inspection - Inspection and data review by Professional Engineer as per QZ14-031 (Clause 100) and QML-0001 (Clause 13.2). Q2 inspection must be completed by an independent engineer by June 30 each year.
Ridgetop Waste Dump	Semi-Annually – May/June post thaw, and September pre freeze-up	Included in site-wide geotechnical inspection - Inspection and data review by Professional Engineer as per QZ14-031 (Clause 100) and QML-0001 (Clause 13.2). Q2 inspection must be completed by an independent engineer by June 30 each year.
South Wall Buttress (SWB)	NA	Covered by Main Pit Dump.

Structure	Frequency	Description
Southwest Waste Dump (SWD)	Semi-Annually – May/June post thaw, and September pre freeze-up	Included in site-wide geotechnical inspection - Inspection and data review by Professional Engineer as per QZ14-031 (Clause 100) and QML-0001 (Clause 13.2). Q2 inspection must be completed by an independent engineer by June 30 each year.
Tailings Diversion Ditch (TDD)	Semi-Annually – May/June post thaw, and September pre freeze-up	Included in site-wide geotechnical inspection - Inspection and data review by Professional Engineer as per QZ14-031 (Clause 100) and QML-0001 (Clause 13.2). Q2 inspection must be completed by an independent engineer by June 30 each year.
Water Storage Pond Dam (WSP)	Monthly	Visual inspection and review of monitoring data. Semi-annual inspections by a professional engineer.

6 Instrumentation

A map of site wide active instrumentation is shown in Appendix A. Installation information and data collection schedules are contained in the following sections. Instruments with a strikethrough shown have been destroyed or are no longer operational since the last revision of this report (2018-01).

Inclinometers

Inclinometers are used to measure lateral, differential ground movement in a borehole. Inclinometer stations consist of grouted, slotted PVC pipe into which the inclinometer probe is lowered and deflection is measured at 0.5m intervals. The current probe used on site is an RST digital MEMS inclinometer system.

Table 5: Inclinometers

Area	ID	Northing (m)	Easting (m)	Elevation (m)	A0 Azimuth	Hole Depth (m)	Date Installed	Reading Frequency
Area 2 Pit	A2I-1	6944164.73	385298.95	822.46	302	55.5	2013-04-26	Semi-annually
~~Dry Stack Tailings Storage Facility and Mill Valley Fill Extension 2~~	~~DSI-22~~	~~6945229~~	~~386043.4~~	~~723.471~~	~~034~~	~~14~~	~~2016-12-12~~	~~Quarterly~~
Dry Stack Tailings Storage Facility and Mill Valley Fill Extension 2	DSI-24	6944971	385951.4	774.416	005	108	2017-02-01	Monthly
Main Pit (Area 1 Pit) and Main Pit Tailings Management Facility (MPTMF)	MDI -2	6945013.08	384217.20	858.67	93	50.5	2010-02-10	Quarterly

Survey Hubs

Survey hubs are used to monitor surface movement of structures and are comprised of steel posts cemented into waste rock or bedrock and equipped with a threaded base to which a high precision RTK-corrected GPS instrument is attached. The GPS currently used on site is a Trimble R8.

Table 6: Survey Hubs

Area	ID	Northing (m)	Easting (m)	Elevation (m)	Date Installed	Frequency
Area 2 Pit	A210	6944268	384935	861	7/1/2011	Quarterly
Area 2 Pit	A215	6944649	385155	809	9/17/2015	Quarterly
Area 2 Pit	A216	6944749	385046	806	9/17/2015	Quarterly
Area 2 Pit	A217	6944757	384853	807	9/17/2015	Quarterly
Area 2 Pit	A218	6944707	384783	807	9/17/2015	Quarterly
~~Area 2 Pit~~	~~A219~~	~~6944082~~	~~385159~~	~~846~~	~~9/15/2017~~	~~Quarterly~~
Area 2 Pit	DS1	6944400	385310	810	1/2/2018	Weekly
Area 2 Pit	DS2	6944382	385319	810	1/2/2018	Weekly
Area 2 Pit	DS3	6944365	385320	811	1/2/2018	Weekly
Area 2 Pit	DS4	6944339	385323	811	1/2/2018	Weekly
Airport Road	ASH05	6944281	385831	850	3/7/2011	Annually
Airport Road	ASH06	6944332	385624	824	3/7/2011	Annually
Dry Stack Tailings Storage Facility	DSSH-06	6944971	385553	784	8/21/2016	Monthly
Dry Stack Tailings Storage Facility	DSSH-10	6944993	385806	769	8/21/2016	Quarterly
Dry Stack Tailings Storage Facility	DSSH-12	6944947	385707	778	8/16/2016	Monthly
Dry Stack Tailings Storage Facility	DSSH-14	6944920	385607	783	4/21/2012	Quarterly
Dry Stack Tailings Storage Facility	DSSH-15	6944944	385490	785	8/16/2016	Quarterly
Dry Stack Tailings Storage Facility	DSSH-18	6945071	385513	782	8/16/2016	Quarterly
Dry Stack Tailings Storage Facility	DSSH-19	6945110	385575	781	8/16/2016	Quarterly
Dry Stack Tailings Storage Facility	DSSH-20	6945072	385754	776	8/21/2016	Quarterly
Dry Stack Tailings Storage Facility	DSSH-24	6944758	385712	792	2/28/2014	Quarterly
Dry Stack Tailings Storage Facility	DSSH-26	6944601	385491	796	7/28/2015	Quarterly
Dry Stack Tailings Storage Facility	DSSH-27	6944757	385884	792	6/25/2017	Quarterly
Dry Stack Tailings Storage Facility	DSSH-28	6945045	385930	768	6/25/2017	Monthly
Dry Stack Tailings Storage Facility	DSSH-29	6945162	385834	766	8/21/2016	Quarterly
Dry Stack Tailings Storage Facility	DSSH-31	6945031	386041	776	11/1/2016	Quarterly

Area	ID	Northing (m)	Easting (m)	Elevation (m)	Date Installed	Frequency
Dry Stack Tailings Storage Facility	DSSH-32	6944985	385896	773	9/10/2017	Quarterly
Dry Stack Tailings Storage Facility	MV1	6945250	386021	728	4/4/2016	Quarterly
Dry Stack Tailings Storage Facility	MV2	6945217	385979	740	4/4/2016	Quarterly
Main Pit	M79	6944847	384209	848	9/4/2011	Quarterly
Main Pit	M80	6944932	384256	842	9/4/2011	Quarterly
Main Pit	M82	6944891	384526	807	4/5/2017	Monthly
Main Pit	M83	6944948	384476	809	1/8/2015	Monthly
Main Pit	M84	6945021	384445	807	1/8/2015	Quarterly
Main Pit	M88	6944873	384377	838	9/4/2017	Monthly
~~Main Pit~~	~~M89~~	~~6944688~~	~~384284~~	~~843~~	~~9/4/2017~~	~~Quarterly~~
Main Pit	M92	6944785	384707	801	9/14/2017	Quarterly
Main Pit	M93	6944779	384621	801	9/14/2017	Quarterly
Main Pit	M94	6944827	384583	801	9/14/2017	Quarterly
Main Pit	M95	6944727	384535	833	5/7/2018	Monthly
Main Pit	M96	6944505	384520	866	5/14/2018	Quarterly
Main Pit	M97	6944782	384380	859	5/14/2018	Monthly
Main Pit	M98	6944887	384510	808	5/14/2018	Monthly
Main Waste Dump Wrap	MWDH01	6944932	383931	872	8/13/2018	Quarterly
Main Waste Dump Wrap	MWDH02	6944957	384113	861	8/13/2018	Quarterly
Main Waste Dump Wrap	MWDH03	6945127	384204	878	8/13/2018	Quarterly
Main Waste Dump Wrap	MWDH04	6945146	384183	881	8/13/2018	Quarterly
~~Main Waste Dump Wrap~~	~~MWDH05~~	~~6945044~~	~~384037~~	~~901~~	~~8/13/2018~~	~~Quarterly~~
~~Main Waste Dump Wrap~~	~~MWDH06~~	~~6945024~~	~~383937~~	~~904~~	~~8/13/2018~~	~~Quarterly~~
Southwest Waste Dump	SWD01	6944761	384078	859	3/7/2011	Quarterly
Southwest Waste Dump	SWD06	6944762	384189	836	7/27/2015	Quarterly
Southwest Waste Dump	SWD07	6944743	384112	840	11/21/2016	Quarterly
Southwest Waste Dump	SWD08	6944560	383883	867	11/21/2016	Quarterly
Southwest Waste Dump	SWD09	6944163	383791	862	11/21/2016	Monthly
Southwest Waste Dump	SWD10	6943943	383838	868	7/10/2017	Monthly
Southwest Waste Dump	SWD11	6944512	383916	850	7/10/2017	Monthly

Area	ID	Northing (m)	Easting (m)	Elevation (m)	Date Installed	Frequency
Southwest Waste Dump	SWD12	6944335	383818	864	9/28/2018	Monthly
Water Storage Pond Dam	WSP1	6945613	386481	723	6/9/2011	Monthly
Water Storage Pond Dam	WSP3	6945552	386549	720	6/9/2011	Monthly
Water Storage Pond Dam	WSP4	6945532	386555	720	6/9/2011	Monthly
Water Storage Pond Dam	WSP5	6945505	386560	721	6/9/2011	Monthly

Thermistors

Thermistor strings are used to measure ground temperature profiles in boreholes, and in particular permafrost conditions at Minto. Thermistor strings consist of multiple temperature sensor nodes distributed along a single multi-conductor cable, installed within or attached to the outside of grouted PVC pipe. EBA and RST thermistor strings have been installed on site. EBA thermistors are read using a basic ohmmeter and RST thermistors are read using a RST TH2016B readout unit.

Table 7: Thermistors

Area	ID	Northing (m)	Easting (m)	Elevation (m)	Thermistor String No.	Nodes	Hole Depth (m)	Date Installed	Reading Frequency
Area 2 Pit	A2T-1	6944162	385306	822.39	3491	16	63.4	2013-04-21	Quarterly
Dry Stack Tailings Storage Facility	DST-10	6944584	385489	797.13	3492	16	63.4	2013-04-17	Quarterly
Dry Stack Tailings Storage Facility	DST-11	6944900	385539	787.66	3494	16	86.9	2013-04-05	Quarterly
Dry Stack Tailings Storage Facility	DST-13	6945015	386271	777.01	3495	16	101.5	2013-04-02	Quarterly
Dry Stack Tailings Storage Facility	DST-14	6944769	385713	791.47	3497	16	66.5	2013-04-12	Quarterly
Dry Stack Tailings Storage Facility	DST-15	6945034	385958	764.51	3493	16	64.0	2013-03-25	Quarterly
Water Storage Pond	WDT-1	6945523	386551	720.03	2072	16	42.49	2007-11-16	Monthly
Water Storage Pond	WDT-2	6945533	386575	713.66	2073	6	44.50	2007-11-07	Monthly
Water Storage Pond	WDT-3	6945544	386544	719.78	2074	16	49.42	2007-11-11	Monthly
Water Storage Pond	WDT-4	6945535	386548	719.85	2075	16	49.42	2007-11-10	Monthly
Water Storage Pond	WDT-5	6945505	386558	721.03	2076	16	35.13	2007-11-13	Monthly
Water Storage Pond	WDT-6	6945506	386556	721.03	2077	16	33.72	2007-11-13	Monthly
Water Storage Pond	WDT-7	6945505	386556	721.08	2078	16	33.92	2007-11-13	Monthly

Water Storage Pond	WDT-8	6945533	386575	713.66	2079	16	34.14	2007-11-07	Monthly
Southwest Waste Dump	SDT-1	6944767	384779	836.36	2220	16	59.1	2010-02-04	Quarterly
Southwest Waste Dump	SDT-2	6944595	383971	847.11	2221	16	14.6	2010-01-31	Quarterly
Southwest Waste Dump	SDT-3	6944334	383825	860.17	2222	16	15.8	2010-01-28	Quarterly
~~Southwest Waste Dump~~	~~SDT-4~~	~~6944164~~	~~383784~~	~~860.99~~	~~2223~~	~~16~~	~~13.1~~	~~2010-01-30~~	~~Quarterly~~

Vibrating Wire Piezometers

Vibrating wire piezometer strings are used to measure piezometric pressure profiles in boreholes. They consist of multiple vibrating wire sensors installed on PVC pipe in grouted boreholes. RST vibrating wire piezometers are installed on site and data is collected with an RST VW2106 readout unit.

Table 8: Vibrating Wire Piezometers

Area	ID	Northing (m)	Easting (m)	Elevation (m)	Sensor	No.	Sensor Elevation (m)	Date Installed	Reading Frequency
Dry Stack Tailings Storage Facility	DSP-5	6944769	385713	791.47	DSP-5A	VW24851	765.47	2013-04-16	Quarterly
					DSP-5B	VW24853	761.47		
Dry Stack Tailings Storage Facility	DSP-6	6944900	385539	787.66	DSP-6A	VW24850	769.56	2013-04-05	Quarterly
					DSP-6B	VW24852	765.56		
Dry Stack Tailings Storage Facility	DSP-7	6944990	385390	780.404	DSP-7-1	VW34657	771.404	2015-12-09	Quarterly
					DSP-7-2	VW34658	763.404	2015-12-09	Quarterly
					DSP-7-3	VW34659	756.404	2015-12-09	Quarterly
					DSP-7-4	VW34660	753.404	2015-12-09	Quarterly
					DSP-7-5	VW34661	751.404	2015-12-09	Quarterly
					DSP-7-6	VW34662	747.404	2015-12-09	Quarterly
~~Dry Stack Tailings Storage Facility~~	~~DSP-8~~	~~6945058~~	~~385872~~	~~755.548~~	~~DSP-8-1~~	~~VW34663~~	~~750.548~~	~~2015-12-10~~	~~Quarterly~~
					~~DSP-8-2~~	~~VW34664~~	~~745.548~~	~~2015-12-10~~	~~Quarterly~~
					~~DSP-8-3~~	~~VW34665~~	~~740.548~~	~~2015-12-10~~	~~Quarterly~~
					~~DSP-8-4~~	~~VW34666~~	~~735.458~~	~~2015-12-10~~	~~Quarterly~~
					~~DSP-8-5~~	~~VW34667~~	~~730.458~~	~~2015-12-10~~	~~Quarterly~~
					~~DSP-8-6~~	~~VW34668~~	~~720.458~~	~~2015-12-10~~	~~Quarterly~~

~~Dry Stack Tailings Storage Facility~~	~~DSP-10~~	~~6945223~~	~~385944~~	~~724.509~~	~~DSP-10~~	~~VW34617~~	~~717.209~~	~~2015-11-27~~	~~Quarterly~~
Southwest Waste Dump	SDP-2	6944595.06	383971.30	843.41	SDP-2A	VW12912	843.414	2010-01-31	Quarterly
					SDP-2B	VW12911	842.714		
Southwest Waste Dump	SDP-3	6944333.87	383824.67	854.27	SDP-3A	VW12906	854.266	2010-01-28	Quarterly
					SDP-3B	VW12907	853.566		
~~Southwest Waste Dump~~	~~SDP-4~~	~~6944163.62~~	~~383783.54~~	~~858.49~~	SDP-4A	VW12908	858.494	~~2010-01-30~~	~~Quarterly~~
					SDP-4B	VW12909	857.794		
Water Storage Pond	WDP-2	6945632	386545	701.67	WDP-2	VW7212	701.67	2007-11-04	Monthly
Water Storage Pond	WDP-3A	6945618	386498	712.62	WDP-3A	VW7557	712.62	2007-11-28	Monthly
Water Storage Pond	WDP-3	6945609	386500	712.60	WDP-3	VW7202	712.60	2007-11-12	Monthly
Water Storage Pond	WDP-4	6945609	386500	702.60	WD -4	VW7210	702.60	2007-11-14	Monthly
Water Storage Pond	WDP-5	6945605	386526	712.35	WDP-5	VW7204	712.35	2007-11-20	Monthly
Water Storage Pond	WDP-6	6945605	386526	701.50	WDP-6	VW7214	701.50	2007-11-20	Monthly
Water Storage Pond	WDP-7	6945605	386526	689.20	WDP-7	VW7208	689.20	2007-11-20	Monthly
Water Storage Pond	WDP-8	6945554	386542	693.10	WDP-8	VW7200	693.10	2007-11-18	Monthly
Water Storage Pond	WDP-9	6945554	386542	687.93	WDP-9	VW7206	687.93	2007-11-18	Monthly
Water Storage Pond	WDP-10	6945554	386542	676.17	WDP-10	VW7211	676.17	2007-11-18	Monthly
Water Storage Pond	WDP-11	6945523	386551	712.96	WDP-11	VW7201	712.96	2007-11-16	Monthly
Water Storage Pond	WDP-12	6945523	386551	694.64	WDP-12	VW7209	694.64	2007-11-16	Monthly
Water Storage Pond	WDP-13	6945533	386578	684.55	WDP-13	VW7205	684.55	2007-11-07	Monthly

7 Instrumentation Procedures and Documentation

Data collection manuals for all monitoring devices are included in Appendix B.

After collection, data is input into a series of spreadsheets and databases used for storing, tracking and interpreting instrumentation data. Instructions for data input are contained in the instrumentation manuals in Appendix B.

8 Quality Assurance/Quality Control

Planned job observations (PJO's) are routinely performed and documented on Environmental Monitors to verify data collection is consistent with the designed procedures.

Data collection equipment is returned to the manufacturers as per their recommended calibration schedules.

All data is reviewed and summarized by a Geotechnical Engineer monthly as part of the Water Licence reporting.

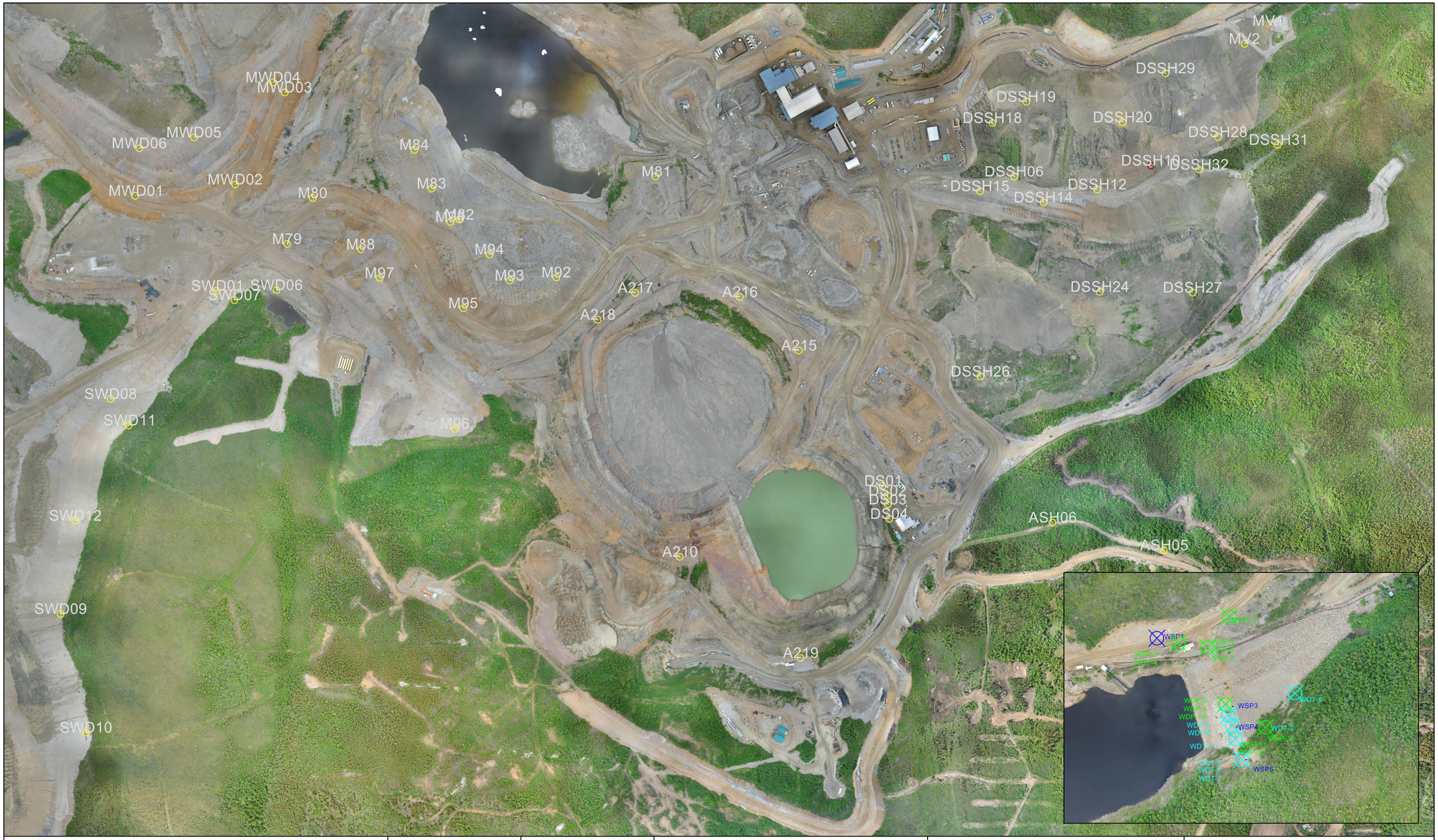
9 Reporting

Regular processing and review of monitoring data is completed and presented in the following documents.

Table 9: Reporting

Report	Frequency	Submission
Minto Mine Type A Water Licence QZ14-031 Monthly Report (Clause 4.4)	Monthly	Submitted to Yukon Water Board maximum 30 days following each month
DSTSF Inspection Reports	Quarterly	Filed internally within one week of the inspection
Water Storage Pond Dam Inspection Reports	Monthly	Filed internally within one week of the inspection
Area 2 and Main Pit Tailings Storage Facility Inspection Reports	Quarterly	Filed internally within one month of the inspection
Semi-Annual Site-wide Geotechnical Inspection Report	After spring melt (May/June) and before freeze-up (September)	Submitted to Yukon Water Board within 60 days of inspection.
Minto Mine Type A Water Licence QZ14-031 Annual Report (Clause 4.5)	Annually	Submitted to Yukon Water Board by March 31 each year
Minto Mine Type B Water Licence MS15-094 Annual Inspection Report (Clause 34)	Annually	Submitted to Yukon Water Board with the Annual Report

Appendix A: Instrumentation Map



Montitoring Stations

C:\ Users\ robp\ Desktop\ Monitoring Hubs.duf

DRAWN BY: R Pharand	Operations Superintendent:	COMMENTS:	
SCALE: <<Scale[][00]>>			
DATE: 13 Feb 2021	CHECKED BY:	Date:	

MINTO

Appendix B: Data Collection and Input Manuals

Inclinometer Measurements

Please refer to RST MEMS Digital Inclinometer System Instruction Manual for complete instruction.

System Overview:



Figure 1 – System Overview

1. Soft Shell Case
2. Digital Inclinometer Probe (w/ protective end cap)
3. Reel Battery Charger
4. 70mm/2.75" OD Cable Grip
5. 85mm/3.34" OD Cable Grip
6. Ultra-Rugged Field PC
7. 12V DC car adapter for Reel Battery Charger or Ultra-Rugged Field PC
8. Spare Reel Battery
9. Silicone Lubricant (for use on connectors)
10. USB Cable for Ultra-Rugged Field PC
11. AC Adapter (110-240V) for Reel Battery Charger
12. AC Adapter (110-240V) for Ultra-Rugged Field PC
13. Cable Reel with Wireless Communication System and protective end cap
14. Reel Carrying Case

1. Make sure the battery for the reel and the Field PC are charged.
2. Lift up protective box with two hands and put it on side as a work bench.



3. Remove cap from inclinometer casing and look for A_0 marking (black mark).





4. Remove excess water inside the probe and the cable connector.
   Probe is very sensitive and susceptible to vibration. **DO NOT BANG THE PROBE**. Use a paper towel to wipe it.

5. Apply silicon lubricant to probe and cable connector when needed.



6. Connect the inclinometer cable to the probe by aligning the keyways and threading the connector onto the probe. Turn the threaded ring, but not the cable.



7. Turn on the power of the reel. A green light indicates that the power is on. This energizes the accelerometers and makes them less susceptible to shock.



8. Check the depth of the hole. Turn on Field PC and select the hole you are going to measure.



9. Always start with **UPPER** Wheel in the A_0 direction.



10. Lower the probe gently and carefully. When it gets close to the bottom lower it very gently to avoid bouncing the probe off the bottom of the hole. The cable has aluminum sleeve marks which are spaced at 0.5m and it has a red measure mark with label every 5m.



11. Lower the probe gently to ensure the bottom of the hole is encountered. (Slightly passed the designated depth). Double check your correct depth by pulling out reel to the next 5m mark and counting back each 0.5m for each increment.

12. Place the cable grip on top of the casing and hang the cable by the aluminum crimps.



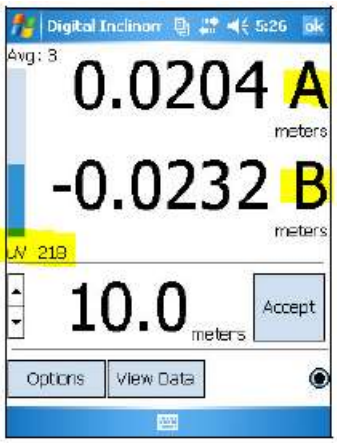
13. Connect the Field PC to the reel. Use the pen attached to the field PC and press "*Connections".*



14. Once connected, hit "*Readings*".




15. At each depth allow the A and B readings as well as the noise level become stabilized before you accept the readings. Ideally noise level should be at or below 30 μV.

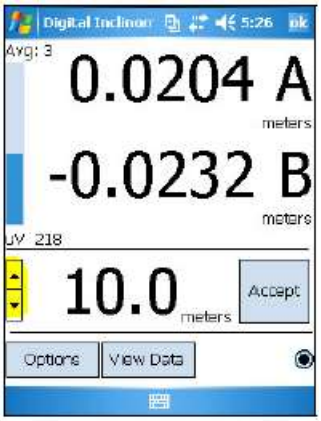


16. Wear gloves as the Envirobind inside the inclinometer casing can be sticky and irritable. Pull up gently to the next marker and let the aluminum crimp to sit on the metal grip. Wait for the readings and noise level to stabilize and then hit *"Accept"*.




17. If you accidentally pull the probe too far (more than an inch), lower the probe back down to the previous bead then pull up to the bead you want to measure. This will ensure that the readings remain consistent.

18. At each 5m mark, check that you are at the right location. If you miss or overpass a reading, go back to the previous 5m depth. For examples, if something goes wrong at 41.5m, go back to 45m and drop the cable to 45.5m. Then gently pull up to 45m and hit *"Accept"* again. There are arrow keys on the Field PC which allow you to adjust your depth.



19. Once the last reading (0.5m) is taken, gently take out the probe and turn it 180° so that the **Lower** wheel is now in the A_0 direction.



20. Go back gently to the bottom of hole and take the second set of readings.

21. During the measurement of the second set of readings, checksum data will appear in a smaller font below the current readings. Checksum should be reasonably small and consistent. Ideally it should be somewhere between -0.0035m to +0.0045m.

22. If the checksum is large (> 0.01m) and inconsistent, check the following:
    - Is the probe at the right depth?
    - Is the probe in the correct direction?
    - Lower the probe to the previous depth and retake the reading again.

    It is possible that checksum is high due to differential pressure in the ground. In that case continue measurement and keep monitoring checksum.

23. Once readings are completed, take out the probe and wipe away the Envirobind gently. Put the caps back onto the probe and connector.



Data Input

Note: Windows Mobile Device Center must be installed on the computer in order to collect the readout unit to the computer.



1. Connect the USB cable from the readout unit to the computer and turn the power on.
2. Open DMM for Windows



3. *File – Open – Project Database*
   The database for all inclinometer data is stored here:
   X:\Mine Technical\03 - Monitoring\! Inclinometers\Master Database

4. *File – Import – Import RPP file*
   Navigate to the mobile device and select the .rpp file for the appropriate monitoring station and date. The data will then import and save in the database automatically.

Thermistor Readings

Two different types of thermistors are currently installed on site – RST and EBA thermistors.

To read RST thermistors:

1. Connect adapter cord to the TH2016B Readout Box.
2. Record the resistivity (Ohms) for each thermistor node on paper or store the data in the readout box with the following steps:
    a. Scroll with the Up/Down arrows to the ***Memory*** screen and press enter (arrow key)



    b. Scroll with the Up/Down arrows to the ***Store Data*** screen and press enter



    c. Scroll with the Up/Down arrows to the station being monitored and press enter to store the reading



    d. The data is now stored and the readbox can be turned off by pressing the escape button (ESC) three times to get back to the main menu and scrolling to Power Off.



To read EBA thermistors:

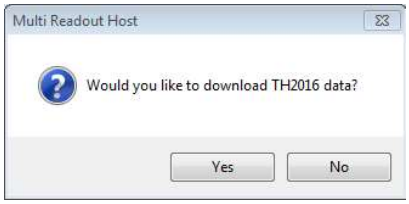
1. Connect the EBA 16 Point Ground Temperature Dial into the thermistor cable.
2. Connect the multi-meter to the EBA 16 Point Ground Temperature Dial.
3. Record on paper the resistance in Ohm's (Ω) for each point.

Data Downloading

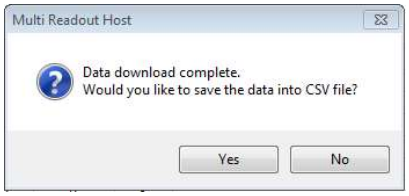
1. Connect USB cord from computer to the readout box.
2. Open the software Multi Readout Host.



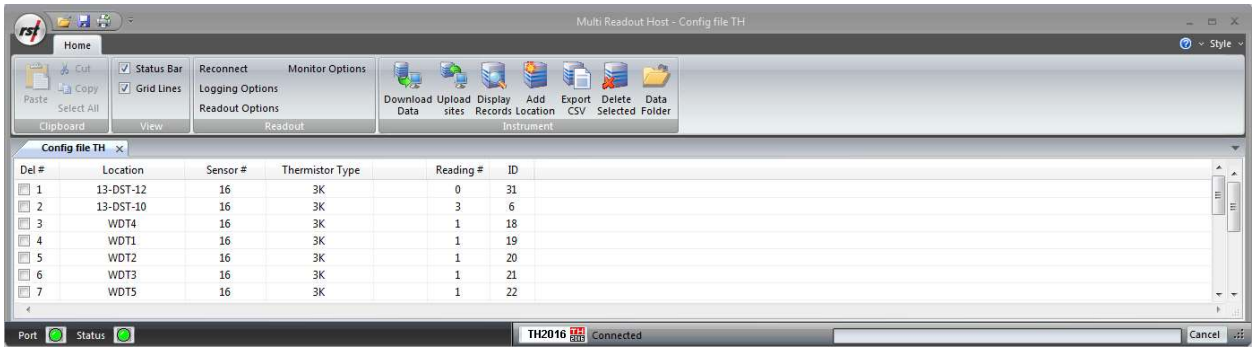
3. Turn on the power on the readout box.
4. The software will recognize the readout unit and prompt to download data. Choose “Yes” to download the data from the readout unit.



5. Once data is downloaded you will have the option to save all data as .csv file. Choose “Yes” and the data will be stored in My Documents in a folder named “TH2016data”.



6. The software can be used to setup new locations or view data but no further steps are required.

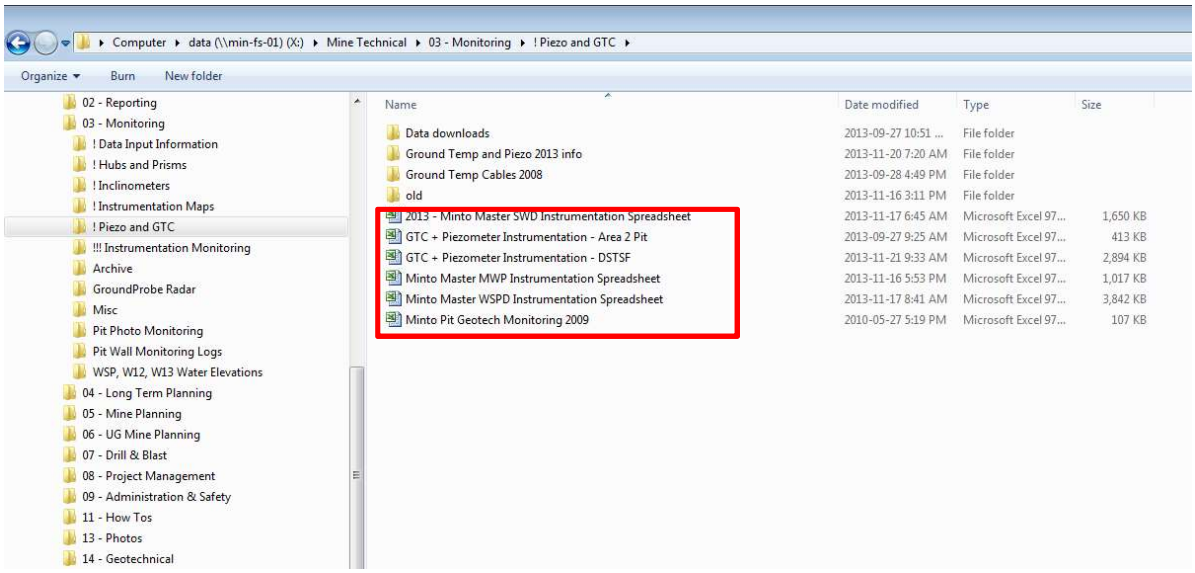


Data Input

Spreadsheets for piezometer data input and tracking are stored here:

X:\Mine Technical\03 - Monitoring\! Piezo and GTC

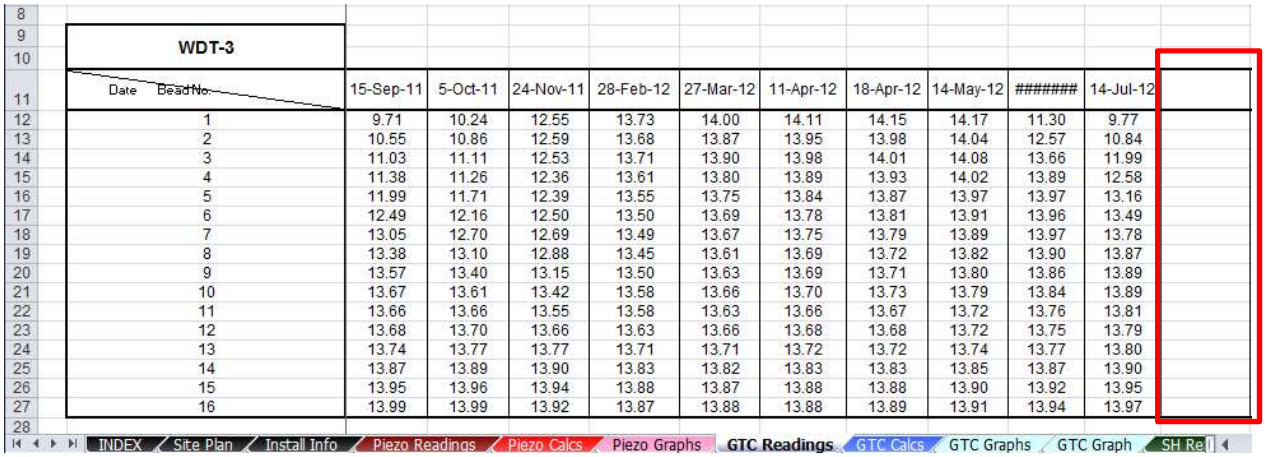
1. Open the spreadsheet for the area monitored



2. Open the tab “GTC Readings”



3. In a new column enter the date and copy the resistivity data (Ohms) from the paper records, or from the .csv file saved in either “TH2016data” or “VW2016data” saved in My Documents.



WDT-3											
Date / Bead No.	15-Sep-11	5-Oct-11	24-Nov-11	28-Feb-12	27-Mar-12	11-Apr-12	18-Apr-12	14-May-12	########	14-Jul-12	
1	9.71	10.24	12.55	13.73	14.00	14.11	14.15	14.17	11.30	9.77	
2	10.55	10.86	12.59	13.68	13.87	13.95	13.98	14.04	12.57	10.84	
3	11.03	11.11	12.53	13.71	13.90	13.98	14.01	14.08	13.66	11.99	
4	11.38	11.26	12.36	13.61	13.80	13.89	13.93	14.02	13.89	12.58	
5	11.99	11.71	12.39	13.55	13.75	13.84	13.87	13.97	13.97	13.16	
6	12.49	12.16	12.50	13.50	13.69	13.78	13.81	13.91	13.96	13.49	
7	13.05	12.70	12.69	13.49	13.67	13.75	13.79	13.89	13.97	13.78	
8	13.38	13.10	12.88	13.45	13.61	13.69	13.72	13.82	13.90	13.87	
9	13.57	13.40	13.15	13.50	13.63	13.69	13.71	13.80	13.86	13.89	
10	13.67	13.61	13.42	13.58	13.66	13.70	13.73	13.79	13.84	13.89	
11	13.66	13.66	13.55	13.58	13.63	13.66	13.67	13.72	13.76	13.81	
12	13.68	13.70	13.66	13.63	13.66	13.68	13.68	13.72	13.75	13.79	
13	13.74	13.77	13.77	13.71	13.71	13.72	13.72	13.74	13.77	13.80	
14	13.87	13.89	13.90	13.83	13.82	13.83	13.83	13.85	13.87	13.90	
15	13.95	13.96	13.94	13.88	13.87	13.88	13.88	13.90	13.92	13.95	
16	13.99	13.99	13.92	13.87	13.88	13.88	13.89	13.91	13.94	13.97	

INDEX | Site Plan | Install Info | Piezo Readings | Piezo Calcs | Piezo Graphs | GTC Readings | GTC Calcs | GTC Graphs | GTC Graph | SH Re

Vibrating Wire Piezometer Readings

1. Connect adapter cord to the VW2106 Readout Box.
2. Connect the coloured wires to the correct wire clips on the extension cable. Make sure the wires do not touch each other.
3. Record the **DATE** and **TIME** as barometric pressure will be needed to calibrate the water level.
4. Record the measurement (between 7000B to 9000B) and the temperature (°C) for each piezometer. The piezometer ID should be labeled on the wire (eg. P5a and P5b).



5. Alternatively the data can be stored in the readout box:

    a. Scroll with the Up/Down arrows to the ***Memory*** screen and press enter (arrow key)



    b. Scroll with the Up/Down arrows to the ***Store Data*** screen and press enter



c. Scroll with the Up/Down arrows to the station being monitored and press enter to store the reading



d. The data is now stored and the readout box can be turned off by pressing the escape button (ESC) three times to get back to the main menu and scrolling to Power Off.

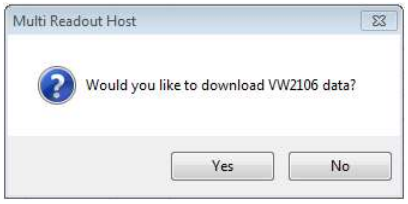


Data Downloading

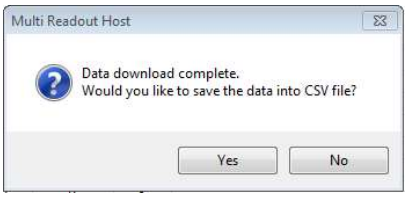
7. Connect USB cord from computer to the readout box.
8. Open the software Multi Readout Host.



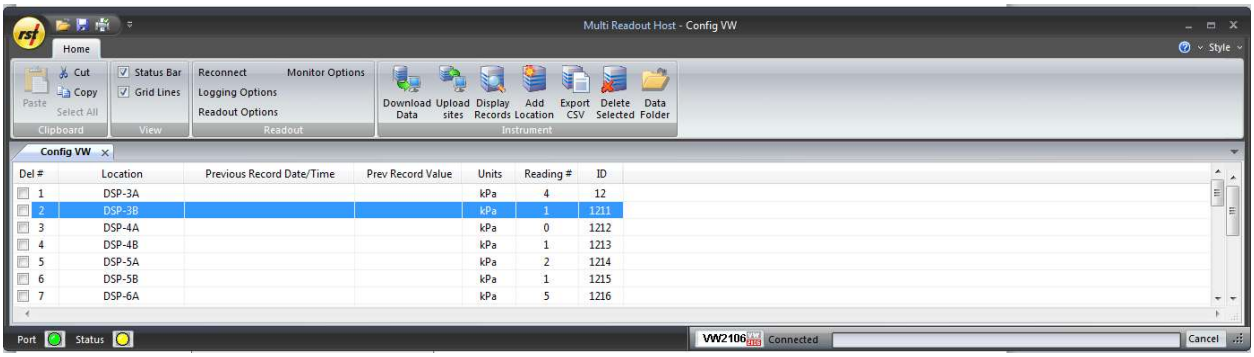
9. Turn on the power on the readout box.
10. The software will recognize the readout unit and prompt to download data. Choose “Yes” to download the data from the readout unit.



11. Once data is downloaded you will have the option to save all data as .csv file. Choose “Yes” and the data will be stored in My Documents in a folder named “VW2016data”.



12. The software can be used to setup new locations or view data but no further steps are required.

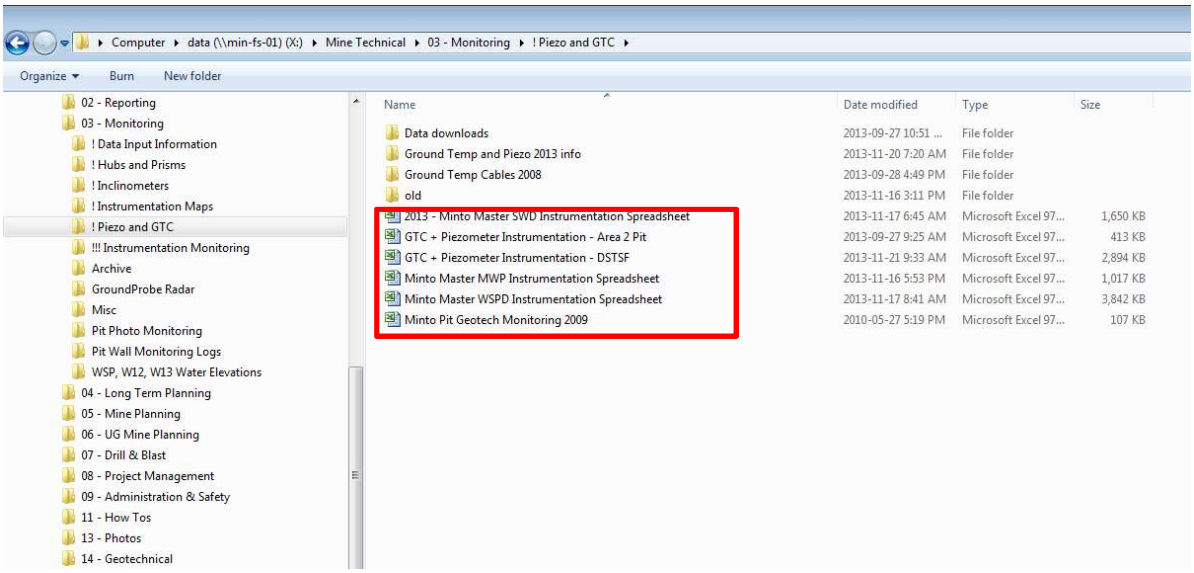


Data Input

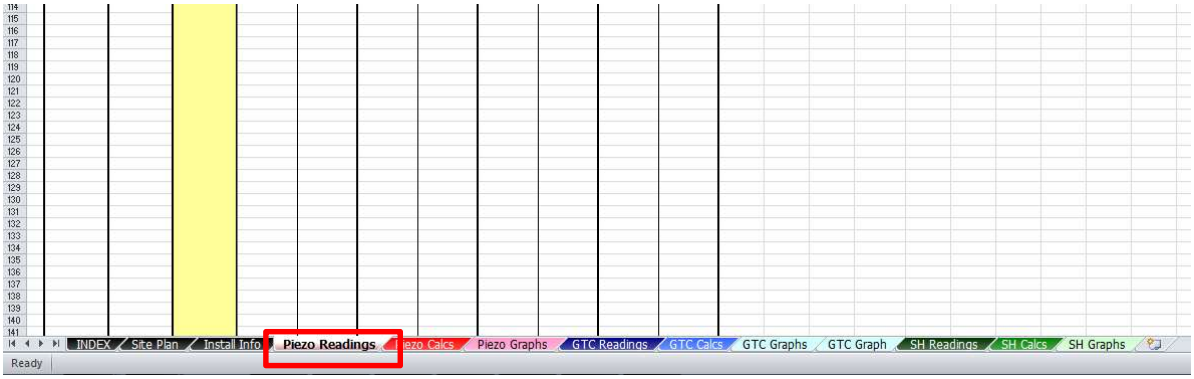
Spreadsheets for piezometer data input and tracking are stored here:

X:\Mine Technical\03 - Monitoring\! Piezo and GTC

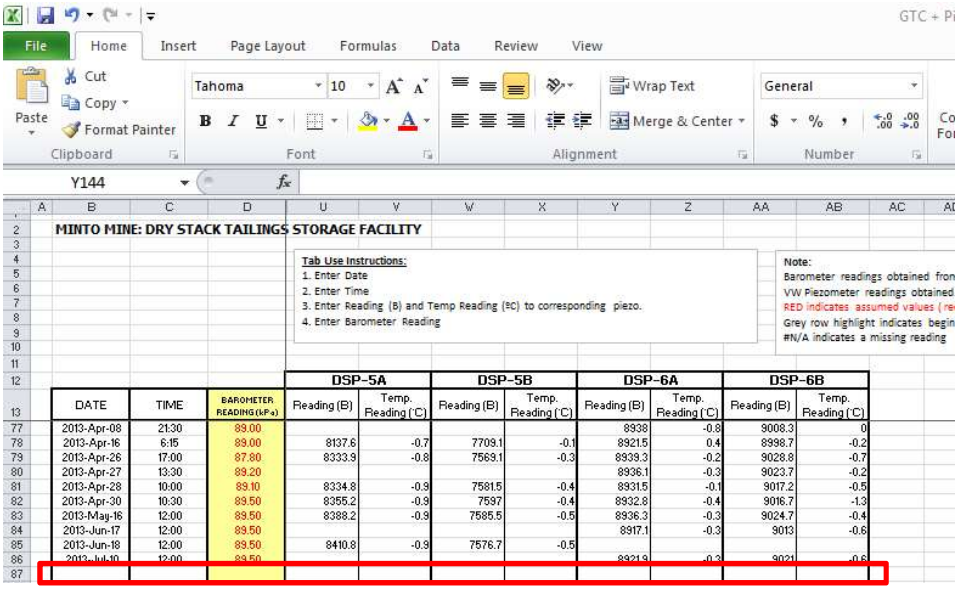
4. Open the spreadsheet for the area monitored



5. Open the tab “Piezo Readings”



6. In a new row, input the date, time, barometric pressure, B-unit and temperature readings for each instrument.



MINTO MINE: DRY STACK TAILINGS STORAGE FACILITY

Tab Use Instructions:
1. Enter Date
2. Enter Time
3. Enter Reading (B) and Temp Reading (ºC) to corresponding piezo.
4. Enter Barometer Reading

Note:
Barometer readings obtained from
VW Piezometer readings obtained
RED indicates assumed values (re
Grey row highlight indicates begin
#N/A indicates a missing reading

	DSP-5A		DSP-5B		DSP-6A		DSP-6B	
DATE	TIME	BAROMETER READING (kPa)	Reading (B)	Temp. Reading (˚C)	Reading (B)	Temp. Reading (˚C)	Reading (B)	Temp. Reading (˚C)	Reading (B)	Temp. Reading (˚C)
2013-Apr-08	21:30	89.00					8938	-0.8	9008.3	0
2013-Apr-16	6:15	89.00	8137.6	-0.7	7709.1	-0.1	8921.5	0.4	8998.7	-0.2
2013-Apr-26	17:00	87.80	8333.9	-0.8	7569.1	-0.3	8939.3	-0.2	9028.8	-0.7
2013-Apr-27	13:30	89.20					8936.1	-0.3	9023.7	-0.2
2013-Apr-28	10:00	89.10	8334.8	-0.9	7581.5	-0.4	8931.5	-0.1	9017.2	-0.5
2013-Apr-30	10:30	89.50	8355.2	-0.9	7597	-0.4	8932.8	-0.4	9016.7	-1.3
2013-May-16	12:00	89.50	8388.2	-0.9	7585.5	-0.5	8936.3	-0.3	9024.7	-0.4
2013-Jun-17	12:00	89.50					8917.1	-0.3	9013	-0.6
2013-Jun-18	12:00	89.50	8410.8	-0.9	7576.7	-0.5				
2013-Jul-10	12:00	89.50					8921.9	-0.3	9021	-0.6

Barometric pressure can be obtained from the site's weather monitoring stations. Data is stored here:

X:\Environmental\Environmental Monitoring Program\1_MASTER LOGS\Meteorology Station Data\Met Station 1 and 2 Data Summary.xlsx

Appendix I – Minto Annual Groundwater Review 2020

FINAL

Minto Mine –2020 Groundwater Review and Summary of OAMP SPT Exceedances

Prepared for

Minto Explorations Ltd.



Prepared by

SRK Consulting (Canada) Inc.
1CM002.055
March 2021

Minto Mine –2020 Groundwater Review and Summary of OAMP SPT Exceedances

March 2021

Prepared for

Minto Explorations Ltd.
PO Box 11, Whitehorse Central PO
Whitehorse, Yukon Y1A 5X9
Canada

Tel: +1 604 759 0860
Web: www.pembridgeresources.com

Prepared by

SRK Consulting (Canada) Inc.
2200–1066 West Hastings Street
Vancouver, BC V6E 3X2
Canada

Tel: +1 604 681 4196
Web: www.srk.com

Project No: 1CM002.055

File Name: Minto_Annual_GW_Review_2020_1CM002.055_20210330_FNL_lv.docx

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Executive Summary

SRK Consulting (SRK) was retained by Minto Explorations Ltd (Minto Explorations) to provide quarterly and annual reporting on groundwater chemistry monitoring in accordance with specific performance threshold (SPT) exceedances as outlined in the Minto Mine Operational Adaptive Management Plan (OAMP; Minto, 2017) and to review overall groundwater quality at the Minto Mine. The purpose of this report is to summarize the 2020 groundwater quality, to expand on findings of the quarterly reporting, and to provide context for the associated risks.

The groundwater monitoring network at Minto includes 10 active multi-level monitoring wells installed between 2009 and 2017 that are used for on-going water quality monitoring. Groundwater is sampled in accordance with the Minto Mine Groundwater Monitoring Plan and a review of the results is carried out as part of the OAMP. There are three SPT levels for groundwater quality defined in the OAMP for the Minto Creek Catchment, and two for the McGinty Creek Catchment. Of the 10 active monitoring wells, only three are compared to the SPT in the AMP: MW12-05 and MW12-06 (Minto Creek Catchment), and MW09-03 (McGinty Creek Catchment).

Groundwater exceedances of the OAMP SPTs in 2020 were limited to a few parameters and consistent SPT exceedance is not widespread; most monitoring zones (~69%) did not exceed more than one OAMP SPT in 2020. A summary of exceedances and relevant discussion points for each catchment is provided below.

Minto Creek Catchment

- Ongoing exceedances include sulphate in MW12-05 and chromium in MW12-06.
- Elevated sulphate concentrations at MW12-05 have been restricted to monitoring zones greater than 85 mbgs. The source of elevated sulphate in the deep groundwater has been investigated in the past and findings do not suggest it is a result of mining activities. As the sulphate concentrations are interpreted to reflect natural conditions, are restricted to the deepest zones, and no effects have been observed in Minto Creek, mitigation actions are not considered necessary at this time.
- Elevated chromium concentrations at MW12-06 have been restricted to only the deepest zone at 142 mbgs and occur simultaneously with lower, sub-SPT, concentration increases in additional trace elements. Changes in chemistry are concurrent with stoppage of the Minto South Underground, and while contact water is not suspected to be the source of chromium, equilibrium conditions in the deep groundwater may be affected by mine activities, resulting in the observed changes in chemistry. As chromium is restricted to the deepest zone, and no effects have been observed in Minto Creek, mitigation actions are not considered necessary at this time.
- Concentrations in Minto Creek have remained in the range of observed baseline conditions with no observed changes that reflect an influence from mine-affected groundwater.

McGinty Creek Catchment

- Ongoing exceedances in the McGinty Creek catchment include arsenic in MW09-03-01 and cadmium, nitrate and zinc in MW09-03-02.
- Minto North Pit acts as a hydraulic sink and migration of pit water towards MW09-03 is not considered to be the cause of elevated concentrations in the groundwater.
- Increases in nitrate concentrations appear to be caused by a shift in redox conditions following mining of the Minto North Pit. The shift in redox conditions may also be indirectly responsible for changes observed in arsenic, cadmium and zinc, as equilibrium conditions were disrupted. Flushing of nitrogen-containing blast residuals from waste rock used to construct the Minto North haul road is another possible source of nitrate load to the groundwater.
- Concentrations in McGinty Creek have remained in the range of observed baseline conditions with no observed changes that reflect an influence from mine-affected groundwater.

Recommendations

- Continue groundwater monitoring as per the Minto Groundwater Monitoring Plan.
- Continue efforts to sample seepage and surface runoff during high precipitation events along the Minto North haul road to better constrain seepage water quality.
- Conduct a mid to late summer flow and water quality accretion survey along McGinty Creek beginning at the headwaters and extending to MN-2.5 to better understand groundwater – surface water interactions and risk due to groundwater discharge and loading.
  - This was also recommended in the 2019 Groundwater Review but plans were postponed as high flow conditions in McGinty Creek were thought to decrease the probability of seeing groundwater influences.
- Conduct opportunistic sampling of deep groundwater to assess sulphate trends with depth during exploratory drilling or from underground workings.

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1 Introduction

The Minto Mine is a high-grade copper mine located approximately 240 kilometers (km) north of Whitehorse in the Yukon Territory. Mining operations began in 2007 and are currently on-going. SRK Consulting (SRK) was retained by Minto Explorations Ltd (Minto Explorations) to provide 2020 quarterly and annual reporting on groundwater monitoring in accordance with specific performance threshold (SPT) exceedances as outlined in the Minto Mine Operational Adaptive Management Plan (OAMP; Minto, 2017). In addition, SRK has completed a review of groundwater chemistry across the whole site to evaluate the potential impacts of mining activities on groundwater. The purpose of this report is to summarize the 2020 groundwater quality, to expand on findings of the quarterly OAMP SPT reporting, and to provide context for the associated risks.

1.1 Scope

The scope of this report includes a summary review of groundwater conditions across the entire project area and specific review of SPT exceedances, with interpretation of cause and/or recommended actions as required. The scope of this work does not include in-depth review of geochemical, hydrological or climatic conditions, unless specifically pertinent to a groundwater-related question. Recommendations regarding SPT exceedances are included.

2 Background

2.1 Catchment Overview

The Minto Mine is situated in the headwaters of Minto Creek and McGinty Creek, both of which drain northeast to the Yukon River (Figure 1). The Minto Creek catchment is characterized by moderate to steep slopes to the north, south and west. The portion of the catchment occupied by the mine is known as Upper Minto Creek, which covers an area of approximately 1,040 hectares (ha) of the larger 4,100 ha Minto Creek catchment and is defined as the catchment area topographically upgradient of the Water Storage Dam (SRK 2012). The catchment below the Water Storage Dam contains no mine components and is known as Lower Minto Creek.

Minto North Pit, which is a relatively small component of the overall mine, is within the McGinty Creek catchment, which has a total area of approximately 3,400 ha (Figure 1). The Minto North Pit is located in the upper portion of the east tributary of McGinty Creek and itself has a catchment area of approximately 12 ha, including related roads.

2.2 OAMP SPT Overview

Groundwater monitoring is conducted as required by the Minto Mine Groundwater Monitoring Plan (Minto, 2016). Review of groundwater monitoring results is carried out as part of the OAMP. In the OAMP, performance thresholds have been defined to establish changes in concentration and concentration values for specific constituents of concern (CoCs) at which actions may need to be taken by Minto to avoid potential impacts to the environment. Specifically, the OAMP states:

> *"Specific Performance Thresholds (SPTs) are defined for each of the Effluent Quality Standards (EQS) parameters identified in Clause 9 (a), Table 1 of Water Use Licence QZ14-031, with the exception of pH, oil and grease, iron and nitrite."*

There are three SPT levels for groundwater quality defined in the OAMP for the Minto Creek Catchment, and two for the McGinty Creek Catchment. Of the 10 multi-port monitoring wells active in the monitoring network, only three are compared to the SPTs in the OAMP. They are MW12-05 and MW12-06 (Minto Creek Catchment), and MW09-03 (McGinty Creek Catchment). All three of these monitoring wells are located hydraulically or topographically down gradient of certain mine components:

- MW09-03 – topographically down gradient of the Minto North Pit in the McGinty Creek catchment;
- MW12-06 – hydraulically and topographically down gradient of the Main and Area 2 open pits, Dry Stack Tailings Storage Facility (DSTSF) and Mill Valley Fill Extension (MVFE), in the Minto Creek catchment;
- MW12-05 – hydraulically and topographically down gradient of all mine activities in the Minto Creek catchment.

Attachment 1 includes tables of SPT threshold concentrations. SPTs for each catchment are summarized below:

Minto Creek Catchment

1. SPT 1 corresponds to a trend-based assessment designed to flag potential increasing groundwater concentrations that have not yet exceeded concentration-based thresholds.
2. SPT 2 corresponds to the EQS concentrations defined in the OAMP, with the exception of Cr-D, Cu-D, Ni-D, for which SPT-2 is set to 50% of (0.5x) the EQS concentration, and sulphate, for which SPT-2 is set to the Aquatic Life guideline from the Contaminated Sites Regulation Schedule 3.
3. SPT 3 corresponds to the estimated concentrations in groundwater that would be necessary to cause exceedance of the Water Quality Objectives in lower Minto Creek under long term steady state groundwater flow conditions based on results of groundwater modeling.

McGinty Creek Catchment

1. SPT 1 is triggered when there are three consecutive exceedances of the 75th percentile background concentration in a single monitoring port.
2. SPT 2 is triggered when there are three consecutive exceedances of the 95th percentile background concentration in a single monitoring port.

Groundwater monitoring results are reviewed quarterly and, if a SPT is reached or exceeded, data are reviewed, interpretations are made, the risk narrative is assessed (in terms of the receiving environment), and recommendations for additional work or management actions are

defined. If an OAMP SPT has not been reached for any parameter at any location, no further action is taken on the assumption that there has been no change of significance from defined baseline conditions. Quarterly OAMP reports are provided to the Yukon Government as per the OAMP.

2.3 Previous and On-going Hydrogeological Studies

In addition to the SPT exceedance reporting under the OAMP, various hydrogeologic studies have been conducted to characterize both the physical and chemical aspects of groundwater at the Minto Mine and contribute to the overall conceptual model of groundwater flow. In addition to the *Minto Groundwater Characterization and Hydrogeologic Conceptual Model Update Report* summarized in Section 2.4, the main studies are summarized as follows:

Minto Mine Phase V/VI Expansion: Hydrogeologic Characterization Report (SRK 2013)

This study presents an early stage hydrogeologic conceptual model that characterizes the groundwater flow regime of the Minto Mine site in order to determine flow paths and where they may discharge into the receiving environment. Existing hydrogeologic knowledge of the site is integrated with site hydrology in context of the proposed plans for mine expansion.

Minto Mine Numerical Groundwater Model (SRK 2014)

This study presents the initial numerical groundwater model developed for the Minto Mine site as specifically required by the Yukon Environmental and Socio-Economic Assessment Board. The objectives of this study were to evaluate the possible extent of a solute plume originating from the mine facilities, identify where groundwater is discharging into Minto Creek and evaluate the effect of the Minto North Pit development on mass loading to McGinty Creek. Modeling included assessment of the potential for geological structures to act as conduits that could transport constituents from the main mining area (Main Pit) to areas close to the property boundary (e.g., MW12-05)

Minto 2015 Groundwater Model Update (SRK 2015)

This study presents an update to the original numerical groundwater model. The report includes a summary of new monitoring data, an update to the hydrogeologic conceptual model, a description of the updated groundwater numerical model and the subsequent results.

Minto Mine Groundwater Monitoring Program – Environmental Tracer Study Results (SRK 2017)

This study presents the results of the environmental tracer study completed as a specific requirement of the Groundwater Monitoring Program under the water license QZ14-031. The objective of the study was to evaluate longitudinal flow paths using non-toxic tracer testing, the results of which were to be ultimately incorporated into the numerical groundwater model. This report presents a succinct summary of the study methods and results. Interpretation of the results are provided in the *Minto Groundwater Characterization and Hydrogeologic Conceptual Model Update Report* (SRK 2018).

Minto Mine 2019 Groundwater Review and Summary of OAMP SPT Exceedances (SRK 2020)

This study summarizes OAMP SPT groundwater exceedances that occurred in 2019 and expands upon the conditions which lead to exceedances and a detailed discussion of associated risks. The report includes an assessment of the suitability of MW17-08 as a background monitoring well and loading calculations to assess the risk of observed concentrations in MW09-03 on McGinty Creek.

SRK Memo – Response to YWB's Request for Information (IR5-48) – Sulphate Exceedances in Groundwater

This memo addresses elevated Sulphate concentrations observed in the deep groundwater at MW12-05 on the property boundary near Minto Creek. Evidence from past studies is gathered and presented to support the hypothesis that the elevated Sulphate concentrations are naturally occurring and not a result of mine activities.

2.4 Groundwater Conceptual Model

A detailed hydrogeologic and hydrogeochemical conceptual model is presented in the *Minto Groundwater Characterization and Hydrogeologic Conceptual Model Update Report* (SRK 2018) and the key points are summarized below:

- There are two hydrostratigraphic units on site: (1) overburden, which is spatially discontinuous but thick along the valley bottoms, and (2) bedrock where hydraulic conductivity is relatively low, and groundwater occurs in secondary permeability along joints and fractures. The majority of flow is expected to occur relatively near to the ground surface, in the absence of permafrost;
- Permafrost can occur within the overburden unit and act as an aquiclude. Permafrost is observed and expected to occur on north-facing slopes and valley bottoms, but the spatial distribution is not well constrained;
- Groundwater flow generally follows topographic gradients overprinted by the effects of open pits or underground development with the overall flow direction towards the Minto and McGinty Creek valleys and ultimately the Yukon River. Vertical gradients across site are variable with upwards, downwards and complex multi-directional gradients observed in the monitoring wells; and
- The Minto North Pit and the Area 2 Pit act as hydraulic sinks and are not thought to contribute load to the groundwater system, while groundwater flow can enter and exit the flooded Main Pit (i.e., flow through).

In addition to the conceptual model, SRK 2018 presents pertinent data collected from the site groundwater monitoring network and a summary of the current groundwater conditions (both physically and chemically). SRK 2018 builds upon the conceptual models presented in the *2013 Hydrogeological Characterization Report* (SRK 2013) and the *Minto 2015 Groundwater Model*

*Update (*SRK 2015) reports by incorporating monitoring data gathered since the submission of those reports together with updated mine infrastructure.

2.5 Groundwater Monitoring Network

The groundwater monitoring network used for on-going water quality monitoring at Minto includes 10 active multi-level monitoring wells that were installed between 2009 and 2017. The monitoring wells are spatially distributed across the site, both outside of the current mining footprint and topographically (and hydraulically) down gradient of mining activities. Monitoring locations are shown on Figure 1 and well installation details can be found in Table 2-1.

All of these monitoring wells were installed after the start of mining, with the exception of MW09-03 in the Minto North area, which was installed after the main Minto operations began, but before mining at the adjacent Minto North Pit started. Nomenclature of the monitoring wells and their zones is as follows:

- The two numeric digits proceeding MW are the year of installation (i.e., MW12-06 was installed in 2012); and
- Vertical monitoring zones are numbered sequentially from deep to shallow, with Zone 1 being the deepest. Zone numbers are added as a suffix to the well name (i.e. MW12-06-01 is zone 1, the deepest monitoring point).

The monitoring zones target either overburden, bedrock (weathered or competent) or the contact between the two. MW12-06-06 is the only zone to target exclusively overburden. The following list summarizes the locations of the active monitoring wells:

- MW09-03 and MW17-11: located in the McGinty Creek catchment, topographically downgradient of the Minto North Pit;
- MW17-08: located topographically upgradient of mine activities in the Minto Creek catchment and is considered representative of background conditions near the western limit of the Minto Creek catchment;
- MW09-01 and MW17-10: located within the mine site between the Main Waste Dump and the Main Pit. MW09-01 has been dry since soon after installation;
- MW17-09: located within the mine site east of the Ice-Rick Overburden Dump and the Southwest Waste Dump;
- MW12-07: located down gradient of the Main pit, between the Main Pit and the mill;
- MW12-06: located between the Dry Stack Tailings Storage Facility (DSTSF) and the Water Storage Pond (WSP); and
- MW12-05 and MW17-12: located alongside Minto Creek, east of the WSP and east of all mine activities, at the property boundary.

More details on the groundwater monitoring network can be found in the ***Minto Groundwater Characterization and Hydrogeologic Conceptual Model Update Report***, submitted to Minto Explorations by SRK in January 2018.

2.6 Site Activity

Site activities and mine development have been dynamic since operations began in 2006 and are important to understand the potential influence on the groundwater system. The following points summarize important events and dates of mining and key water management actions over time and a visual representation of the timeline is presented in Figure 2:

- Early 2006 to Mid 2011: Mining of the Main Pit, during which time the pit was dewatered and acted as a hydraulic sink.
- Mid 2011 to Late 2012: Water accumulated in the Main Pit
- Late 2012 to Early 2015: Tailings and water deposited into the Main Pit.
- Early 2015 to Present: Water pumped from Main Pit to the Area 2 pit and vice versa. In late 2019, Area 2 Stage 2 Pit began overflowing to Stage 3 where pumping now occurs.
- Early 2011 to Mid 2015: Mining of Area 2 Stage 2 Pit, during which time the pit was dewatered and acted as a hydraulic sink.
- Early to Mid 2015: Road was built to access the Minto North Pit, adjacent to MW09-03 and MW17-11.
- Late 2015 to Late 2016: Mining of Minto North Pit to a bottom elevation of 835 meters above sea level (masl).
- Mid 2015 to Present: Tailings and water deposited into Area 2 Stage 2 Pit, in addition to water pumped from the Main Pit.
- 2016 to Present: Minto North Pit accumulates water from runoff and groundwater inflow only.
- Mid 2012 to October 2018; September 2019 to Present: Minto Underground advanced, during which time the underground acted as a hydraulic sink and collected water pumped to Area 2 Pit and Main Pit.
- Late 2019 to Present: Water from the Main Pit is pumped to the mill and then to the Area 2 Pit as tailings. Water is reclaimed from the Area 2 Stage 4 Pit and pumped back to the Main Pit.

2.7 Groundwater Data and Current Conditions

2.7.1 Water Elevations and Flow

Consistent with the conceptual model, groundwater generally flows in the same direction as surface water, discharging into Minto and McGinty Creeks, and ultimately the Yukon River (Figure 3). Groundwater is expected to be contained within each catchment, with a groundwater

divide located along the ridge between Minto North Pit and main site activities in the Minto Creek catchment. Locally, the Minto North Pit acts as hydraulic sink, while the Main Pit and Area 2 Pit act as both a sink and source for groundwater with groundwater entering from the north and west uphill directions and discharging to the east and south towards Minto Creek.

Groundwater elevations in the McGinty Creek Catchment range from 887.6 to 899.4 masl in the shallowest monitoring ports of the multi-level wells. Vertical gradients are downwards in both MW09-03 and MW17-11.

Groundwater elevations in the Minto Creek Catchment range from 921.6 masl in MW17-08, located west of the mining activities, to 661.7 masl in MW12-05, located approximately 0.5 km downgradient of the Water Storage Pond along Minto Creek. Vertical gradients are variable within the catchment, with overall upwards gradients in MW17-10 and MW17-12 and downwards gradients in MW17-08, MW12-07 and MW12-05 (Figure 3).

2.7.2 Groundwater Quality

Groundwater quality at the Minto Mine is largely within the range of observed baseline conditions, with a low number of consistent SPT exceedances. While SPTs are not exceeded or applied to specific wells, visual trends (increasing or decreasing) are observed for various parameters. Table 2-1 summarizes qualitative trends observed in groundwater chemistry at each well with parameters identified that consistently exceed thresholds. The review focused on data from 2016 to present, a period which has a consistent record from all monitoring zones. In addition to Table 2-1, time series presenting monitoring data for each CoC for each well are provided in Attachment 2 and a discussion of the trends is provided in Section 4.

Table 2-1: Summary of Qualitative Trends in CoCs and Consistent SPT Exceedances in Active Monitoring Wells

Catchment	Well ID	Monitoring Zone	Visual Trends		Consistent Threshold Exceedances		
			Increasing	Decreasing	SPT 1	SPT 2	SPT 3
Minto Creek	MW12-05	1	SO_4	NH_3	-	SO_4	-
		2	SO_4		-	SO_4	-
		3	-	Zn, NH_3	-	-	-
		4	SO_4, Se		-	-	-
		5	SO_4	Zn, NO_3	-	-	-
		6	SO_4	Zn, NO_3	-	-	-
		7	NH_3, SO_4	-	-	-	-
	MW12-06	1	Al, As, Se, NH_3, SO_4	-	-	-	Cr
		2		-	-	-	-
		3	NH_3	Cr, Zn	-	-	-
		4	-	Zn	-	-	-
		5	-	Zn	-	-	-
		6		Zn	-	-	-
	MW12-07	1	As, Zn, NO_3	Cr	---	---	---
		2	Cd, Cu, Se, Zn, NO_3	NH_3	---	---	---
		3	--	--	---	---	---
		4	--	--	---	---	---
	MW17-08	1		-	---	---	---
		2		-	---	---	---
		3	-	Se	---	---	---
		4	--	--	---	---	---
	MW17-10	1	Se, Zn, NO_3		---	---	---
		2	Se, NO_3	Cu, Ni	---	---	---
		3	Se, NO_3	Cu, Ni	---	---	---
		4	--	--	---	---	---
		5	--	--	---	---	---
	MW17-12	1	Se	-	---	---	---
		2	Se, Zn	-	---	---	---
		3	As, Zn	-	---	---	---
		4			---	---	---
		5		Ni, Se	---	---	---
		6	NO_3	Ni, Se	---	---	---
		7	Zn	Se, NO_3	---	---	---
		8		Se, NO_3	---	---	---
McGinty Creek	MW09-03	1	Cd	Al, Ni, Mo, SO_4	-	As	---
		2	Cd, Zn, NO_3	Al, As, Mo, NH_3, SO_4	Cd	Zn, NO_3	---
		3	--	--	-	-	---
	MW17-11	1	As	Mo	---	---	---
		2	As		---	---	---
		3			---	---	---
		4		Ni	---	---	---
		5	--	--	---	---	---

Notes:

'-' No trends or exceedances were identified

'--' Insufficient data to evaluate trends

'---' SPT does not apply to monitoring well or catchment

3 2019 Groundwater AMP SPT Events

Table 3-1 and Table 3-2 summarize groundwater locations and parameters for which OAMP SPTs have been reached for the 2020 monitoring year. CoCs at any groundwater monitoring location that are not identified in this table did not have changes of significance in terms of OAMP SPTs. Baseline groundwater conditions are defined in the OAMP based on data from MW09-03 prior to 2015 (start of Minto North mining).

Figures representing groundwater monitoring data for all CoCs are included in Attachment 2. A complete dataset for all monitoring wells along with key monitoring stations in McGinty Creek, Minto Creek and within the mine operations are provided in Attachment 3 and a description of each monitoring station is provided in Attachment 4.

Table 3-1: Minto Creek Catchment Threshold Exceedances

Monitoring Well Zone	Parameter	SPT	Context
MW12-05-01	Cr	1	1 of 4 samples exceeded threshold concentration
	Se	1	1 of 4 samples exceeded threshold concentration
	SO_4^{2-}	2	4 of 4 samples exceeded threshold concentration
MW12-05-02	Cr	1	1 of 4 samples exceeded threshold concentration
	Zn	1	1 of 4 samples exceeded threshold concentration
	Se	1	1 of 4 samples exceeded threshold concentration
	SO_4^{2-}	2	4 of 4 samples exceeded threshold concentration
MW12-05-03	SO_4^{2-}	1	1 of 4 samples exceeded threshold concentration
MW12-05-04	Se	1	1 of 4 samples exceeded threshold concentration
MW12-05-06	Zn	1	1 of 4 samples exceeded threshold concentration
MW12-06-01	As	1	1 of 4 samples exceeded threshold concentration
	As	2	1 of 4 samples exceeded threshold concentration
	Cr	3	4 of 4 samples exceeded threshold concentration
	Se	2	1 of 4 samples exceeded threshold concentration
	NH_3	2	2 of 4 samples exceeded threshold concentration
MW12-06-04	Cr	1	1 of 4 samples exceeded threshold concentration

Table 3-2: McGinty Creek Catchment Threshold Exceedances

Monitoring Well Zone	Parameter	SPT	Context
MW09-03-01	Al	1	1 of 11 samples exceeded threshold concentration
	As	2	11 of 11 samples exceeded threshold concentration
	Cd	1	2 of 11 samples exceeded threshold concentration
	Cd	2	1 of 11 samples exceeded threshold concentration
	Se	1	1 of 11 samples exceeded threshold concentration
	Zn	1	1 of 11 samples exceeded threshold concentration
		2	1 of 11 samples exceeded threshold concentration
MW09-03-02	Al	2	1 of 11 samples exceeded threshold concentration
	Cd	1	11 of 11 samples exceeded threshold concentration
	Cu	2	1 of 11 samples exceeded threshold concentration
	Zn	2	11 of 11 samples exceeded threshold concentration
	NO_3^-	2	11 of 11 samples exceeded threshold concentration

4 2020 Discussion Points

4.1 Groundwater Quality in Minto Creek Catchment

4.1.1 SPT Exceedances

Trends in certain parameters within the groundwater monitoring network in the Minto Creek catchment are present, as listed in Table 2-1; however, only sulphate and chromium have consistently exceeded SPTs. While the other parameters provide useful insight for interpretation of overall conditions at the Project and comparison with previously provided water quality predictions, they are not considered problematic at this time as concentrations remain below OAMP thresholds. Changes in groundwater quality within the mine site are consistent with what is expected during active operations and concentrations in Minto Creek generally remain in the range of baseline conditions. Figures representing groundwater monitoring data for all CoCs are included in Attachment 2. A complete dataset for all monitoring wells along with key monitoring stations in McGinty Creek, Minto Creek and within the mine operations are provided in Attachment 3 and a description of each monitoring station is provided in Attachment 4.

Sulphate

Sulphate SPT exceedances only occur in MW12-05 and have been restricted to the deeper zones (MW12-05-01, MW12-05-03 and MW12-05-03) which monitor depths greater than 85 meters below ground surface (mbgs) (Figure 4, Figure 5, & Figure 6). Concentrations have been increasing in these three zones, but at a slower rate than previously (Figure 6). Monitoring zones shallower than Zone 3 have also been increasing since installation, but at far lower sulphate concentrations (<100 mg/L) and show signs of stabilization in recent monitoring events. This trend is characteristic of groundwaters reaching equilibrium following installation, which can take several years in aquifers with low hydraulic conductivity.

Figure 4 presents a cross sectional representation of sulphate concentrations in the Minto Creek catchment and Figure 5 presents the distribution of sulphate concentrations in plan view, with nested diamonds representing multi-level wells and the smallest diamonds as the deepest zones. The highest concentrations are localized to the deepest groundwater furthest downgradient in the catchment, within the Main and Area 2 Pit and the underground workings. While many of the wells show increasing sulphate concentrations with depth, MW17-12 is the only other location with concentrations above 1000 mg/L and is the only well to monitor water as deep as MW12-05.

Elevated sulphate concentrations in groundwaters near sulphide-containing ore bodies are not uncommon due to interaction with sulphur bearing minerals along the groundwater flow paths. Sulphate concentrations have been examined in multiple investigations, all of which suggest elevated concentrations at MW12-05 are not related to mining activities. Details of these investigations can be found in SRK 2021, and a summary of the observations that contribute to this conclusion are provided below.

- Sulphate concentrations at MW12-05 immediately following installation were higher than any mine source (i.e. Main Pit, DSTSF seepage, etc.).
- The Main Pit acted as a hydraulic sink for groundwater until 2013, one year after the installation of MW12-05 and after the initial increase was observed in MW12-05.
- Chloride, which is only present in high concentrations in mine affected waters, did not increase in MW12-05 concurrent with sulphate. If MW12-05 was receiving mine affected waters, the chloride would also have been expected to increase, which it did not.
- The isotopic signatures of deep groundwater at MW12-05 are not indicative of recent mixing with surface/mine site sources.
- Measured hydraulic conductivities in the bedrock are very low and there are no mapped structures that would act as a conduit for groundwater flow. Additionally, all solute transport simulations conducted during modelling concluded the observed concentrations are unrelated to mine activities.

While sulphate concentrations have been increasing and exceeding thresholds in the deeper zones, all available evidence suggests they are not related to mine activities and they are considered to be naturally occurring due to interaction with the sulphur-bearing minerals of the ore body.

Chromium

Chromium concentrations have consistently exceeded thresholds in the deepest zone of MW12-06 (150 mbgs) since installation. Concentrations in MW12-06-01 increased until mid-2019 but have since stabilized at concentrations greater than SPT 3 (Figure 7). Chromium is the only parameter to consistently exceed thresholds in MW12-06 and is not thought to be caused by mine affected waters infiltrating into groundwater.

As chromium is sensitive to changes in redox conditions, the analysis of other redox-sensitive elements is useful to understand possible mechanisms for observed concentrations in MW12-06-

01. Manganese and iron, which exist in an aqueous phase under reducing conditions at neutral pH, were stable until late 2018, at which point they suddenly increased (Figure 11). This event coincides with stoppage of active mining in the Minto South Underground (Figure 8). At that time, water levels (pressure) in MW12-06-01 dropped significantly while no other monitoring zones were affected (Figure 9).

The drop in pressure in MW12-06-01 suggests deep groundwaters in the vicinity of the well are affected by underground mining activities which may disrupt the system's equilibrium. The changes in redox sensitive elements are likely a response to this disruption, as hydraulic gradients shift due to pressure changes.

While mine activities may influence the groundwater system equilibrium in the vicinity of MW12-06-01, elevated concentrations are not a direct result of mine water infiltration. These trends are not unexpected near active mining, where the development of pits and underground workings abruptly depressurizes the groundwater system.

Other Parameters

Isolated exceedances of SPT 1 and SPT 2 criteria occurred at multiple locations for a variety of parameters. SPT definitions were provided in Section 2.2. SPT 1 generally identifies significant change in concentration since the previous monitoring event but have not exceeded a concentration-based threshold. SPT 2 criteria generally identify concentrations that have exceeded a defined baseline or EQS concentration.

- Isolated SPT 1 exceedances in 2020 include: chromium and selenium in MW12-05-01 and MW12-05-02; zinc in MW12-05-02 and MW12-05-06; selenium in MW12-05-04; sulphate in MW12-05-03; arsenic in MW12-06-01; and, chromium in MW12-06-04.
- Arsenic and selenium exceeded SPT 2 in MW12-06-01 during one monitoring event and ammonia exceeded in two of the four monitoring events.

While the exact cause of these exceedances is uncertain, they occur as sporadic and, with the exception of ammonia in MW12-06-01, as isolated events. Continuous trends are not present for these parameters and are therefore not considered a risk at this time.

4.1.2 General Visual Trends

In addition to the exceedances discussed above, some parameters exhibit increasing trends at concentrations that are currently below thresholds, as outlined in Table 2-1.

While it is important to monitor these trends, they are not unexpected in the vicinity of active mining where the development of pits and underground workings depressurize the system and upset equilibrium conditions, and do not currently pose a risk to Minto Creek water quality.

4.1.3 Risk Context

Elevated concentrations of CoCs in groundwater are assessed to identify and mitigate potential risks to surface water quality in Minto Creek. At this time, elevated concentrations of CoCs in

groundwater are not considered a high risk to surface water quality. The following points summarize the rationale for this conclusion:

- Consistent exceedances are not widespread and are limited to only sulphate and chromium.
- Elevated concentrations of sulphate and chromium are isolated to the deepest zones of MW12-05 and MW12-06, with no known conduit connecting groundwater at these depths to Minto Creek at surface.
- Data suggest sulphate concentrations in MW12-05 are not related to mine activities.
- Data suggest chromium concentrations are a result of the groundwater equilibrium being disrupted by depressurization and not direct mine-water infiltration.
- Concentrations in Minto Creek have remained in the range of observed baseline conditions with no observed changes that reflect an influence from mine-affected groundwater.

The overall risk of mine-affected groundwater contributions to Minto Creek water quality is considered low; mitigation is not considered necessary at this time.

4.2 Groundwater Quality in McGinty Creek Catchment

4.2.1 SPT Exceedances

Trends in certain parameters within the groundwater monitoring network in the McGinty Creek catchment are present, as listed in Table 2-1; however, only arsenic in MW09-03-01 and cadmium, nitrate and zinc in MW09-03-02 have consistently exceeded SPTs. While the other parameters provide useful insight for interpretation of overall conditions at the Project and comparison with previously provided water quality predictions, they are not considered problematic at this time as concentrations remain below OAMP thresholds. Figures representing groundwater monitoring data for all CoCs are included in Attachment 2. A complete dataset for all monitoring wells along with key monitoring stations in McGinty Creek, Minto Creek and within the mine operations are provided in Attachment 3 and a description of each monitoring station is provided in Attachment 4.

For context, in 2019, zinc, molybdenum and selenium consistently exceeded thresholds in MW09-03-01. In 2020, concentrations decreased with only two exceedances for zinc, one for selenium and none for molybdenum.

Nitrate

Nitrate at MW09-03-02 has been increasing since the beginning of 2017 and has consistently exceeded SPT 2. The nitrate concentration of the deeper zone, MW09-03-01, remains stable and below both SPT 1 and SPT 2. Concentrations of the same magnitude observed at MW09-03-02 are consistently observed in MW17-11-05, which is at a similar elevation and adjacent to MW09-03-02 (Figure 10). Presently, the Minto North Pit acts as a hydraulic sink, with a hydraulic divide possible in the vicinity of MW09-03 and MW-17-11 and gradient towards the pit from both wells.

As the pit water level is much lower than water levels in the wells, migration of pit water is not the cause of the nitrate increase observed at MW09-03-02.

The increase in nitrate concentrations do coincide with development of the Minto North Pit, which resulted in a water level decrease in MW09-03 and subsequent changes in redox conditions which can cause an increase in nitrate (discussed below). The development of Minto North involved the construction of a haul road using blasted rock and may also contribute nitrogen load to the groundwater. Observed concentrations in MW09-03-02 may be the result of these two different mechanisms.

Nitrate is sensitive to changes in redox conditions. Other redox-sensitive elements were assessed to understand the observed concentrations in MW09-03. Concentrations of ammonia, iron and manganese decreased significantly and concurrently with an increase in oxidation-reduction potential (ORP) at the same time as the observed water level decrease (Figure 11). These observations suggest conditions in the aquifer changed from reducing to oxidizing, resulting in the formation of iron and manganese oxides/oxyhydroxides and a shift in nitrogen speciation from an ammonia dominated system to nitrate (Figure 12).

Blasted rock was used to construct the Minto North haul road which contains nitrogen compounds as residue from the process. These nitrogen compounds can be mobilized as nitrate by precipitation infiltrating through the blasted material. Seepage from nitrogen-containing blast residuals in the haul road material may also contribute an additional load of nitrate to the groundwater.

Arsenic

Arsenic concentrations in MW09-03-01 increased concurrent with the development of the Minto North Pit but appear to have reached equilibrium quickly, as concentrations have since stabilized. Concentrations are consistently above SPT 2 but, as Minto North Pit acts as a hydraulic sink, are not due to pit water infiltration. An inverse trend was observed in MW09-03-02, with an initial decrease followed by stabilization (Figure 13).

Similar to nitrate, arsenic is redox sensitive, and these trends may be attributed to a change in aquifer conditions as water levels dropped in 2015 following the onset of mining at Minto North.

Cadmium and Zinc

Zinc increased in concentration and variability in MW09-03-01 and MW09-03-02, beginning in 2015 when mining of the Minto North pit started (Figure 14). Cadmium showed similar behavior, particularly in MW09-03-02 (Figure 15). The dominant attenuation process for these ions is adsorption, and it is possible with a change in conditions, competition for adsorption sites caused the increased mobility of zinc and cadmium which have not yet reached equilibrium.

Other Parameters

In addition to the consistent exceedances discussed above, isolated exceedances to SPT 1 were observed: aluminum in MW09-03-01 and MW09-03-02; selenium in MW09-03-01; zinc in MW09-

03-01; and, copper in MW09-03-02. Cadmium exceeded SPT 1 twice in MW09-03-01 and SPT 2 once. Zinc in MW09-03-01 showed an isolated SPT 2 exceedance.

While the exact cause of these exceedances is uncertain, they occur sporadically and, with the exception of cadmium in MW09-03-01, as isolated events. Continuous trends are not present for these parameters and are therefore not discussed further at this time.

4.2.2 General Visual Trends

In addition to the exceedances discussed above, some parameters exhibit increasing trends at concentrations that are currently below thresholds, as outlined in Table 2-1.

While it is important to monitor these trends, they are not unexpected near active mining, where the development of pits abruptly depressurizes the groundwater system and upsets equilibrium conditions, and do not currently pose a risk to McGinty Creek water quality.

4.2.3 Risk Context

Elevated concentrations of CoCs in groundwater are assessed to identify and mitigate potential risks to surface water quality in Minto Creek. At this time, elevated concentrations of CoCs in groundwater are not considered a high risk to surface water quality. The following points summarize the rationale for this conclusion:

- Groundwater levels in all monitoring zones of MW09-03 and MW17-11 are at least 30 m higher than the Minto North Pit, creating a hydraulic barrier preventing pit water from migrating towards McGinty Creek.
- Concentrations in McGinty Creek have remained in the range of observed baseline conditions with no observed changes that reflect an influence from mine-affected groundwater.
- Loading calculations presented in SRK 2020 indicate groundwater concentrations would have to increase by at least one order of magnitude from the 2019 average to contribute enough load to McGinty Creek for SPT 1 to be exceeded, with the exception of selenium, which has been elevated in baseline data and already exceeds SPT 1 at MN-4.5 (Table 4-1). Additional context is provided below.

While the required nitrate concentration (37 mg/L) determined by the loading calculations is an order of magnitude higher than the 2019 average (7.9 mg/L), monitoring events during Q4 2020 had concentrations as high as 31.6 mg/L in MW09-03-02 with a 2020 average concentration of 13.7 mg/L. If nitrate continues to increase in MW09-03-02, the loading calculations suggest an impact could be seen in McGinty Creek. It is still uncertain, however, if the groundwater poses the highest risk of loading, or if surficial seeps from the Minto North haul road are more important. The overall estimated percentage of groundwater loading to McGinty Creek, which was calculated using an area percentage of the total McGinty Creek catchment, is low (0.45%) and as the Minto North Pit acts as a hydraulic sink, this is a conservative estimate of groundwater contributions. This method is also considered conservative compared to using observed

baseflows presented in the *Minto Mine Numerical Groundwater Model Report* (SRK 2014), which were considerably lower than the flows calculated for use in the loading assessment.

Apart from nitrate, the average concentrations from 2020 were not significantly different than 2019, and even decreased in some cases (Table 4-1).

The overall risk of mine-affected groundwater contributions to McGinty Creek water quality is considered low; mitigation is not considered necessary at this time.

Table 4-1: Results of McGinty Creek Loading Calculations

Parameter (mg/L)	Units	Minto Creek SPT 1	2019 Average Concentrations		2020 Average Concentrations		Total Concentration (C_{tot})	Groundwater Concentration Required to Exceed SPT 1
			Surface Water (MN-4.5)	Groundwater (MW-09-03-02)	Surface Water (MN-4.5)	Groundwater (MW-09-03-02)		
Ag-D	mg/L	0.00002	0.00001	0.00001	0.00002	0.00001	0.00001	0.0022
Al-D	mg/L	0.049	0.0092	0.0025	0.0421	0.0035	0.0091	8.8
As-D	mg/L	0.00055	0.00032	0.00023	0.00061	0.00016	0.00032	0.051
Cd-D	mg/L	0.000026	0.0000053	0.00012	0.000008	0.00011	0.000006	0.0046
Cr-D	mg/L	0.001	0.00016	0.00012	0.00060	0.00015	0.00016	0.19
Cu-D	mg/L	0.0029	0.0016	0.0022	0.0042	0.0024	0.0016	0.29
Pb-D	mg/L	0.0002	0.00005	0.00006	0.00008	0.00007	0.00005	0.034
Mo-D	mg/L	0.001	0.00096	0.0042	0.0012	0.0046	0.00097	0.01
Ni-D	mg/L	0.0016	0.00073	0.0005	0.0018	0.0006	0.00073	0.19
Se-D	mg/L	0.00017	0.00023	0.00031	0.00028	0.00039	0.00023	-
Zn-D	mg/L	0.005	0.001	0.052	0.002	0.038	0.0012	0.89
$N\text{-}NO_3$	mg/L	0.2	0.036	7.9	0.050	13.7	0.0718	37
Ammonia	mg/L	0.04	0.0063	0.0085	0.014	0.008	0.0063	7.5
Sulphate	mg/L	-	11	5.5	12.4	7.1	11	-

Notes:

red cell indicates surface water concentrations are historically higher than Minto Creek SPTs

"Groundwater concentration required to exceed SPT 1" are based on 2019 average concentrations. 2020 average concentrations are provided for comparison.

5 Conclusions

Groundwater exceedances of the OAMP SPTs in 2020 have been limited to a few parameters and consistent SPT exceedance is not widespread; most monitoring zones (~69%) did not exceed more than one OAMP SPT in 2020.

5.1 Minto Creek

- On-going exceedances in the Minto Creek catchment include sulphate in MW12-05-01 and MW12-05-02 and chromium in MW12-06-01.

- Sulphate concentrations exhibit an increasing trend with depth across the site and events have been restricted to the deepest monitoring zones at depths greater than 85 mbgs.
- The source of elevated sulphate in the groundwater has been examined in multiple investigations, all of which suggest elevated concentrations at MW12-05 are not related to mining activities and is instead likely due to interaction with sulphur-bearing minerals in the ore body.
- Changes in water levels and redox sensitive parameters indicate underground mine activities may disrupt the equilibrium conditions of groundwater at MW12-06-01, but elevated chromium concentrations are not a direct result of mine water infiltration.
- Concentrations in Minto Creek have remained in the range of observed baseline conditions with no observed changes that reflect an influence from mine-affected groundwater.

5.2 McGinty Creek

- On-going exceedances in the McGinty Creek catchment include arsenic in MW09-03-01 and cadmium, nitrate and zinc in MW09-03-02.
- Minto North Pit acts as a hydraulic sink and the migration of pit water is not responsible for elevated concentrations in groundwater.
- The system experienced a shift in redox conditions following a water level drop concurrent with the development of Minto North. This shift may be responsible in part for observed exceedances as equilibrium conditions were disrupted.
- Flushing of nitrogen-containing blast residuals from waste rock used to construct the Minto North haul road is considered another likely source of loading to the groundwater.
- Results of the groundwater loading calculations indicate most parameters would have to increase beyond current concentrations by at least one order of magnitude to contribute enough load into McGinty Creek for SPT 1 to be exceeded.
- The overall contribution of groundwater to McGinty Creek is low and a hydraulic barrier exists between Minto North Pit and McGinty Creek, preventing seepage from entering the surface water system from the pit itself.

Concentrations in Minto and McGinty Creeks have remained in the range of observed baseline conditions with no observed changes that reflect an influence from mine-affected groundwater. The overall risk of contact water migrating through the groundwater and negatively affecting McGinty and Minto Creeks is considered low and mitigation efforts are not necessary at this time.

6 Recommendations

Groundwater exceedances of the OAMP SPTs do not require mitigation as surface water bodies have not been impacted by elevated groundwater concentrations and several lines of evidence, along with water quality predictions for the overall project, suggest the overall risk of future impacts to surface water quality is low. Groundwater monitoring should continue as per the Minto

Mine Groundwater Monitoring Plan, and results should continue to be evaluated against the Operational Adaptive Management Plan SPTs and compared with other studies assessing natural background conditions. The following actions are also recommended to inform future mitigation efforts:

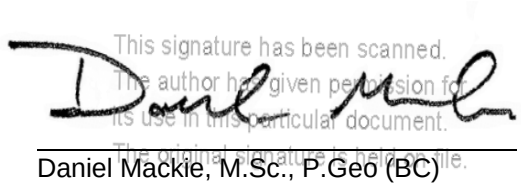
- Continue groundwater monitoring as per the Minto Groundwater Monitoring Plan.
- Continue efforts to sample seepage and surface runoff during high precipitation events along the Minto North haul road to better constrain seepage water quality.
- Conduct a mid to late summer flow and water quality accretion survey along McGinty Creek beginning at the headwaters and extending to MN-2.5 to better understand groundwater – surface water interactions and risk due to groundwater discharge and loading when conditions are appropriate.
  - This was also recommended in the 2019 Groundwater Review but plans were postponed as high flow conditions in McGinty Creek were thought to decrease the probability of seeing groundwater influences.
- Conduct opportunistic sampling of deep groundwater to assess sulphate trends with depth during exploratory drilling or from underground workings.

This report, Minto Mine – 2020 Groundwater Review and Summary of OAMP SPT Exceedances, was prepared by:



Laura Volden, M.Sc., P.Geo (BC)
Consultant - Hydrogeochemistry

and reviewed by



Daniel Mackie, M.Sc., P.Geo (BC)
Principle Consultant – Hydrogeology

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

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The opinions expressed in this report have been based on the information available to SRK at the time of preparation. SRK has exercised all due care in reviewing information supplied by others for use on this project. Whilst SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information, except to the extent that SRK was hired to verify the data.

7 References

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Minto Explorations Ltd., 2017. Minto Mine Operations Adaptive Management Plan 2017-02. April 2017.

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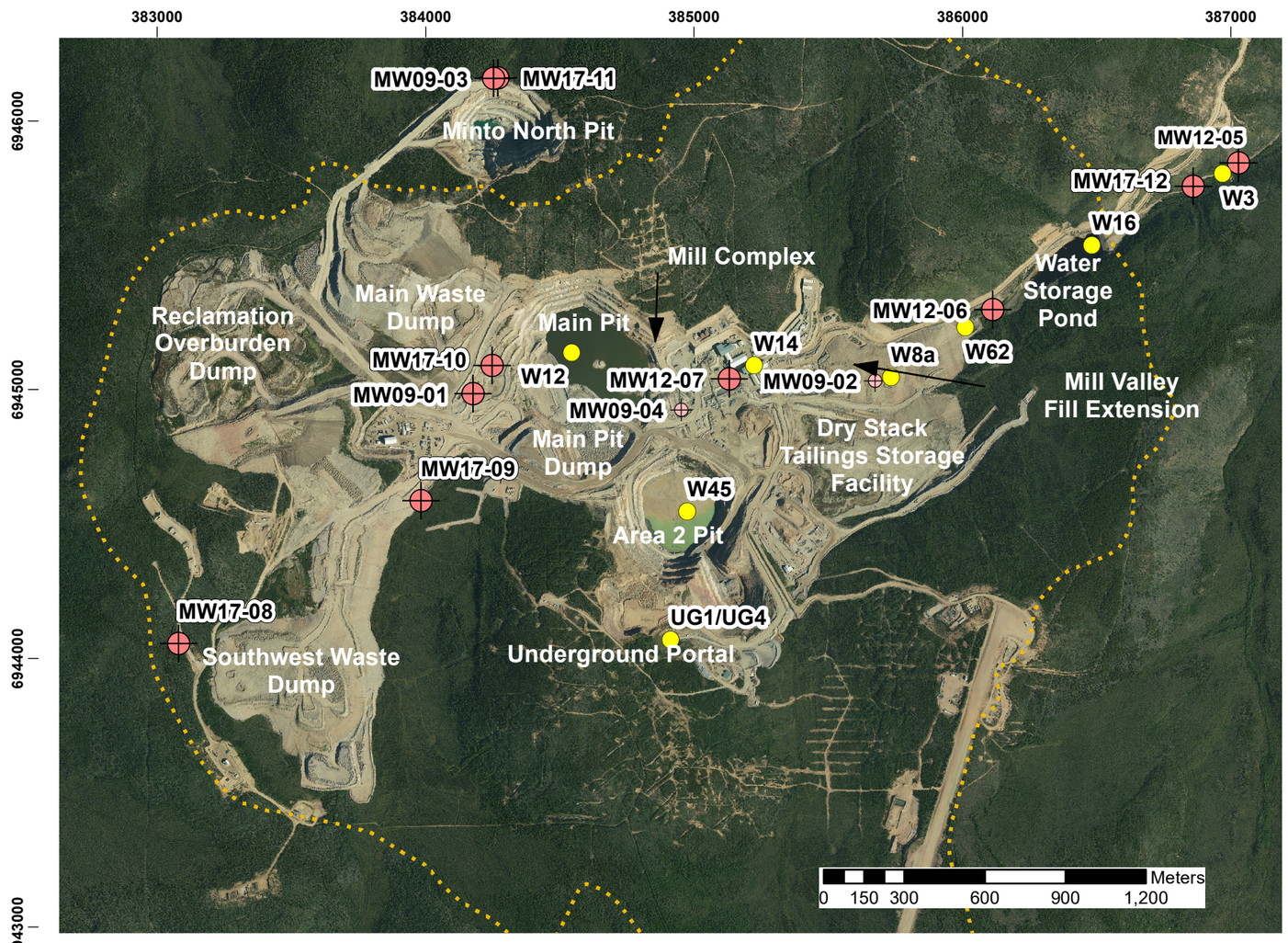
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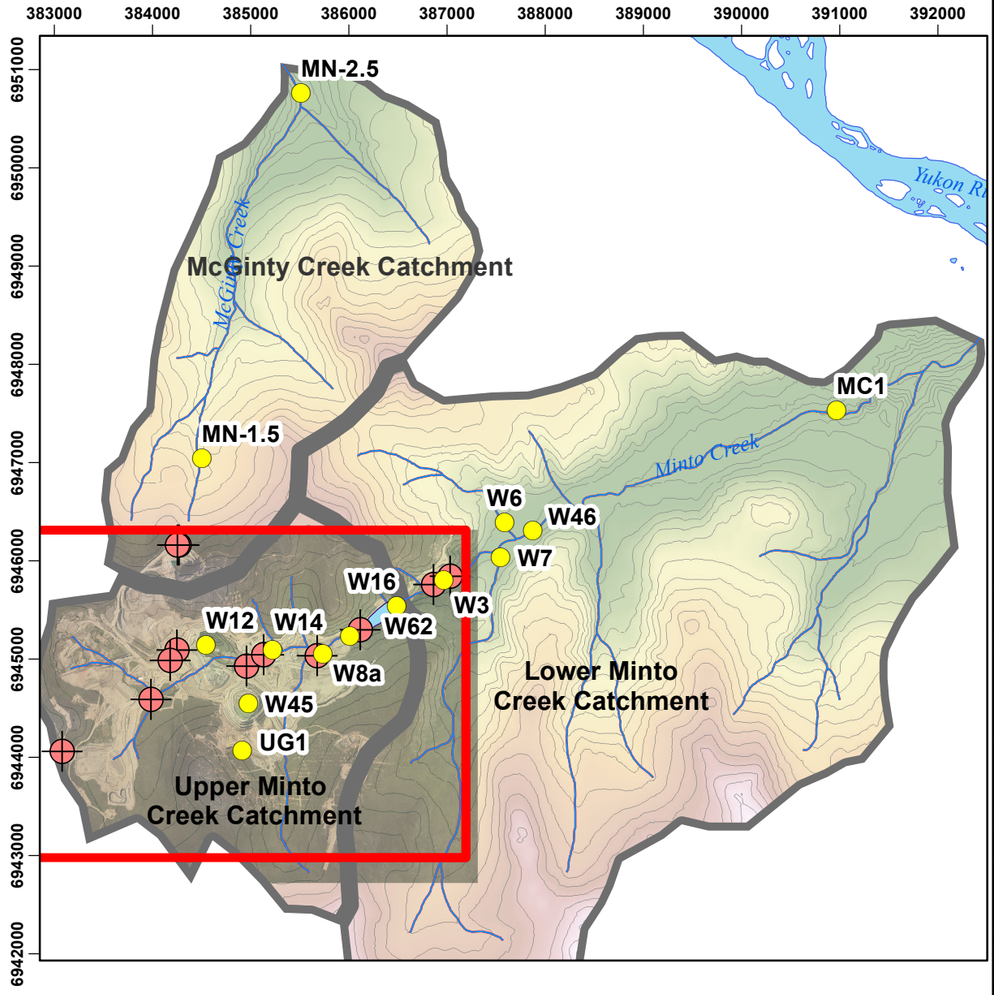
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Figures





Legend

- Streams
- Elevation Contours 20m
- Upper Minto Creek Catchment
- MP Monitoring Wells
- Surface Water Stations
- **Topography (masl)**
  - High : 1020
  - Low : 650

Notes:
1. Data presented in NAD 1983 UTM Zone 8N.
2. Topography provided by Minto Mine, 2017.
3. Base orthophoto provided by Minto Mine, 2017.

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Filename: Monitoring_Sites_rev03_msi_2021.mxd

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MINTO MINE

2020 Groundwater Quality and OAMP Exceedance Review

Groundwater Monitoring Stations

Date:	Approved:	Figure:
May 2021	MSi	1

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		Main Pit (MP)	Area 2 Stage 2 (A2S2)	Area 2 Stage 3 Pit (A2S3)	Area 118 (118)	Minto North Pit (MN)	MZone UG (MZUG)	Minto South UG (MSUG)	Minto East UG (MEUG)	Copper Keel UG (CKUG)
2006	Q1	Mining								
	Q2	Mining								
	Q3	Mining								
	Q4	Mining								
2007	Q1	Mining								
	Q2	Mining								
	Q3	Mining								
	Q4	Mining								
2008	Q1	Mining								
	Q2	Mining								
	Q3	Mining								
	Q4	Mining								
2009	Q1	Mining								
	Q2	Mining								
	Q3	Mining								
	Q4	Mining								
2010	Q1	Mining								
	Q2	Mining								
	Q3	Mining								
	Q4	Mining								
2011	Q1	Mining								
	Q2	Mining	Mining							
	Q3	Water accum.	Mining							
	Q4	Water accum.	Mining							
2012	Q1	Water accum.	Mining							
	Q2	Water accum.	Mining							
	Q3	Water accum.	Mining					Mining		
	Q4	T+W	Mining					Mining		
2013	Q1	T+W	Mining					Mining		
	Q2	T+W	Mining					Mining		
	Q3	T+W	Mining					Mining		
	Q4	T+W	Mining					Mining		
2014	Q1	T+W	Mining		Mining		Mining	Mining		
	Q2	T+W	Mining		Mining		Mining			
	Q3	T+W	Mining		Mining		Mining			
	Q4	T+W	Mining				Mining			
2015	Q1	T+W	Mining				Mining			
	Q2	T+W	Mining				Flooded by A2S2	Mining		
	Q3	T+W, P from/to A2S2	T+W, P from/to MP			Mining	Flooded by A2S2	Mining		
	Q4	T+W, P from/to A2S2	T+W, P from/to MP			Mining	Flooded by A2S2	Mining		
2016	Q1	T+W, P from/to A2S2	T+W, P from/to MP			Mining	Flooded by A2S2	Mining		
	Q2	T+W, P from/to A2S2	T+W, P from/to MP			Mining	Flooded by A2S2	Mining		
	Q3	T+W, P from/to A2S2	T+W, P from/to MP			Mining	Flooded by A2S2	Mining		
	Q4	T+W, P from/to A2S2	T+W, P from/to MP		Ovb backfill	Mining	Flooded by A2S2	Mining		
2017	Q1	T+W, P from/to A2S2	T+W, P from/to MP	Mining	Ovb backfill	Water accum.	Flooded by A2S2	Mining	Mining	
	Q2	T+W, P from/to A2S2	T+W, P from/to MP	Mining	Ovb backfill	Water accum.	Flooded by A2S2	Mining	Mining	
	Q3	T+W, P from/to A2S2	T+W, P from/to MP	Mining	Ovb backfill	Water accum.	Flooded by A2S2	Mining	Mining	
	Q4	T+W, P from/to A2S2	T+W, P from/to MP	Mining	Ovb backfill	Water accum.	Flooded by A2S2	Mining	Mining	
2018	Q1	T+W, P from/to A2S2	T+W, P from/to MP	Mining	Ovb backfill	Water accum.	Flooded by A2S2	Mining	Mining	
	Q2	T+W, P from/to A2S2	T+W, P from/to MP	Mining	Ovb backfill	Water accum.	Flooded by A2S2	Mining	Mining	
	Q3	T+W, P from/to A2S2	T+W, P from/to MP	Mining	Ovb backfill	Water accum.	Flooded by A2S2	Mining	Mining	
	Q4	T+W, P from/to A2S2	T+W, P from/to MP	Water accum.	Ovb backfill	Water accum.	Flooded by A2S2			
2019	Q1	T+W, P from/to A2S2	T+W, P from/to MP	Water accum.	Ovb backfill	Water accum.	Flooded by A2S2			
	Q2	T+W, P from/to A2S2	T+W, P from/to MP	Water accum.	Ovb backfill	Water accum.	Flooded by A2S2			
	Q3	T+W, P from/to A2S3	Overflow to A2S3	T+W, P from/to MP	Ovb backfill	Water accum.	Flooded by A2S2			Mining
	Q4	T+W, P from/to A2S3	Overflow to A2S3	T+W, P from/to MP	Ovb backfill	Water accum.	Flooded by A2S2			Mining
2020	Q1	T+W, P from/to A2S2	Overflow to A2S3	T+W, P from/to MP	Ovb backfill	Water accum.	Flooded by A2S2			Mining
	Q2	T+W, P from/to A2S2	Overflow to A2S3	T+W, P from/to MP	Ovb backfill	Water accum.	Flooded by A2S2			Mining
	Q3	T+W, P from/to A2S3	Overflow to A2S3	T+W, P from/to MP	Ovb backfill	Water accum.	Flooded by A2S2			Mining
	Q4	T+W, P from/to A2S3	Overflow to A2S3	T+W, P from/to MP	Ovb backfill	Water accum.	Flooded by A2S2			Mining

Notes:

T+W: Deposition of tailings (T) and collection of water (W)

P from/to A2S2: Pumping water to and from Main Pit to Area 2 Stage 2 Pit

P from/to MP: Pumping water to and from Main Pit

Overflow to A2S3: Area 2 Stage 2 Pit overflowing into Area 2 Stage 3 Pit

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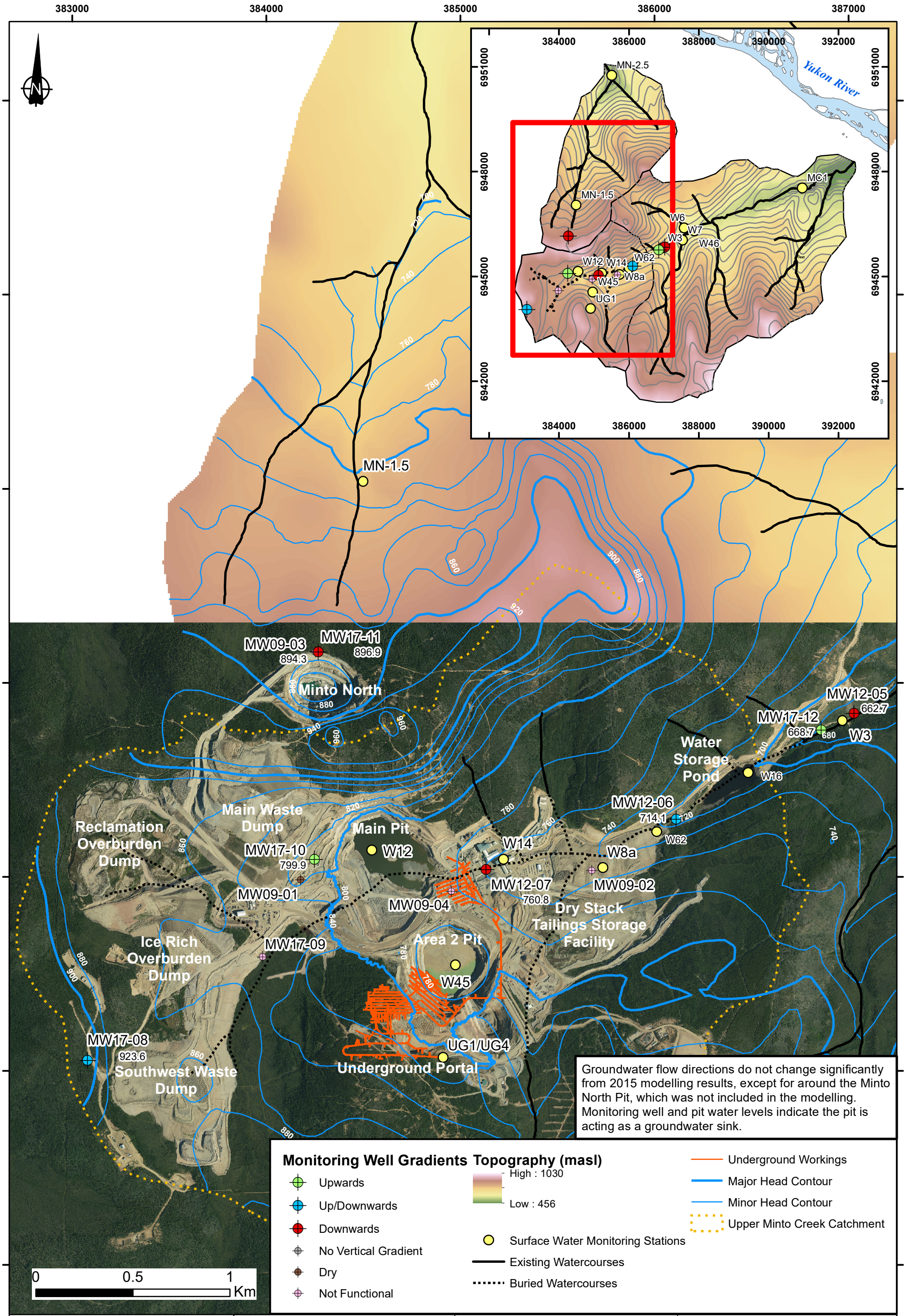
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Minto Mine

Minto Mine – 2019 Groundwater Review and Summary of OAMP SPT Exceedances

Timeline of Mine Sequence and Water Management

Date:	Approved:	Figure:
May 2020	LV	2



Notes:
1. Data presented in NAD 1983 UTM Zone 8N.
2. Base orthophoto provided by Minto Mine, 2017.
3. Head contours are in masl with 20 m intervals
4. Water levels based on Q4 2020 measurements. Groundwater contours based on 2015 groundwater model with adjustments to fit current water levels.
5. Groundwater contours reflect near surface groundwater, represented by shallow-most sensors in multi-level monitoring wells unless that sensor is dry, in which case the second shallowest value is reported. Well is marked "Dry" if all sensors are dry.
6. Value below Well ID labels indicate hydraulic head (masl).

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Filename: 2021 WT Contours_1CM002.055

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Minto Mine

2020 Annual Groundwater Review

2020 Groundwater Contours and Vertical Gradients

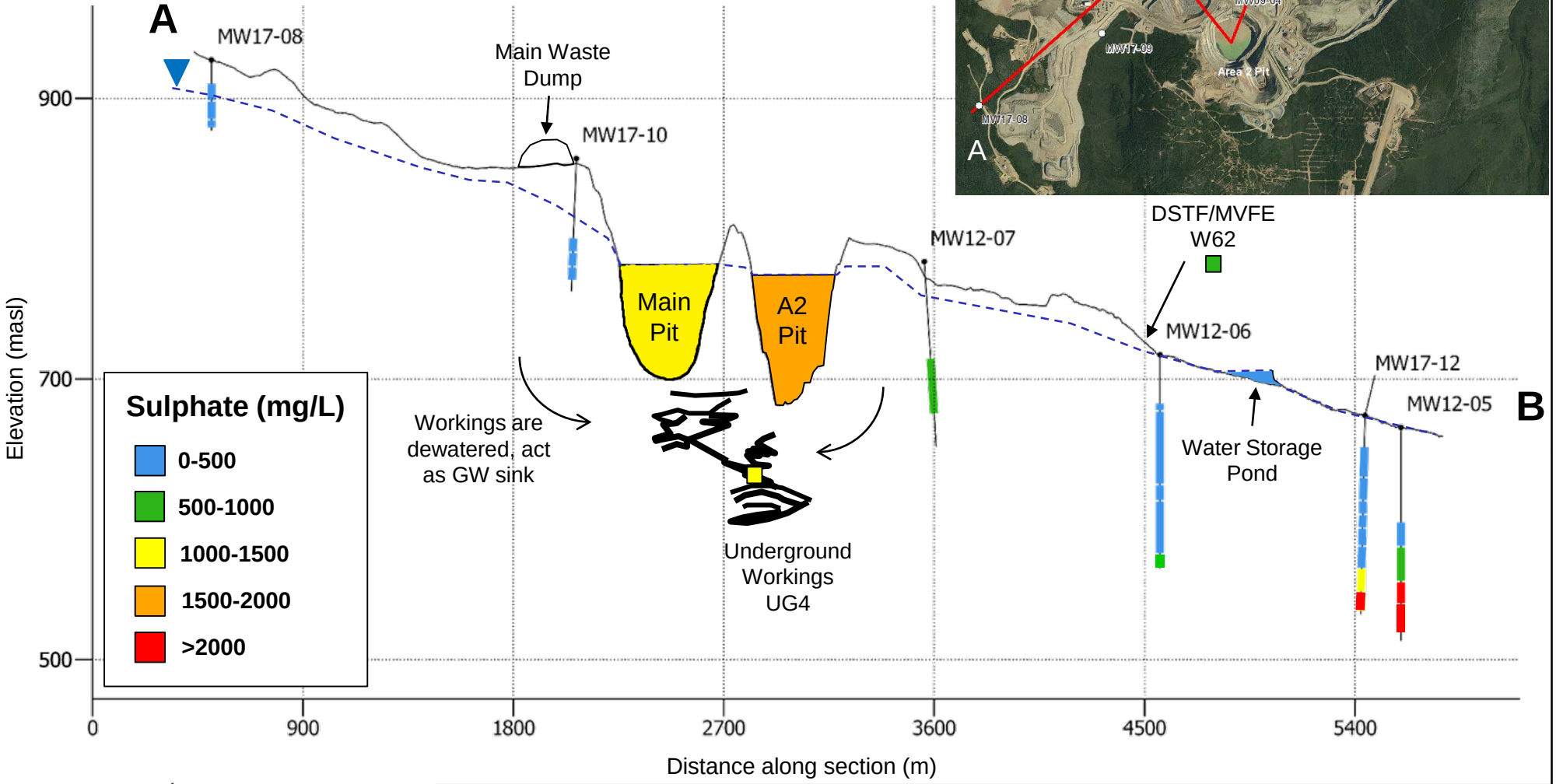
Date:	Approved:	Figure:
March 2021	MSi	#

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Notes:

1. Base orthophoto provided by Minto Mine, 2017
2. Water table based on Dec 2020 measurements, combined with 2015 groundwater model results
3. Sulphate concentrations are maximum observed value at a given location in 2020.
4. For most ports, maximum sulphate concentration fell in the same category as the mean concentration throughout 2020. Exceptions to this are MW12-05-01 (mean of 1557 mg/L), MW12-05-02 (mean of 1840 mg/L), MW12-07-02 (mean of 357 mg/L) and MW17-12-01 (mean of 1592 mg/L). All outliers except for MW12-05-02 occurred in February.
5. Main Pit bottom elevation estimated to be 700m.
6. Underground workings location is roughly accurate, but not to scale due to nature of diagram. Workings could not be projected onto section.





Scale: 1:25,000

Vertical exaggeration: 6x

0m 1000m

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Job No: 1CM002.055

Filename: Fig5_Xsection_Sulphate_rev00.pdf

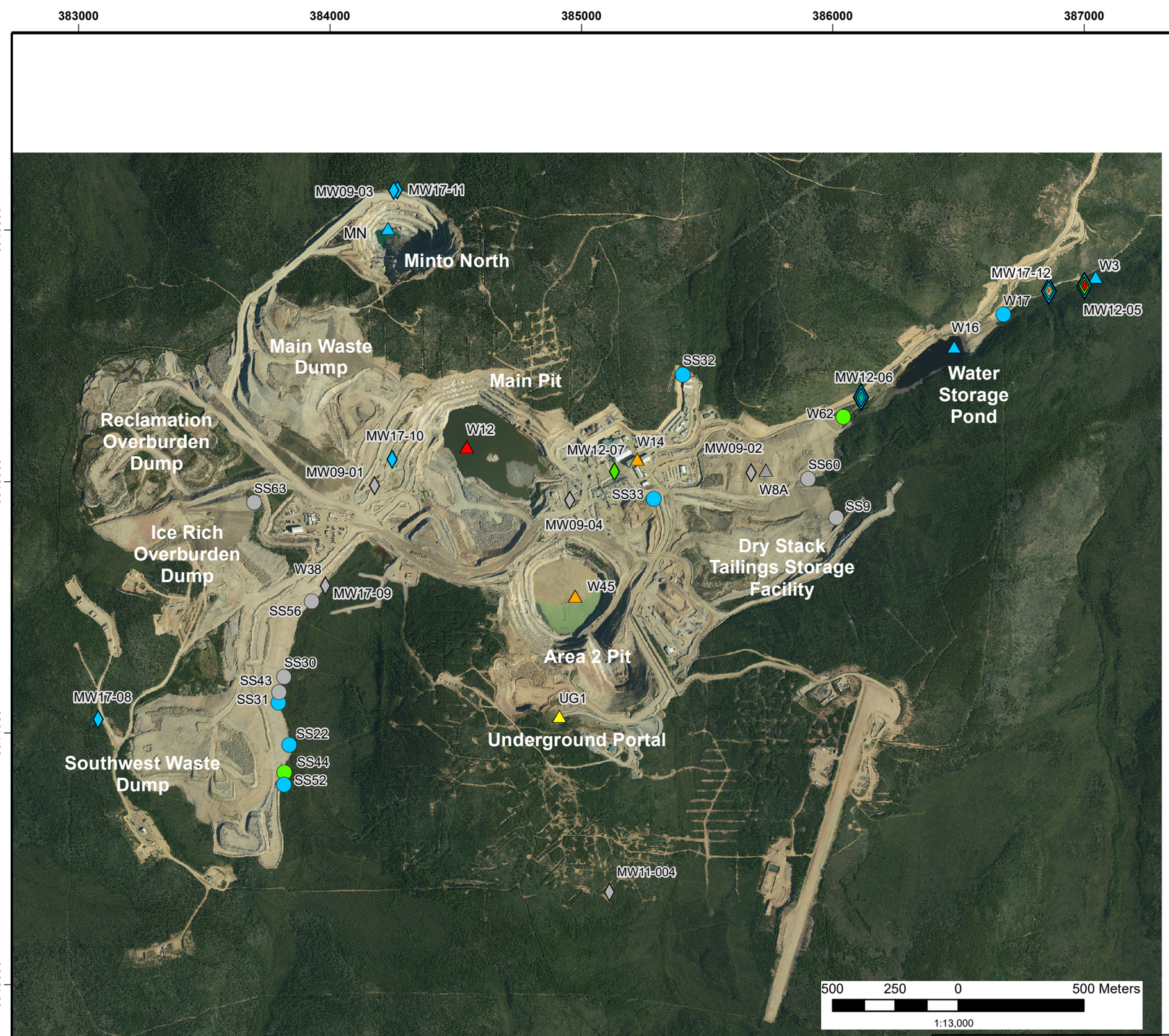
Minto Mine

Minto Mine – 2020 Groundwater Review and Summary of OAMP SPT Exceedances

2020 Monitoring Well Sulphate Concentration Fence Diagram

Date:	Approved:	Figure:
March 2021	LV	4

\\VAN-SVR01\Projects\01_SITES\Minto\1CM002.057_Enviro_Tracer_Study\1040_AutoCAD\minto_SO4_fence_section_inset.mxd

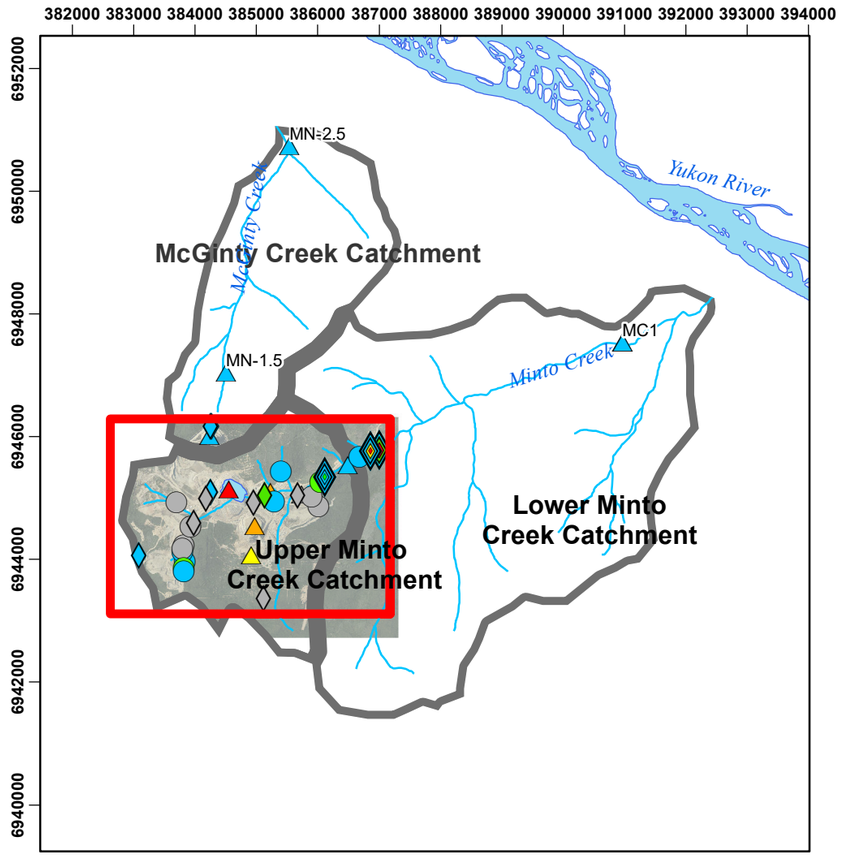


Legend

Sulphate (mg/L)

- 0-500
- 500-1000
- 1000-1500
- 1500-2000
- >2000
- No 2020 Data

- Surface Station
- Groundwater Well
- Seep Station



Notes:
1. Data presented in NAD 1983 UTM Zone 8N.
2. Base orthophoto provided by Minto Mine, 2017.
3. Posted sulphate concentrations are maximum observed at a given location in 2020.
4. Multi-level monitoring wells are presented as nested diamonds only if concentrations are variable between depths.
5. The inside marker in a nested diamond represents the deepest port, with diamond size increasing towards the ground surface.
6. Ports shallower than Zone 4 in MW12-05 have sulphate concentrations <500 mg/L and are not presented on the figure.
7. Maximum 2020 sulphate concentration in MW12-05-02 and MW12-05-01 were 2540 mg/L, all other concentrations were <1500 mg/L.

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Job No: 1CM002.055
Filename: minto_GW_so4_colour_2020.mxd

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A PEMBRIDGE RESOURCES COMPANY

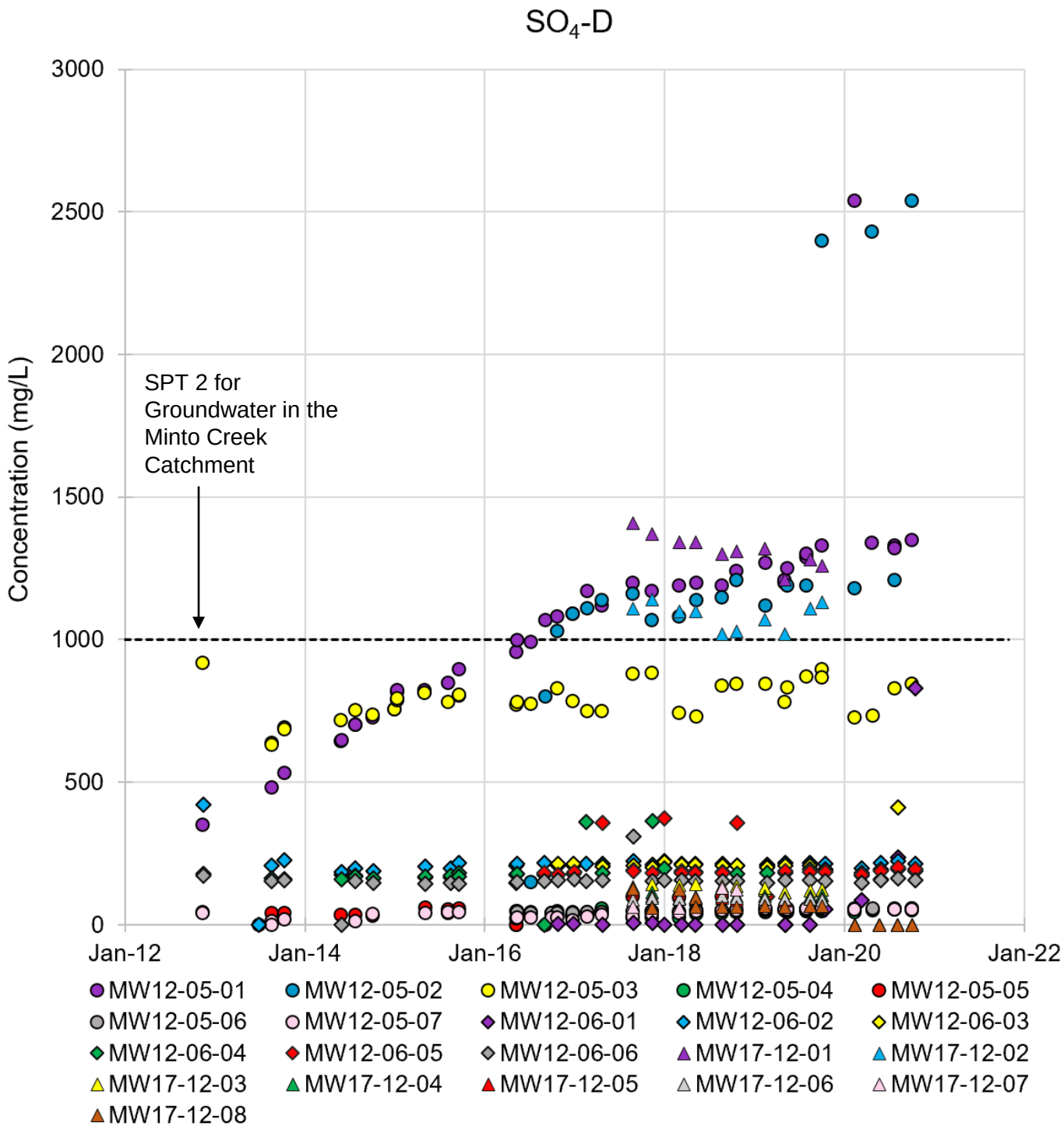
MINTO MINE

2020 Groundwater Quality and OAMP Exceedance Review

Maximum Sulphate Concentration in 2020

Date: March 2021 | Approved: MSi | Figure: **5**

\\srk.ad.srk\Projects\01_SITES\Minto1\CM002.055_AMP_Trigger_Responses\20210301_2020_GW_Review\03_Figures\minto_GW_so4_colour_2020.mxd



X:\01_SITES\Minto\1CM002.055_AMP_Trigger_Responses\20200304_2019_GW_Review\Working Files\[1CM002.055_ChemistryDataFigures_WorkingFile_Rev01_lv.xlsx]MW17-10_Charts

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MINTO EXPLORATIONS
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Minto Mine – 2020 Groundwater Review and Summary of OAMP SPT Exceedances

Sulphate at MW12-05, MW12-06 and MW17-12

Job No: 1CM002.057

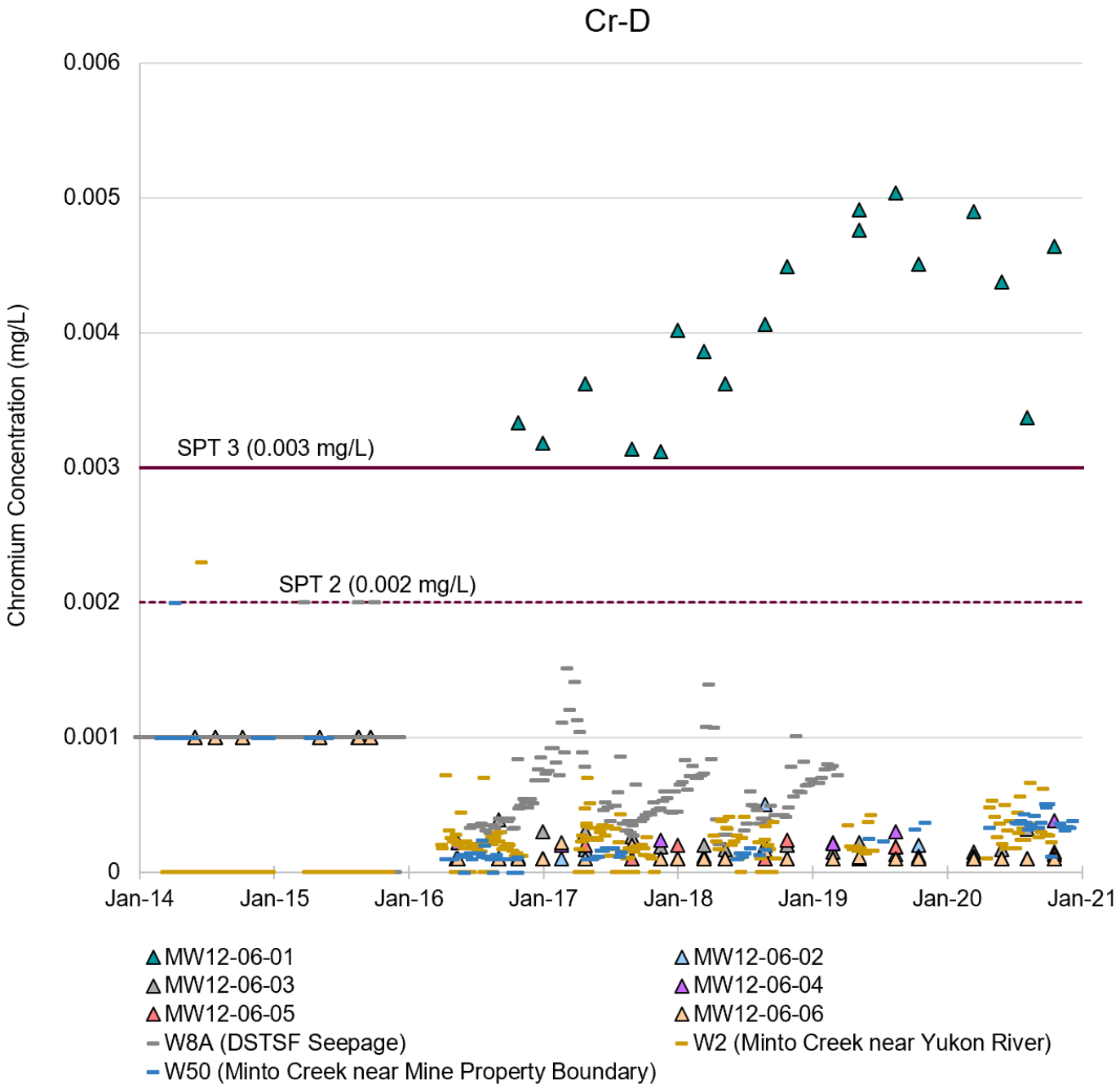
Filename: Fig7&8_ChemistryPlots_1CM002.057

Minto Mine

Date: May 2021

Approved: LV

Figure: **6**



X:\01_SITES\Minto\1CM002.055_AMP_Trigger_Responses\20200304_2019_GW_Review\Working Files\[1CM002.055_ChemistryDataFigures_WorkingFile_Rev01_lv.xlsx]MW17-10_Charts

srk consulting

MINTO EXPLORATIONS
A PEMBRIDGE RESOURCES COMPANY

Minto Mine – 2020 Groundwater Review and Summary of OAMP SPT Exceedances

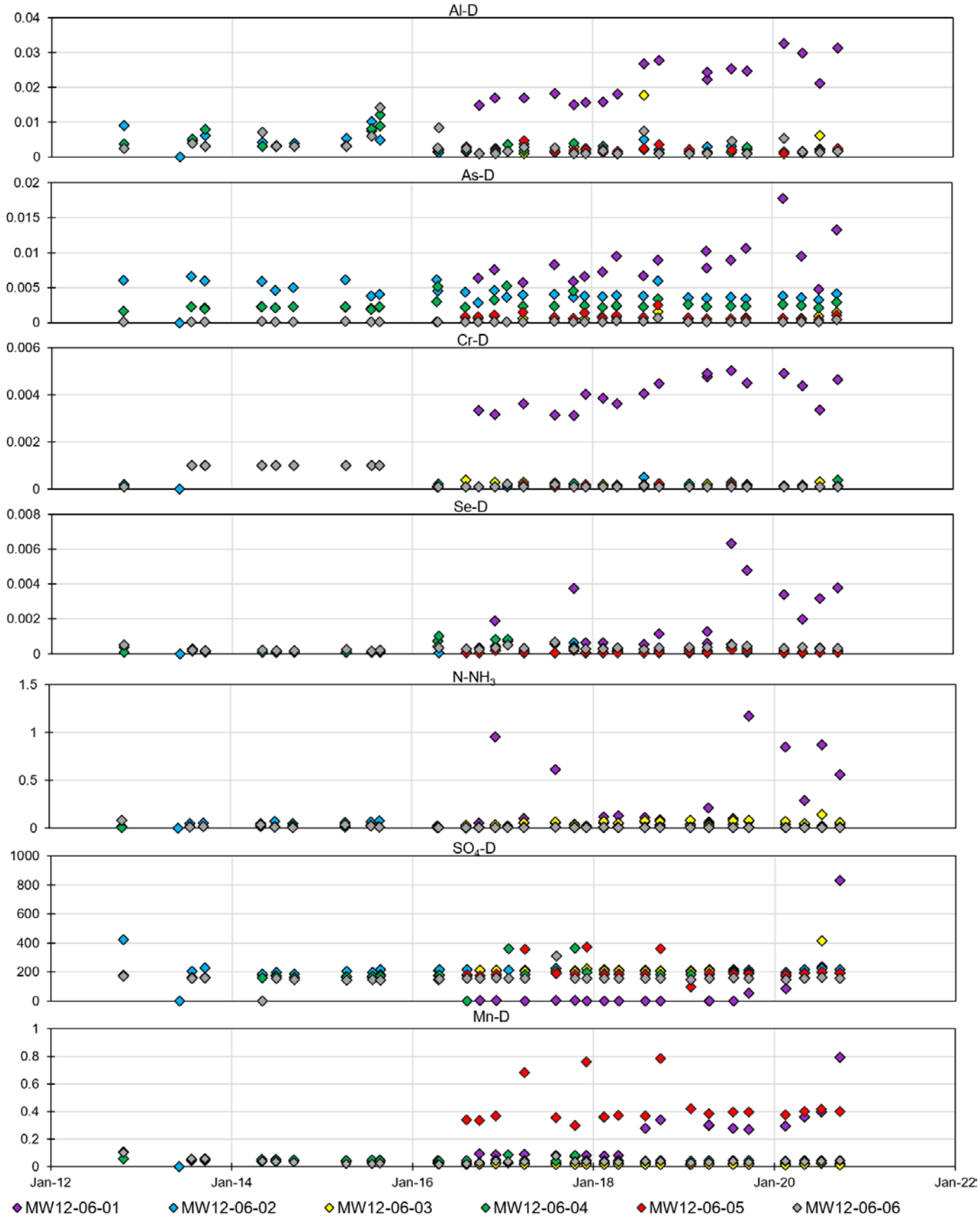
Chromium at MW12-06, W8A and W2

Job No: 1CM002.057

Filename: Fig7&8_ChemistryPlots_1CM002.057

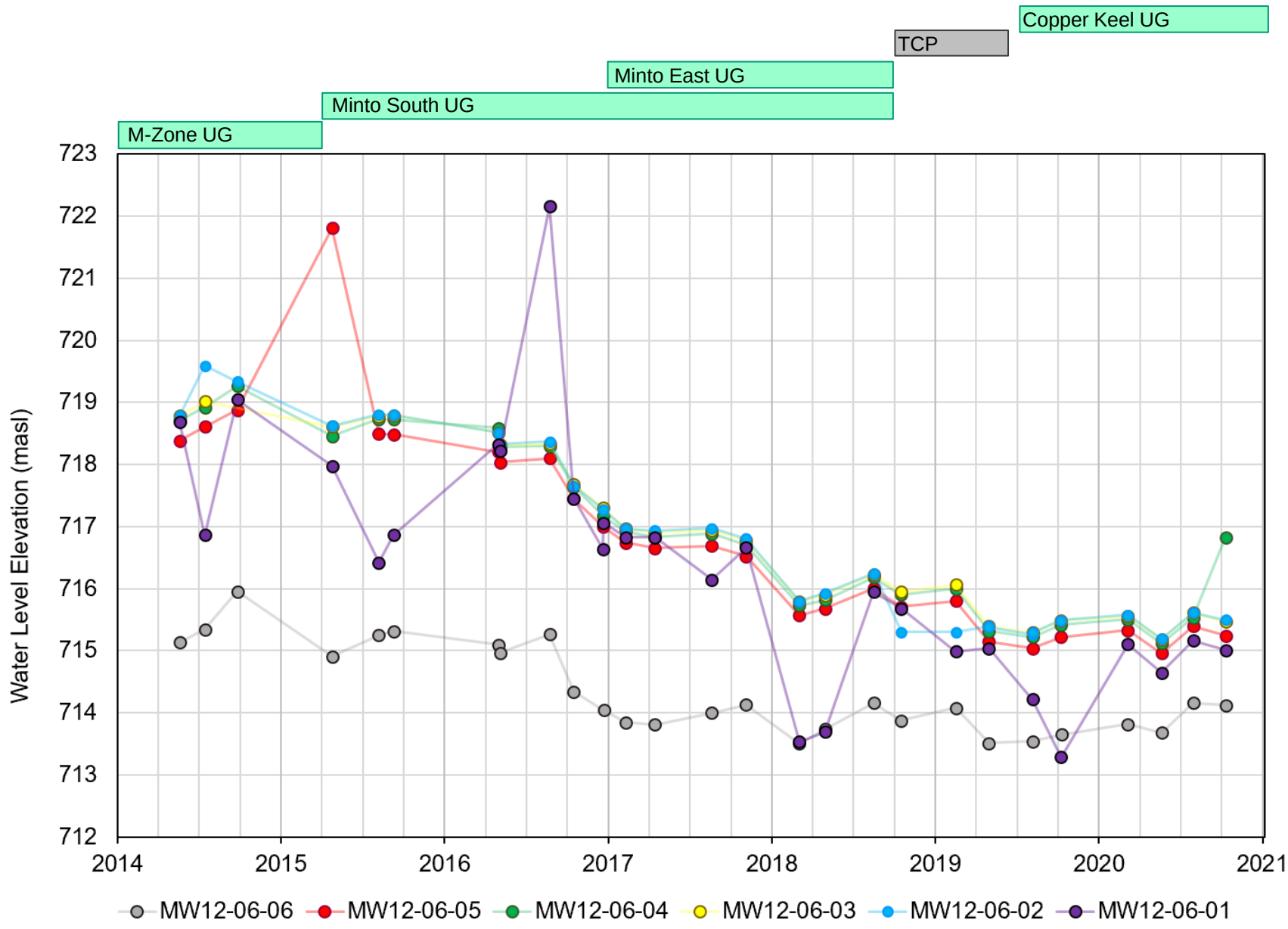
Minto Mine

Date:	Approved:	Figure:
May 2021	LV	7



X:\01_SITES\Minto\1CM002.055_AMP_Trigger_Responses\20200304_2019_GW_Review\Working Files\[1CM002.055_ChemistryDataFigures_WorkingFile_Rev01_lv.xlsx]MW17-10_Charts

srk consulting	MINTO EXPLORATIONS A PEMBRIDGE RESOURCES COMPANY	Minto Mine – 2020 Groundwater Review and Summary of OAMP SPT Exceedances		
		Iron and Manganese at MW12-06-01		
Job No: 1CM002.057 Filename: Fig7&8_ChemistryPlots_1CM002.057	Minto Mine	Date: May 2021	Approved: LV	Figure: **8**



Notes:
1. TCP refers to the Temporary Closure Period

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Job No: 1CM002.057

Filename: Fig9_MW12-06_WLs.pptx

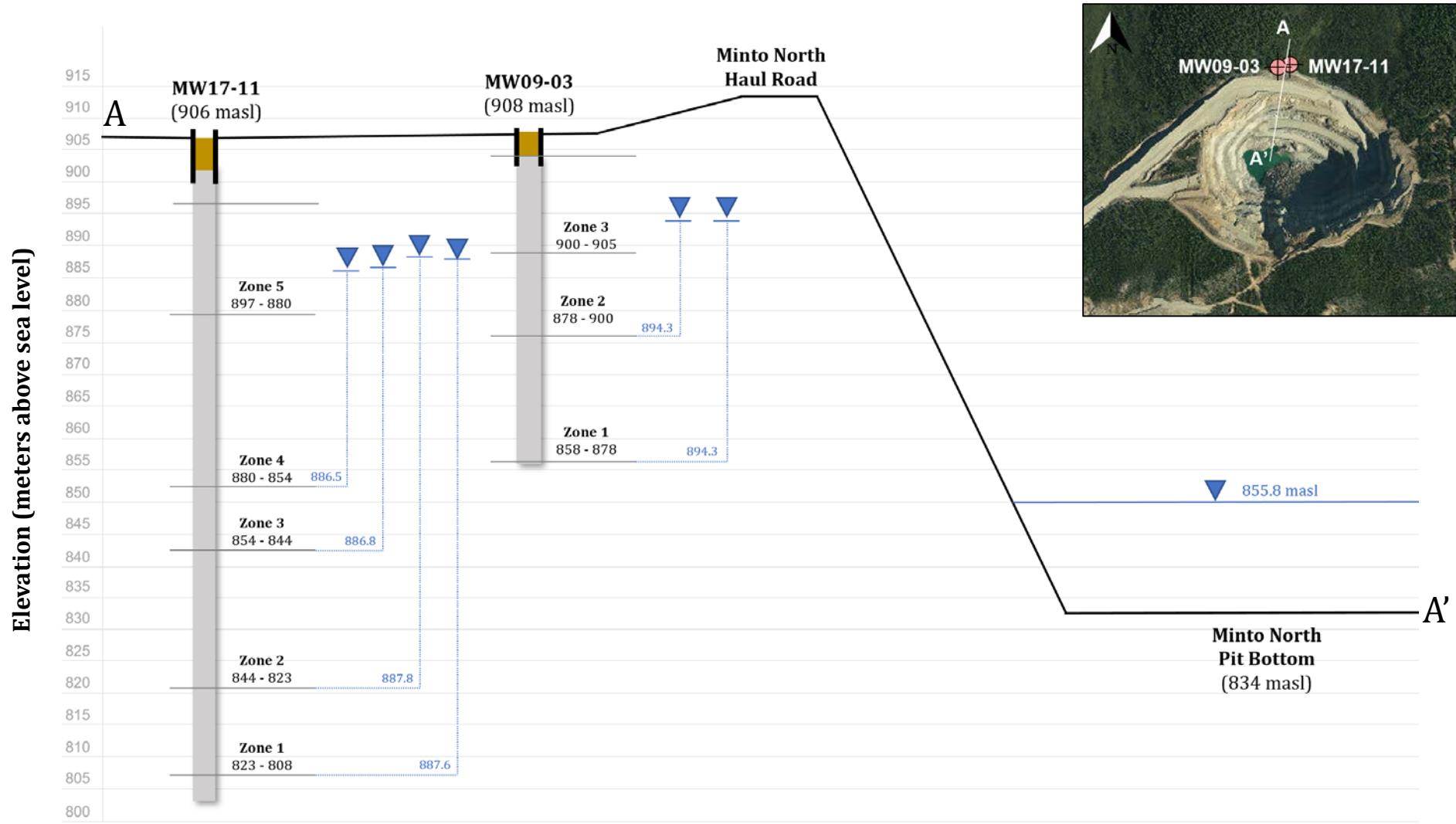
MINTO

Minto Mine

Minto Mine – 2020 Groundwater Review and Summary of OAMP SPT Exceedances

Water Level Elevations in MW12-06 and Timeline of Underground Workings

Date:	Approved:	Figure:
March 2021	LV	9



Notes:
Drawing is not to scale
Groundwater levels in MW17-11 recorded in Oct 2020
Pit water level and MW09-03 recorded in Dec 2020

LEGEND

- Overburden
- Granodiorite
- Water Level
- Monitoring Well

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Job No: 1CM002.044
Filename: MintoNorthCrossSection_Figure_rev01.pptx

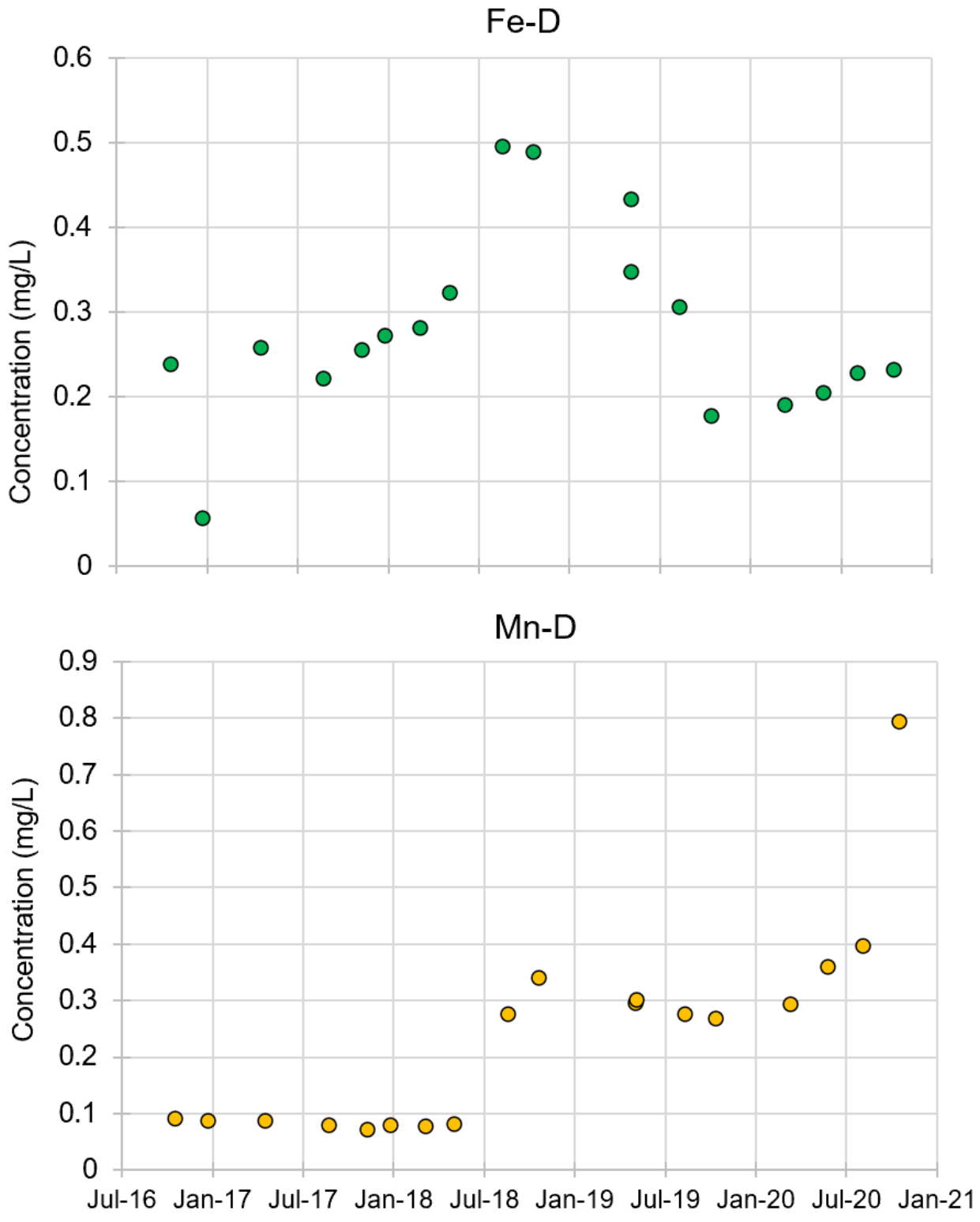
MINTO

Minto Mine

2020 Groundwater Review

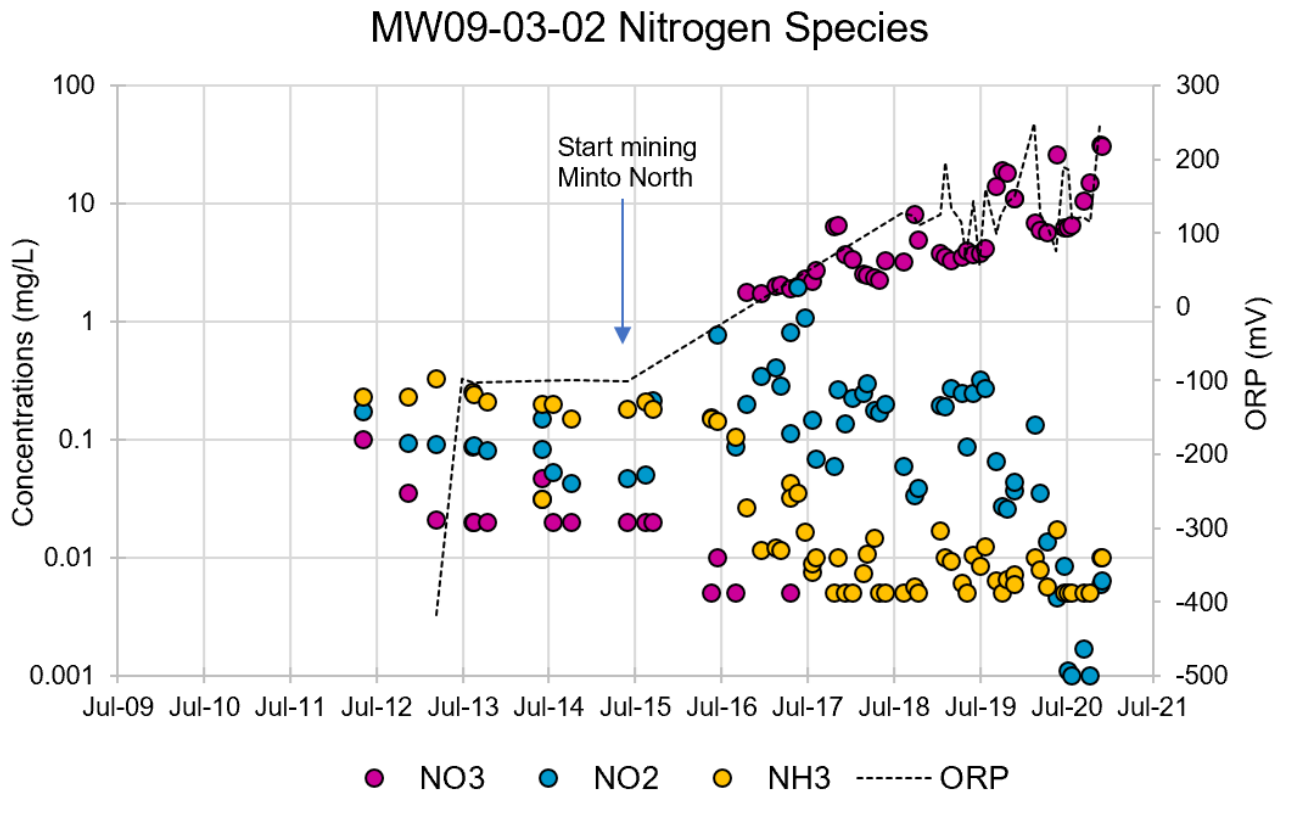
Cross Section of Minto North Pit

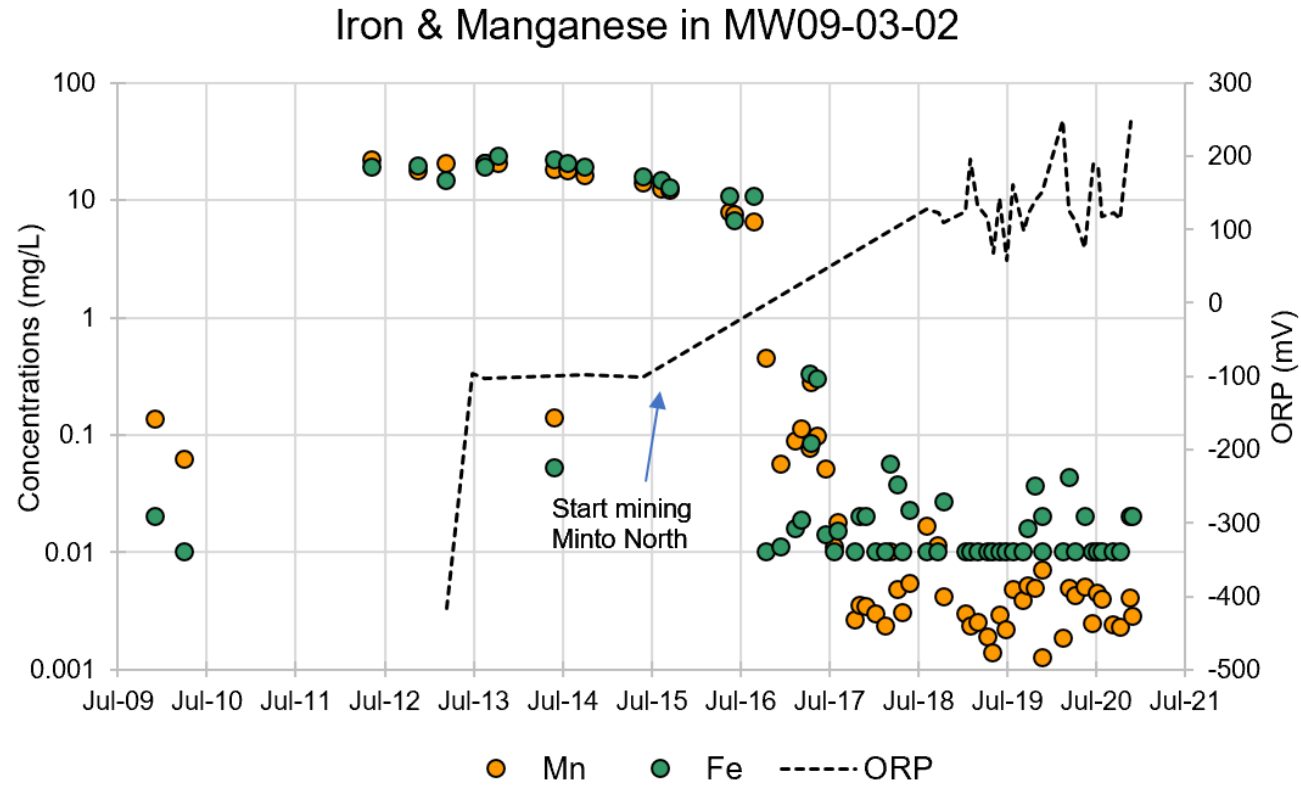
Date:	Approved:	Figure:
March 2021	LV	10



X:\01_SITES\Minto\1CM002.055_AMP_Trigger_Responses\20200304_2019_GW_Review\Working Files\[1CM002.055_ChemistryDataFigures_WorkingFile_Rev01_lv.xlsx]MW17-10_Charts

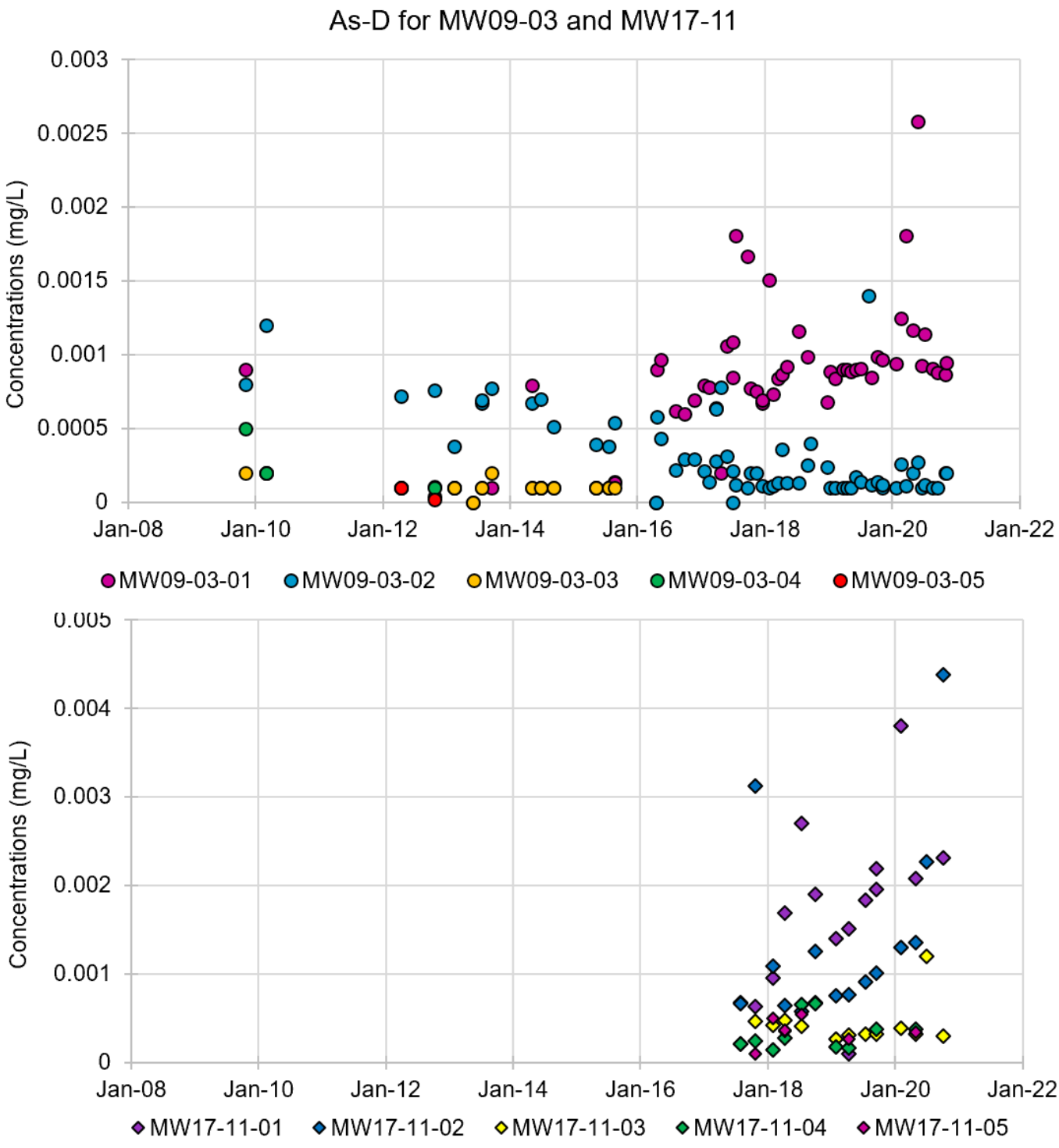
srk consulting	MINTO EXPLORATIONS A PEMBRIDGE RESOURCES COMPANY	Minto Mine – 2020 Groundwater Review and Summary of OAMP SPT Exceedances		
		Iron and Manganese MW12-06-01		
Job No: 1CM002.057 Filename: Fig10-16_ChemistryPlots_1CM002.057	Minto Mine	Date: March 2021	Approved: LV	Figure: **11**





X:\01_SITES\Minto\1CM002.055_AMP_Trigger_Responses\20200304_2019_GW_Review\Working Files\[1CM002.055_ChemistryDataFigures_WorkingFile_Rev01_lv.xlsx]MW17-10_Charts

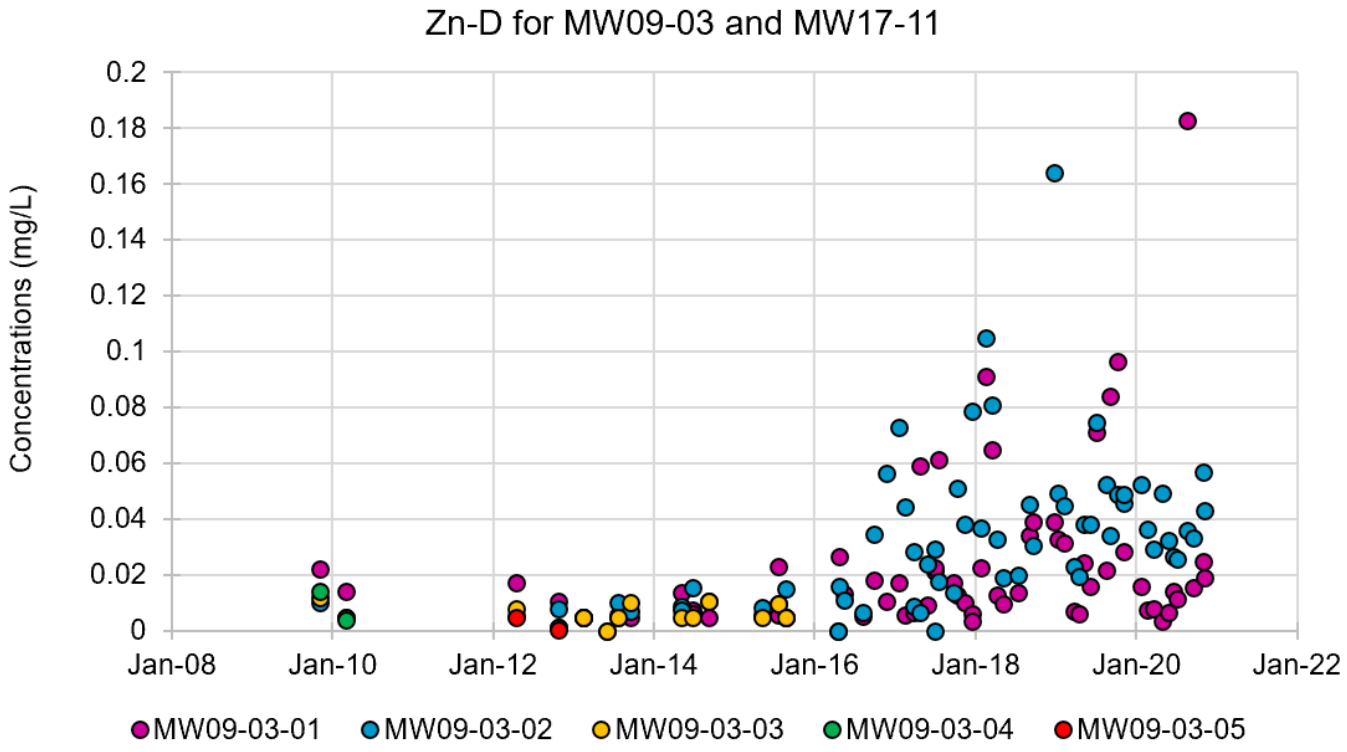
srk consulting	MINTO EXPLORATIONS A PEMBRIDGE RESOURCES COMPANY	Minto Mine – 2020 Groundwater Review and Summary of OAMP SPT Exceedances		
		Iron, Manganese and Nitrogen Species Compared to ORP in MW09-03-02		
Job No: 1CM002.057 Filename: Fig10-16_ChemistryPlots_1CM002.057	Minto Mine	Date: March 2021	Approved: LV	Figure: **12**

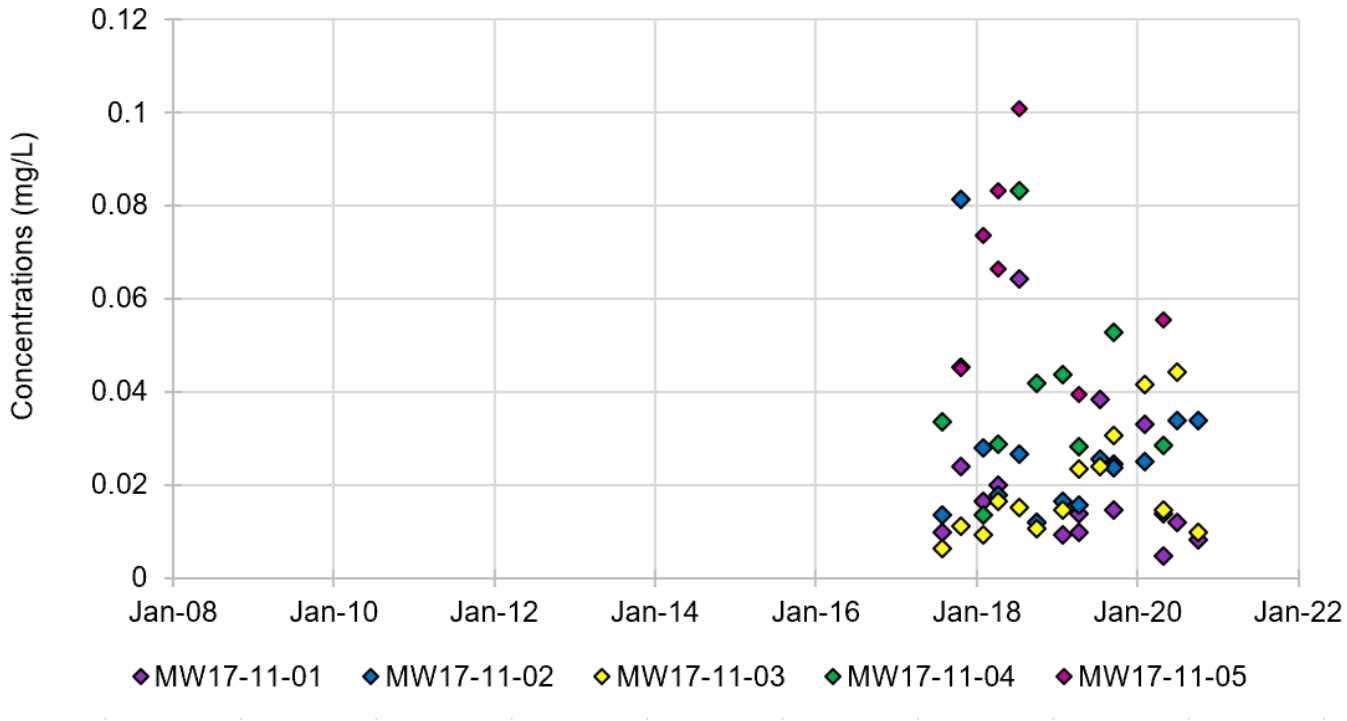


Outliers were removed for interpretation:
MW09-03-01: 0.0093 (Oct 19, 2018), 0.0041 (Sept 13, 2019), 0.0026 (Jun 26, 2020)
MW17-11-01: 0.030 (Jul 26, 2020)

X:\01_SITES\Minto\1CM002.055_AMP_Trigger_Responses\20200304_2019_GW_Review\Working Files\[1CM002.055_ChemistryDataFigures_WorkingFile_Rev01_lv.xlsx]MW17-10_Charts

srk consulting	MINTO EXPLORATIONS A PEMBRIDGE RESOURCES COMPANY	Minto Mine – 2019 Groundwater Review and Summary of OAMP SPT Exceedances
		Arsenic in MW09-03 and MW17-11
Job No: 1CM002.057 Filename: Fig10-16_ChemistryPlots_1CM002.057	Minto Mine	Date: March 2021 / Approved: LV / Figure: **13**





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MINTO EXPLORATIONS
A PEMBRIDGE RESOURCES COMPANY

Minto Mine – 2019 Groundwater Review and Summary of OAMP SPT Exceedances

Zinc in MW09-03 and MW17-11

Job No: 1CM002.057

Filename: Fig10-16_ChemistryPlots_1CM002.057

Minto Mine

Date:	Approved:	Figure:
March 2021	LV	**14**



Outliers were removed for interpretation:
MW09-03-01: 0.001 (Feb 23, 2020)
MW17-11-01: 0.007 (Aug 12, 2018)
MW17-11-03: 0.0004 (Oct 14, 2019)
MW17-11-04: 0.0005 (Oct 14, 2019)

X:\01_SITES\Minto\1CM002.055_AMP_Trigger_Responses\20200304_2019_GW_Review\Working Files\[1CM002.055_ChemistryDataFigures_WorkingFile_Rev01_lv.xlsx]MW17-10_Charts

srk consulting	MINTO EXPLORATIONS A PEMBRIDGE RESOURCES COMPANY	Minto Mine – 2019 Groundwater Review and Summary of OAMP SPT Exceedances		
		Cadmium in MW09-03 and MW17-11		
Job No: 1CM002.057 Filename: Fig10-16_ChemistryPlots_1CM002.057	Minto Mine	Date: March 2021	Approved: LV	Figure: **15**

Attachment 1: SPT Threshold Concentrations

Attachment 1

Minto Creek SPTs

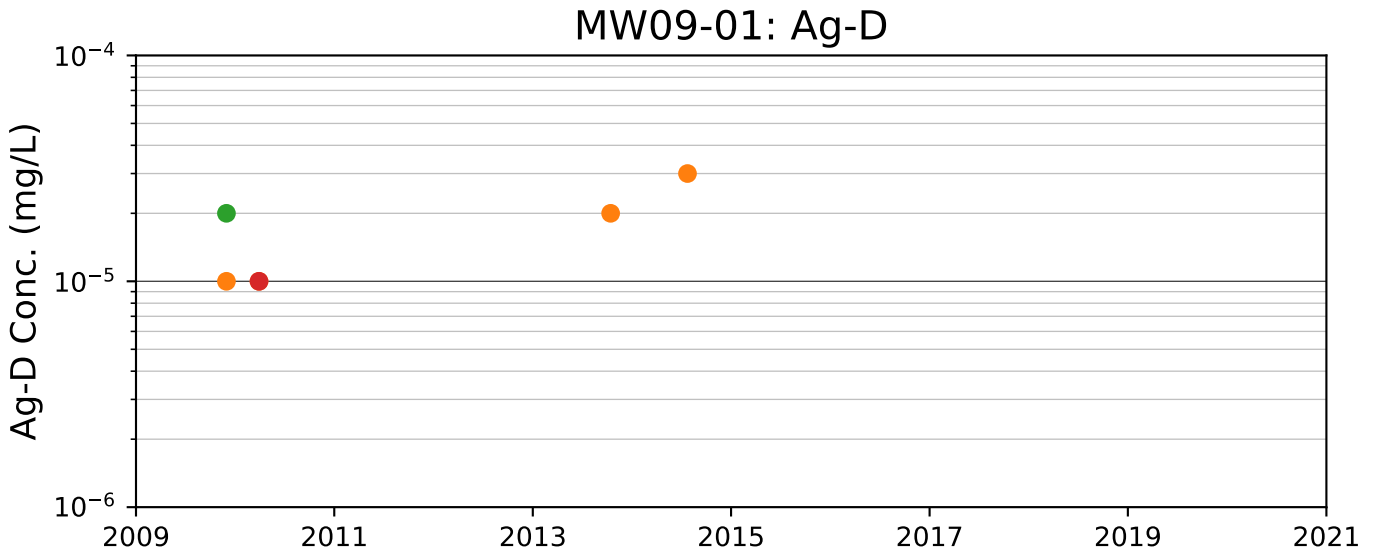
	Ag-D	Al-D	As-D	Cd-D	Cr-D	Cu-D	Pb-D	Mo-D	Ni-D	Se-D	Zn-D	N-NO3	Ammonia	Sulphate
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
SPT-2	0.00030	0.30	0.015	0.003	0.0020	0.030	0.012	0.22	0.165	0.0060	0.090	27	0.75	1000
SPT-3	0.00046	0.48	0.025	0.006	0.0030	0.060	0.020	0.34	0.34	0.0093	0.13	45	1.0	4951

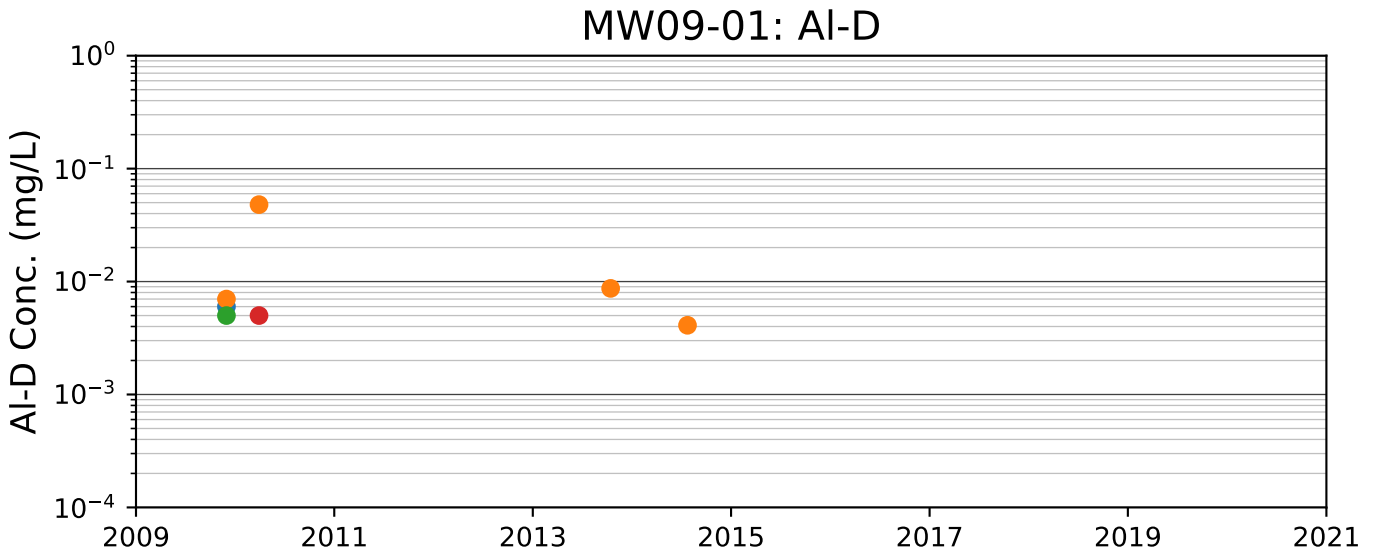
McGinty Creek SPTs

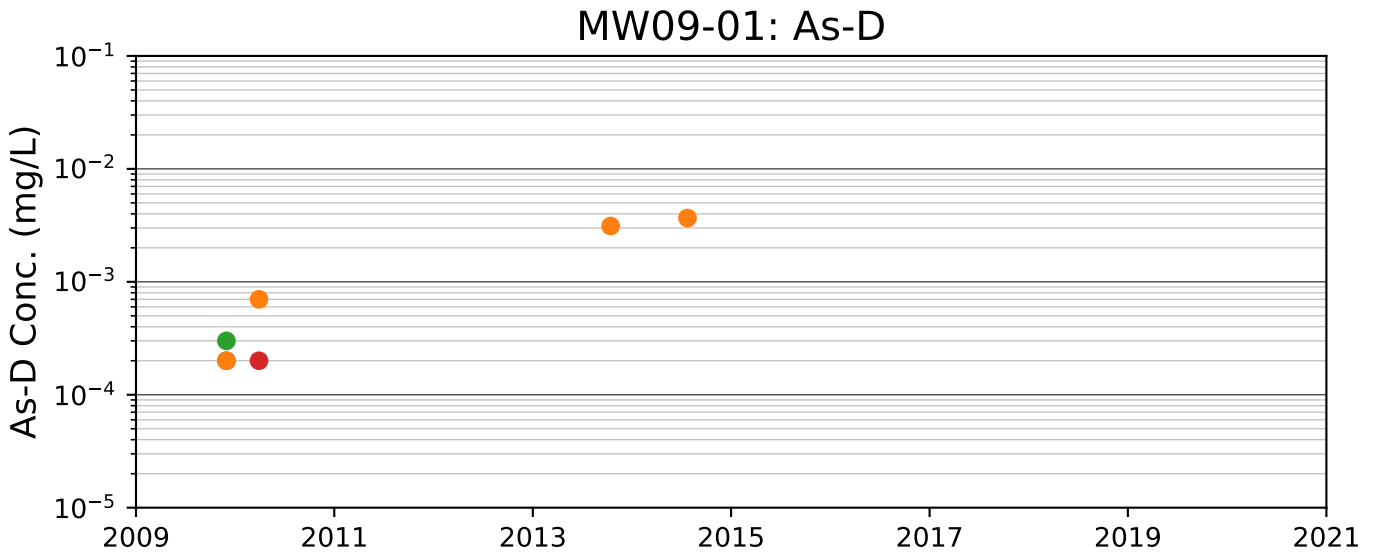
		Ag-D	Al-D	As-D	Cd-D	Cr-D	Cu-D	Pb-D	Mo-D	Ni-D	Se-D	Zn-D	N-NO3	Ammonia	Sulphate
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
MW09-03-01	SPT-1	0.000010	0.0065	0.00011	0.000075	0.000500	0.00155	0.0001	0.005	0.0021	0.0001	0.013	0.13	0.067	24
	SPT-2	0.000016	0.0101	0.00081	0.000272	0.000575	0.00625	0.0003	0.026	0.0060	0.0015	0.022	0.28	0.133	38
MW09-03-02	SPT-1	0.000018	0.0073	0.00074	0.000031	0.000500	0.00263	0.0001	0.018	0.0009	0.0005	0.010	0.03	0.230	7
	SPT-2	0.000034	0.0095	0.00092	0.000272	0.000796	0.01080	0.0002	0.062	0.0026	0.0040	0.015	0.07	0.282	67
MW09-03-03	SPT-1	0.000010	0.0047	0.00005	0.000023	0.000500	0.00247	0.0001	0.006	0.0005	0.0004	0.008	0.50	0.020	12
	SPT-2	0.000010	0.0075	0.00014	0.000069	0.000500	0.00500	0.0003	0.018	0.0011	0.0004	0.011	0.54	0.058	13

Source: Minto 2017-02 OAMP, pages 21 and 25 (Minto, 2017)

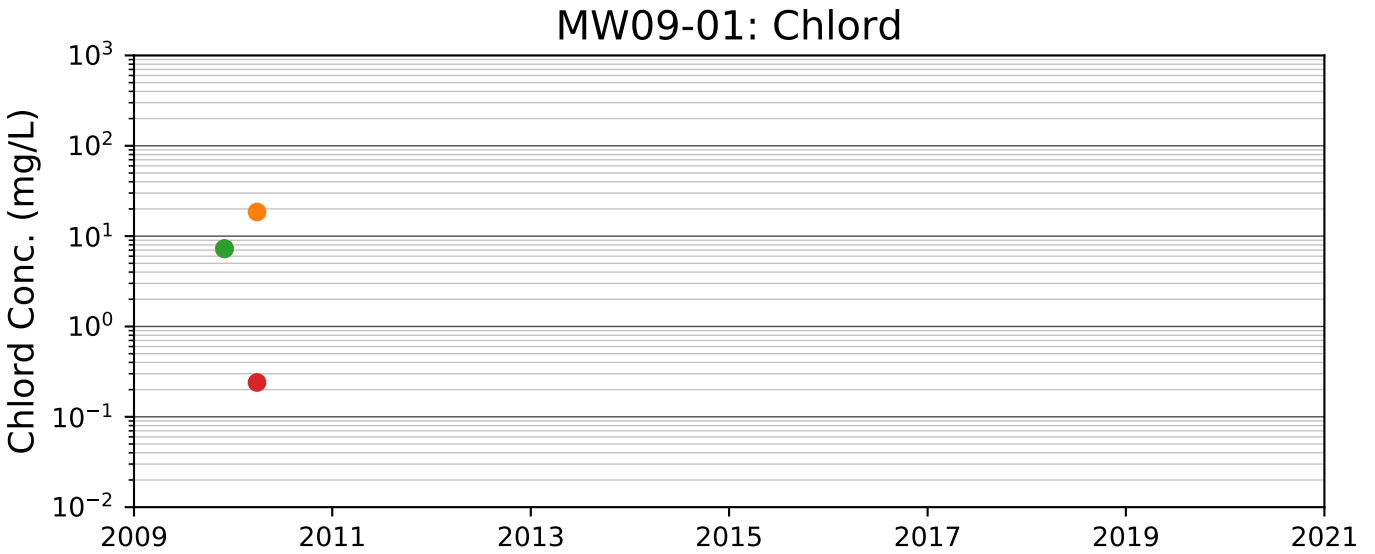
Attachment 2: Groundwater Monitoring Data for All CoCs

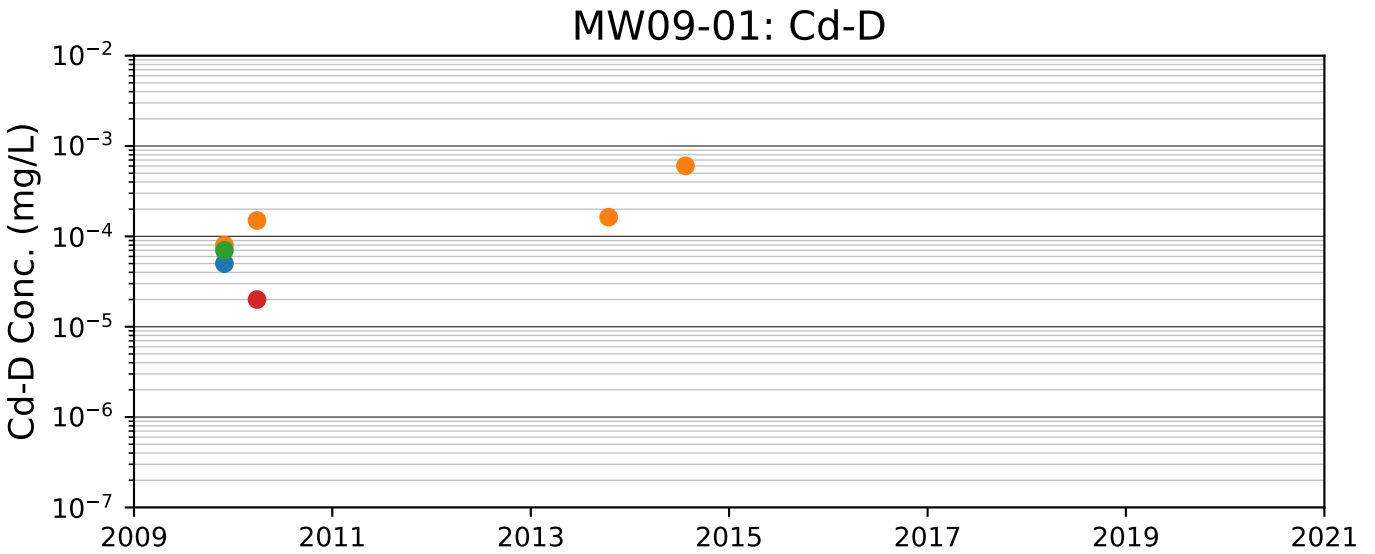

MW09-01: Ag-D
Ag-D Conc. (mg/L)
10^{-4}
10^{-5}
10^{-6}
2009
2011
2013
2015
2017
2019
2021

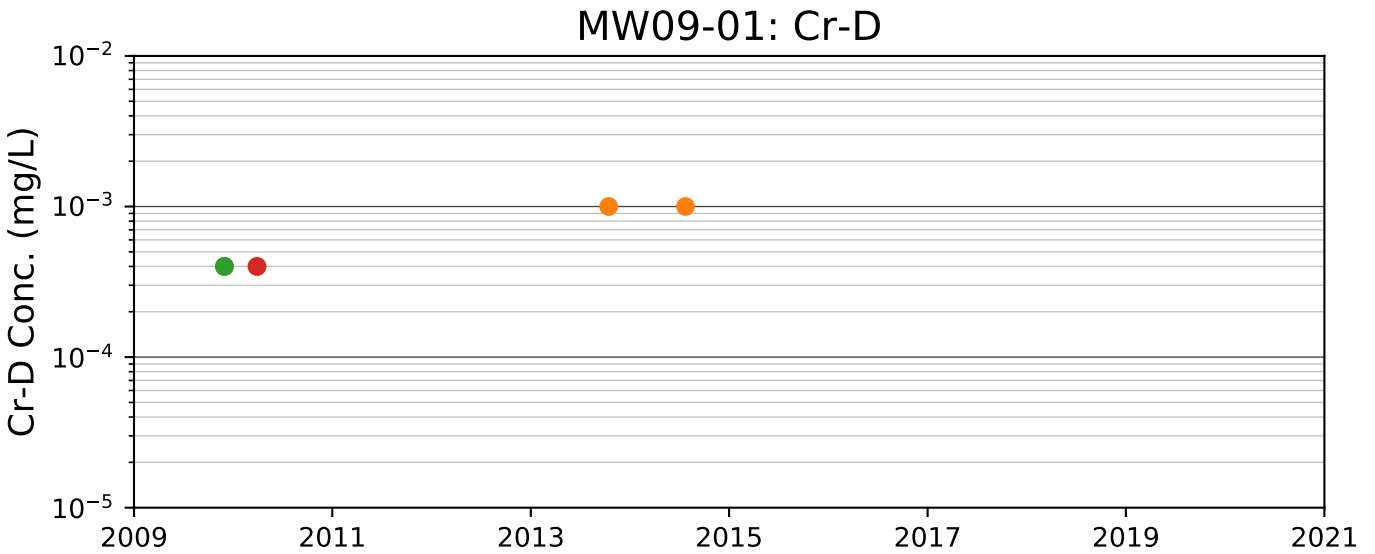

MW09-01: Al-D
Al-D Conc. (mg/L)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
2009
2011
2013
2015
2017
2019
2021

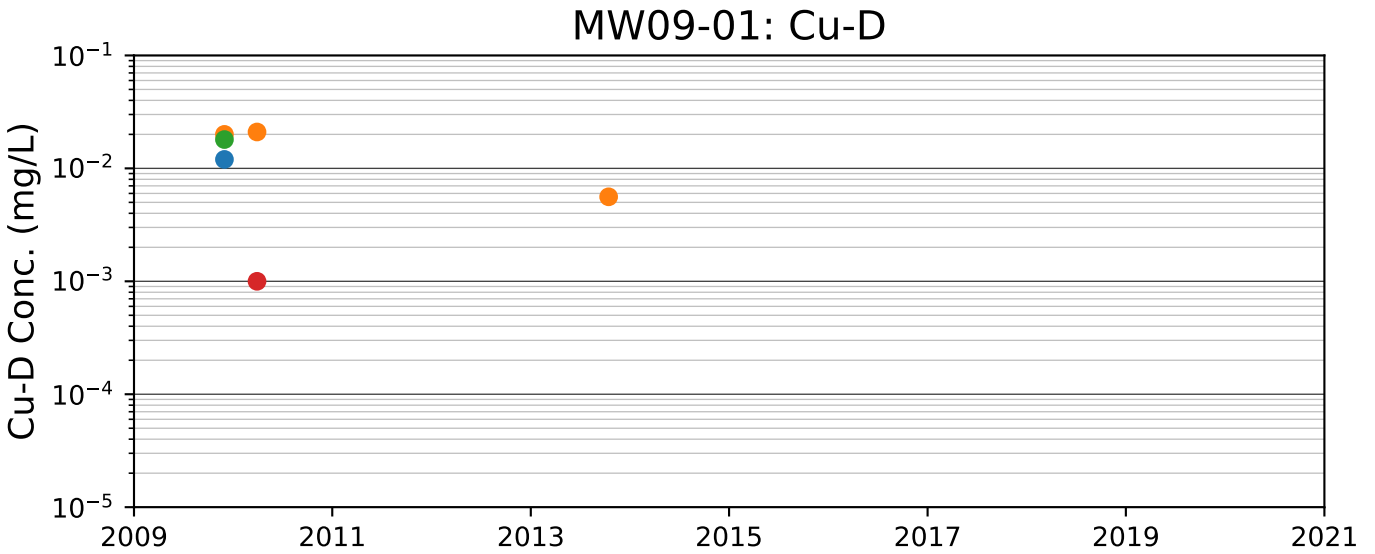

MW09-01: As-D
As-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021

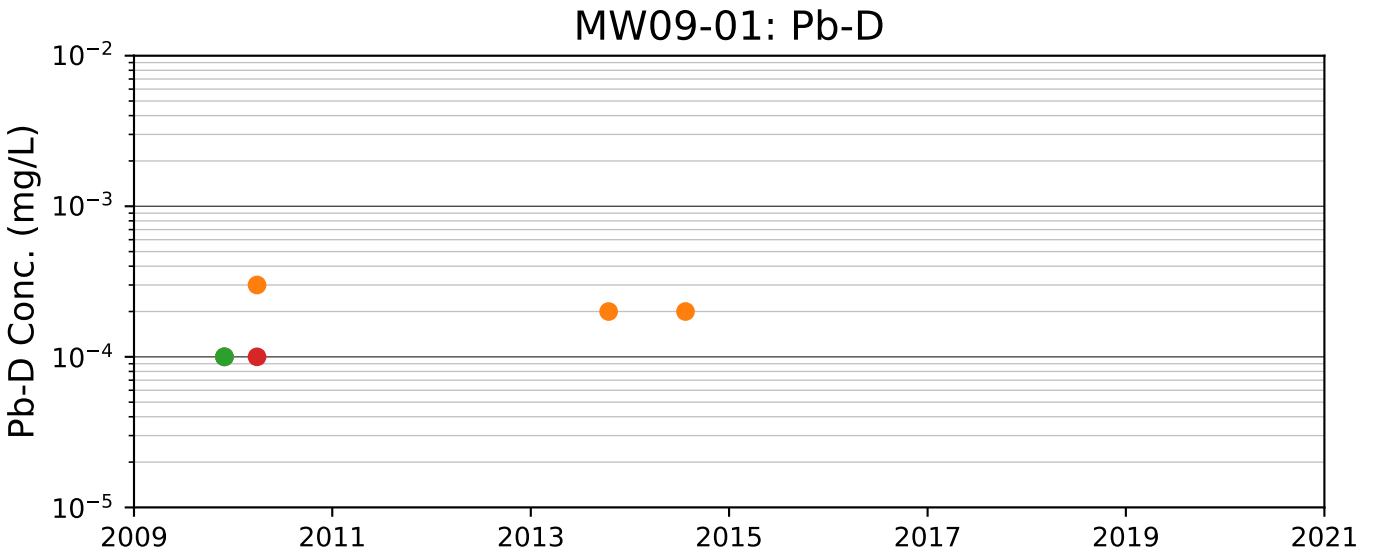

MW09-01-02
MW09-01-03
MW09-01-04
MW09-01-05

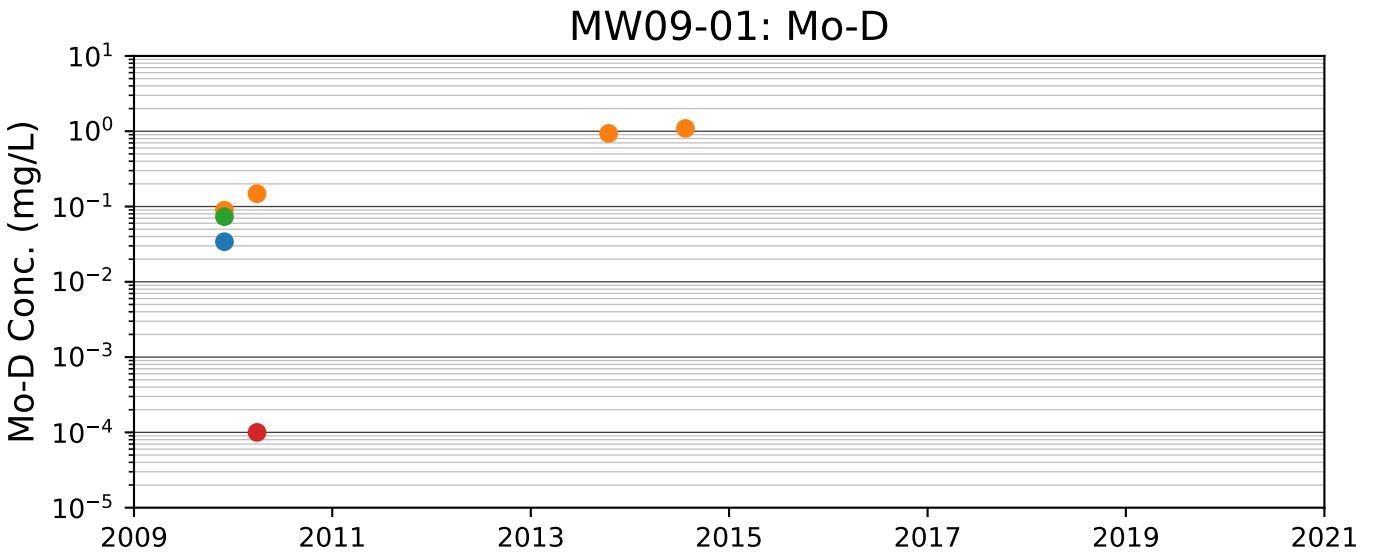

MW09-01: Chlord
Chlord Conc. (mg/L)
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
2009
2011
2013
2015
2017
2019
2021

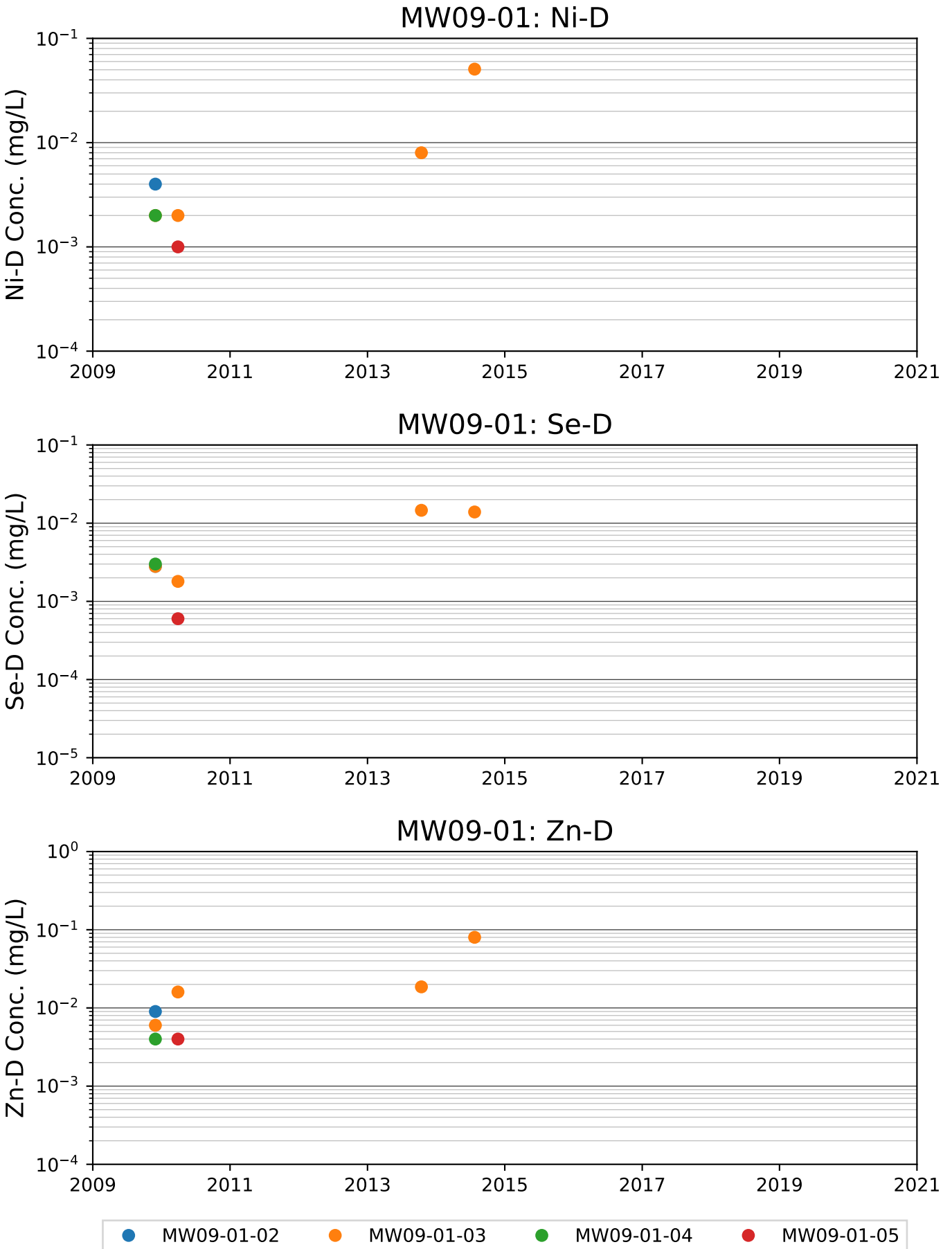

MW09-01: Cd-D
Cd-D Conc. (mg/L)
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-7}
2009
2011
2013
2015
2017
2019
2021

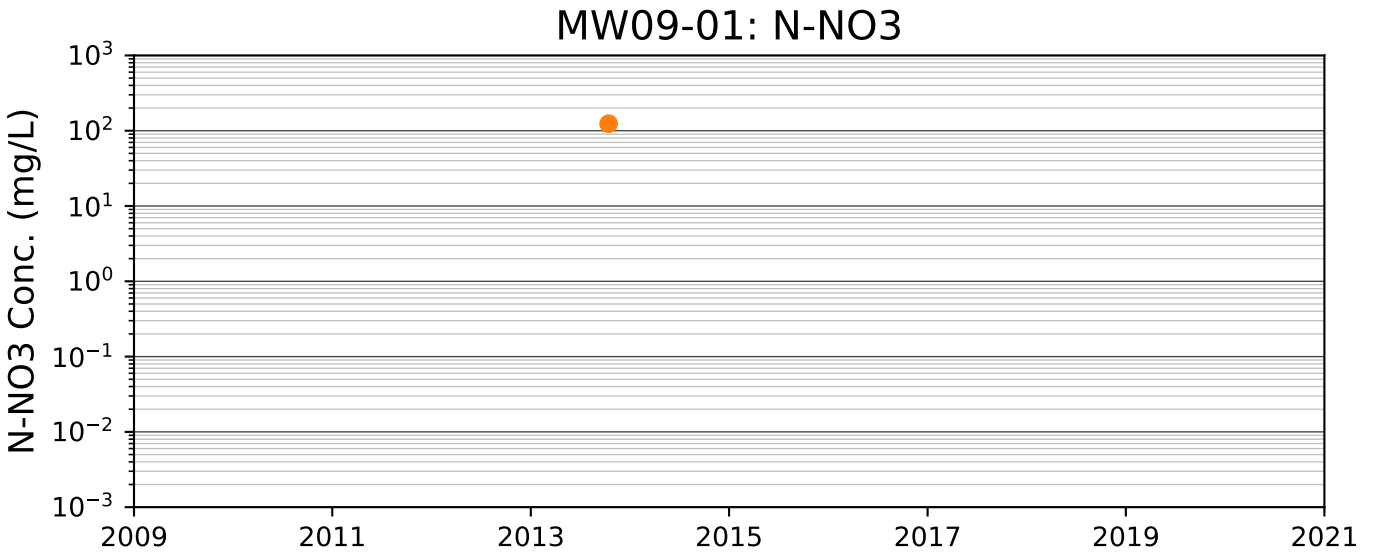

MW09-01: Cr-D
Cr-D Conc. (mg/L)
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021
MW09-01-02
MW09-01-03
MW09-01-04
MW09-01-05

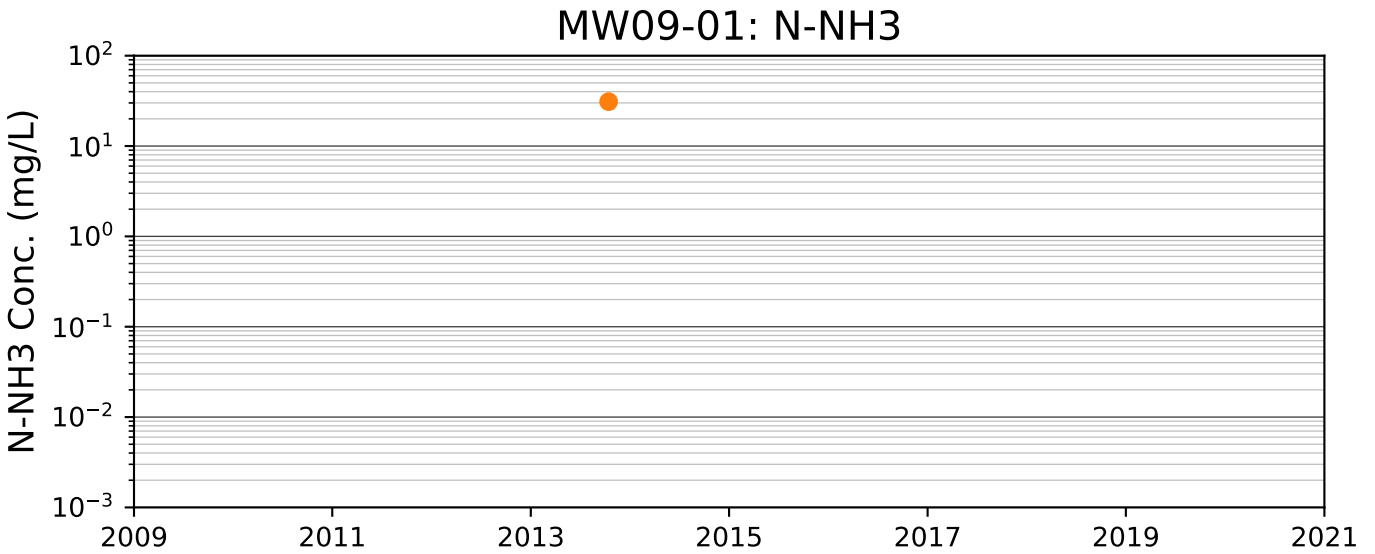

MW09-01: Cu-D
Cu-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021

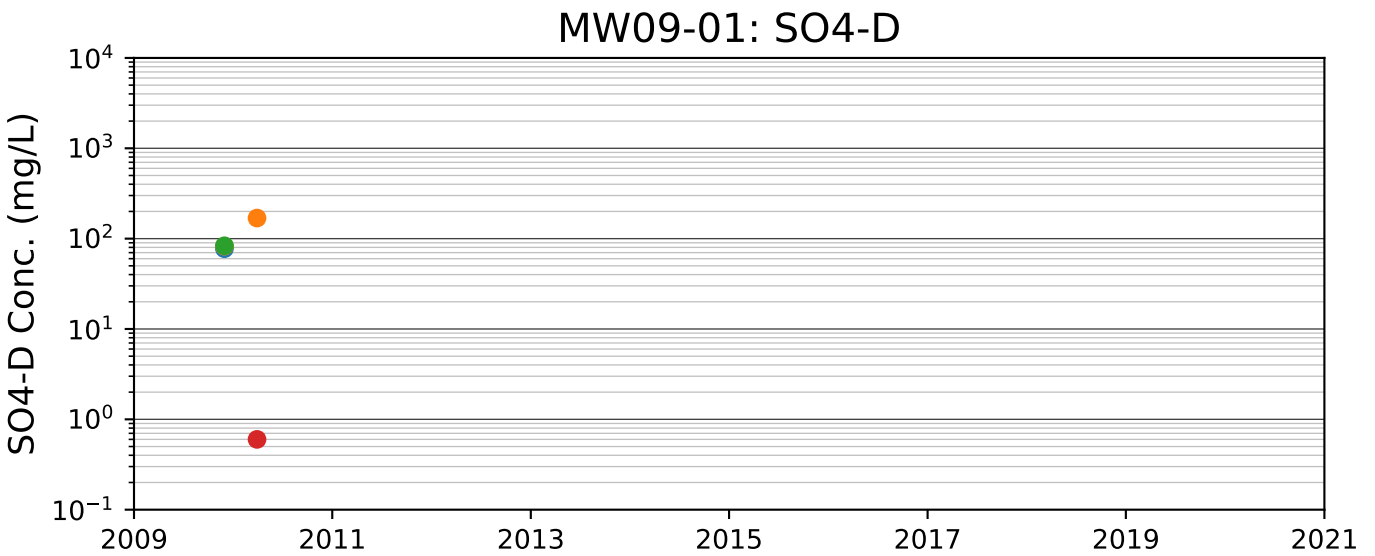

MW09-01: Pb-D
Pb-D Conc. (mg/L)
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021

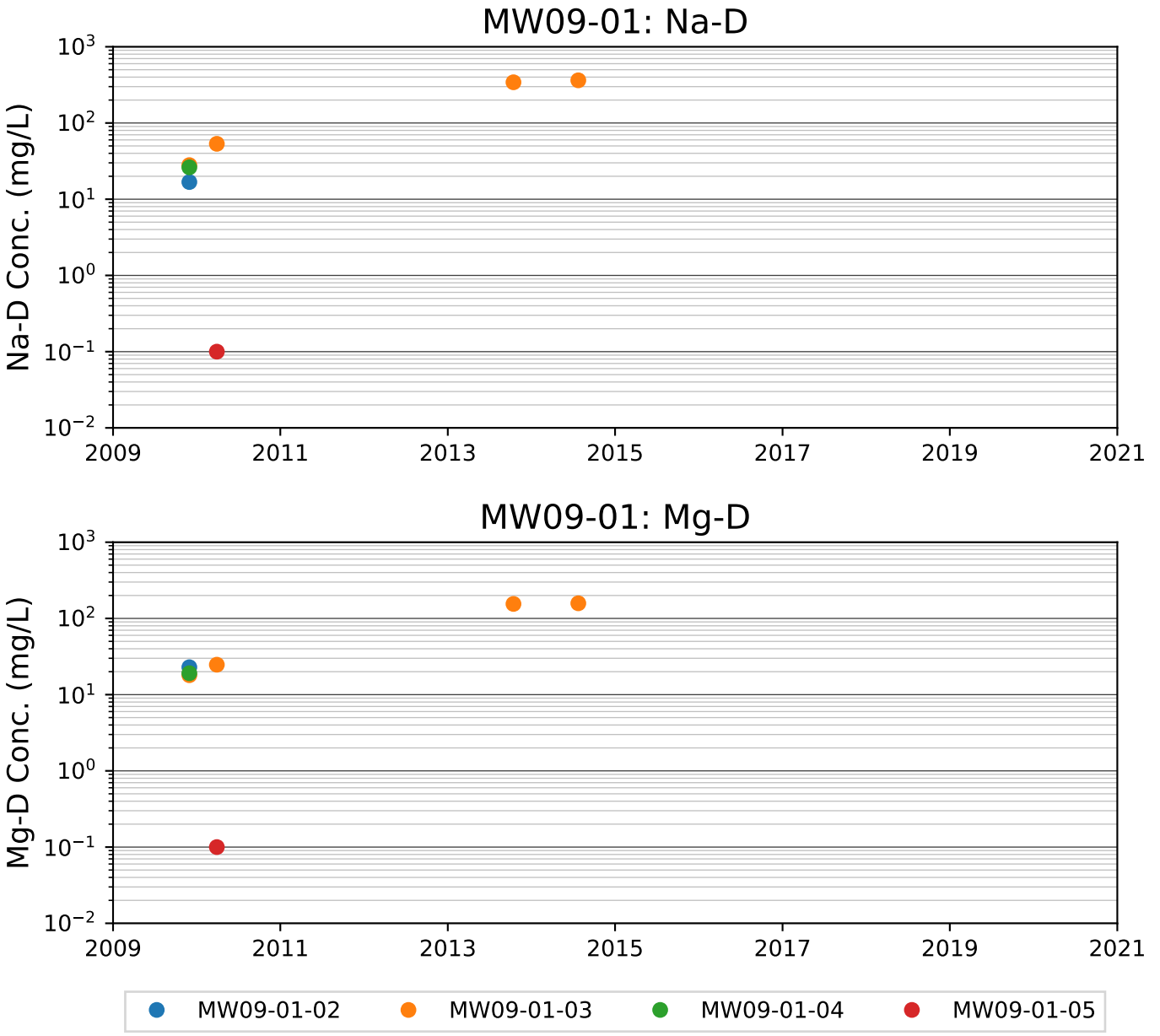

MW09-01: Mo-D
Mo-D Conc. (mg/L)
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021
MW09-01-02
MW09-01-03
MW09-01-04
MW09-01-05

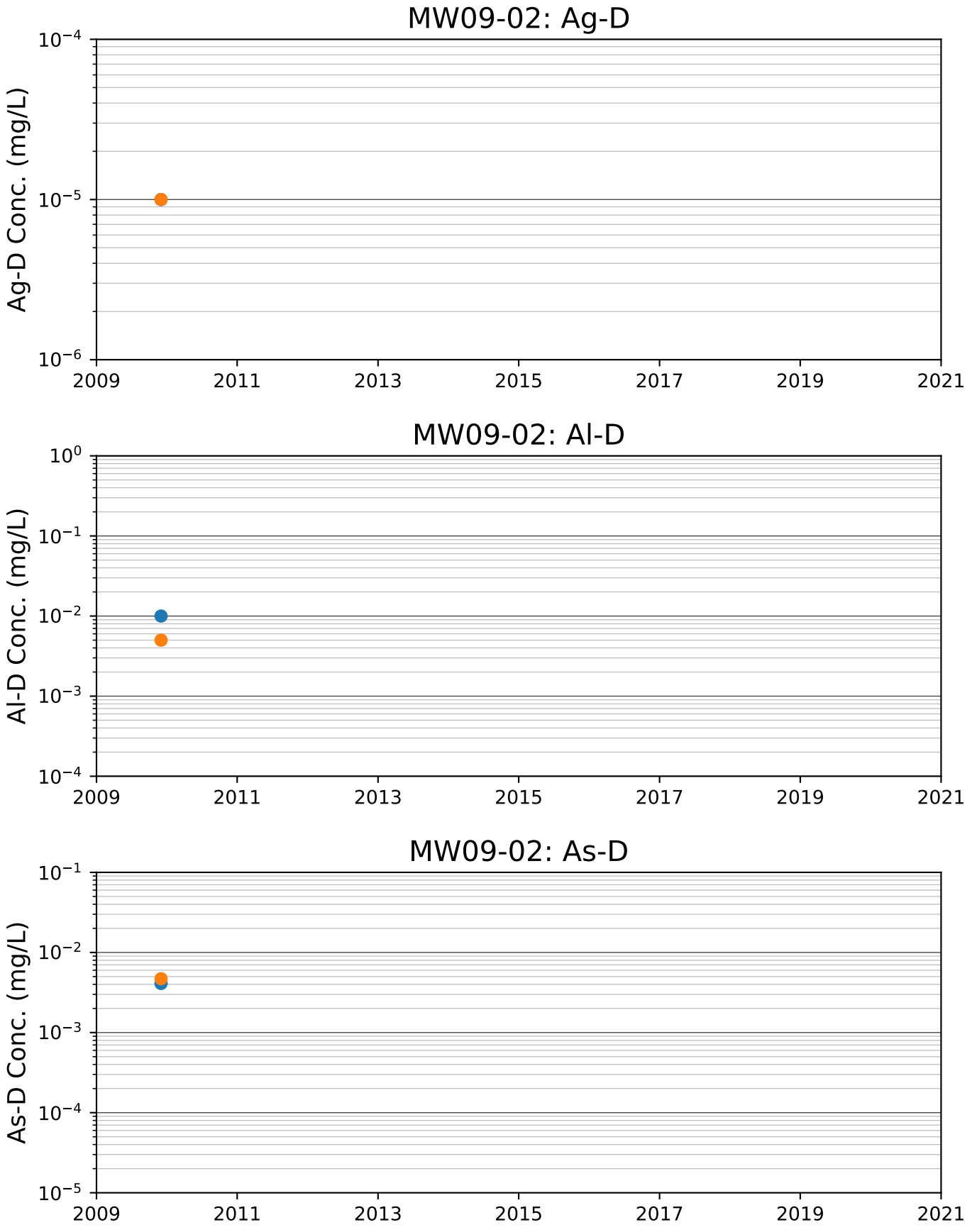

MW09-01: Ni-D
Ni-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
2009
2011
2013
2015
2017
2019
2021
MW09-01: Se-D
Se-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021
MW09-01: Zn-D
Zn-D Conc. (mg/L)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
2009
2011
2013
2015
2017
2019
2021
MW09-01-02
MW09-01-03
MW09-01-04
MW09-01-05

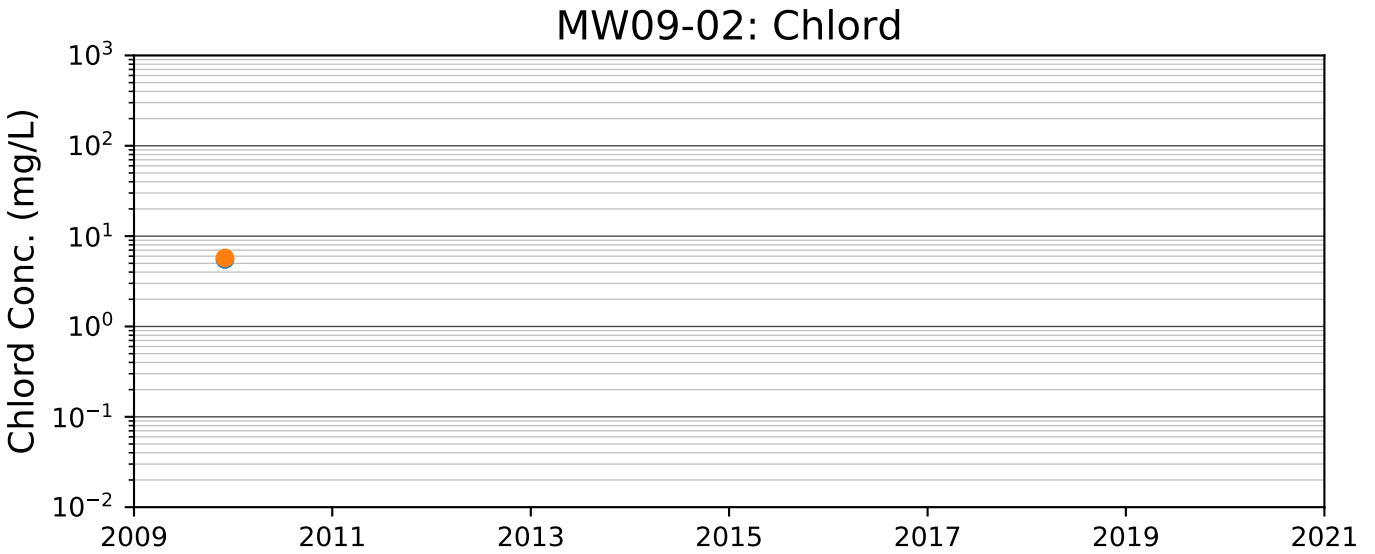

MW09-01: N-NO3
N-NO3 Conc. (mg/L)
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
2009
2011
2013
2015
2017
2019
2021

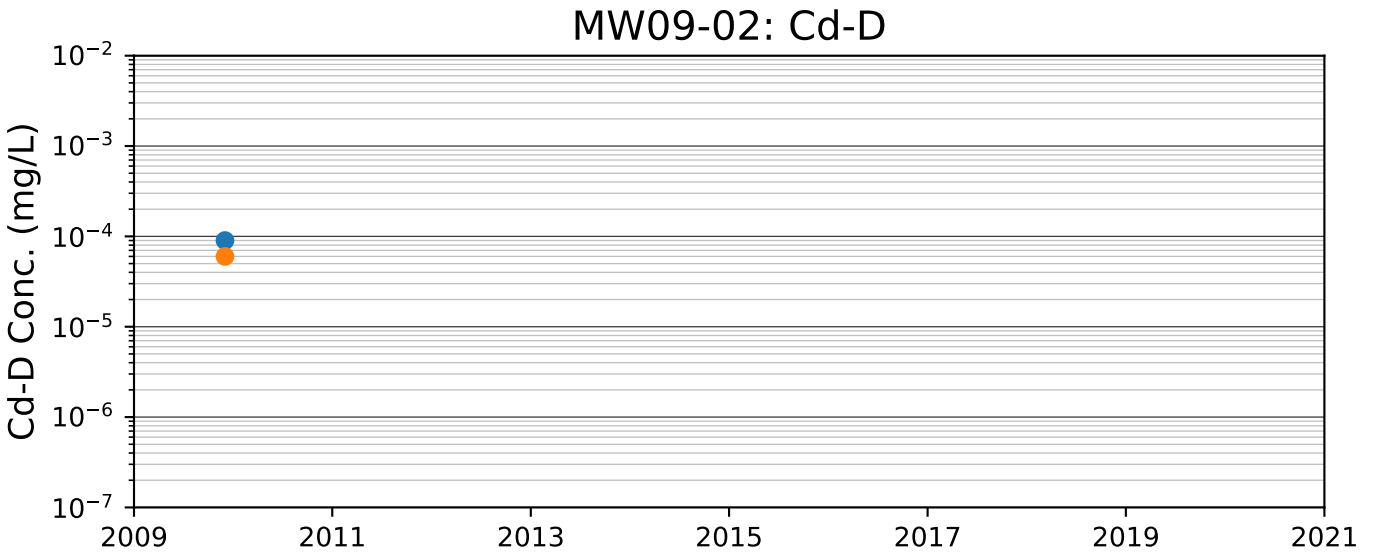

MW09-01: N-NH3
N-NH3 Conc. (mg/L)
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
2009
2011
2013
2015
2017
2019
2021

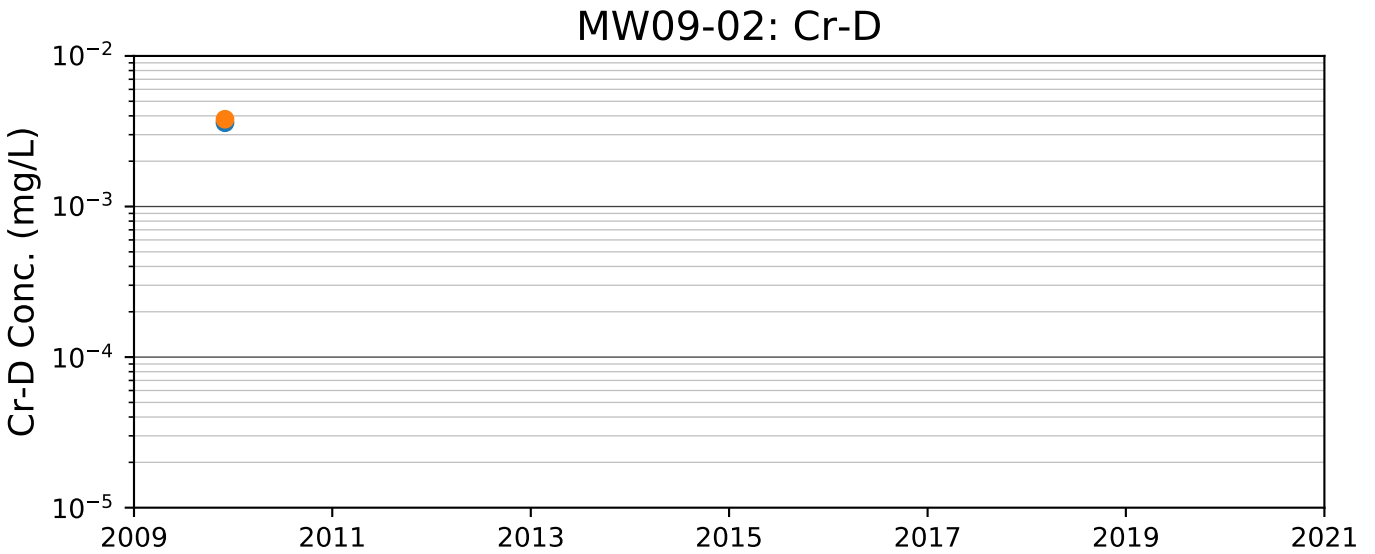

MW09-01: SO4-D
SO4-D Conc. (mg/L)
10^{4}
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
2009
2011
2013
2015
2017
2019
2021
MW09-01-02
MW09-01-03
MW09-01-04
MW09-01-05

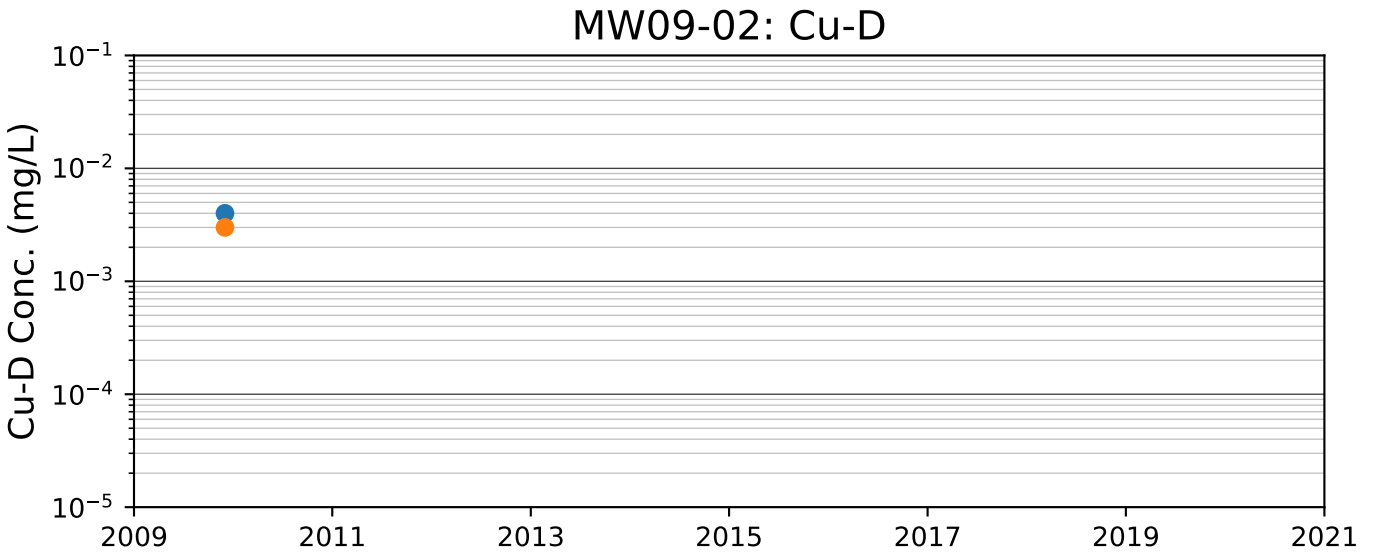

MW09-01: Na-D
Na-D Conc. (mg/L)
10^3
10^2
10^1
10^0
10^{-1}
10^{-2}
2009
2011
2013
2015
2017
2019
2021
MW09-01: Mg-D
Mg-D Conc. (mg/L)
MW09-01-02
MW09-01-03
MW09-01-04
MW09-01-05

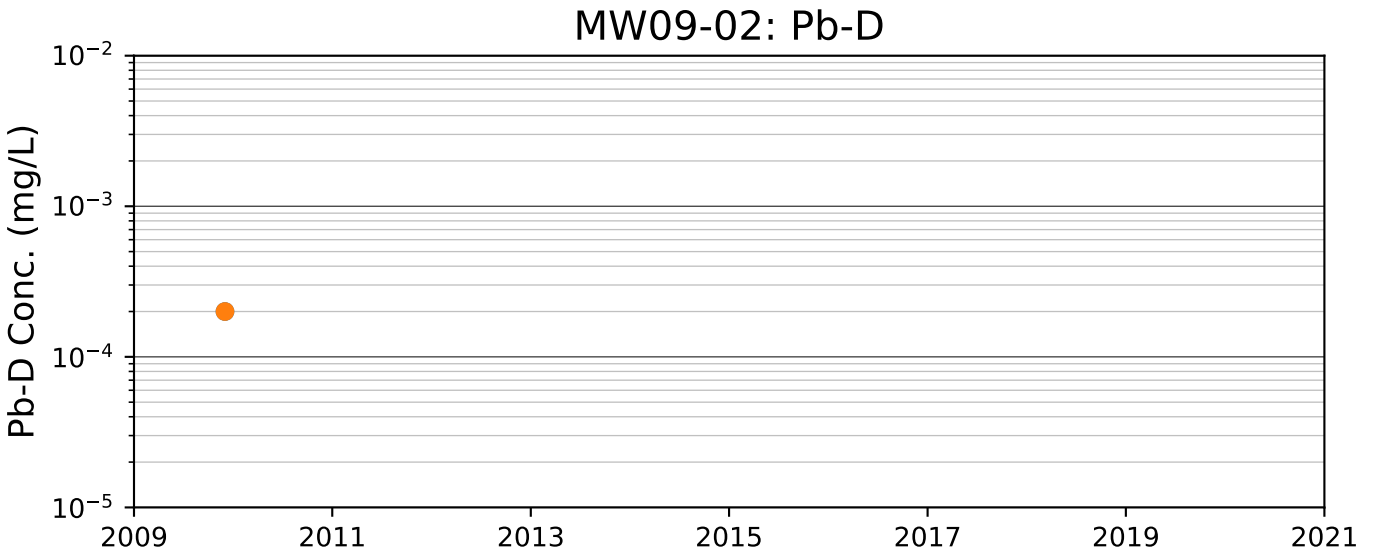

MW09-02: Ag-D
Ag-D Conc. (mg/L)
10^{-4}
10^{-5}
10^{-6}
2009
2011
2013
2015
2017
2019
2021
MW09-02: Al-D
Al-D Conc. (mg/L)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
2009
2011
2013
2015
2017
2019
2021
MW09-02: As-D
As-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021
MW09-02-01
MW09-02-03

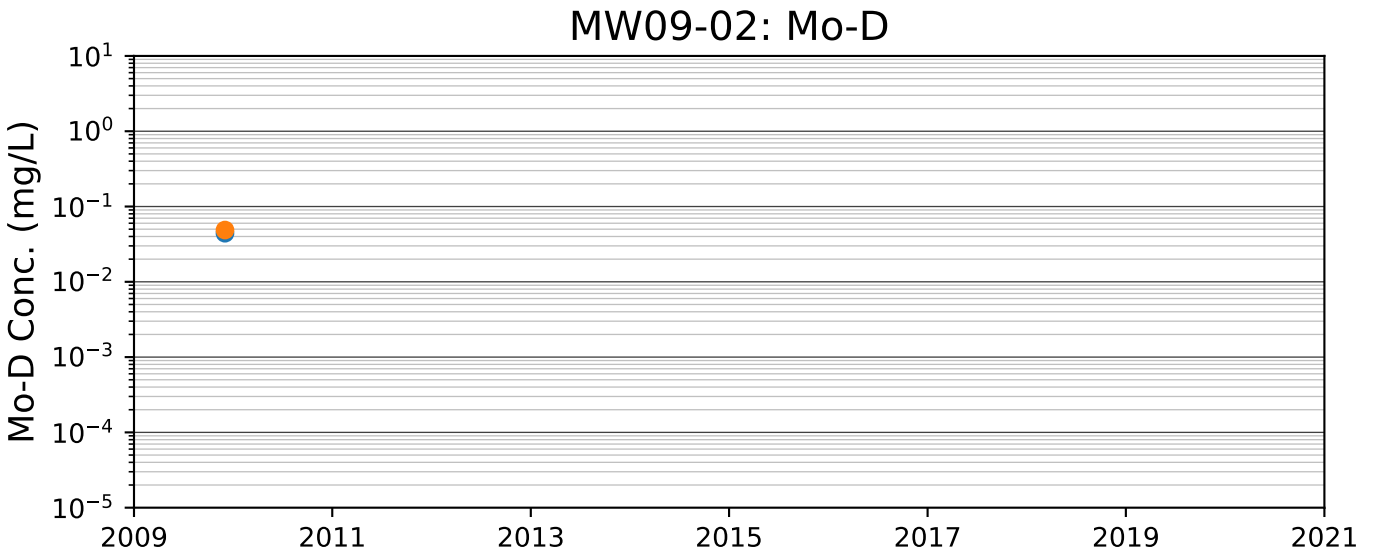

MW09-02: Chlord
Chlord Conc. (mg/L)
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
2009
2011
2013
2015
2017
2019
2021

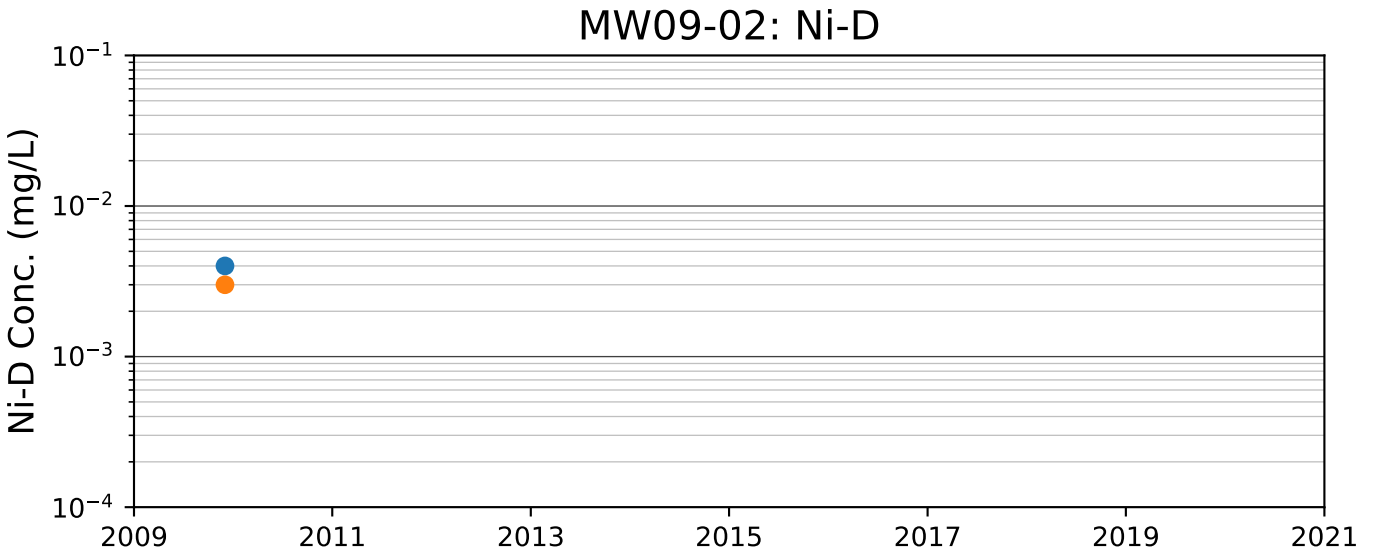

MW09-02: Cd-D
Cd-D Conc. (mg/L)
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-7}
2009
2011
2013
2015
2017
2019
2021

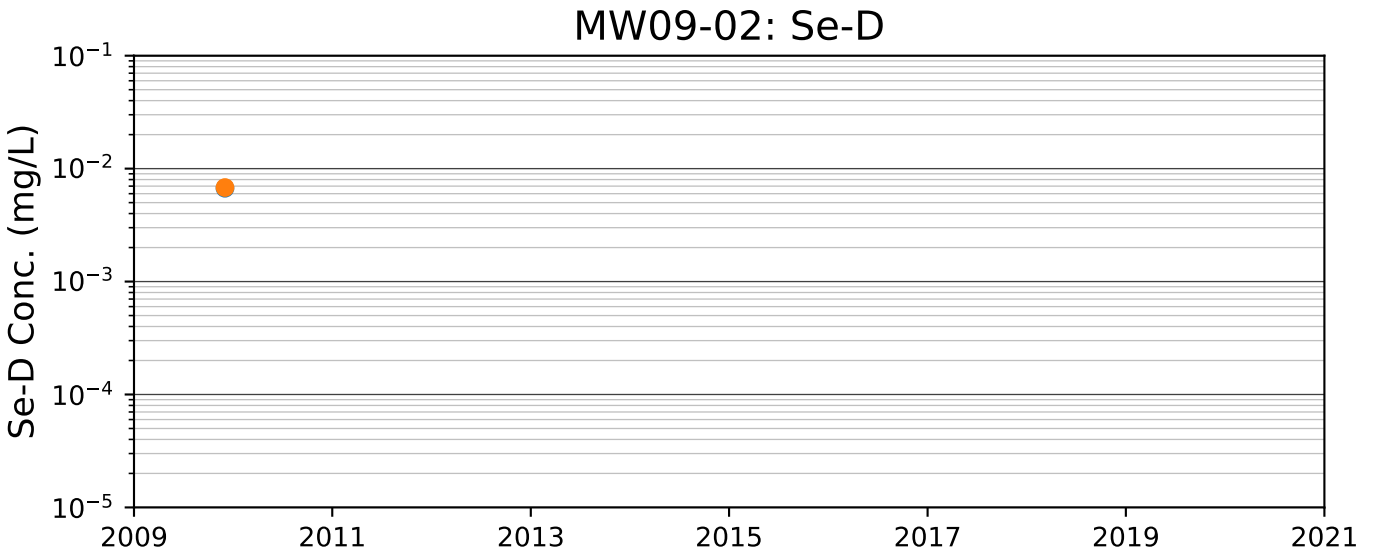

MW09-02: Cr-D
Cr-D Conc. (mg/L)
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021
MW09-02-01
MW09-02-03

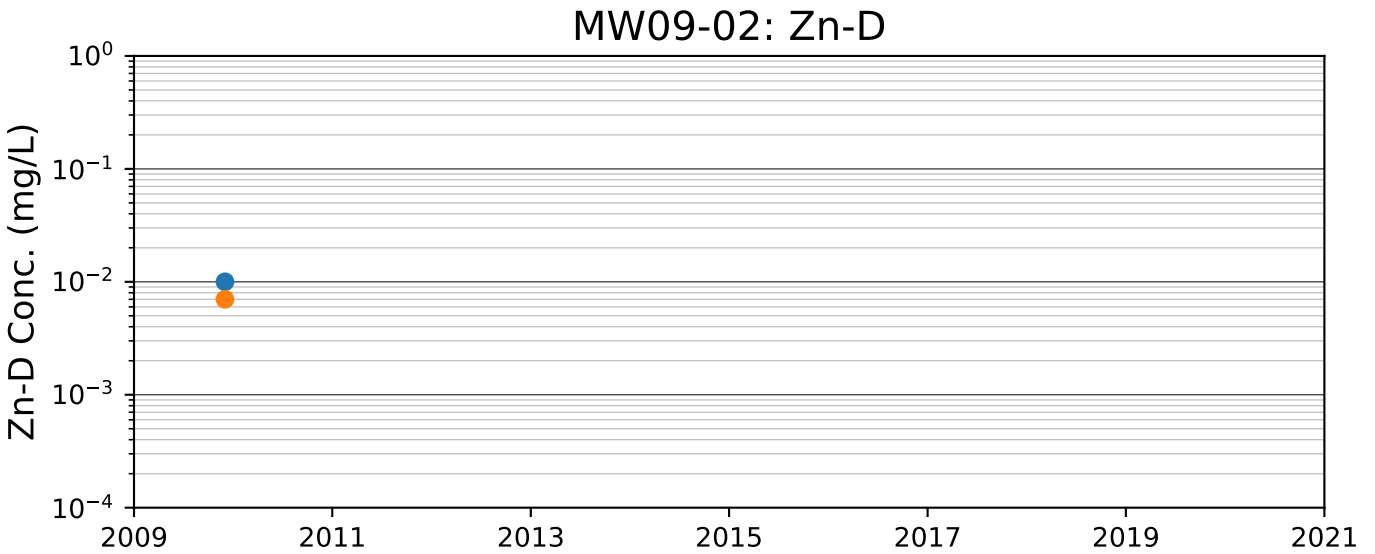

MW09-02: Cu-D
Cu-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021

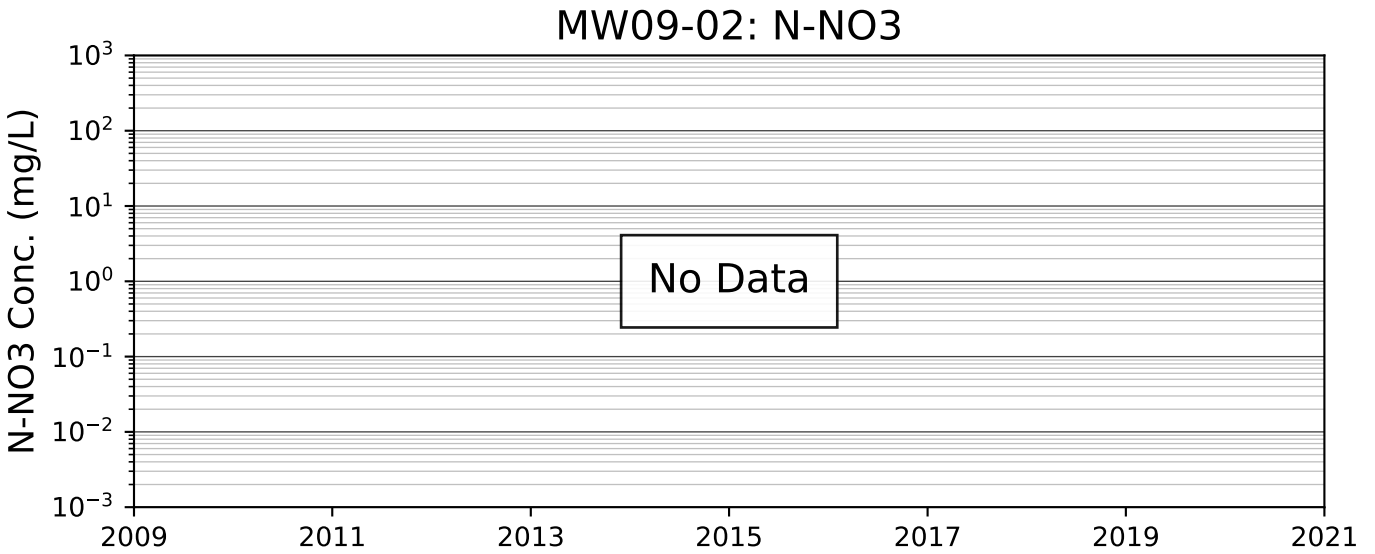

MW09-02: Pb-D
Pb-D Conc. (mg/L)
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021

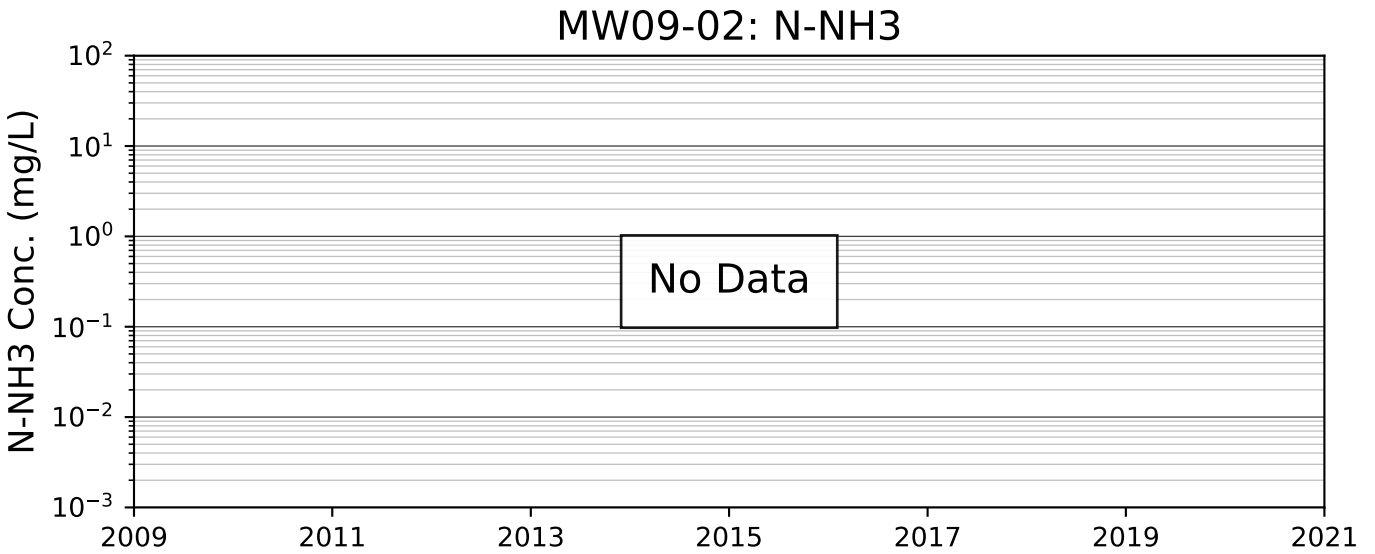

MW09-02: Mo-D
Mo-D Conc. (mg/L)
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021
MW09-02-01
MW09-02-03

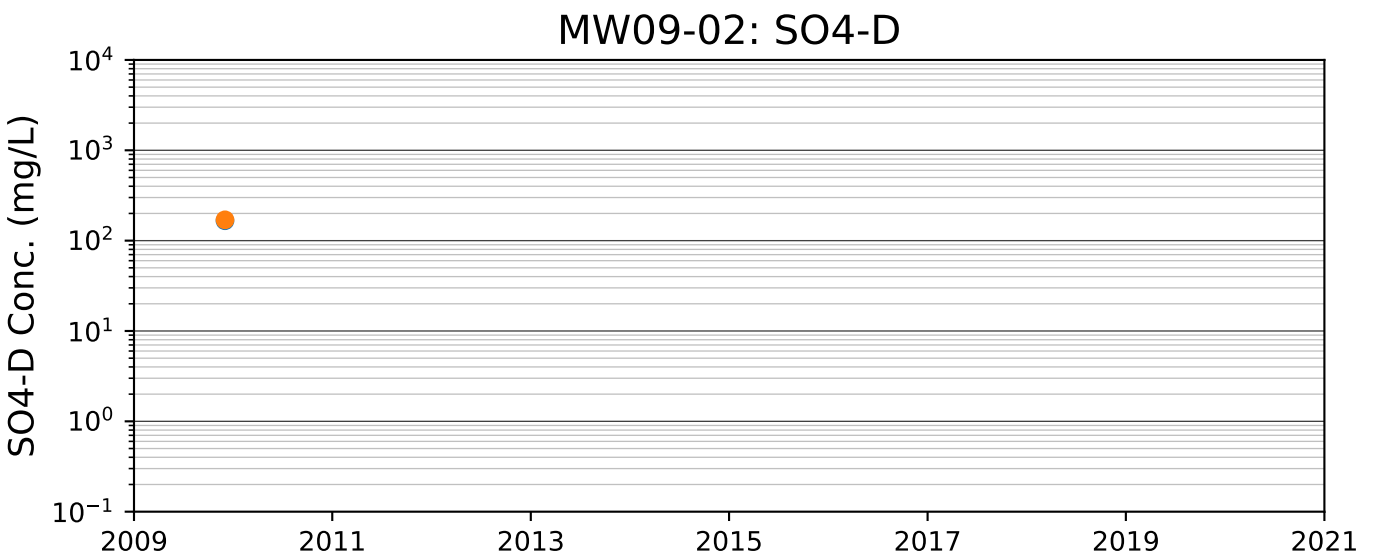

MW09-02: Ni-D
Ni-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
2009
2011
2013
2015
2017
2019
2021

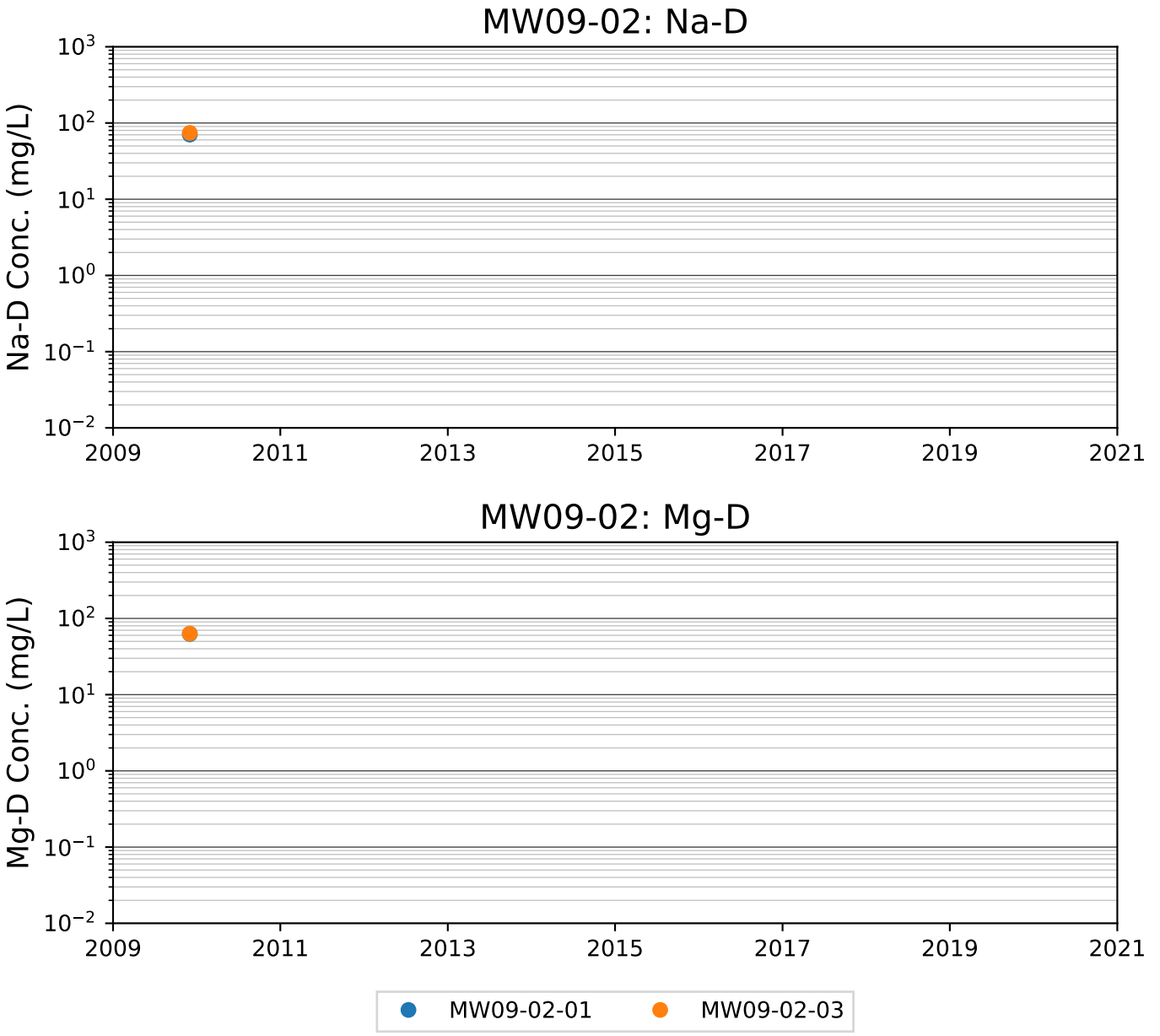

MW09-02: Se-D
Se-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021

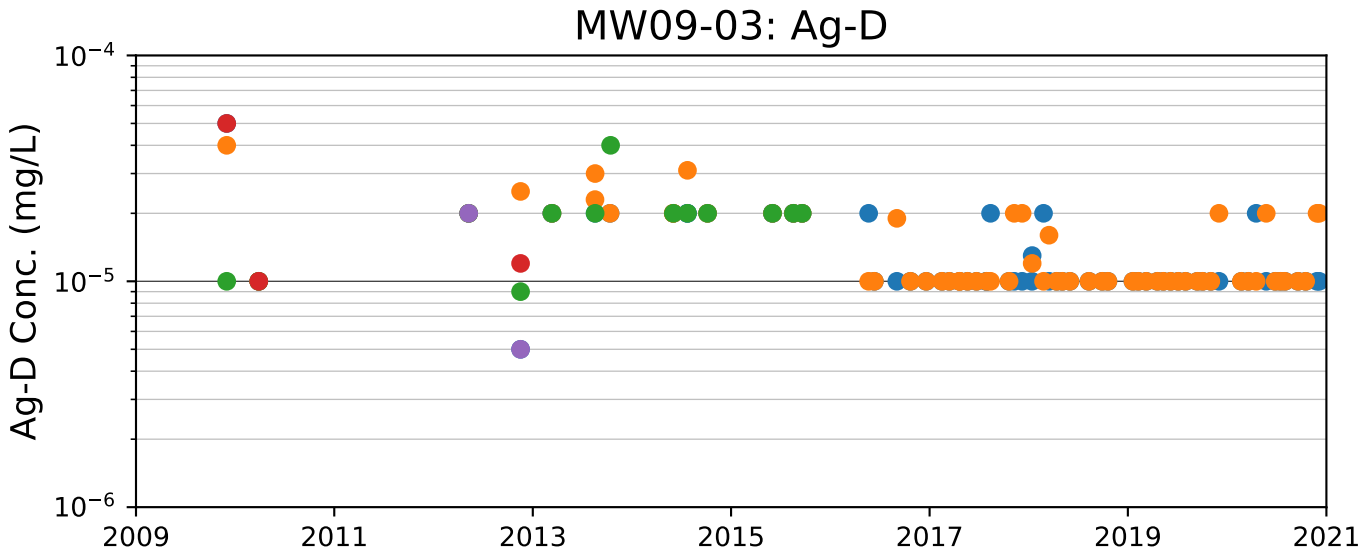

MW09-02: Zn-D
Zn-D Conc. (mg/L)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
2009
2011
2013
2015
2017
2019
2021
MW09-02-01
MW09-02-03

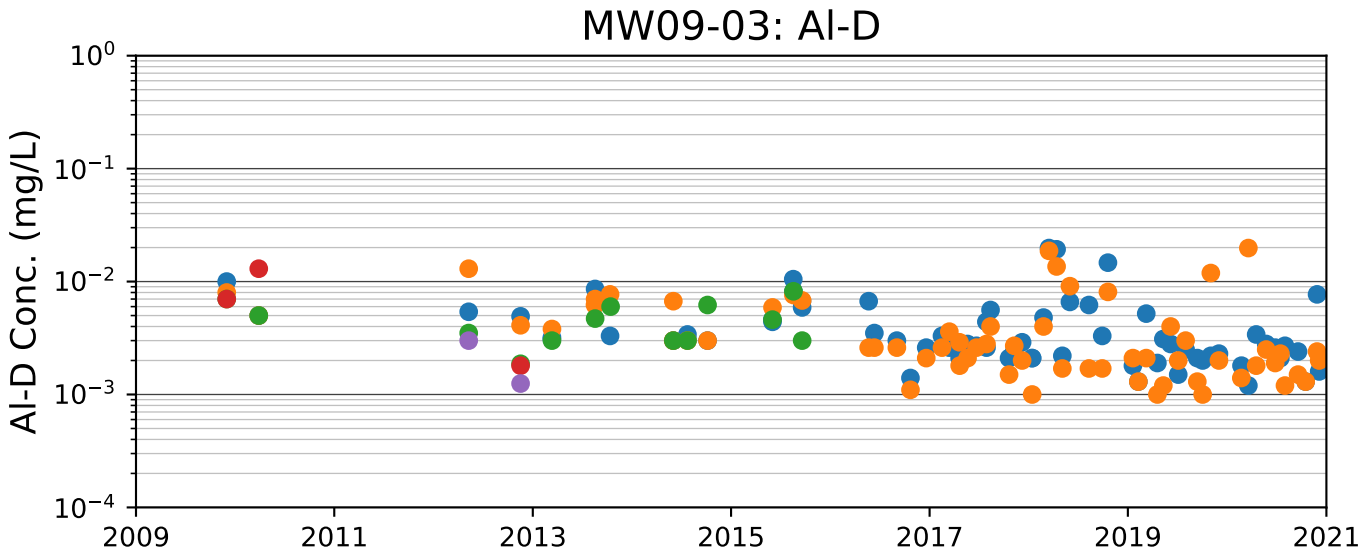

MW09-02: N-NO3
N-NO3 Conc. (mg/L)
No Data
2009
2011
2013
2015
2017
2019
2021

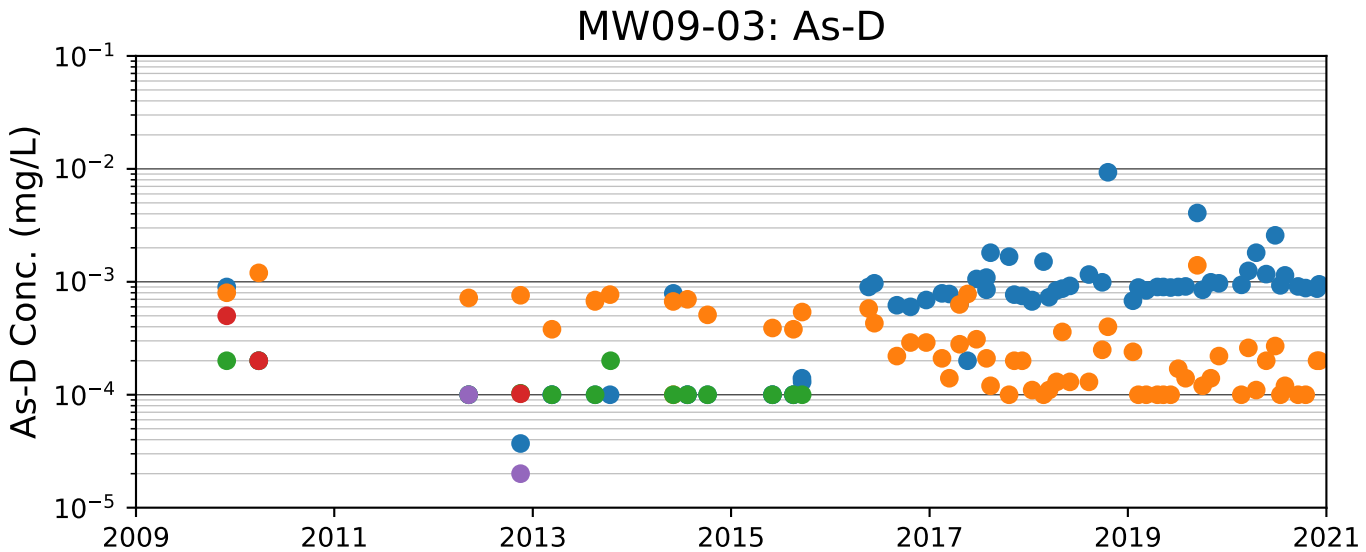

MW09-02: N-NH3
N-NH3 Conc. (mg/L)
No Data
2009
2011
2013
2015
2017
2019
2021


MW09-02: SO4-D
SO4-D Conc. (mg/L)
2009
2011
2013
2015
2017
2019
2021
MW09-02-01
MW09-02-03

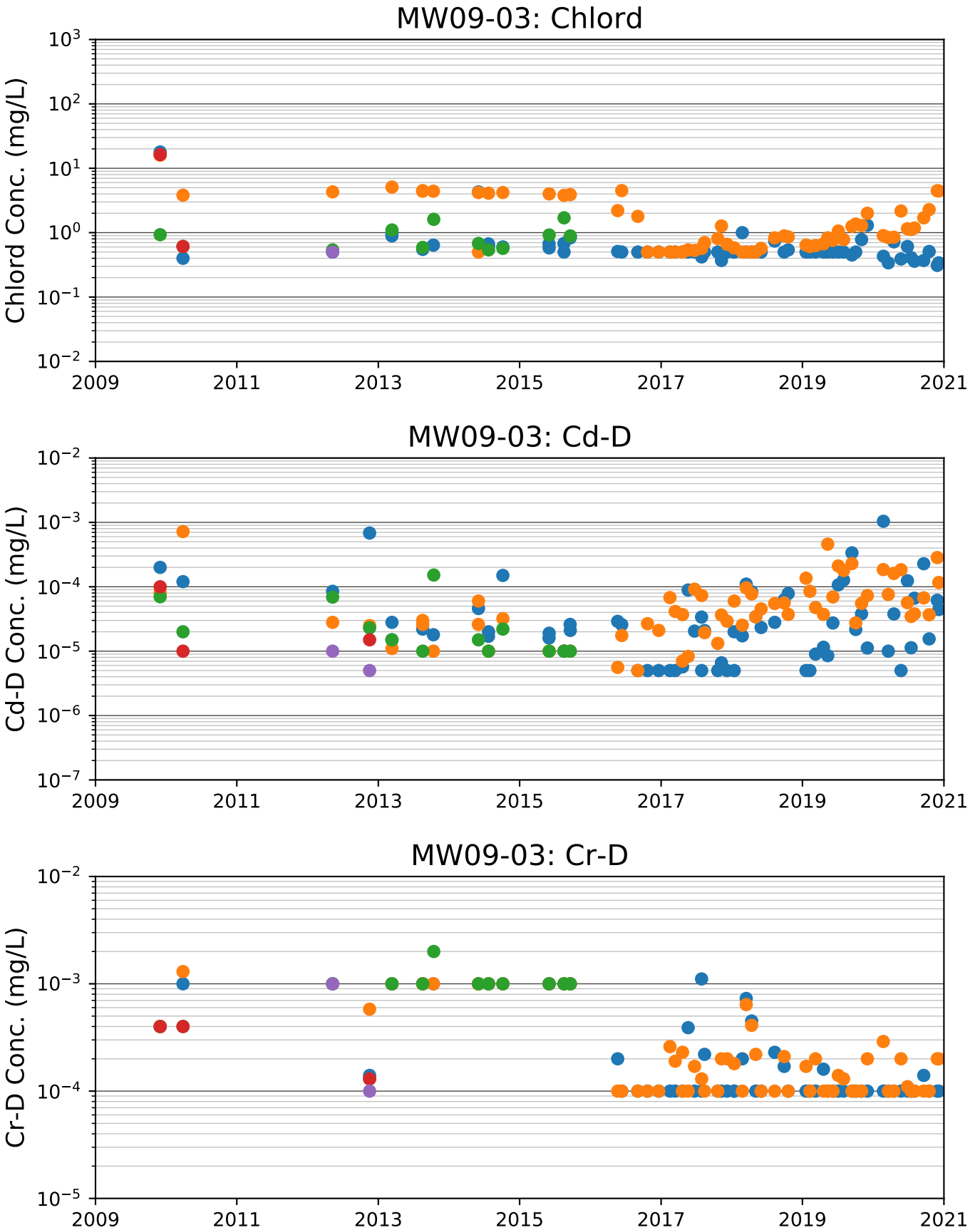

MW09-02: Na-D
Na-D Conc. (mg/L)
10^3
10^2
10^1
10^0
10^{-1}
10^{-2}
2009
2011
2013
2015
2017
2019
2021
MW09-02: Mg-D
Mg-D Conc. (mg/L)
10^3
10^2
10^1
10^0
10^{-1}
10^{-2}
2009
2011
2013
2015
2017
2019
2021
MW09-02-01
MW09-02-03

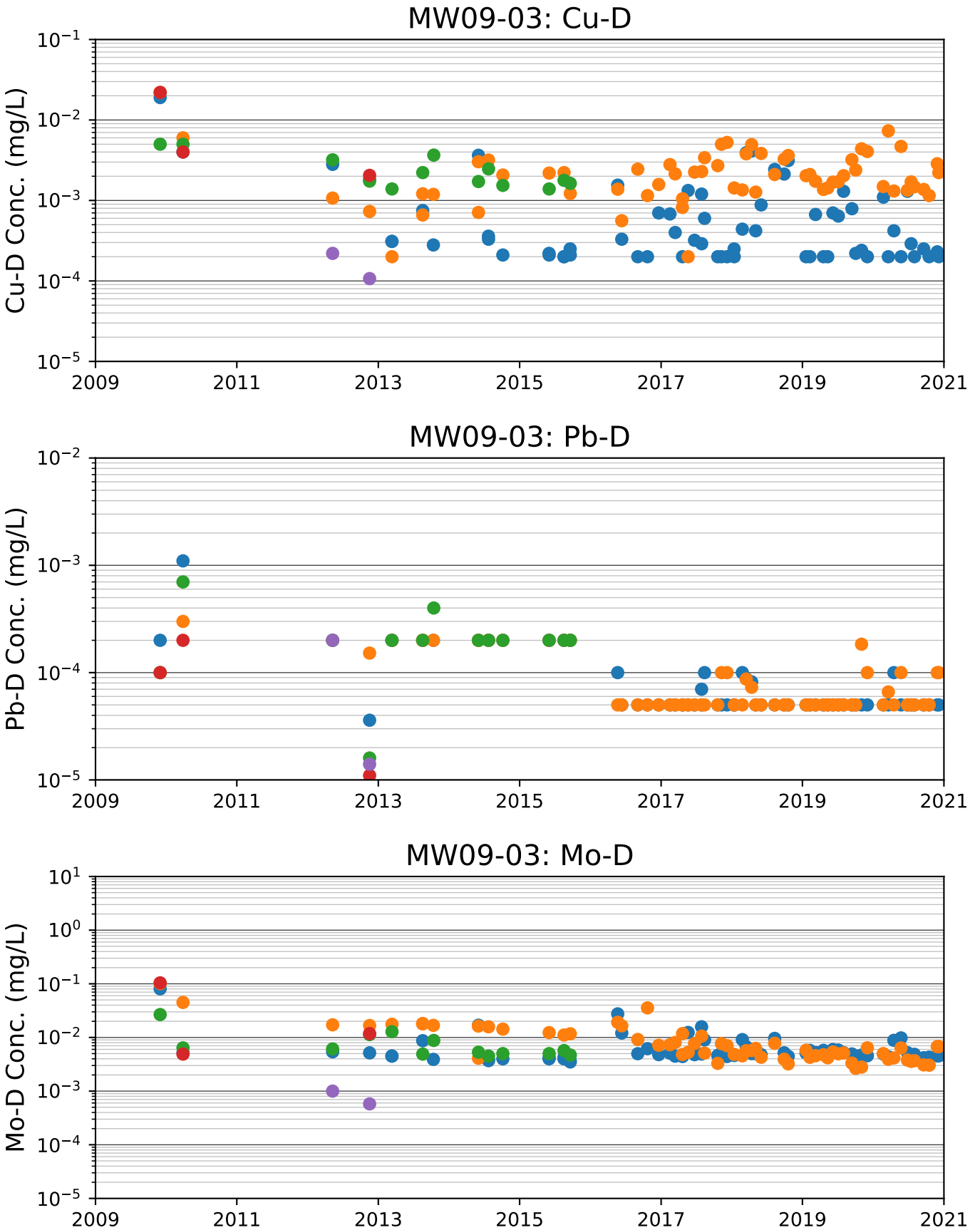

MW09-03: Ag-D
Ag-D Conc. (mg/L)
10^{-4}
10^{-5}
10^{-6}
2009
2011
2013
2015
2017
2019
2021

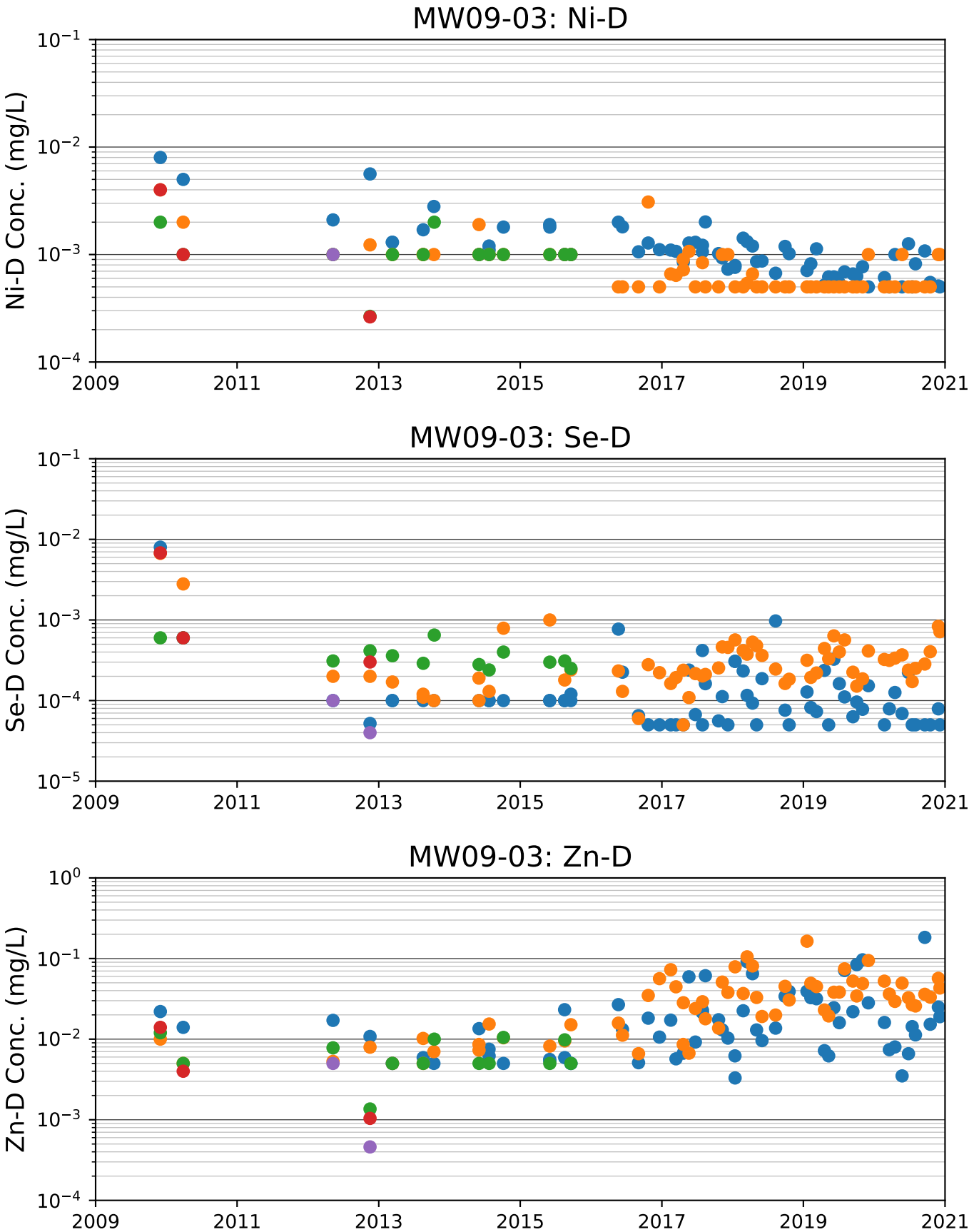

MW09-03: Al-D
Al-D Conc. (mg/L)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
2009
2011
2013
2015
2017
2019
2021

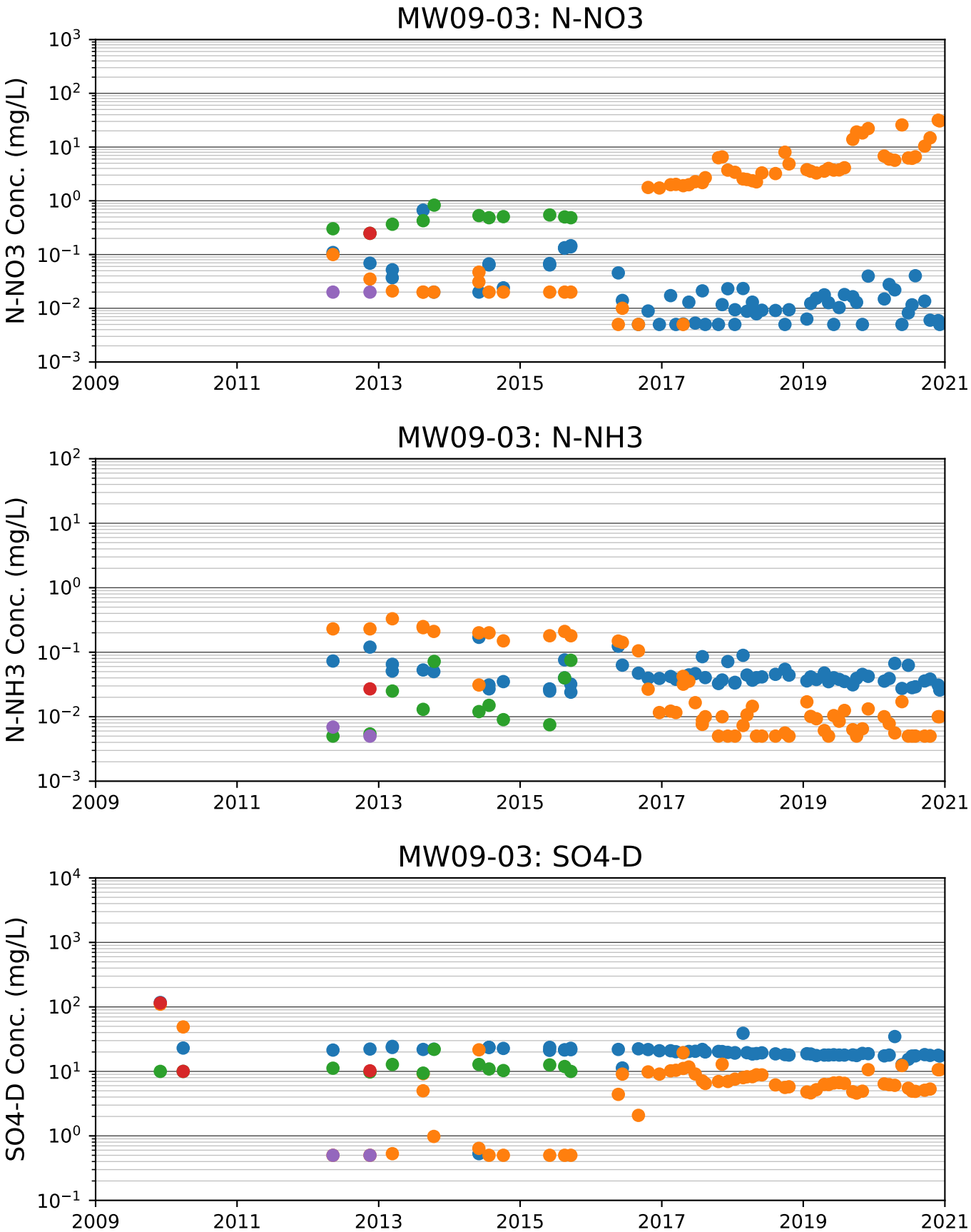

MW09-03: As-D
As-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021

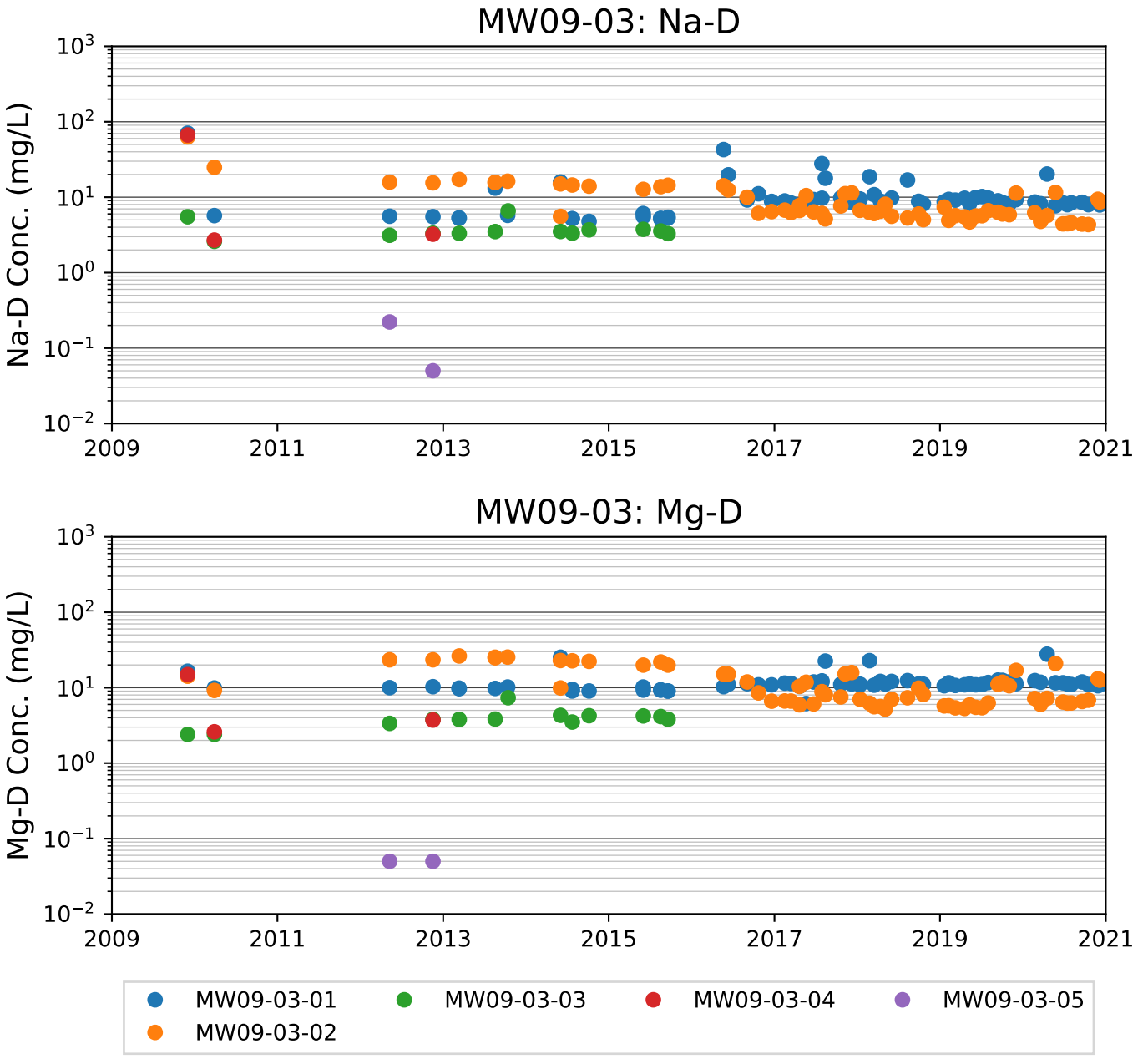

MW09-03-01
MW09-03-02
MW09-03-03
MW09-03-04
MW09-03-05

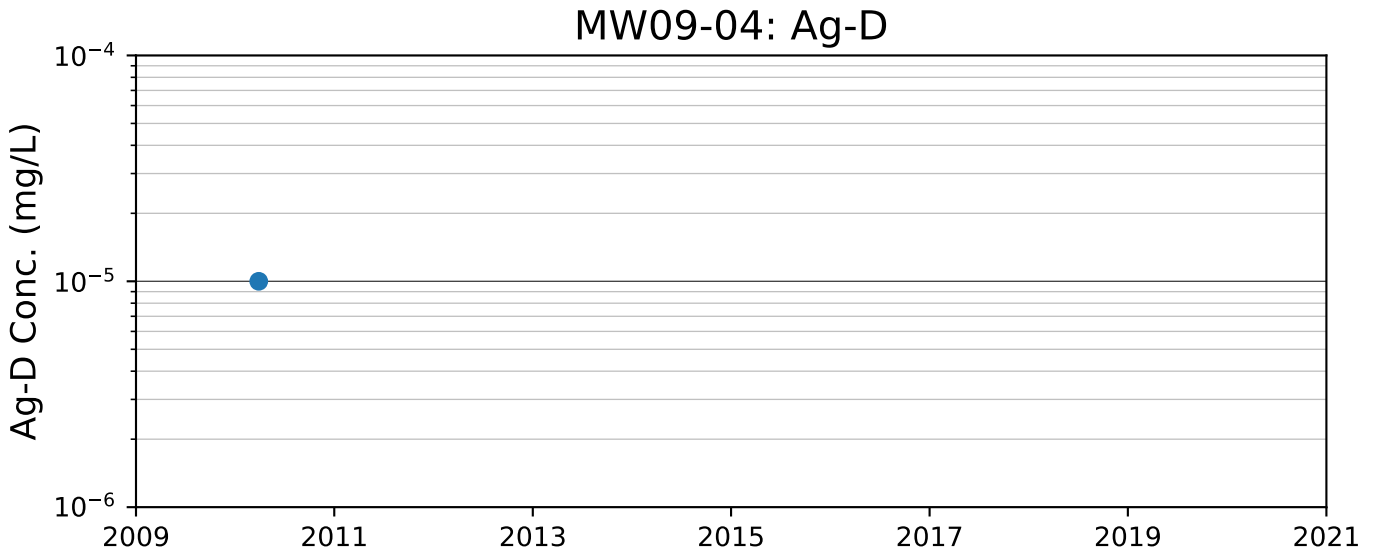

MW09-03: Chlord
Chlord Conc. (mg/L)
MW09-03: Cd-D
Cd-D Conc. (mg/L)
MW09-03: Cr-D
Cr-D Conc. (mg/L)
2009
2011
2013
2015
2017
2019
2021
MW09-03-01
MW09-03-02
MW09-03-03
MW09-03-04
MW09-03-05

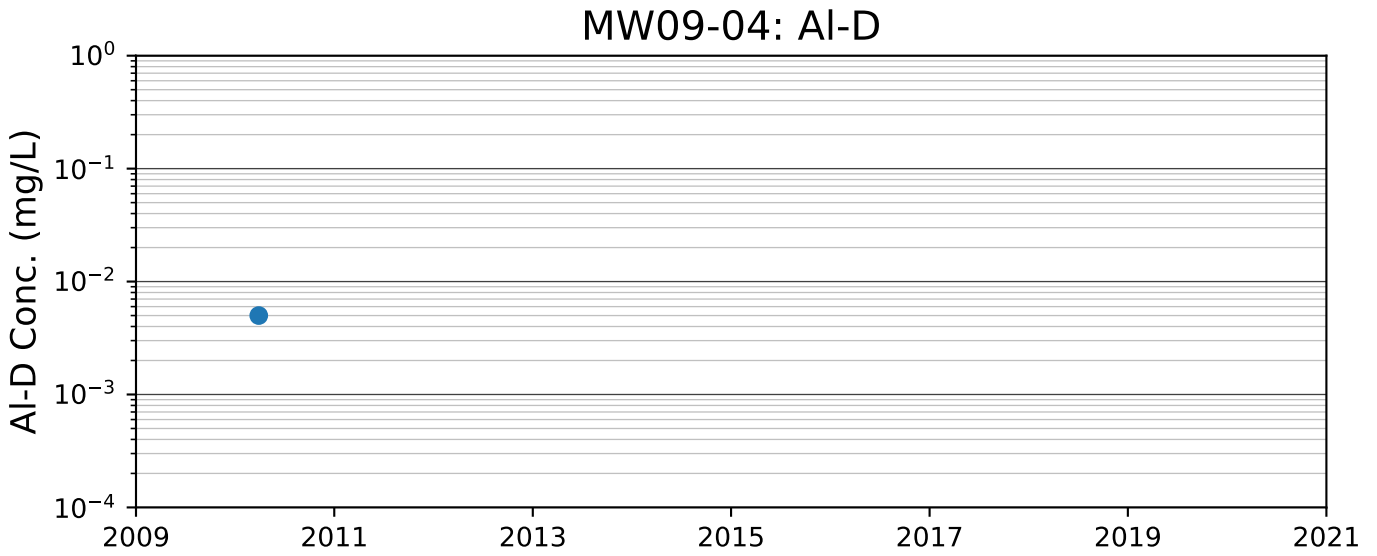

MW09-03: Cu-D
Cu-D Conc. (mg/L)
MW09-03: Pb-D
Pb-D Conc. (mg/L)
MW09-03: Mo-D
Mo-D Conc. (mg/L)
2009
2011
2013
2015
2017
2019
2021
MW09-03-01
MW09-03-02
MW09-03-03
MW09-03-04
MW09-03-05

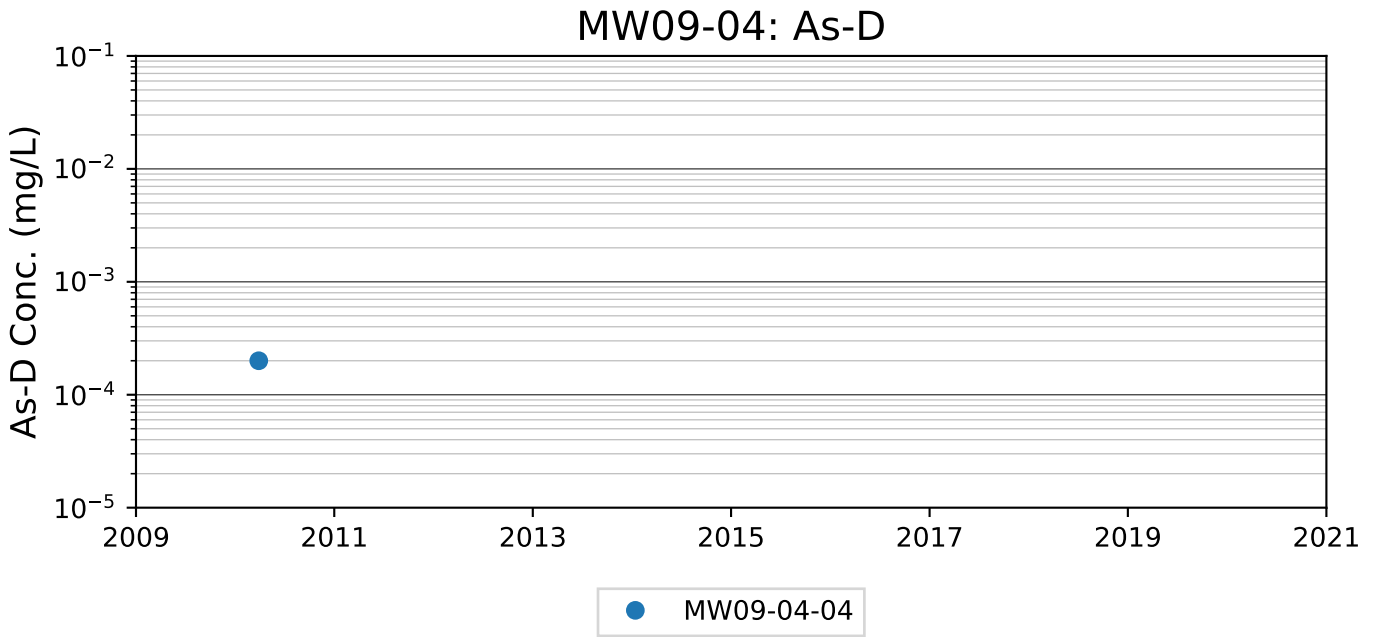

MW09-03: Ni-D
Ni-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
2009
2011
2013
2015
2017
2019
2021
MW09-03: Se-D
Se-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021
MW09-03: Zn-D
Zn-D Conc. (mg/L)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
2009
2011
2013
2015
2017
2019
2021
MW09-03-01
MW09-03-02
MW09-03-03
MW09-03-04
MW09-03-05

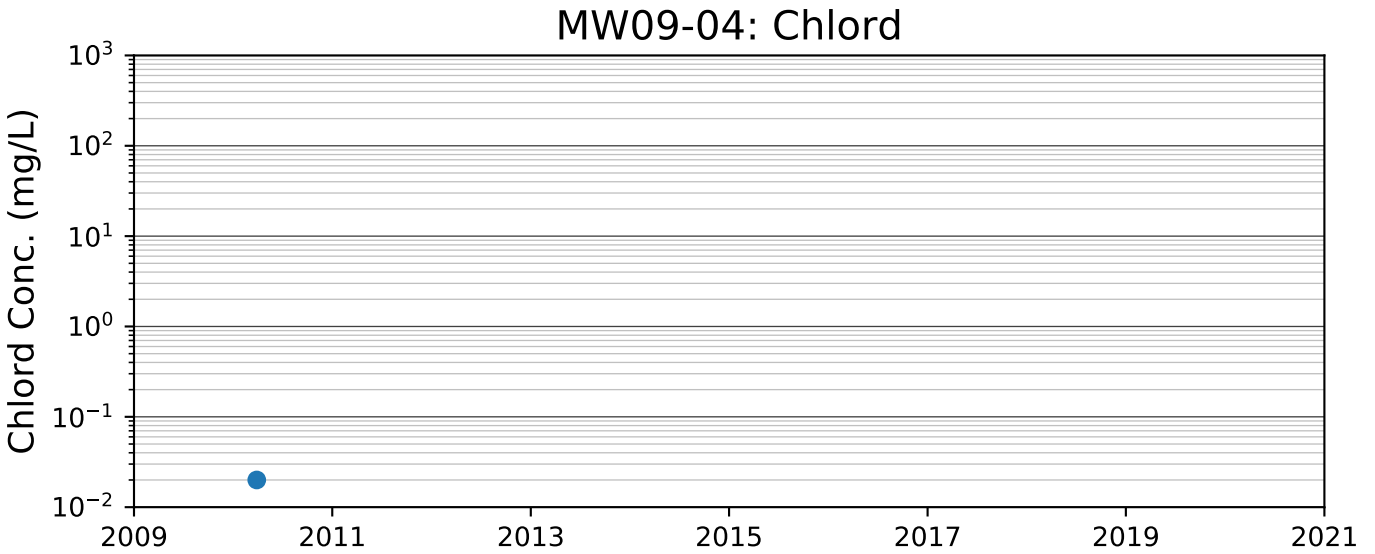

MW09-03: N-NO3
N-NO3 Conc. (mg/L)
MW09-03: N-NH3
N-NH3 Conc. (mg/L)
MW09-03: SO4-D
SO4-D Conc. (mg/L)
2009
2011
2013
2015
2017
2019
2021
MW09-03-01
MW09-03-02
MW09-03-03
MW09-03-04
MW09-03-05

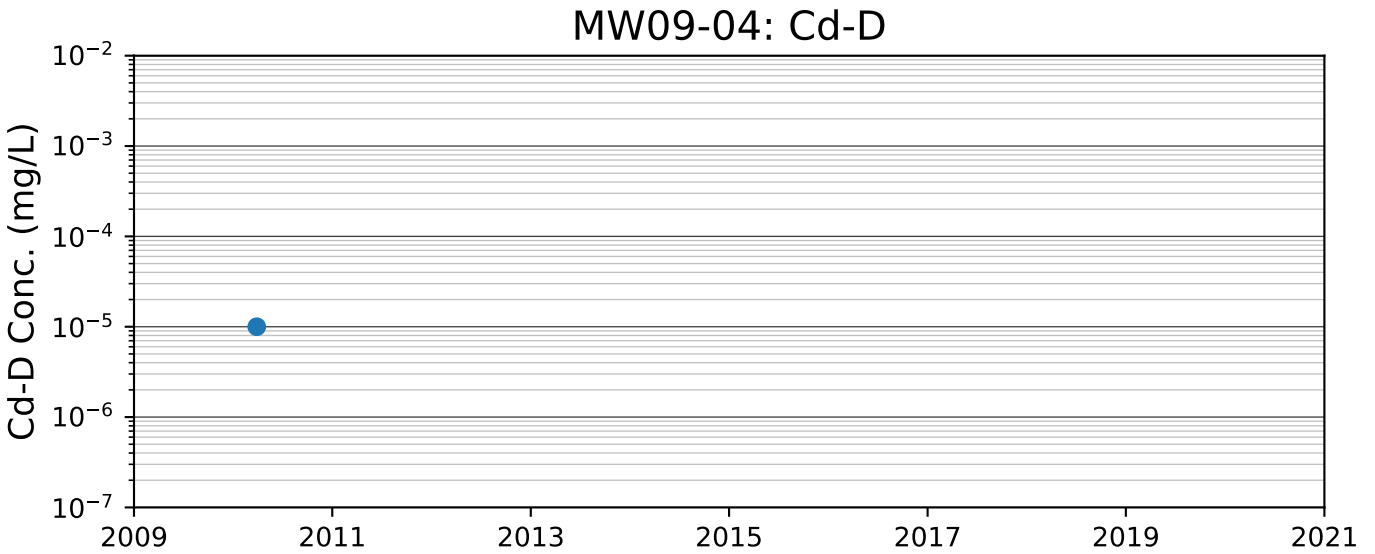

MW09-03: Na-D
Na-D Conc. (mg/L)
10^3
10^2
10^1
10^0
10^{-1}
10^{-2}
2009
2011
2013
2015
2017
2019
2021
MW09-03: Mg-D
Mg-D Conc. (mg/L)
MW09-03-01
MW09-03-02
MW09-03-03
MW09-03-04
MW09-03-05

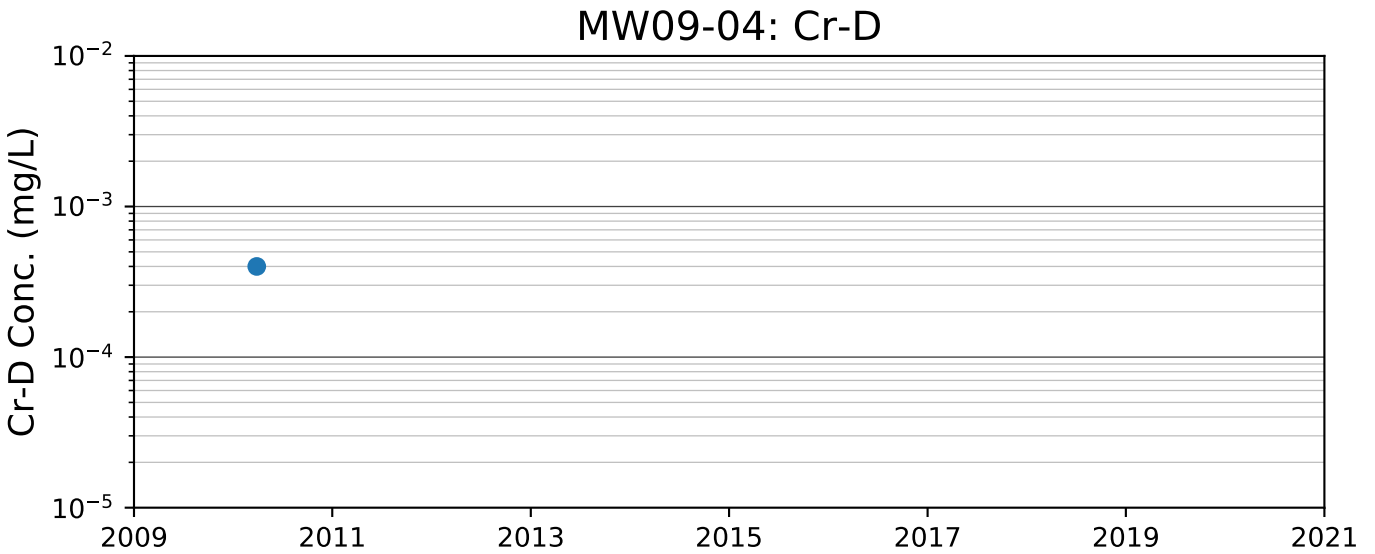

MW09-04: Ag-D
Ag-D Conc. (mg/L)
10^{-4}
10^{-5}
10^{-6}
2009
2011
2013
2015
2017
2019
2021

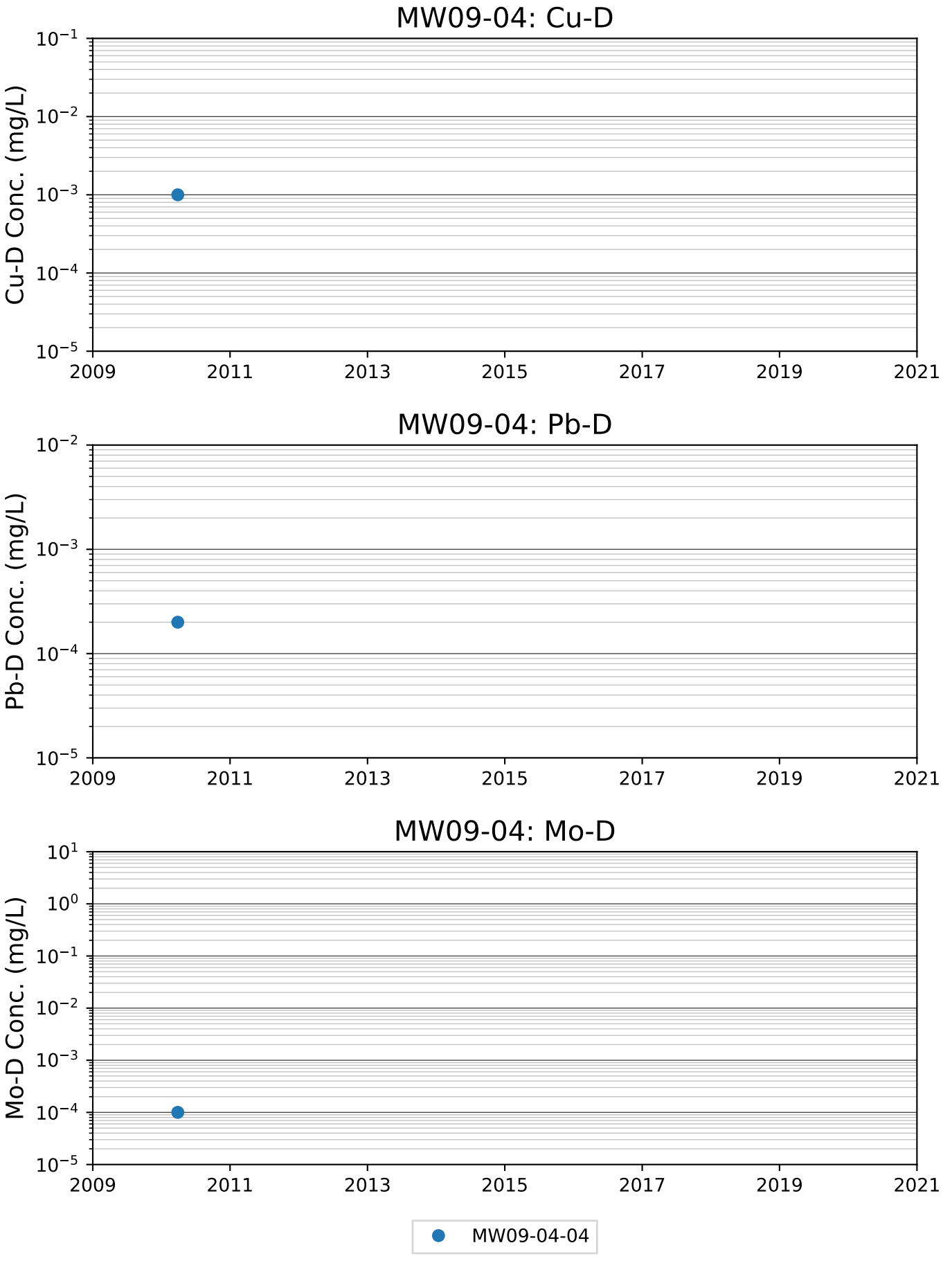

MW09-04: Al-D
Al-D Conc. (mg/L)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
2009
2011
2013
2015
2017
2019
2021

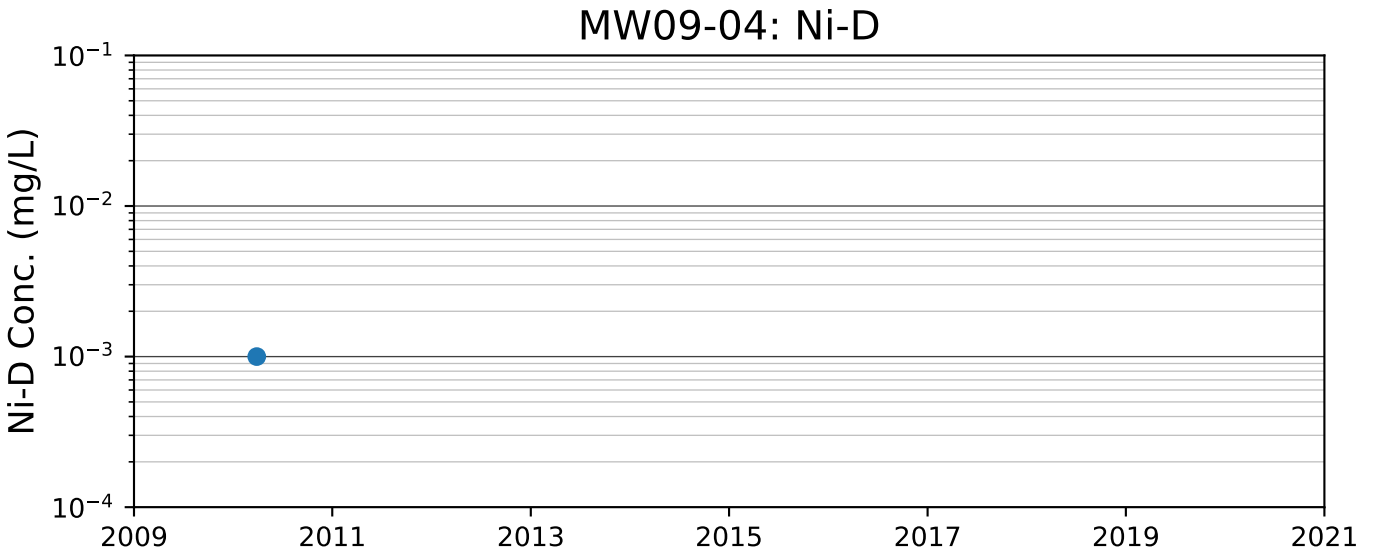

MW09-04: As-D
As-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021
MW09-04-04

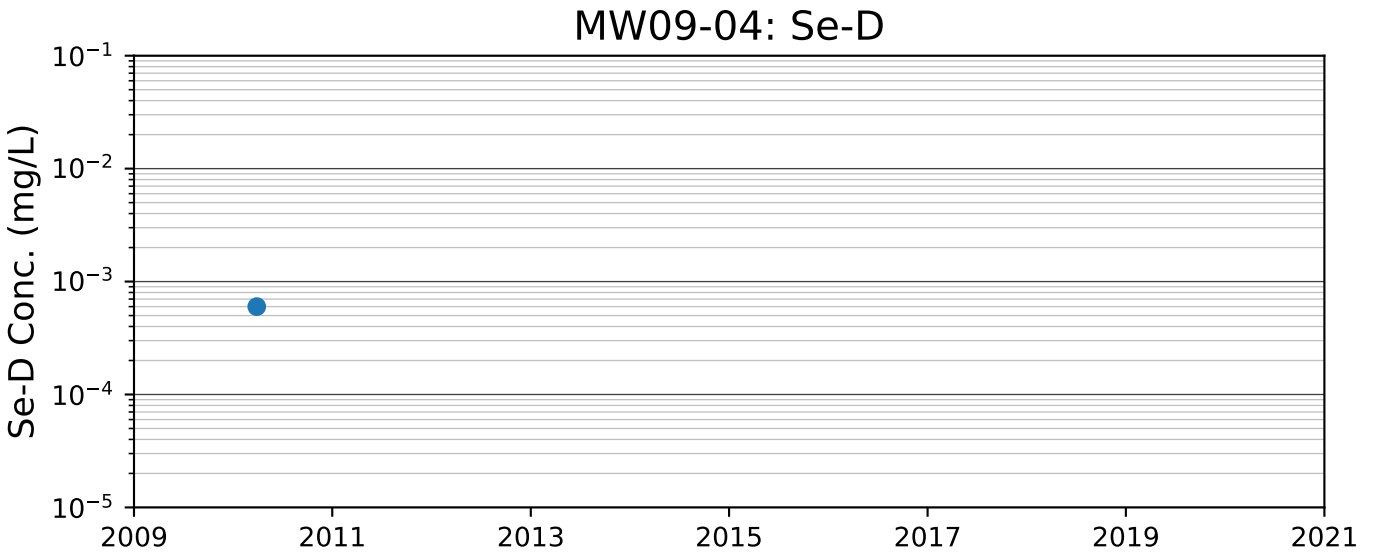

MW09-04: Chlord
Chlord Conc. (mg/L)
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
2009
2011
2013
2015
2017
2019
2021

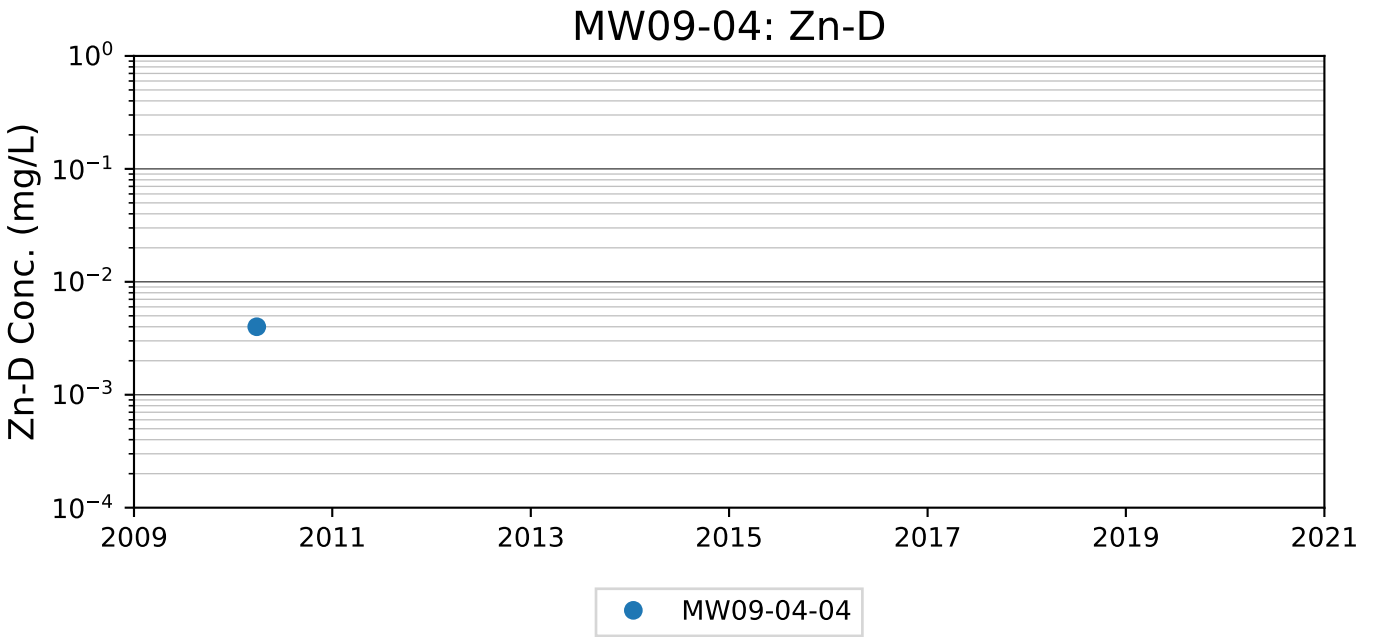

MW09-04: Cd-D
Cd-D Conc. (mg/L)
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-7}
2009
2011
2013
2015
2017
2019
2021

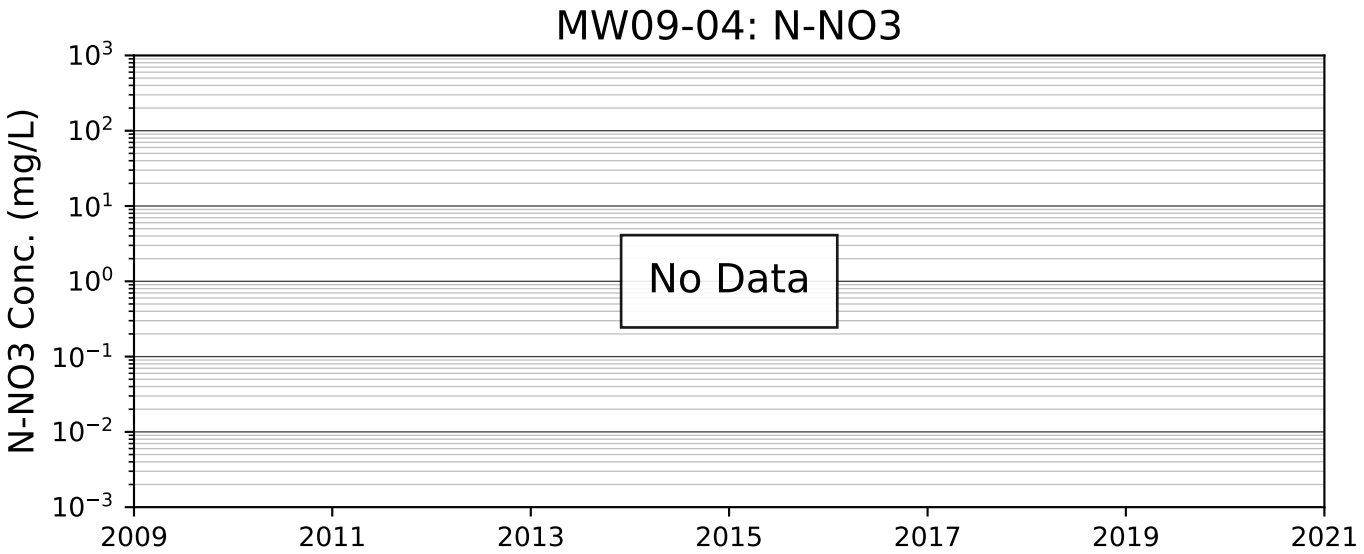

MW09-04: Cr-D
Cr-D Conc. (mg/L)
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021
MW09-04-04

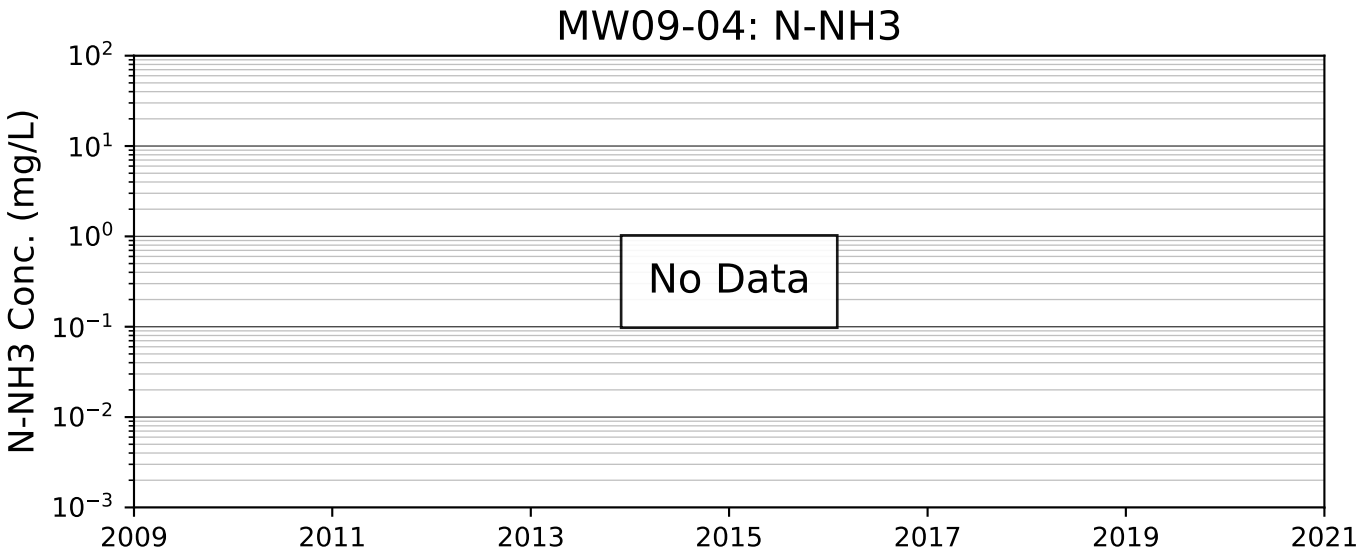

MW09-04: Cu-D
Cu-D Conc. (mg/L)
MW09-04: Pb-D
Pb-D Conc. (mg/L)
MW09-04: Mo-D
Mo-D Conc. (mg/L)
2009
2011
2013
2015
2017
2019
2021
MW09-04-04

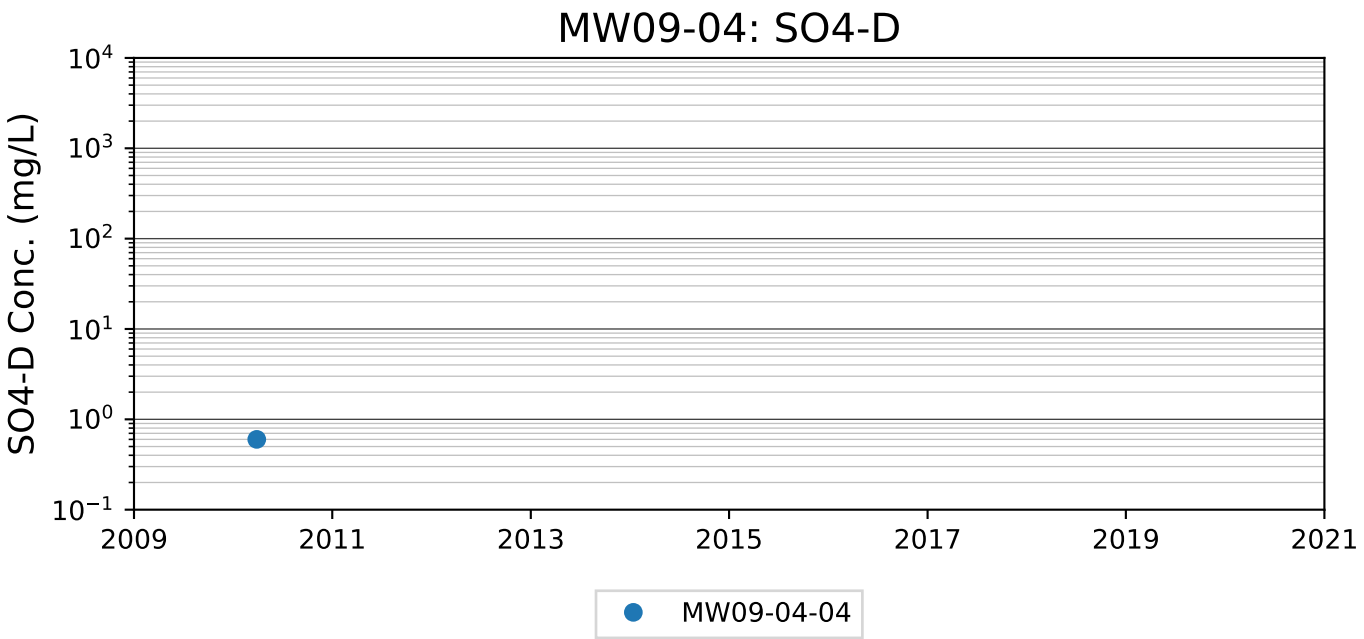

MW09-04: Ni-D
Ni-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
2009
2011
2013
2015
2017
2019
2021

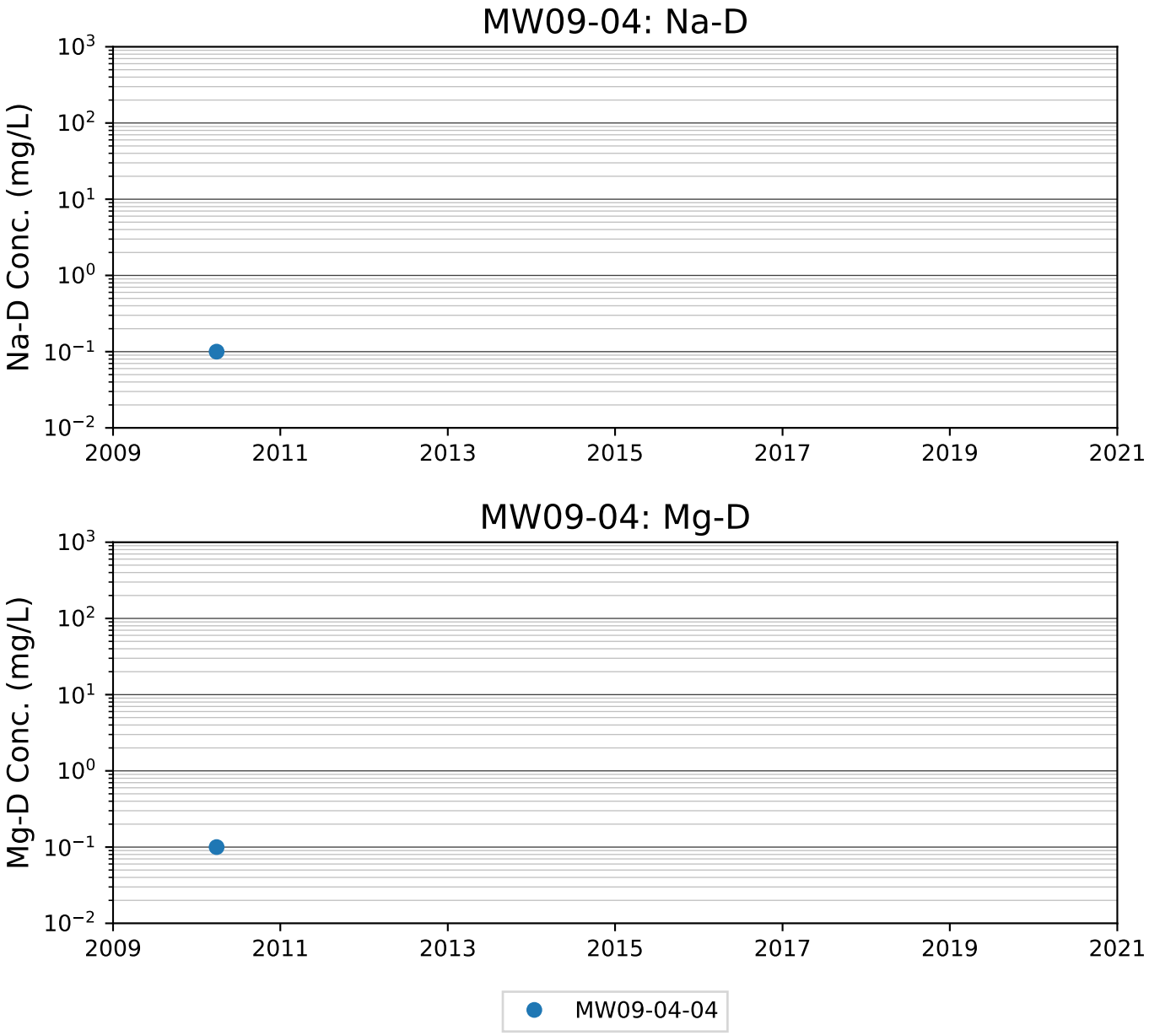

MW09-04: Se-D
Se-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021

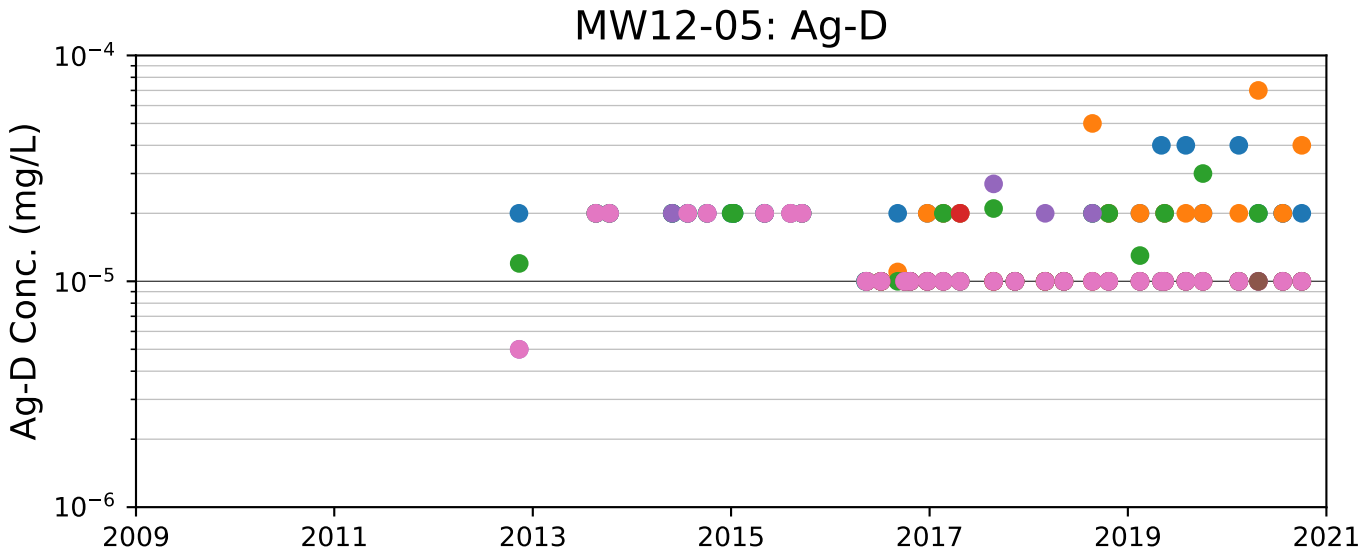

MW09-04: Zn-D
Zn-D Conc. (mg/L)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
2009
2011
2013
2015
2017
2019
2021
MW09-04-04

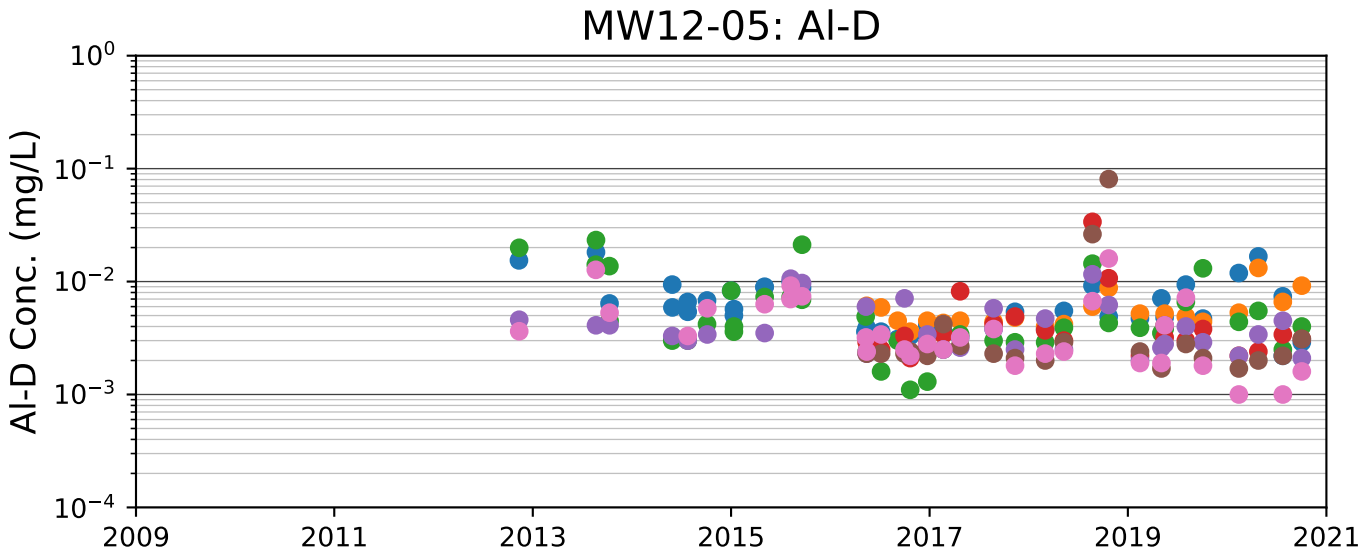

MW09-04: N-NO3
N-NO3 Conc. (mg/L)
No Data
2009
2011
2013
2015
2017
2019
2021

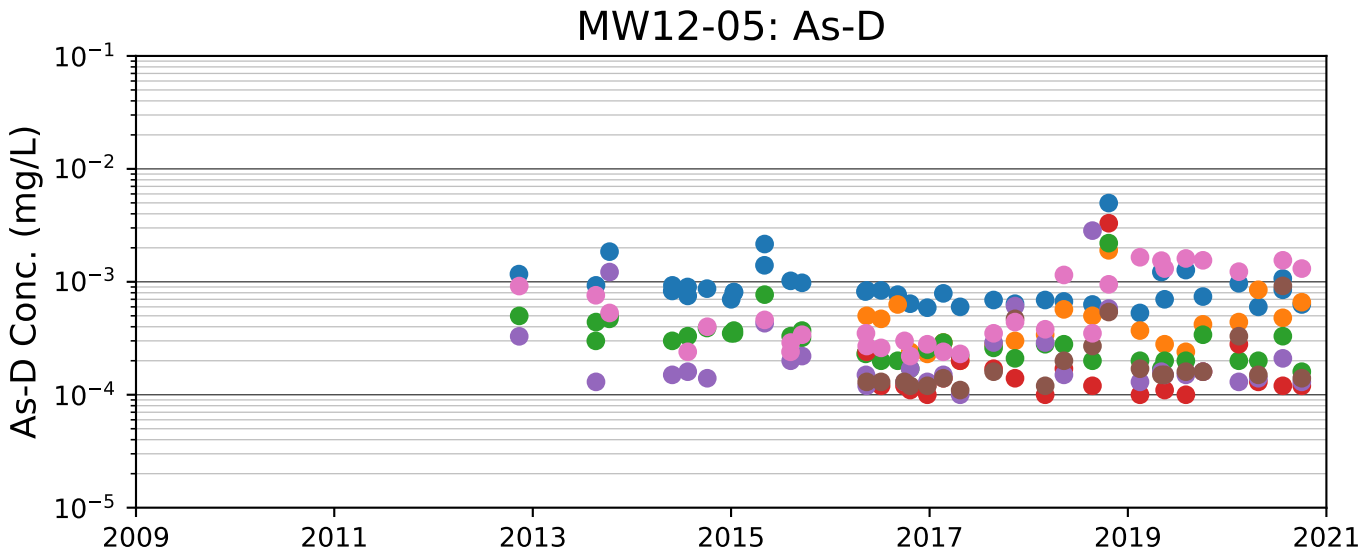

MW09-04: N-NH3
N-NH3 Conc. (mg/L)
No Data
2009
2011
2013
2015
2017
2019
2021

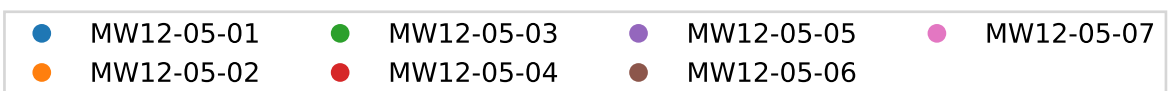

MW09-04: SO4-D
SO4-D Conc. (mg/L)
2009
2011
2013
2015
2017
2019
2021
MW09-04-04

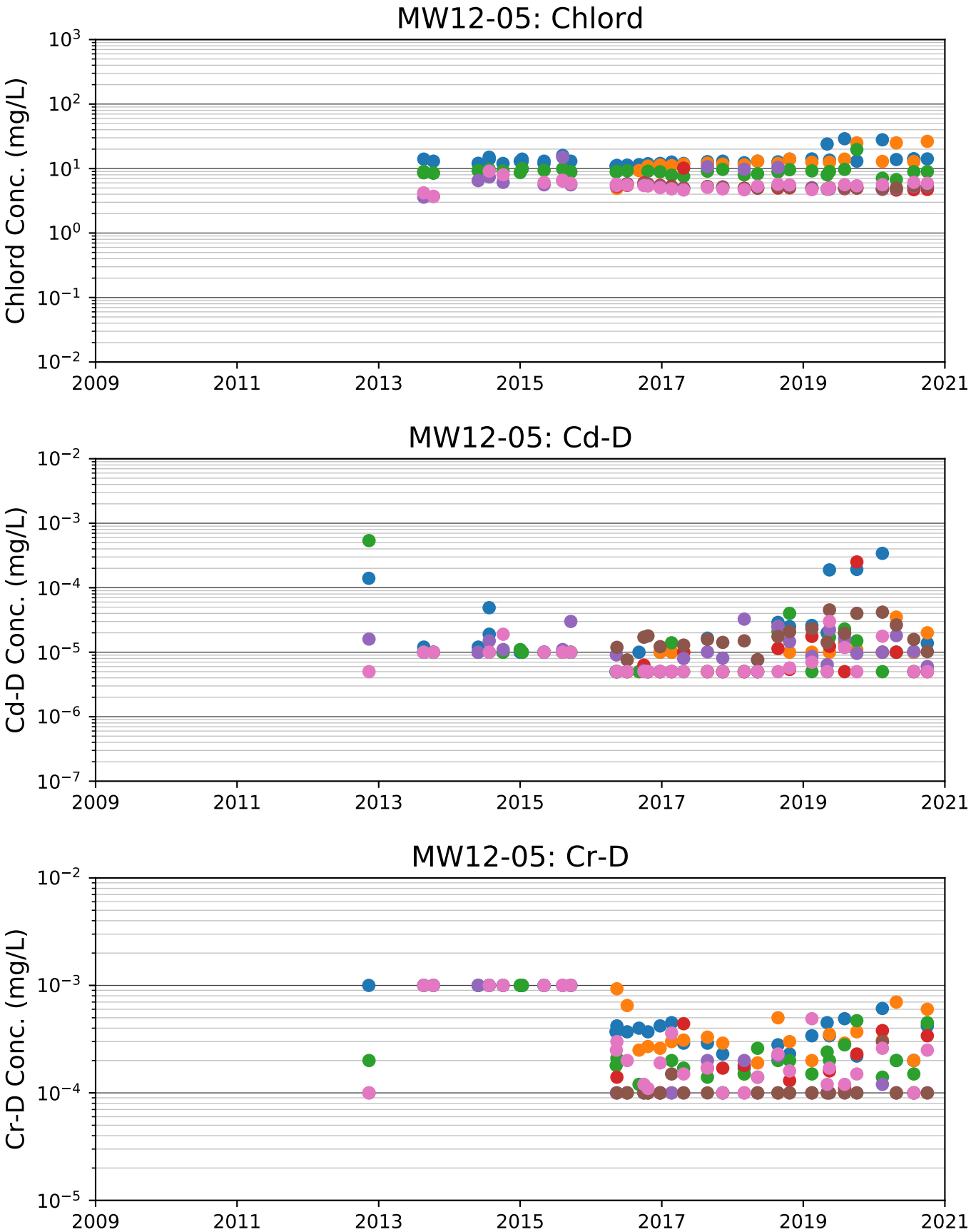

MW09-04: Na-D
Na-D Conc. (mg/L)
10^3
10^2
10^1
10^0
10^{-1}
10^{-2}
2009
2011
2013
2015
2017
2019
2021
MW09-04: Mg-D
Mg-D Conc. (mg/L)
10^3
10^2
10^1
10^0
10^{-1}
10^{-2}
2009
2011
2013
2015
2017
2019
2021
MW09-04-04

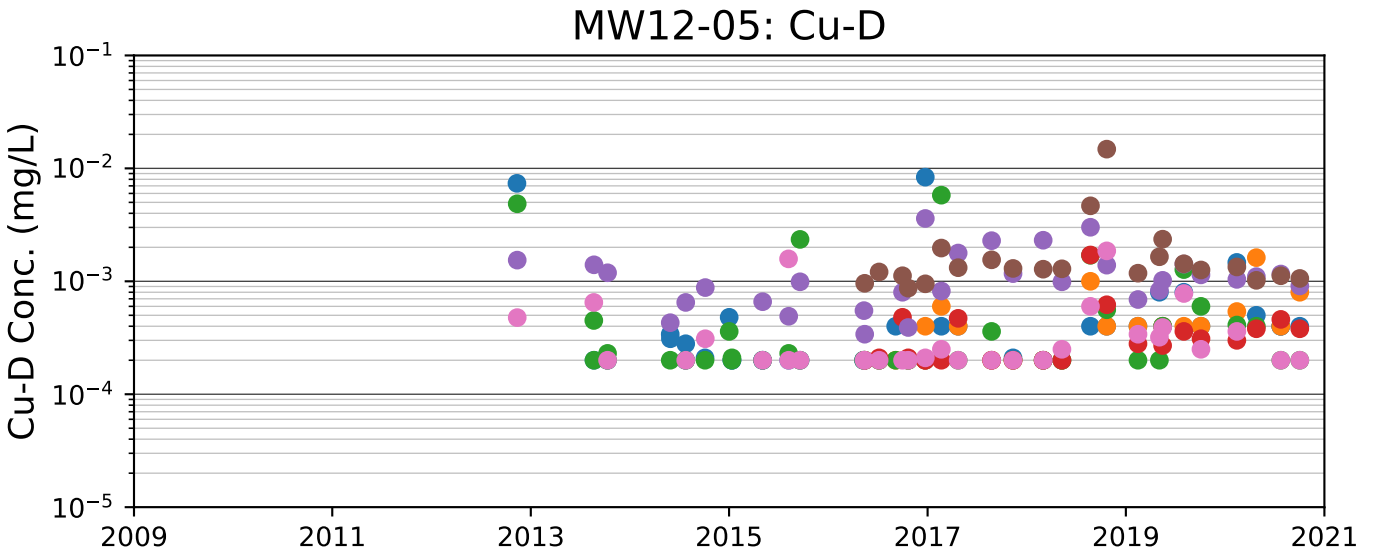

MW12-05: Ag-D
Ag-D Conc. (mg/L)
10^{-4}
10^{-5}
10^{-6}
2009
2011
2013
2015
2017
2019
2021

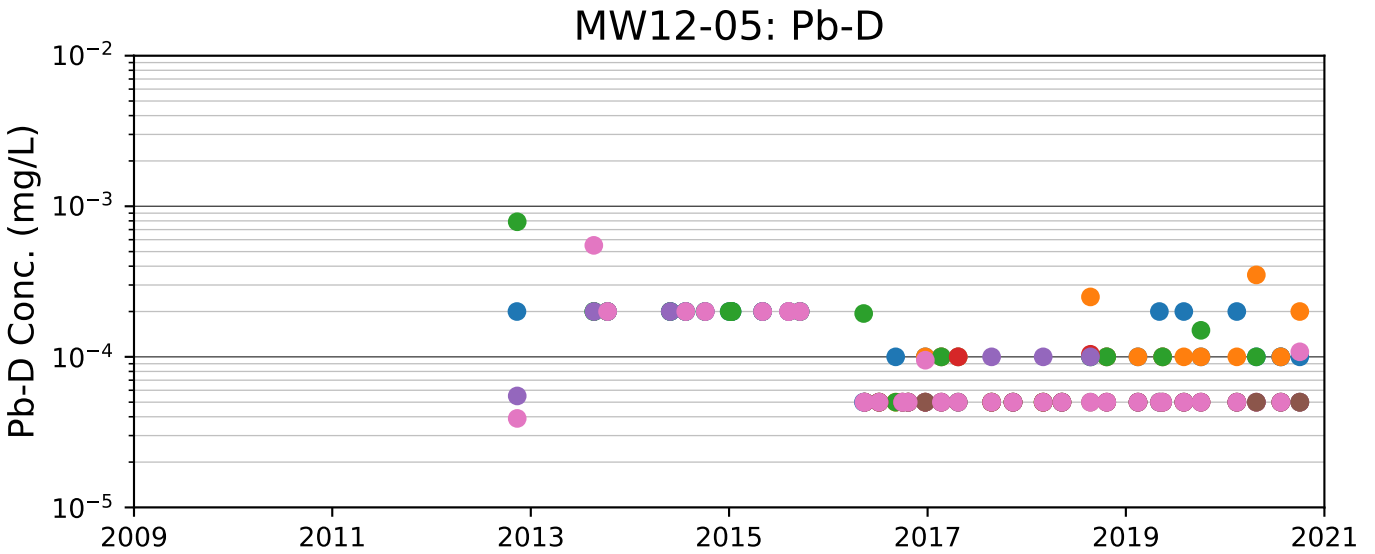

MW12-05: Al-D
Al-D Conc. (mg/L)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
2009
2011
2013
2015
2017
2019
2021

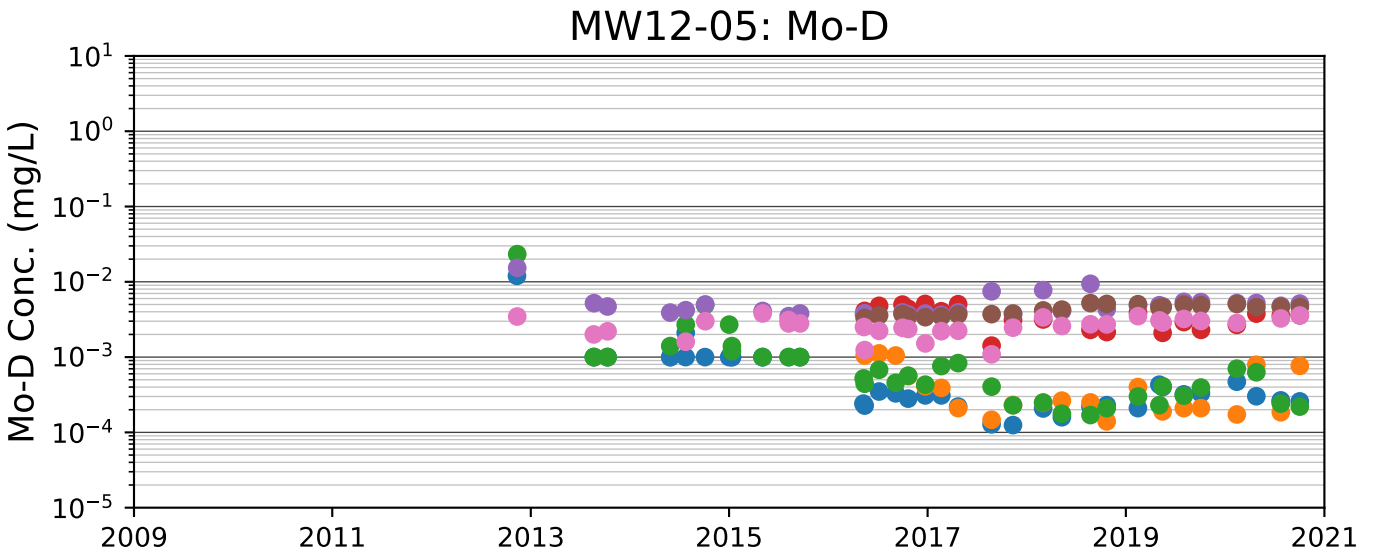

MW12-05: As-D
As-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021

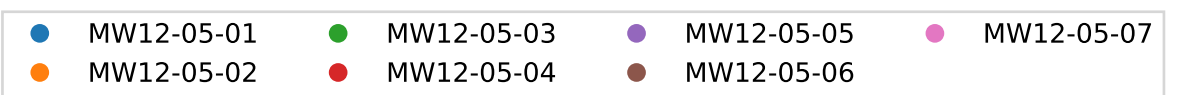

MW12-05-01
MW12-05-02
MW12-05-03
MW12-05-04
MW12-05-05
MW12-05-06
MW12-05-07

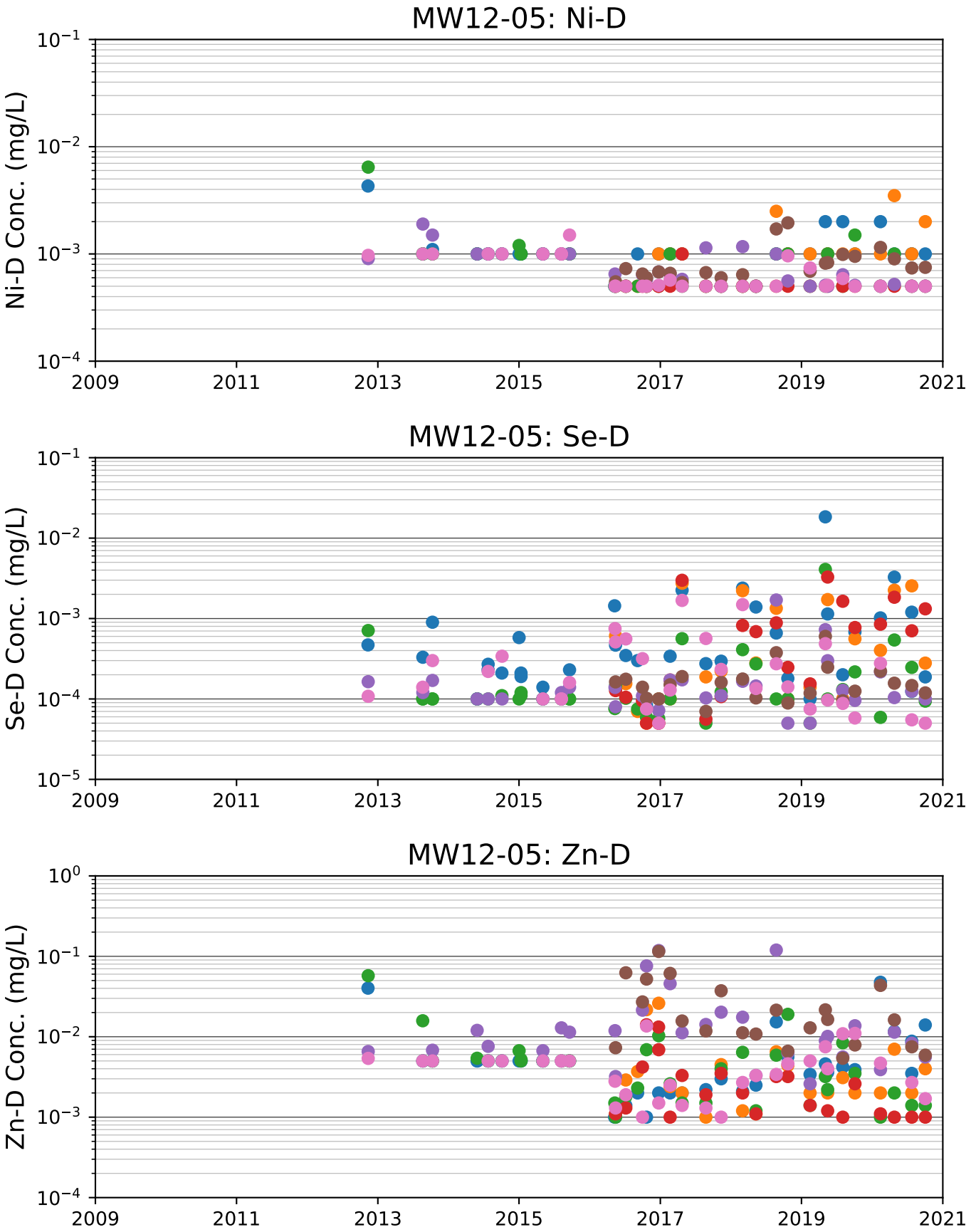

MW12-05: Chlord
Chlord Conc. (mg/L)
MW12-05: Cd-D
Cd-D Conc. (mg/L)
MW12-05: Cr-D
Cr-D Conc. (mg/L)
2009
2011
2013
2015
2017
2019
2021
MW12-05-01
MW12-05-02
MW12-05-03
MW12-05-04
MW12-05-05
MW12-05-06
MW12-05-07

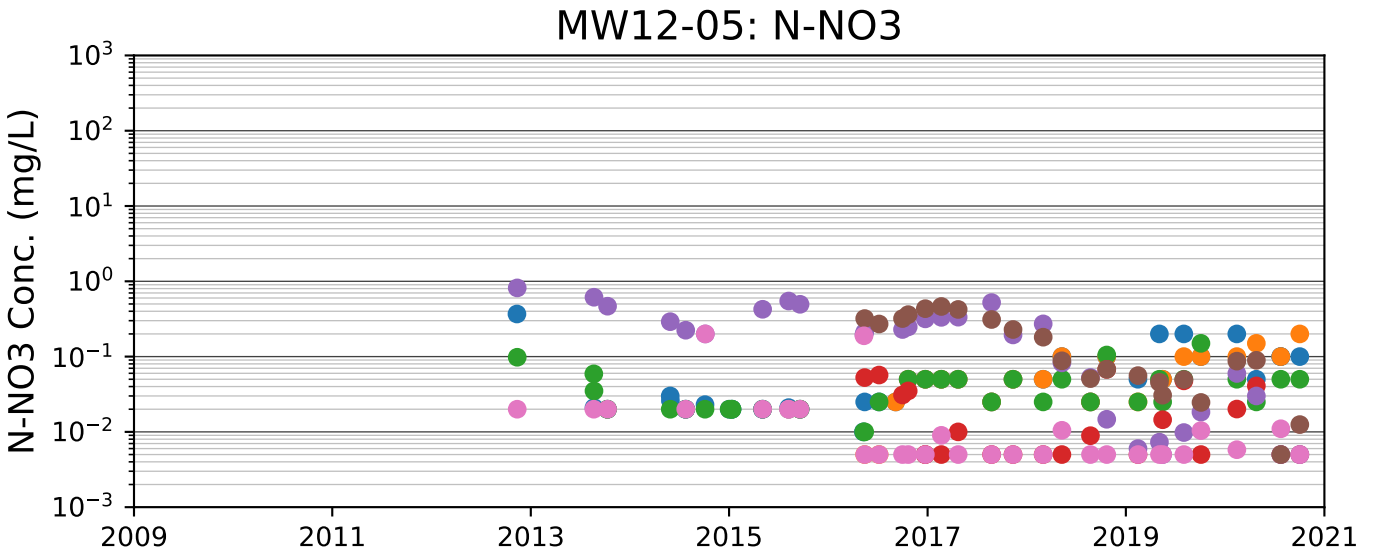

MW12-05: Cu-D
Cu-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021

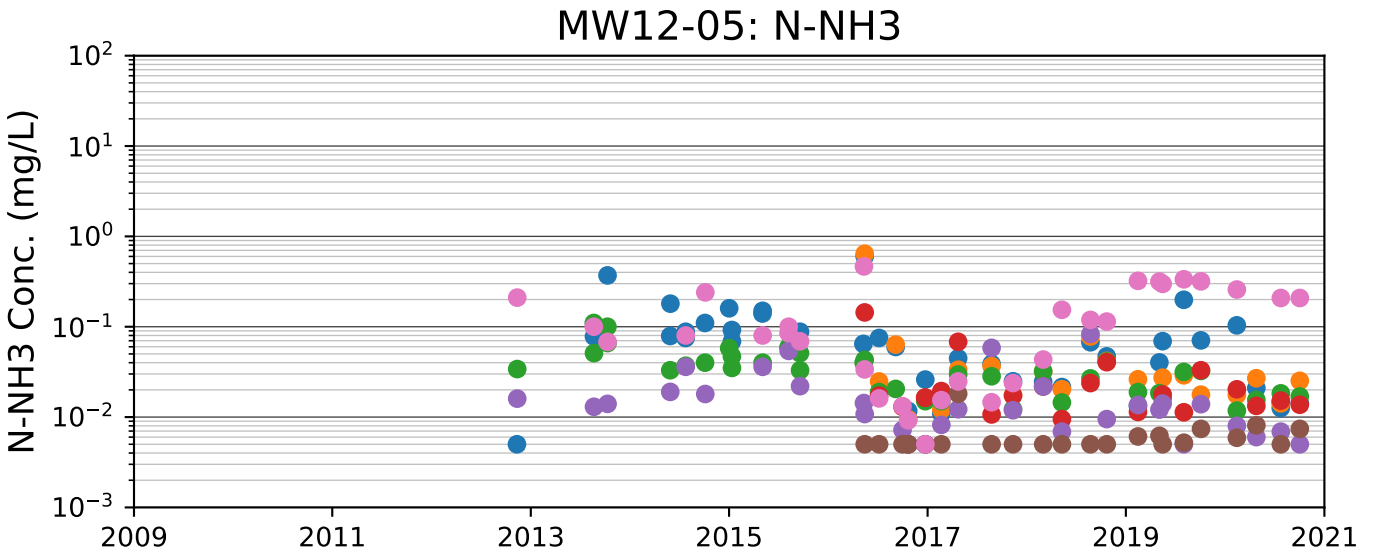

MW12-05: Pb-D
Pb-D Conc. (mg/L)
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021

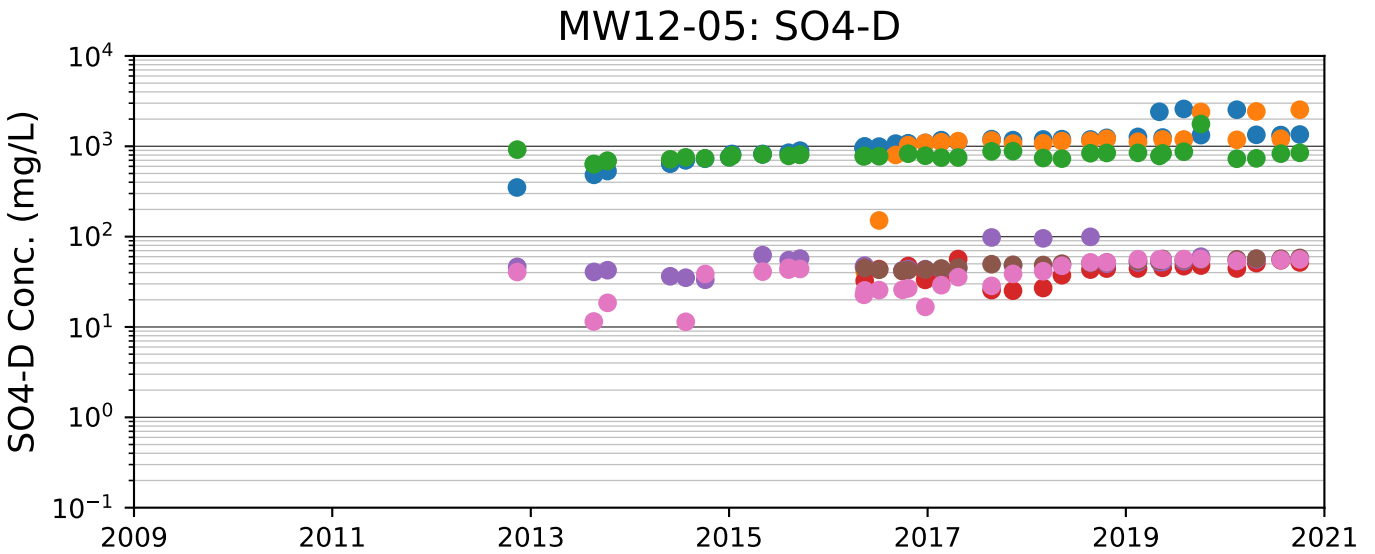

MW12-05: Mo-D
Mo-D Conc. (mg/L)
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021

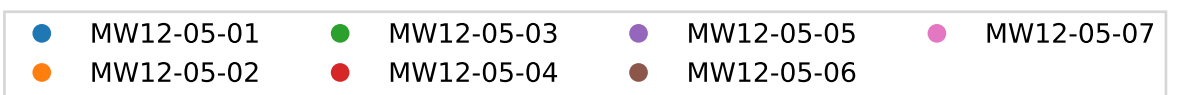

MW12-05-01
MW12-05-02
MW12-05-03
MW12-05-04
MW12-05-05
MW12-05-06
MW12-05-07

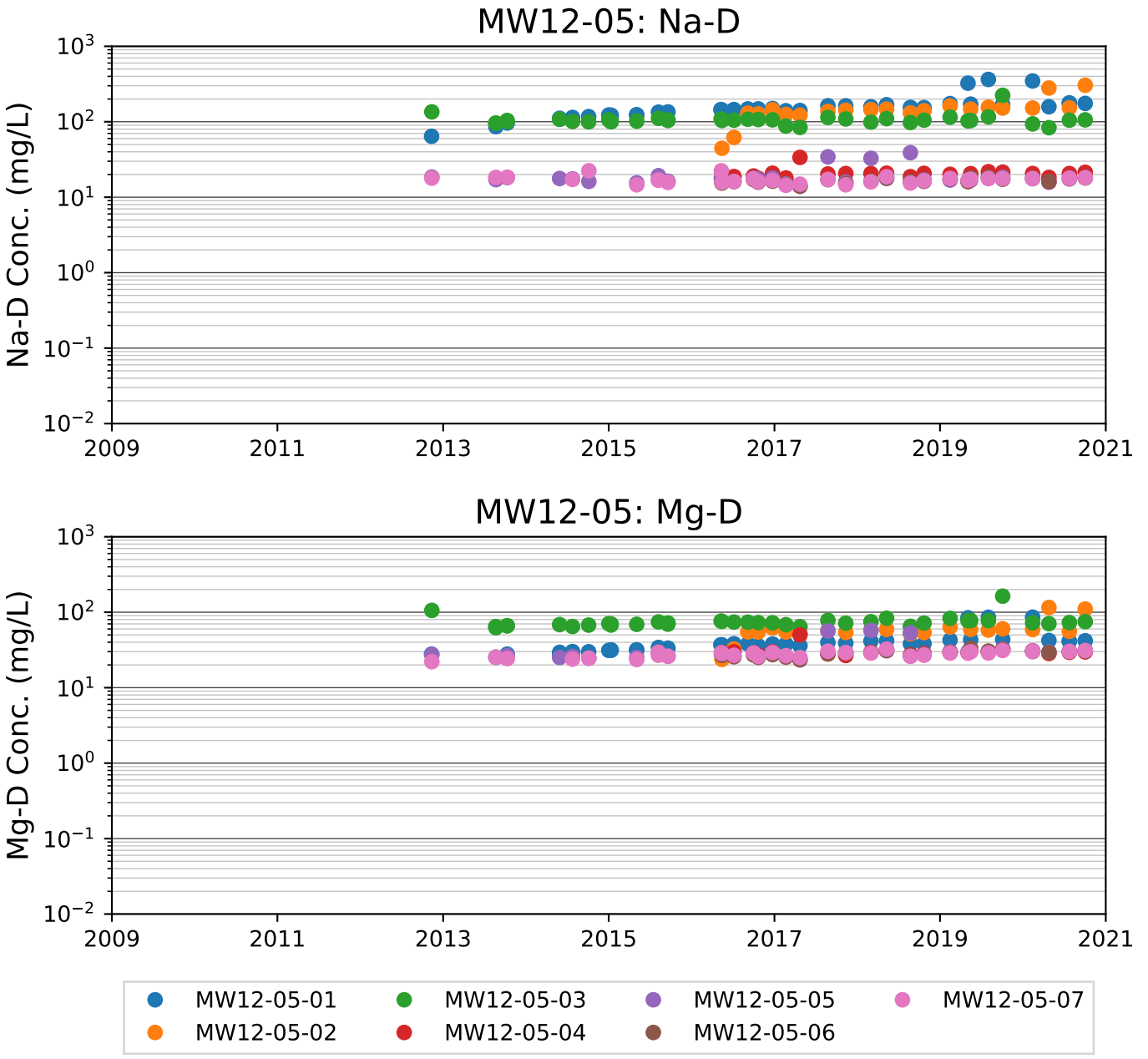

MW12-05: Ni-D
Ni-D Conc. (mg/L)
MW12-05: Se-D
Se-D Conc. (mg/L)
MW12-05: Zn-D
Zn-D Conc. (mg/L)
2009
2011
2013
2015
2017
2019
2021
MW12-05-01
MW12-05-02
MW12-05-03
MW12-05-04
MW12-05-05
MW12-05-06
MW12-05-07

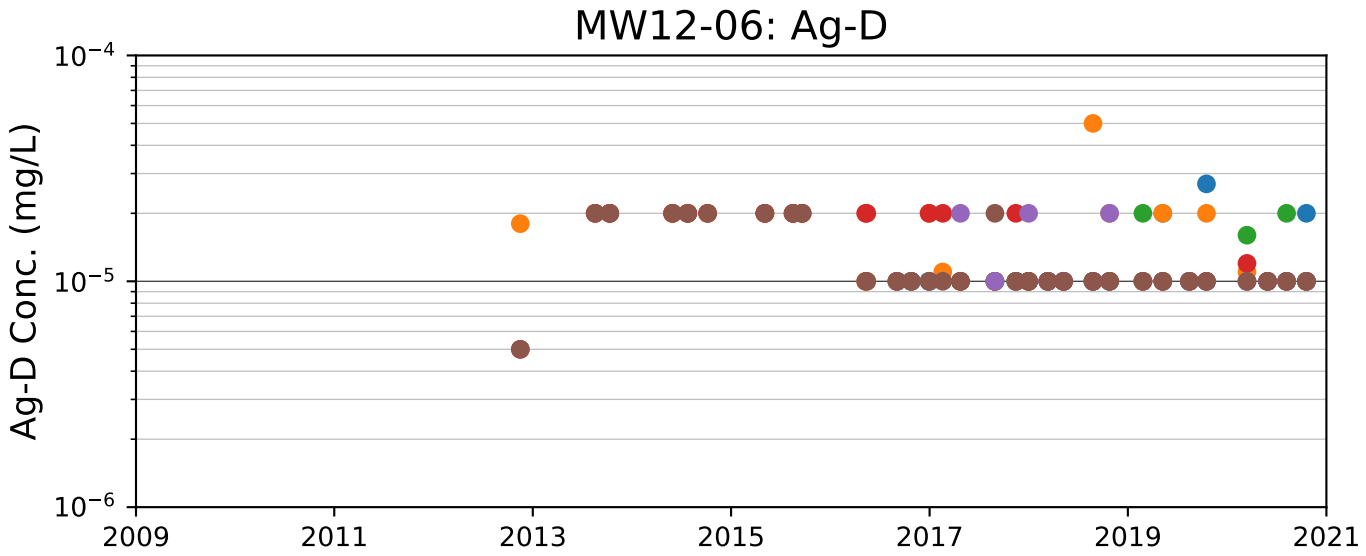

MW12-05: N-NO3
N-NO3 Conc. (mg/L)
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
2009
2011
2013
2015
2017
2019
2021

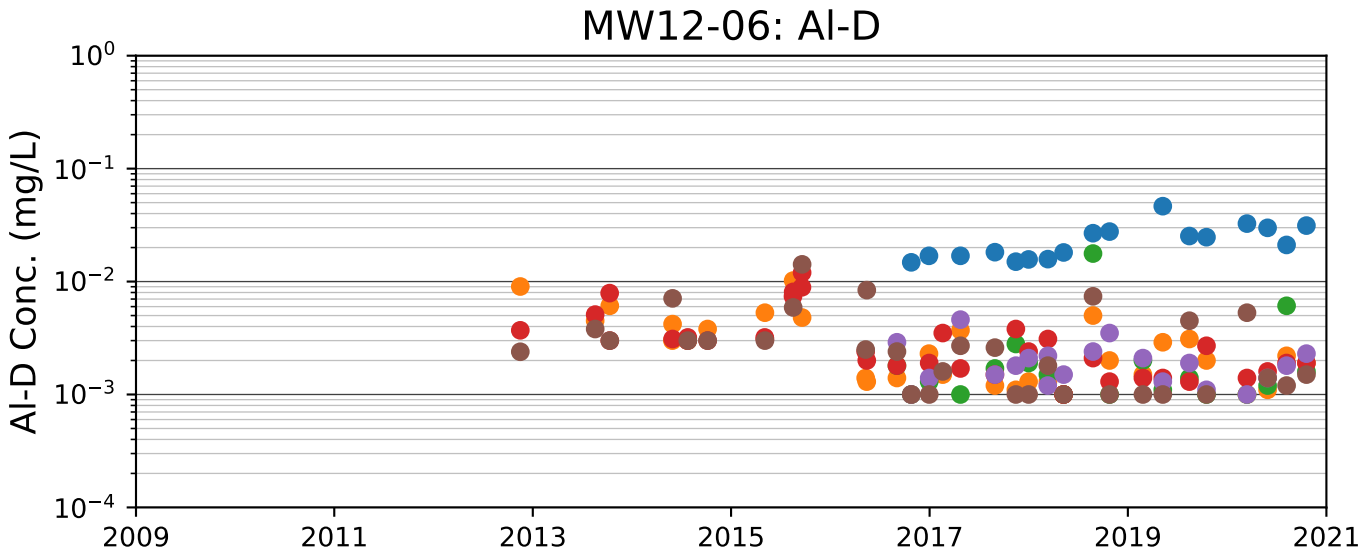

MW12-05: N-NH3
N-NH3 Conc. (mg/L)
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
2009
2011
2013
2015
2017
2019
2021

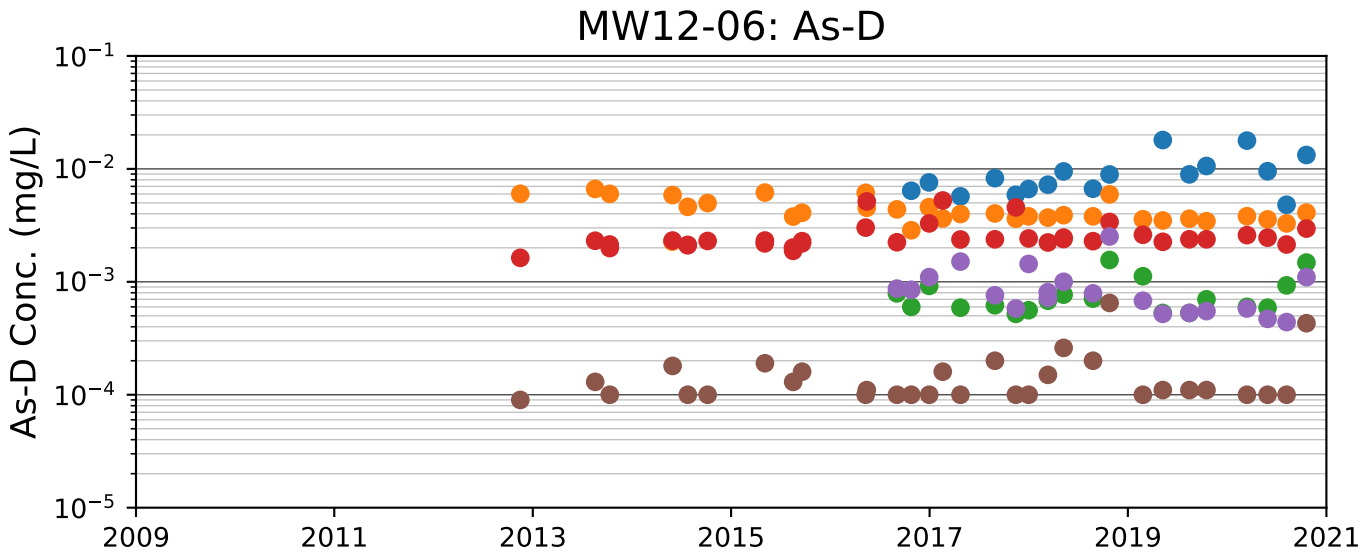

MW12-05: SO4-D
SO4-D Conc. (mg/L)
10^{4}
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
2009
2011
2013
2015
2017
2019
2021

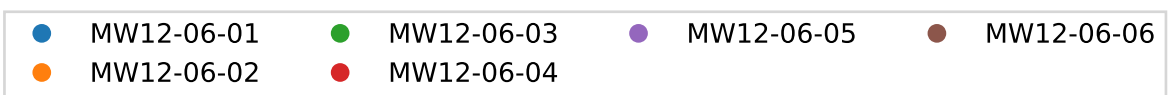

MW12-05-01
MW12-05-02
MW12-05-03
MW12-05-04
MW12-05-05
MW12-05-06
MW12-05-07

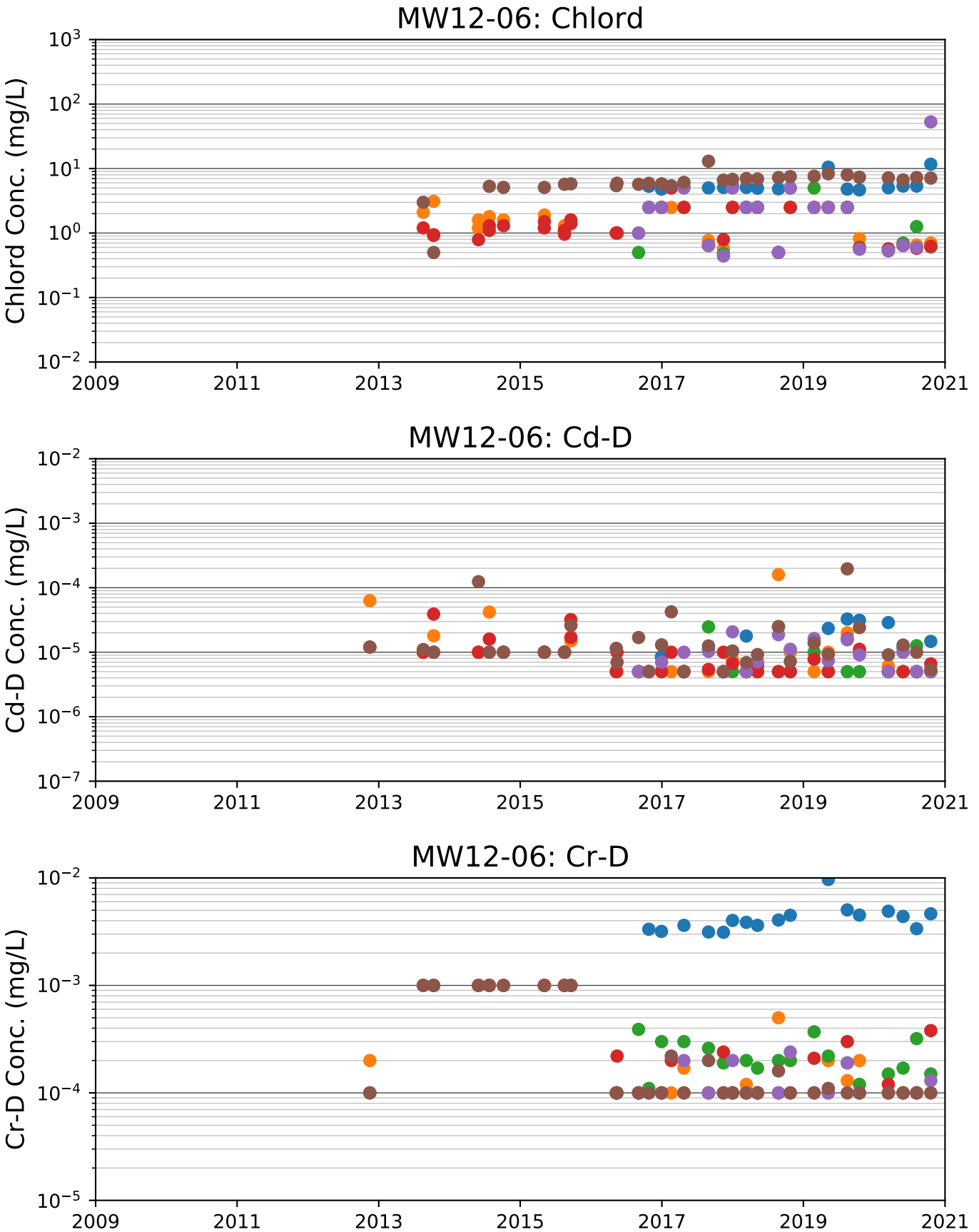

MW12-05: Na-D
Na-D Conc. (mg/L)
10^3
10^2
10^1
10^0
10^{-1}
10^{-2}
2009
2011
2013
2015
2017
2019
2021
MW12-05: Mg-D
Mg-D Conc. (mg/L)
MW12-05-01
MW12-05-02
MW12-05-03
MW12-05-04
MW12-05-05
MW12-05-06
MW12-05-07

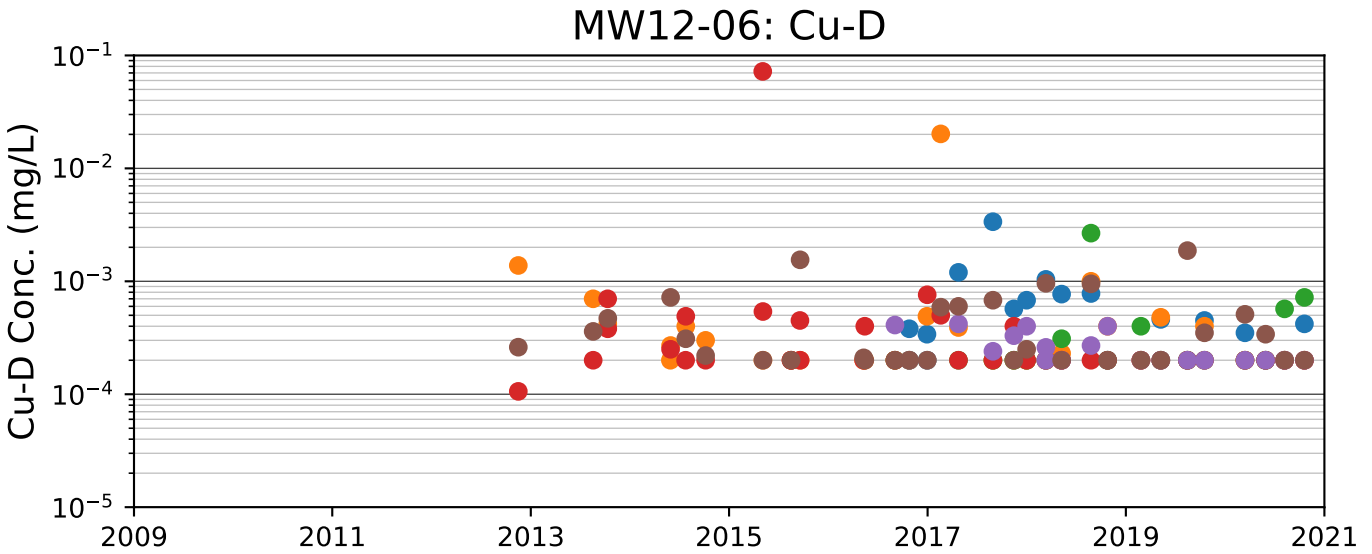

MW12-06: Ag-D
Ag-D Conc. (mg/L)
10^{-4}
10^{-5}
10^{-6}
2009
2011
2013
2015
2017
2019
2021

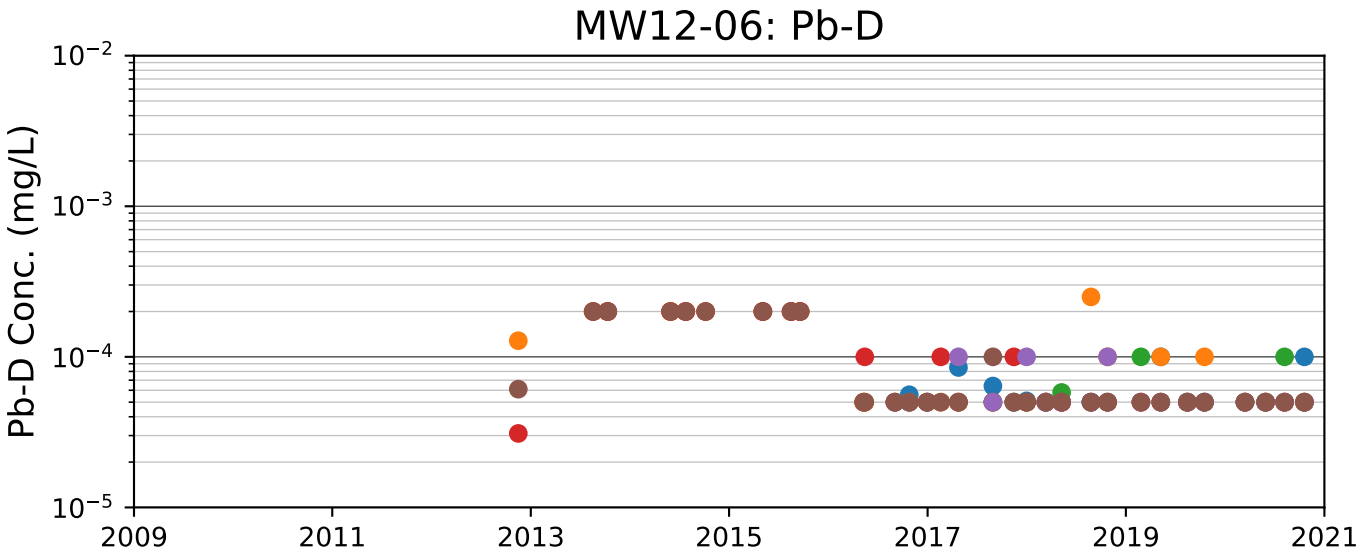

MW12-06: Al-D
Al-D Conc. (mg/L)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
2009
2011
2013
2015
2017
2019
2021

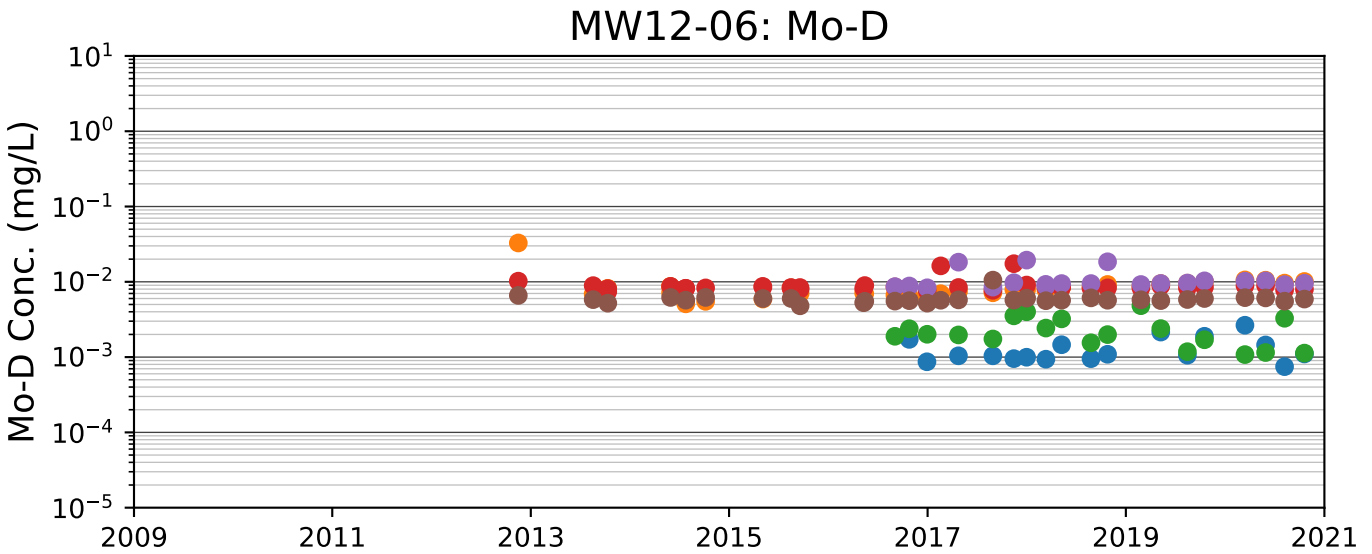

MW12-06: As-D
As-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021

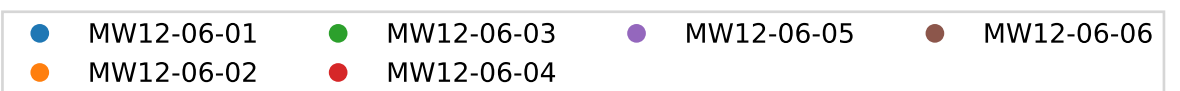

MW12-06-01
MW12-06-02
MW12-06-03
MW12-06-04
MW12-06-05
MW12-06-06

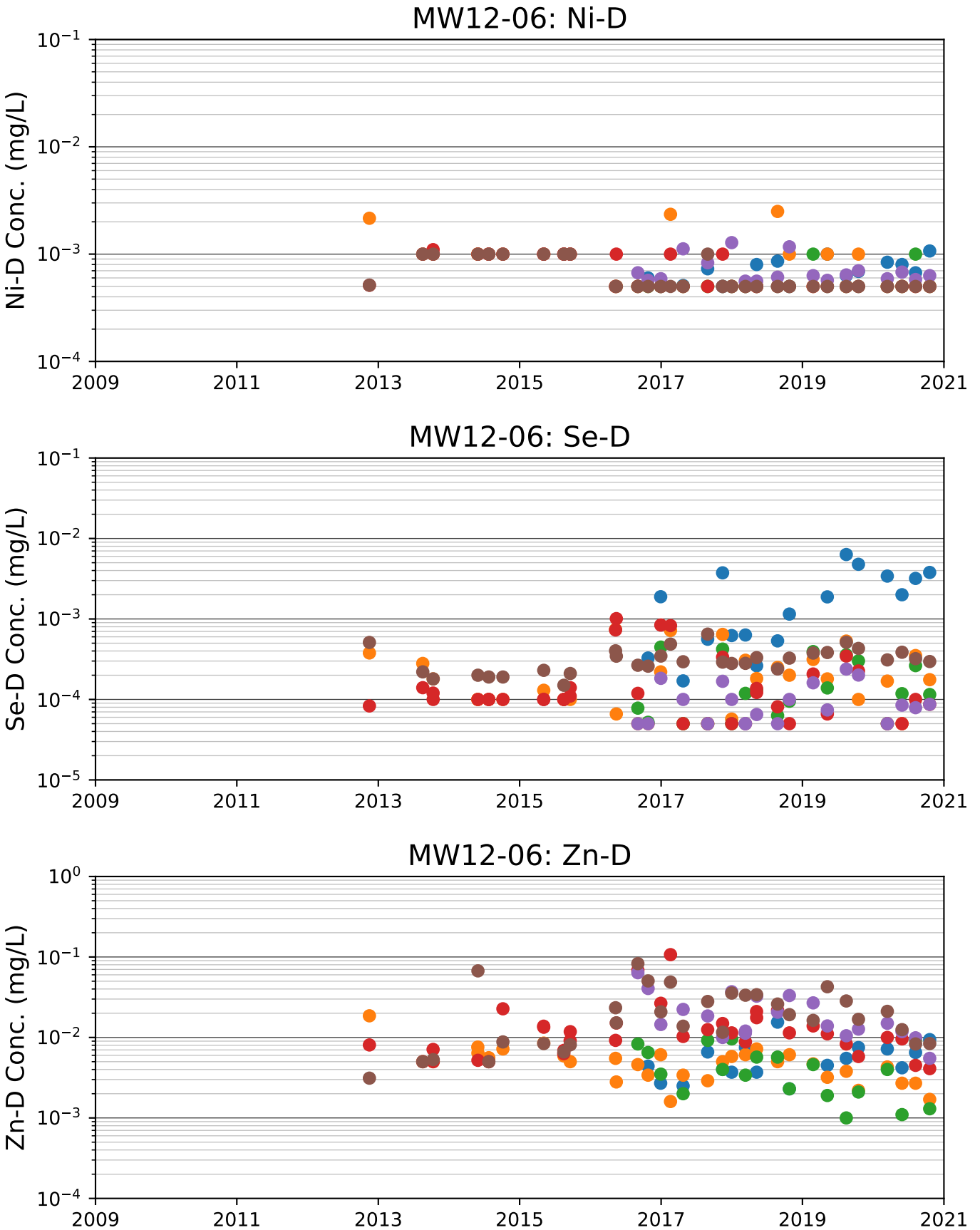

MW12-06: Chlord
Chlord Conc. (mg/L)
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
2009
2011
2013
2015
2017
2019
2021
MW12-06: Cd-D
Cd-D Conc. (mg/L)
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-7}
MW12-06: Cr-D
Cr-D Conc. (mg/L)
10^{-2}
10^{-3}
10^{-4}
10^{-5}
MW12-06-01
MW12-06-02
MW12-06-03
MW12-06-04
MW12-06-05
MW12-06-06

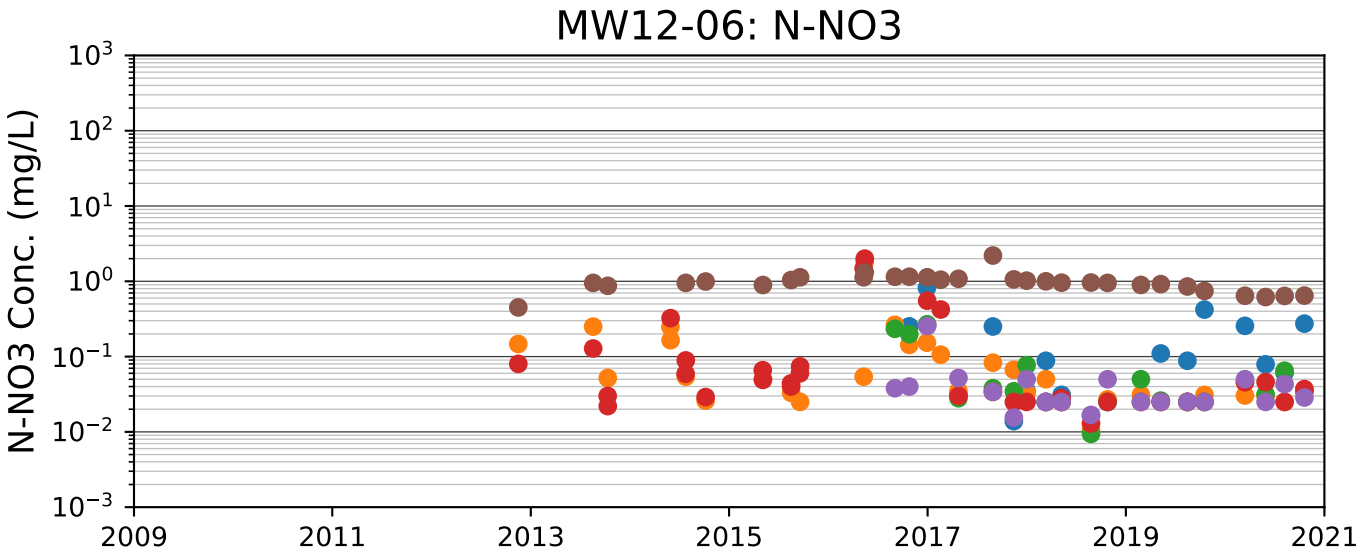

MW12-06: Cu-D
Cu-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021

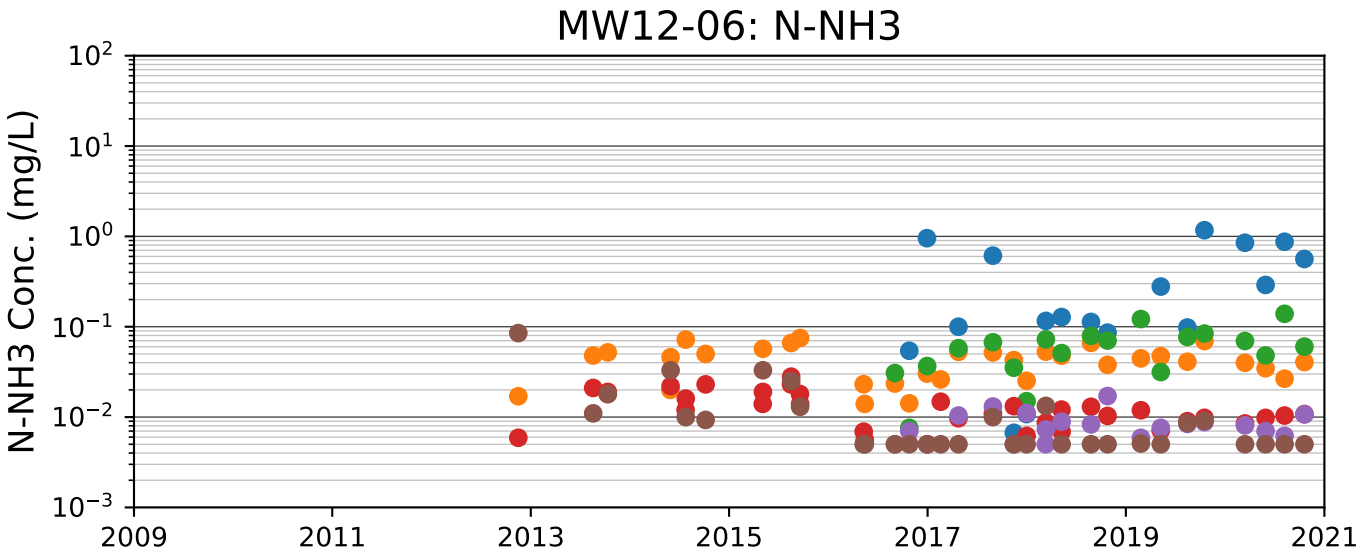

MW12-06: Pb-D
Pb-D Conc. (mg/L)
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021

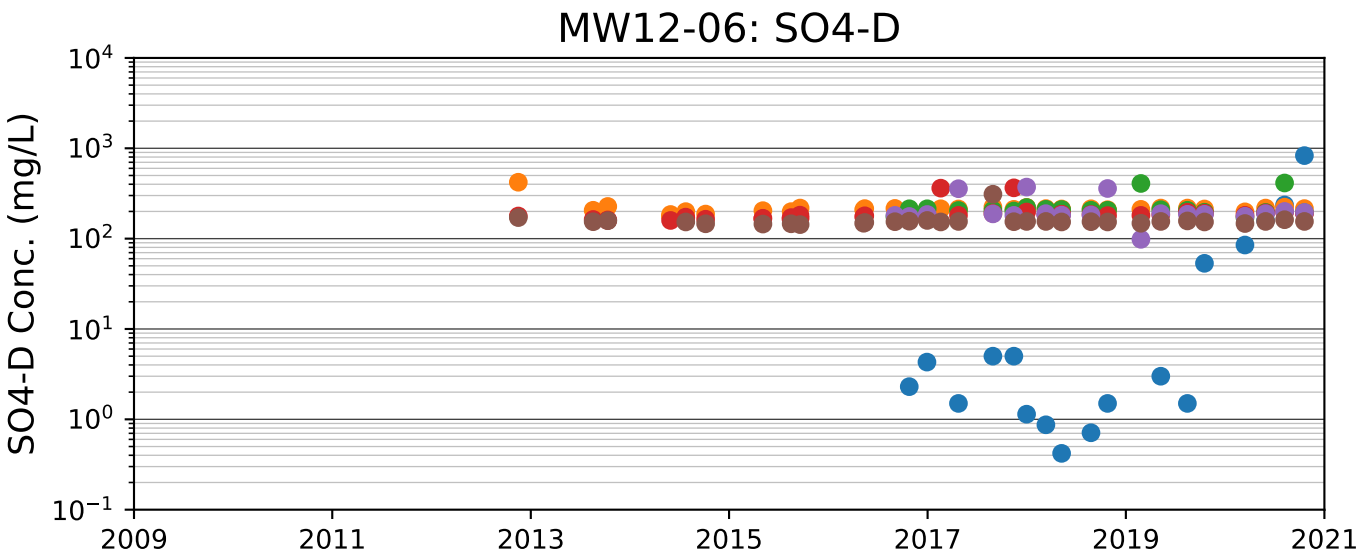

MW12-06: Mo-D
Mo-D Conc. (mg/L)
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021

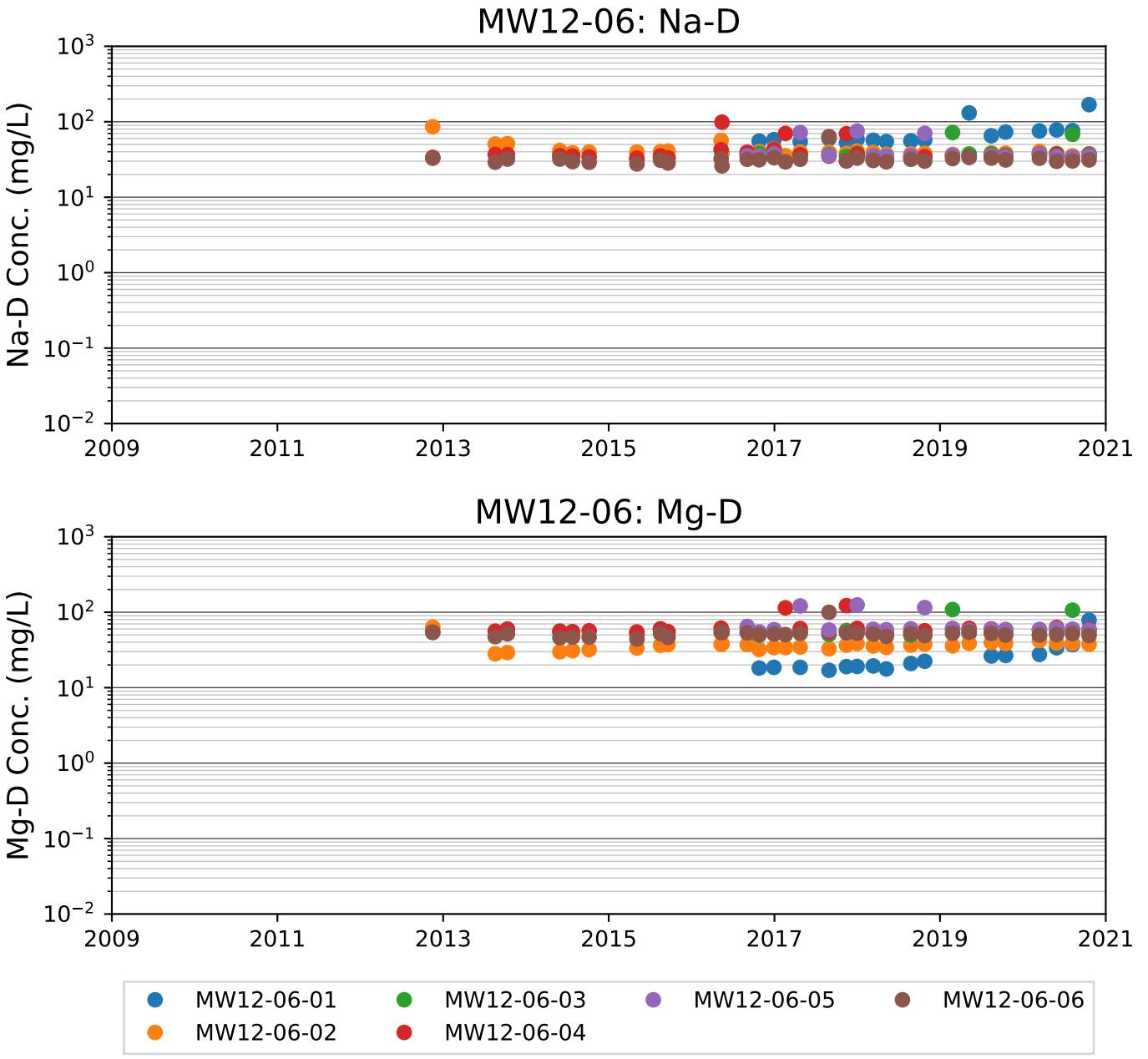

MW12-06-01
MW12-06-02
MW12-06-03
MW12-06-04
MW12-06-05
MW12-06-06

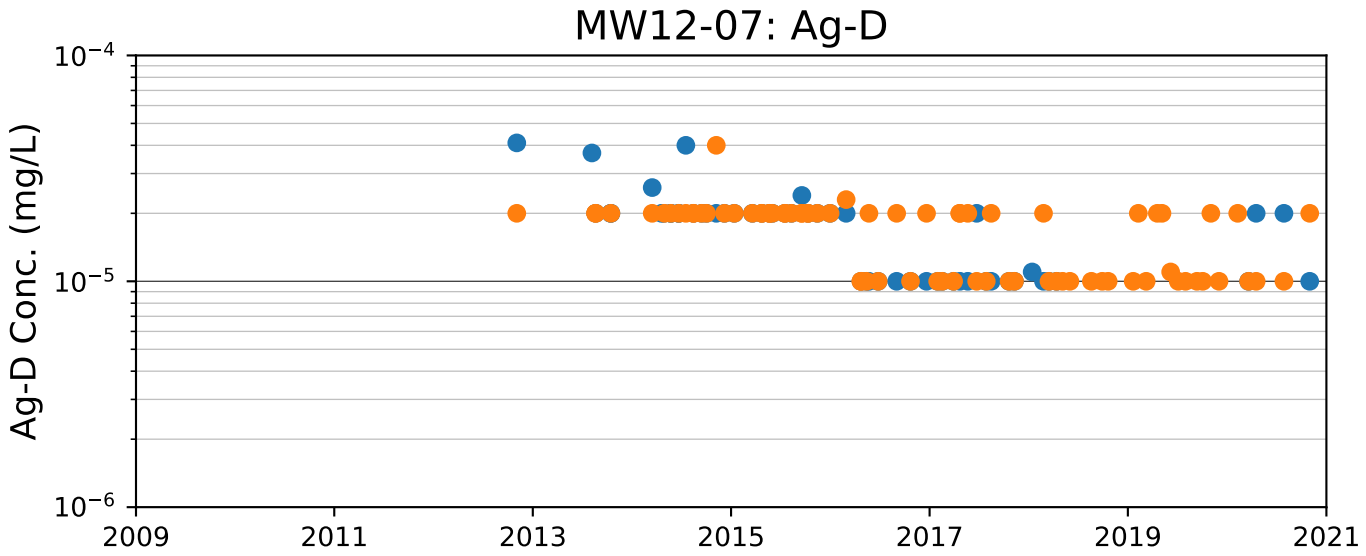

MW12-06: Ni-D
Ni-D Conc. (mg/L)
MW12-06: Se-D
Se-D Conc. (mg/L)
MW12-06: Zn-D
Zn-D Conc. (mg/L)
2009
2011
2013
2015
2017
2019
2021
MW12-06-01
MW12-06-02
MW12-06-03
MW12-06-04
MW12-06-05
MW12-06-06

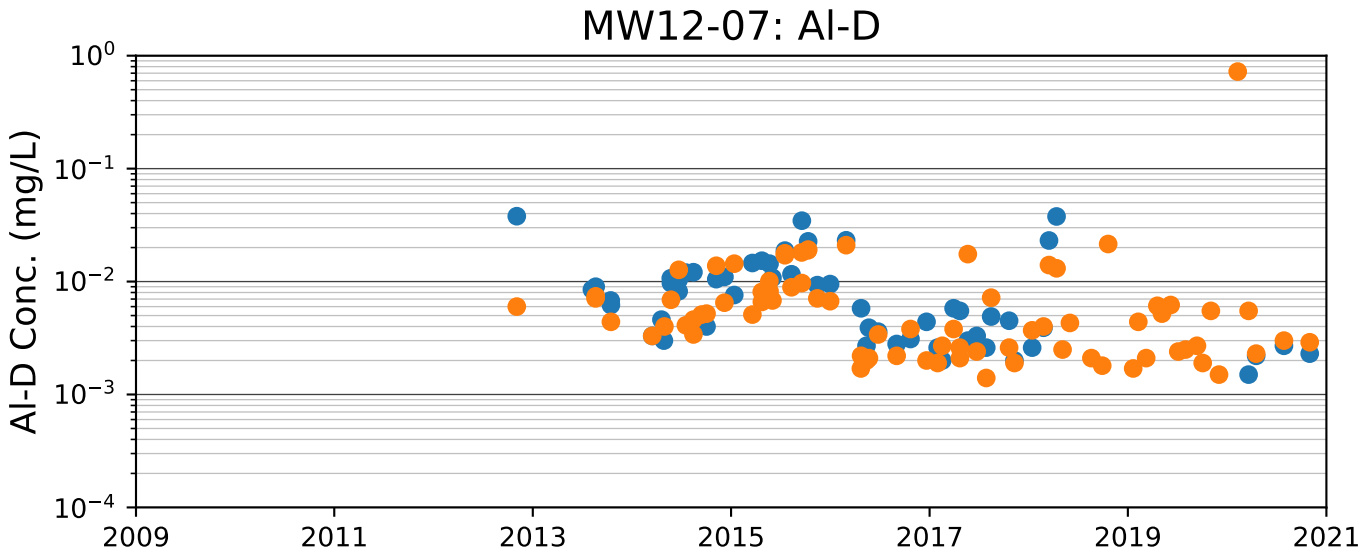

MW12-06: N-NO3
N-NO3 Conc. (mg/L)
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
2009
2011
2013
2015
2017
2019
2021

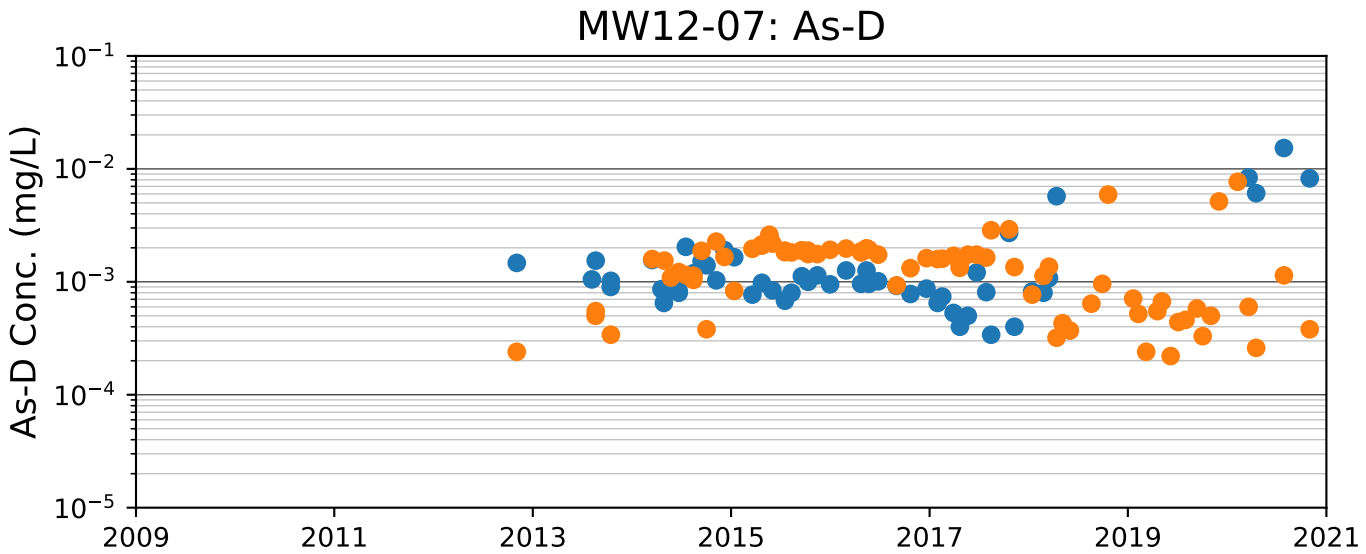

MW12-06: N-NH3
N-NH3 Conc. (mg/L)
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
2009
2011
2013
2015
2017
2019
2021

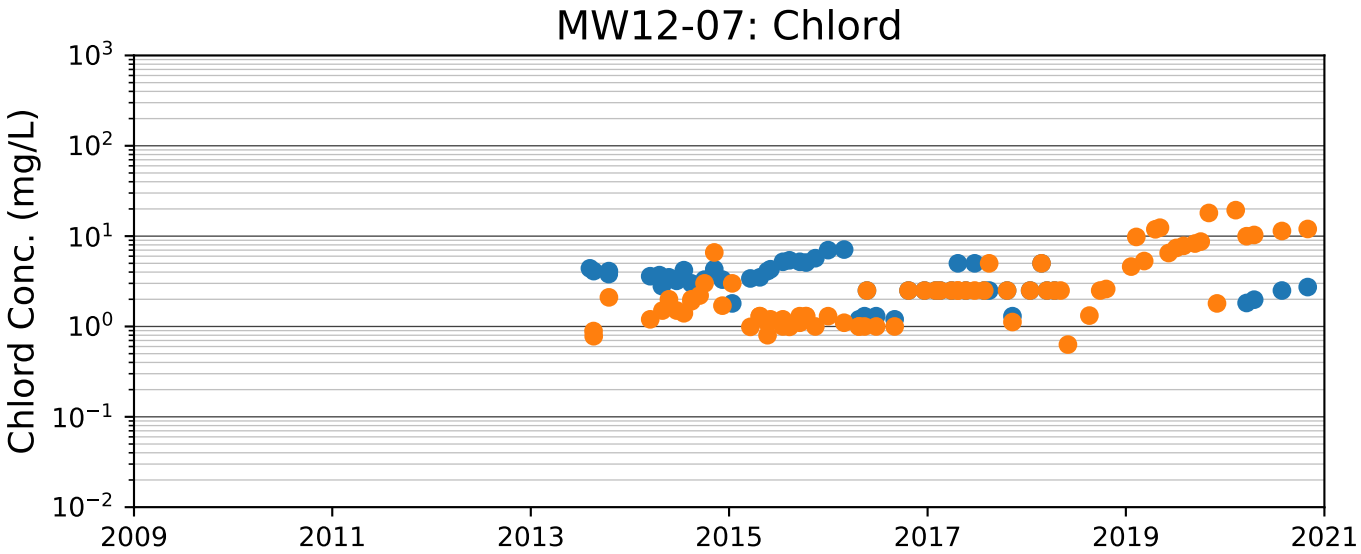

MW12-06: SO4-D
SO4-D Conc. (mg/L)
10^{4}
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
2009
2011
2013
2015
2017
2019
2021
MW12-06-01
MW12-06-02
MW12-06-03
MW12-06-04
MW12-06-05
MW12-06-06

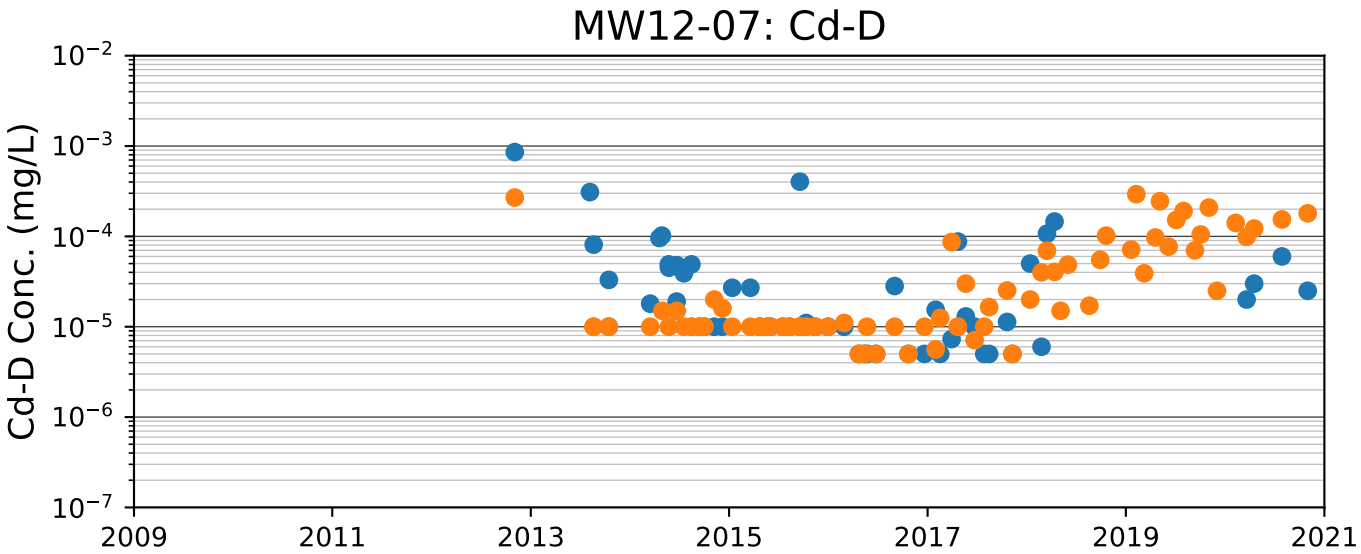

MW12-06: Na-D
Na-D Conc. (mg/L)
10^3
10^2
10^1
10^0
10^{-1}
10^{-2}
2009
2011
2013
2015
2017
2019
2021
MW12-06: Mg-D
Mg-D Conc. (mg/L)
MW12-06-01
MW12-06-02
MW12-06-03
MW12-06-04
MW12-06-05
MW12-06-06

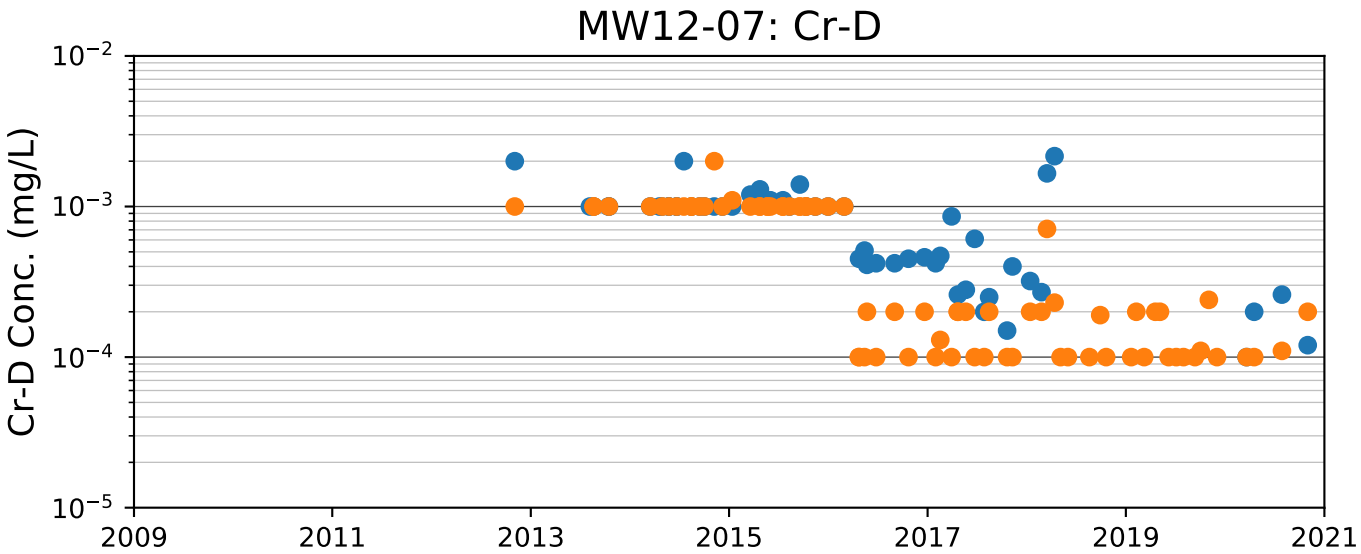

MW12-07: Ag-D
Ag-D Conc. (mg/L)
10^{-4}
10^{-5}
10^{-6}
2009
2011
2013
2015
2017
2019
2021

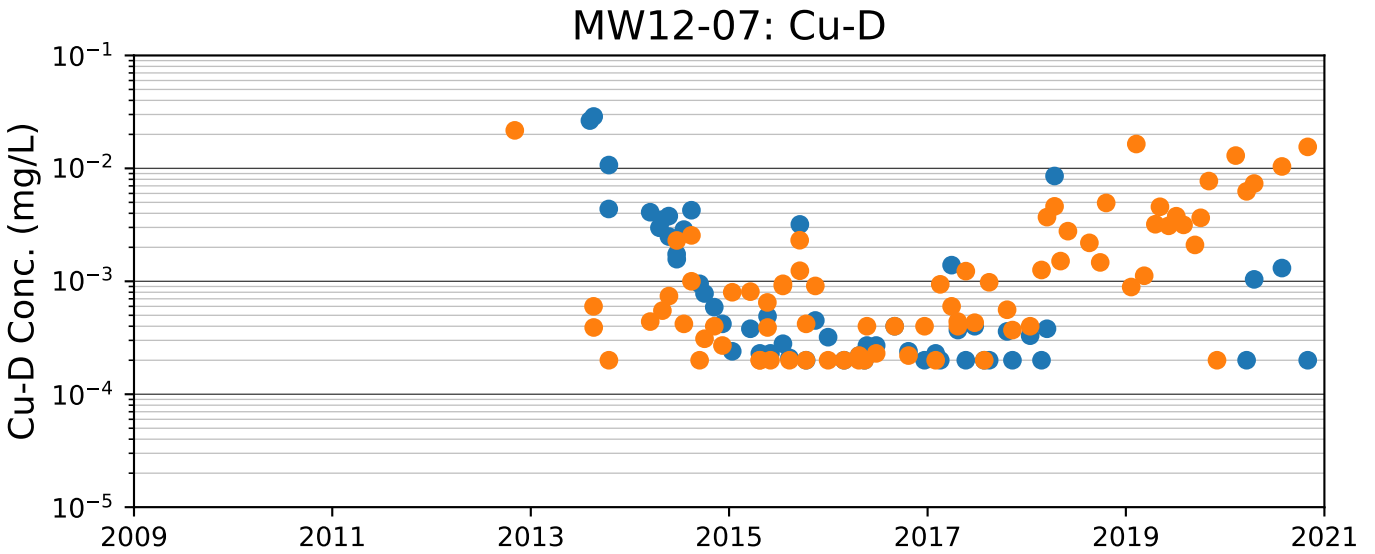

MW12-07: Al-D
Al-D Conc. (mg/L)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
2009
2011
2013
2015
2017
2019
2021

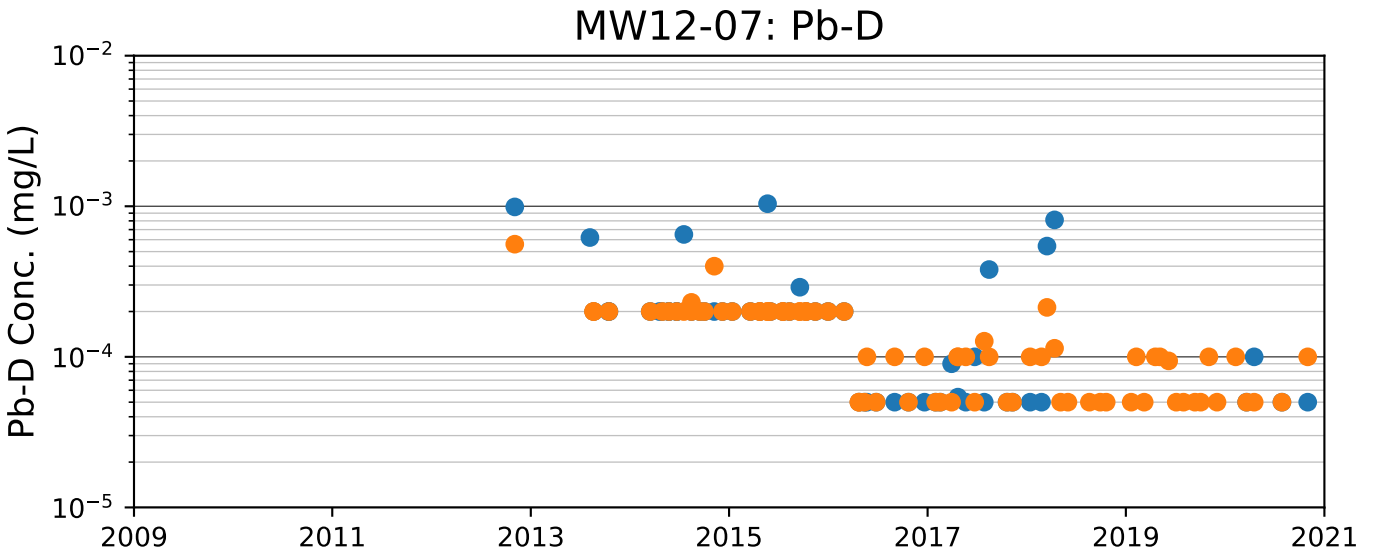

MW12-07: As-D
As-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021
MW12-07-01
MW12-07-02

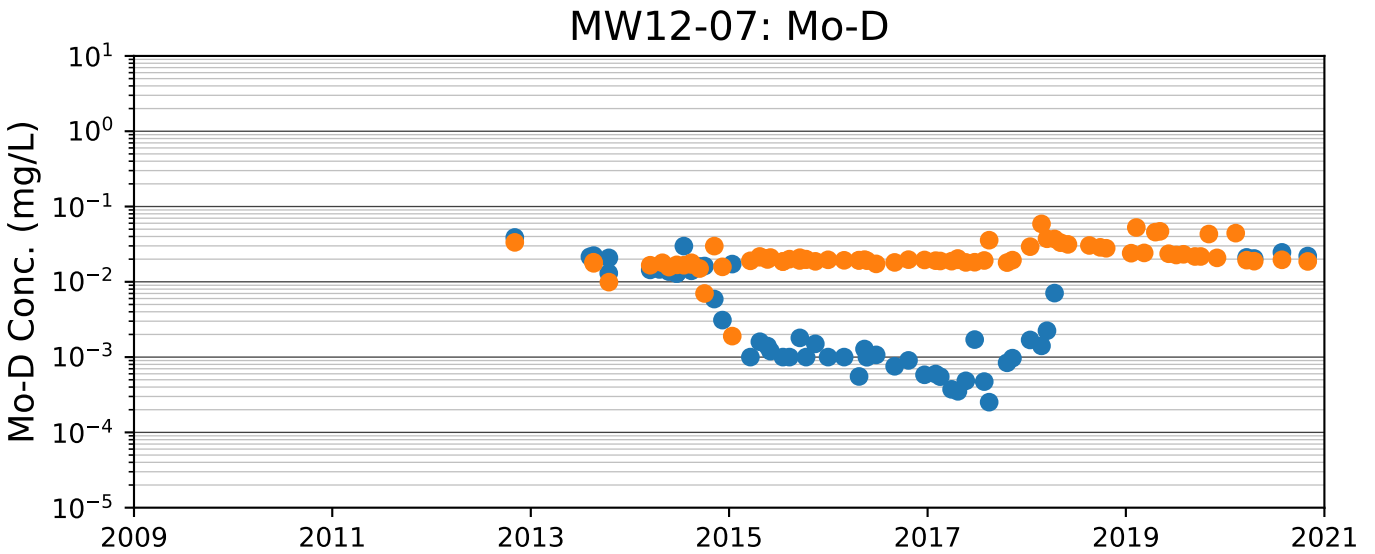

MW12-07: Chlord
Chlord Conc. (mg/L)
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
2009
2011
2013
2015
2017
2019
2021

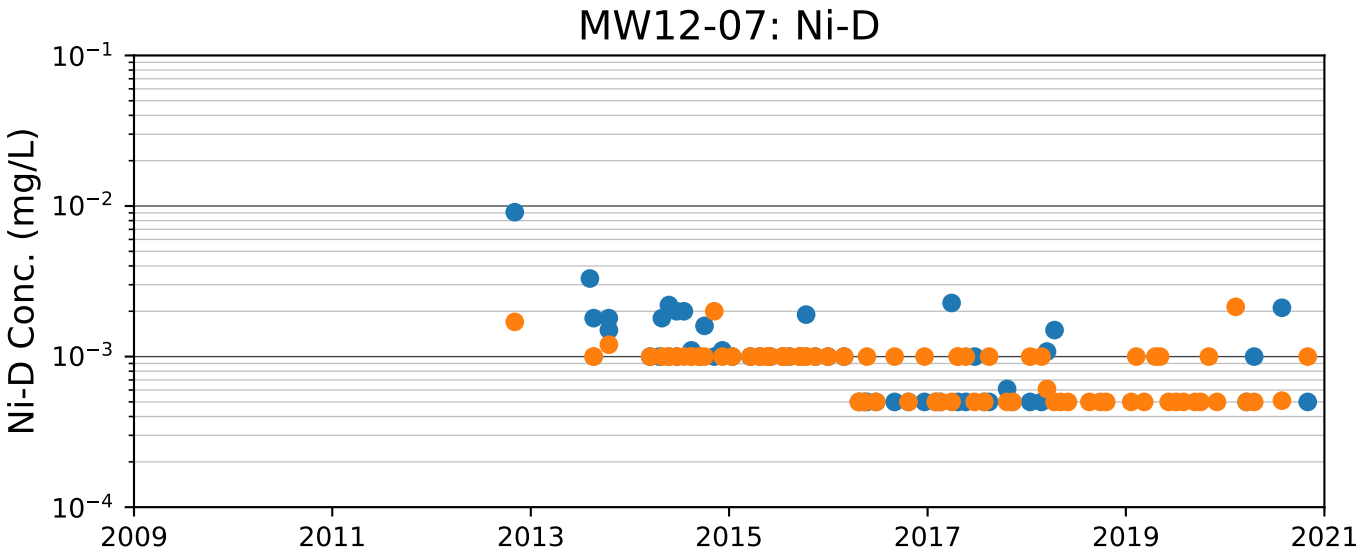

MW12-07: Cd-D
Cd-D Conc. (mg/L)
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-7}
2009
2011
2013
2015
2017
2019
2021

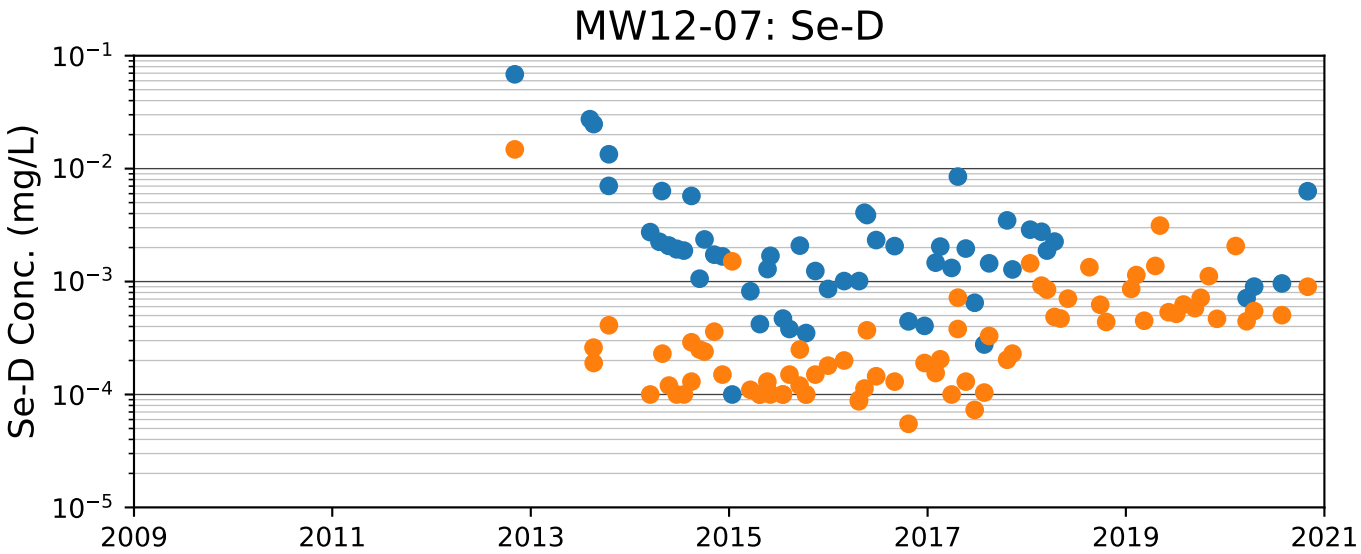

MW12-07: Cr-D
Cr-D Conc. (mg/L)
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021
MW12-07-01
MW12-07-02

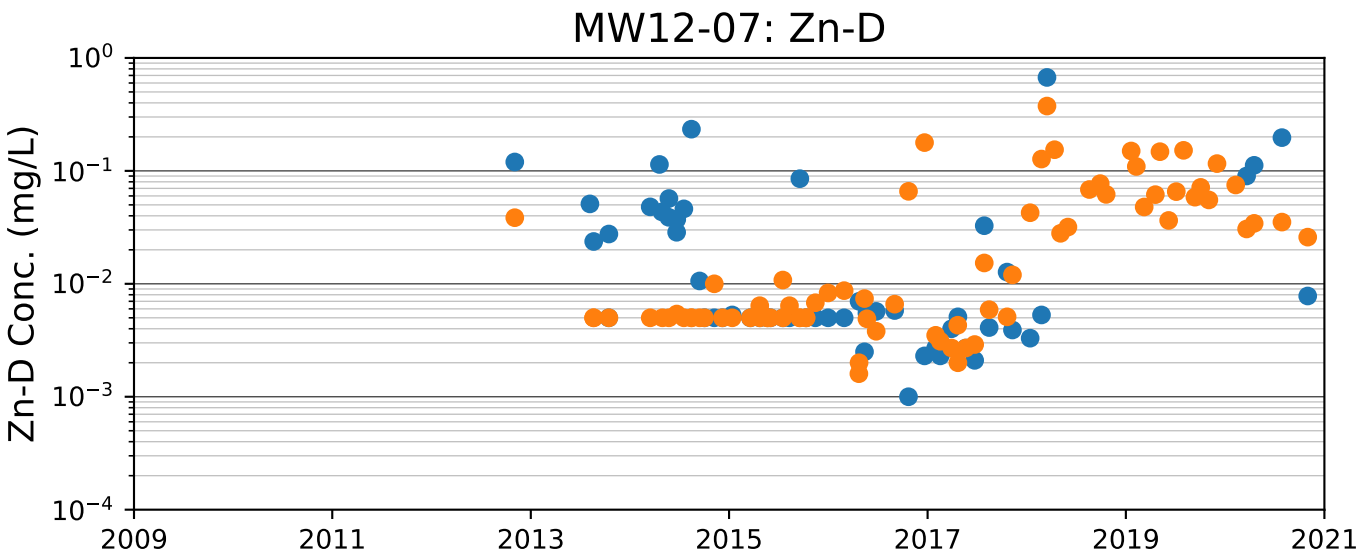

MW12-07: Cu-D
Cu-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021

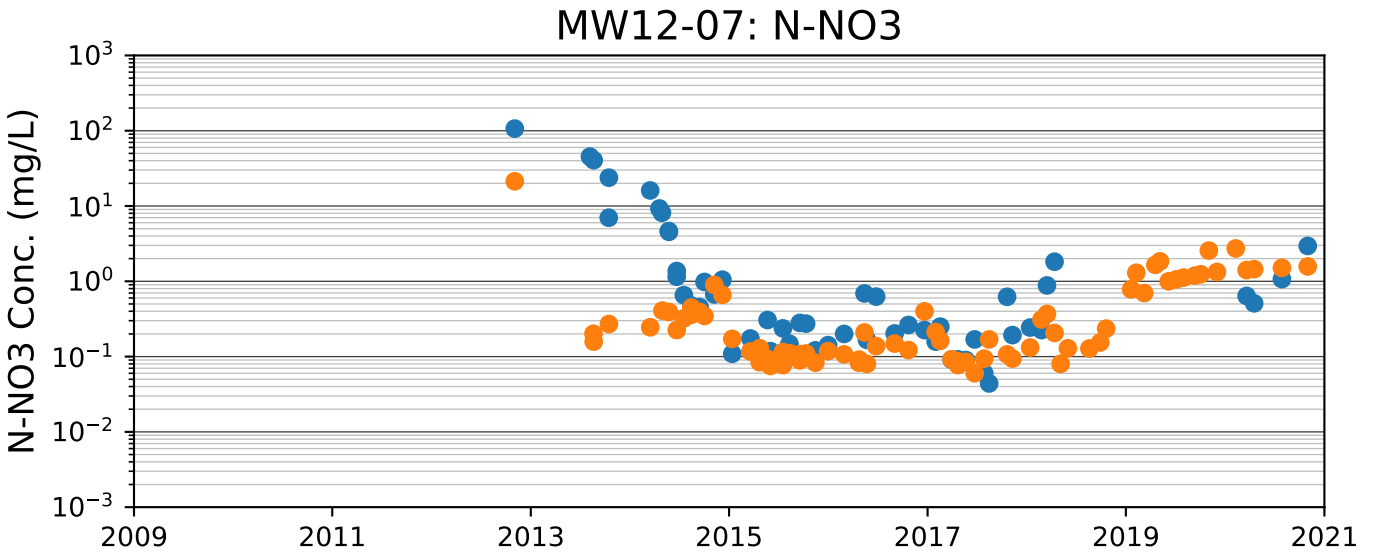

MW12-07: Pb-D
Pb-D Conc. (mg/L)
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021

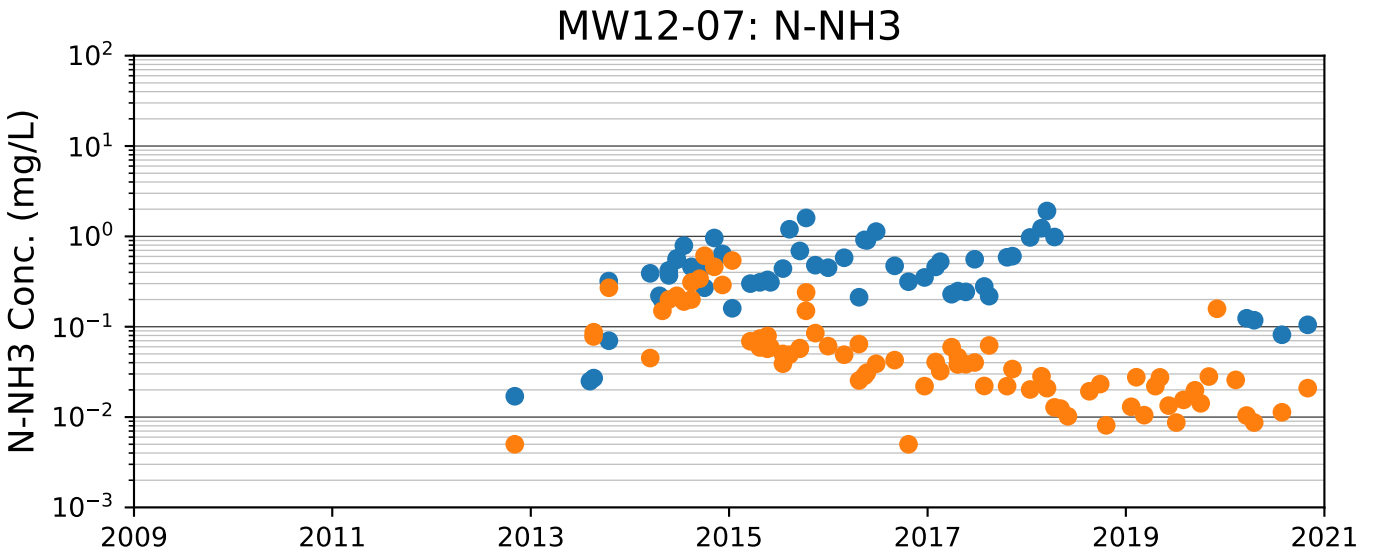

MW12-07: Mo-D
Mo-D Conc. (mg/L)
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021
MW12-07-01
MW12-07-02

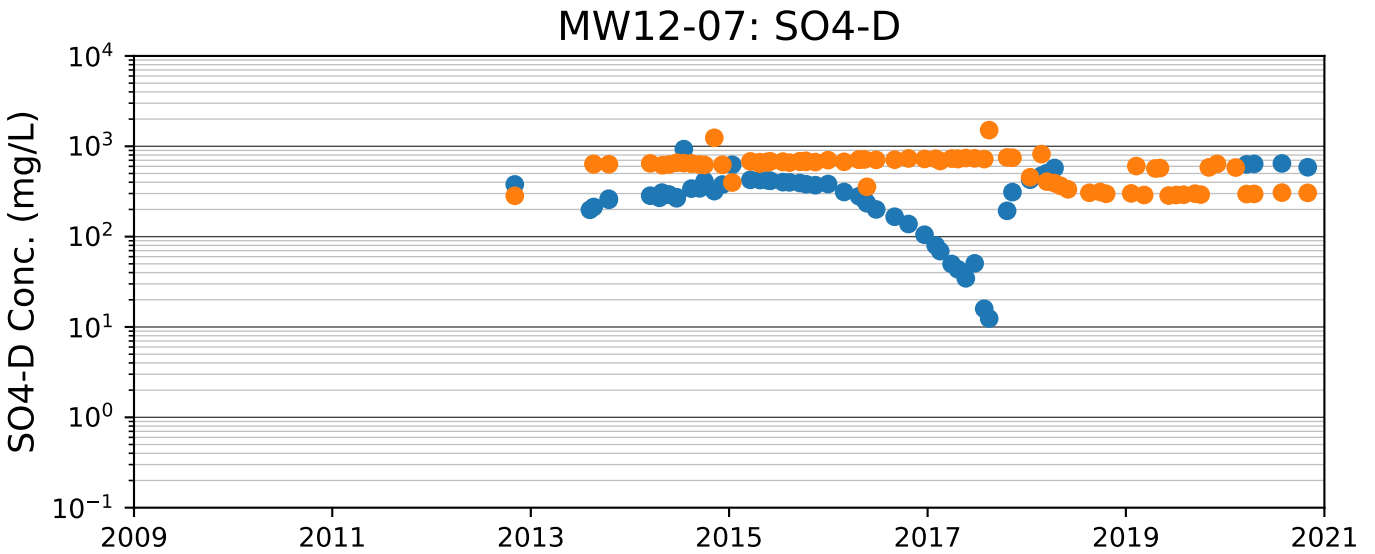

MW12-07: Ni-D
Ni-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
2009
2011
2013
2015
2017
2019
2021

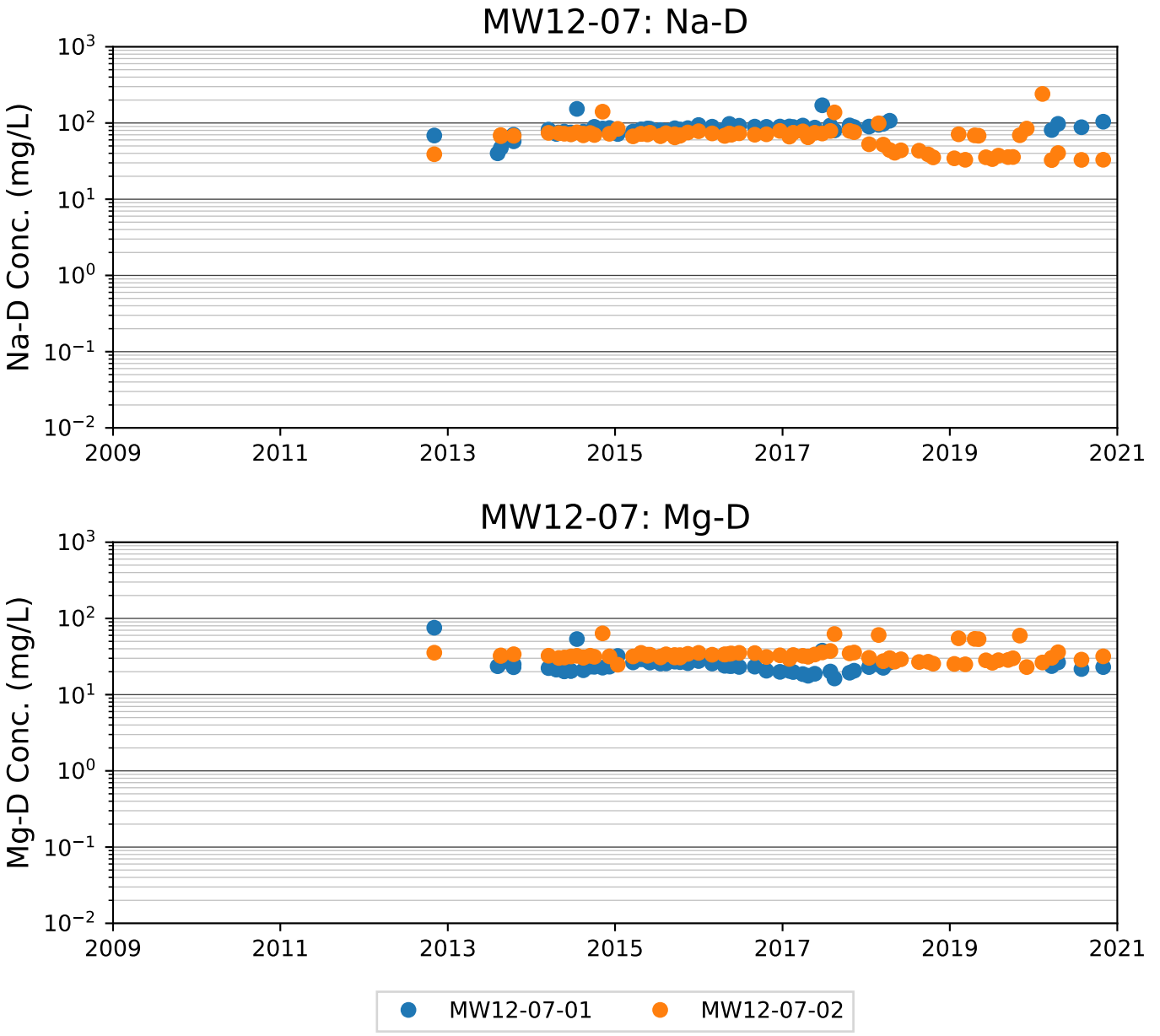

MW12-07: Se-D
Se-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021

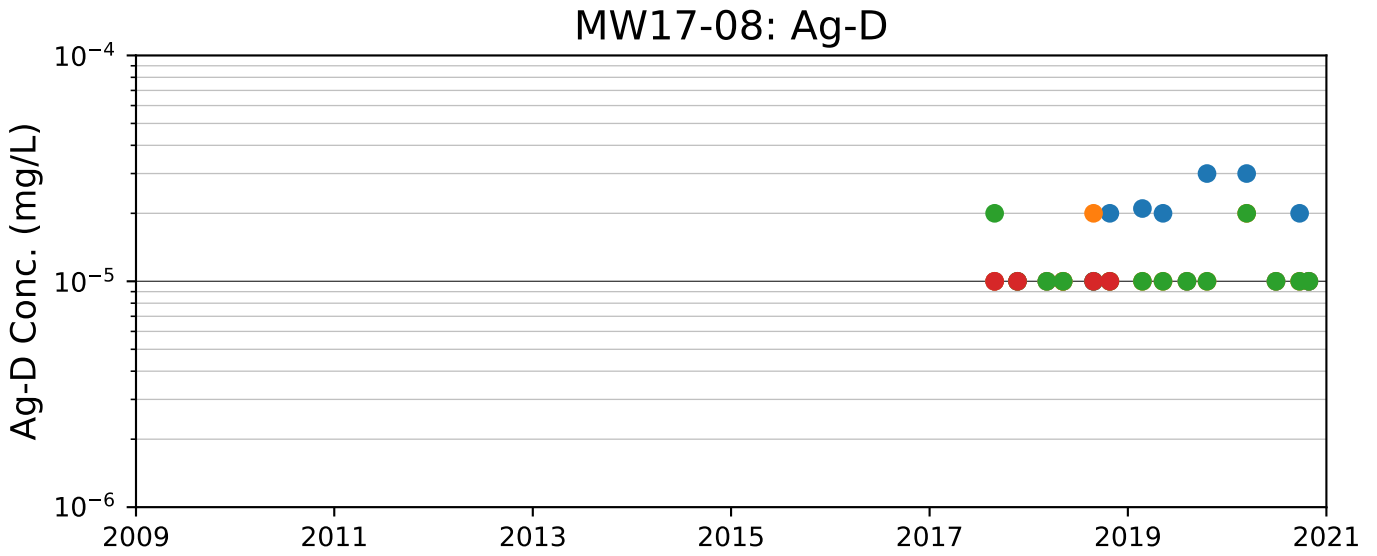

MW12-07: Zn-D
Zn-D Conc. (mg/L)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
2009
2011
2013
2015
2017
2019
2021
MW12-07-01
MW12-07-02

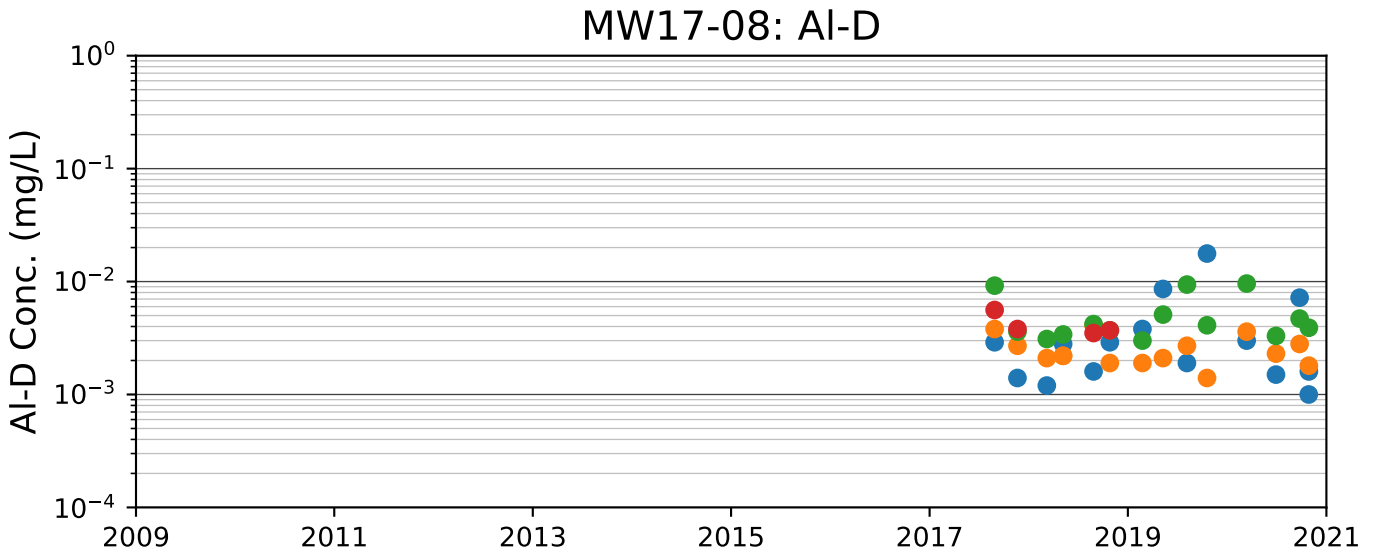

MW12-07: N-NO3
N-NO3 Conc. (mg/L)
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
2009
2011
2013
2015
2017
2019
2021

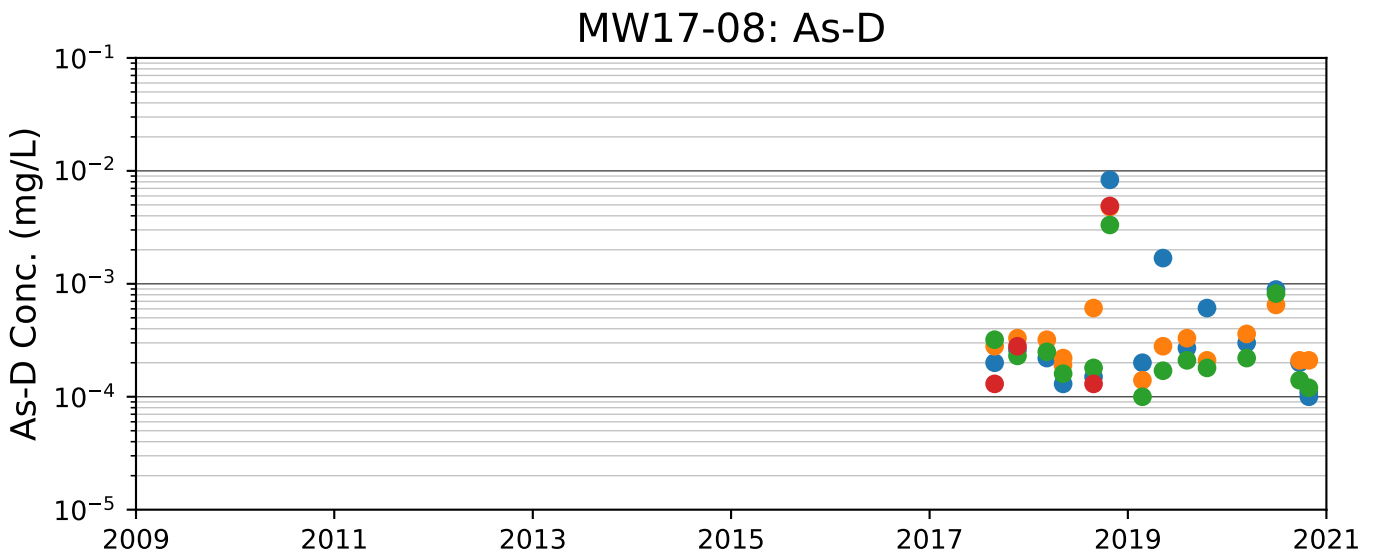

MW12-07: N-NH3
N-NH3 Conc. (mg/L)
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
2009
2011
2013
2015
2017
2019
2021

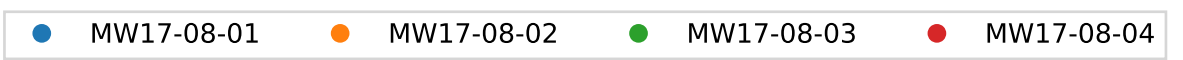

MW12-07: SO4-D
SO4-D Conc. (mg/L)
10^{4}
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
2009
2011
2013
2015
2017
2019
2021
MW12-07-01
MW12-07-02

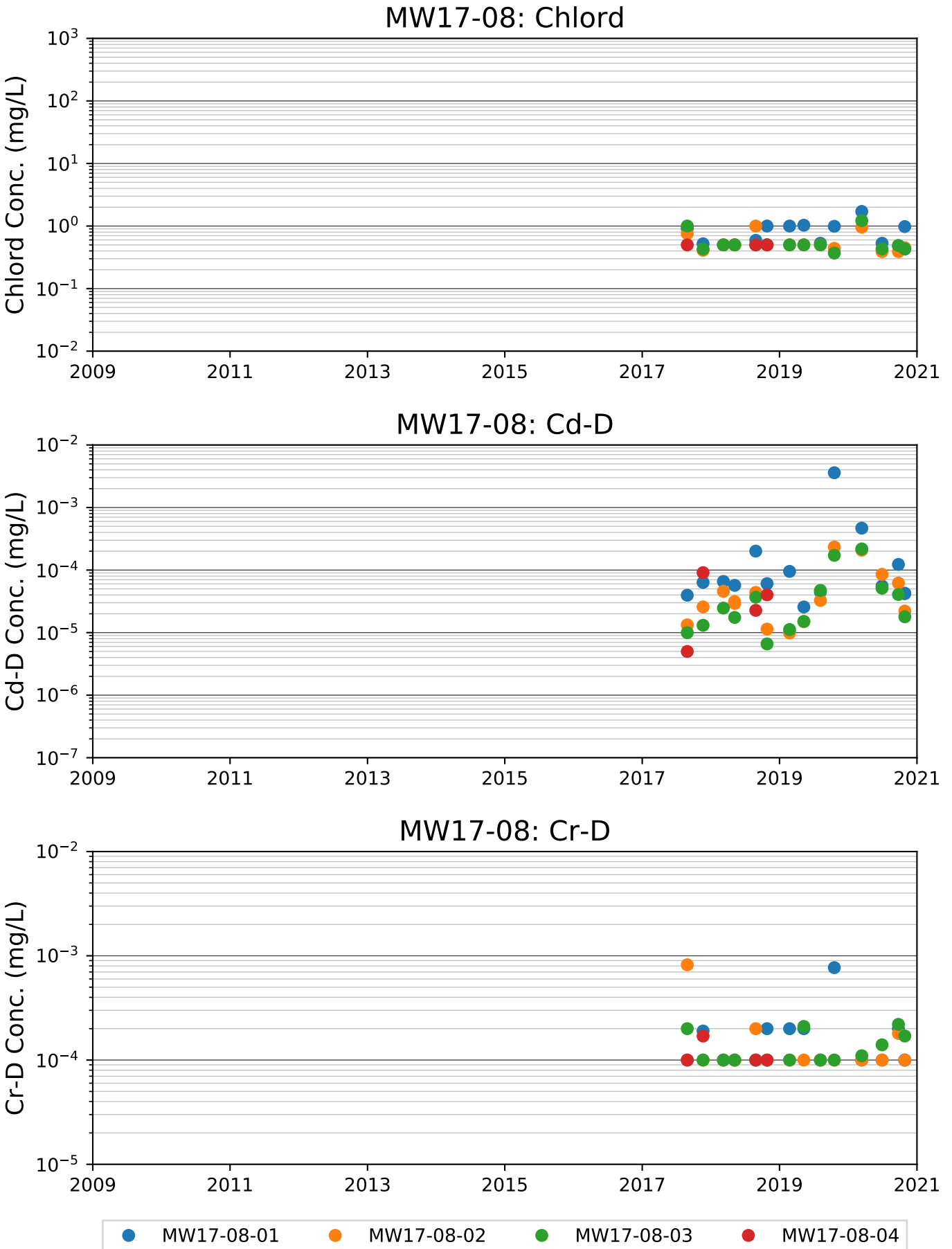

MW12-07: Na-D
Na-D Conc. (mg/L)
10^3
10^2
10^1
10^0
10^{-1}
10^{-2}
2009
2011
2013
2015
2017
2019
2021
MW12-07: Mg-D
Mg-D Conc. (mg/L)
MW12-07-01
MW12-07-02

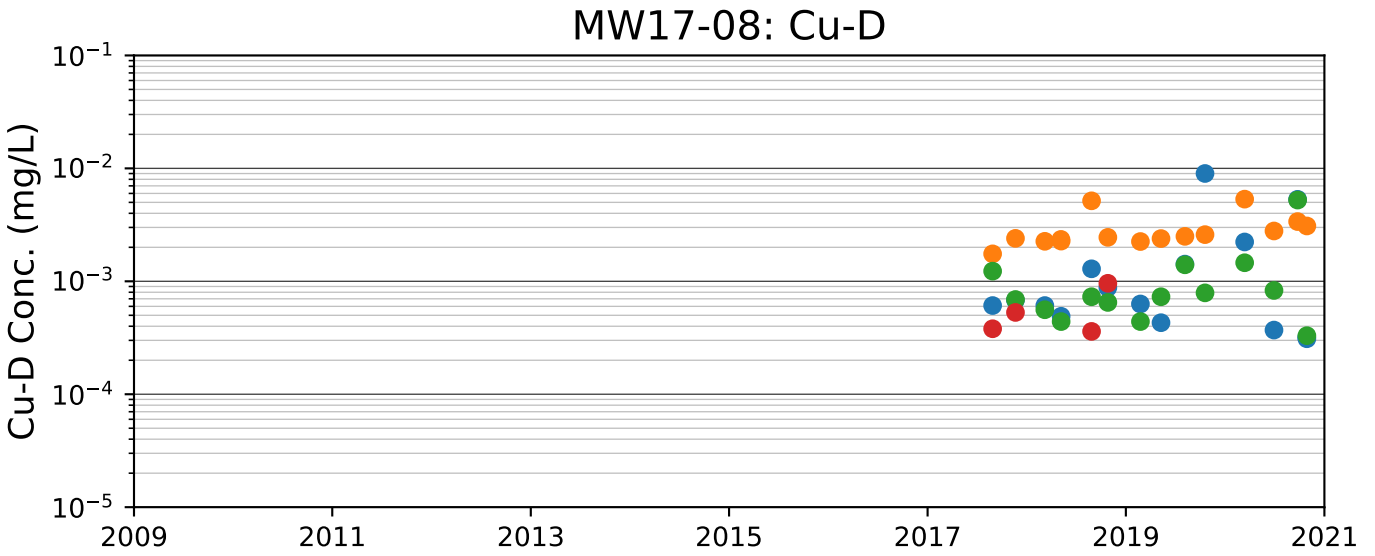

MW17-08: Ag-D
Ag-D Conc. (mg/L)
10^{-4}
10^{-5}
10^{-6}
2009
2011
2013
2015
2017
2019
2021

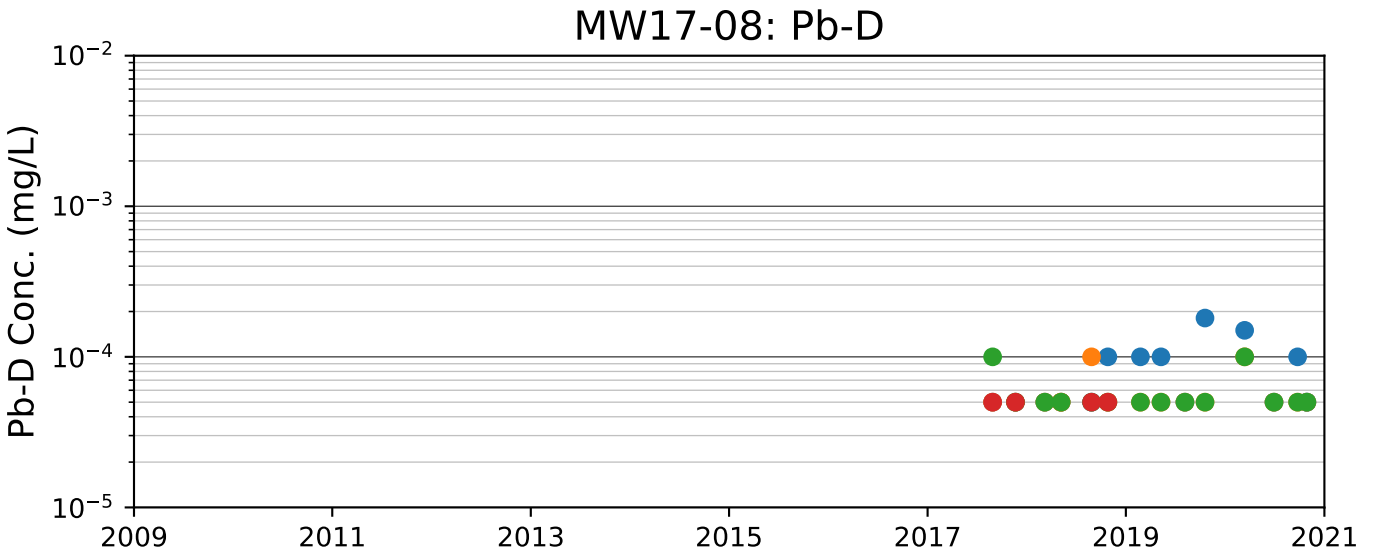

MW17-08: Al-D
Al-D Conc. (mg/L)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
2009
2011
2013
2015
2017
2019
2021

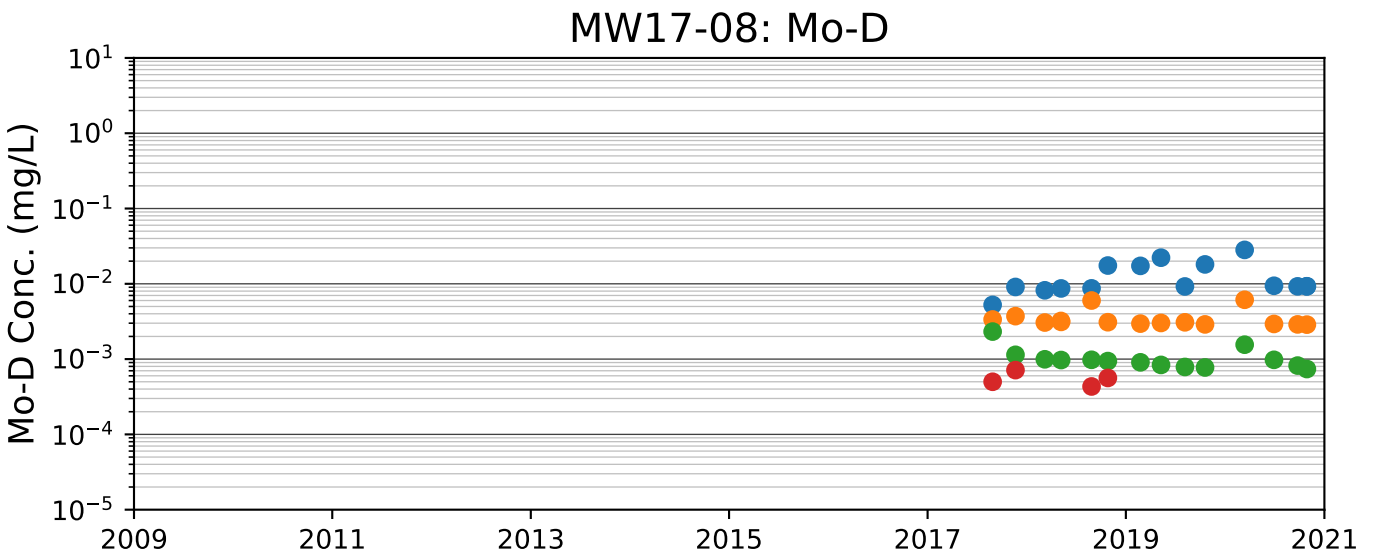

MW17-08: As-D
As-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021

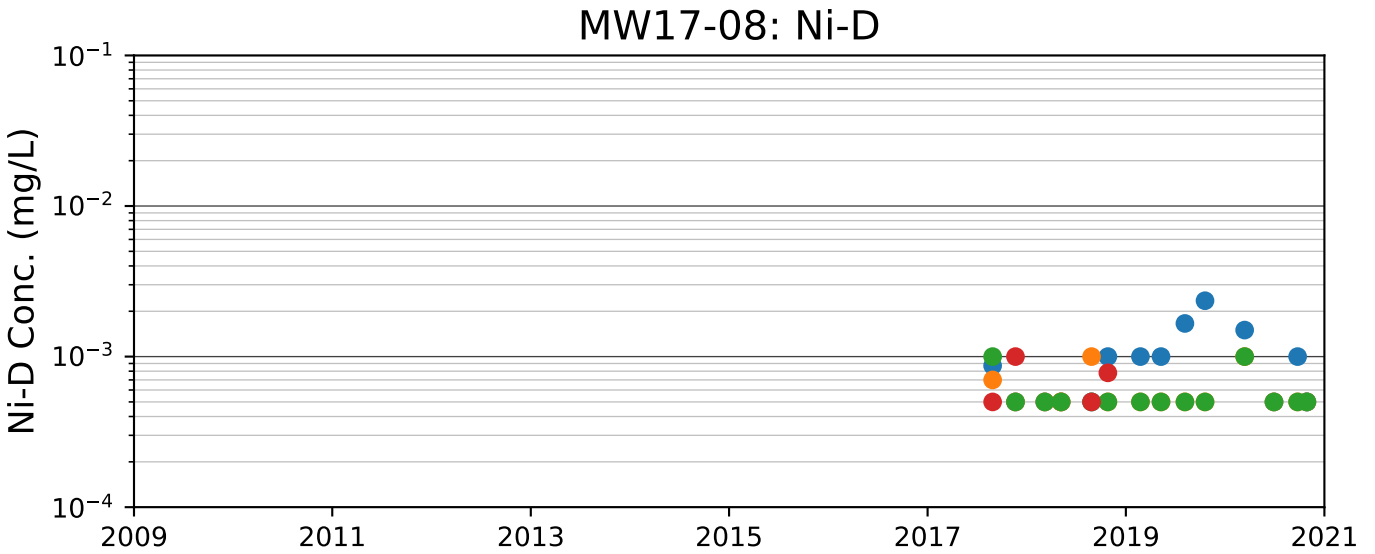

MW17-08-01
MW17-08-02
MW17-08-03
MW17-08-04

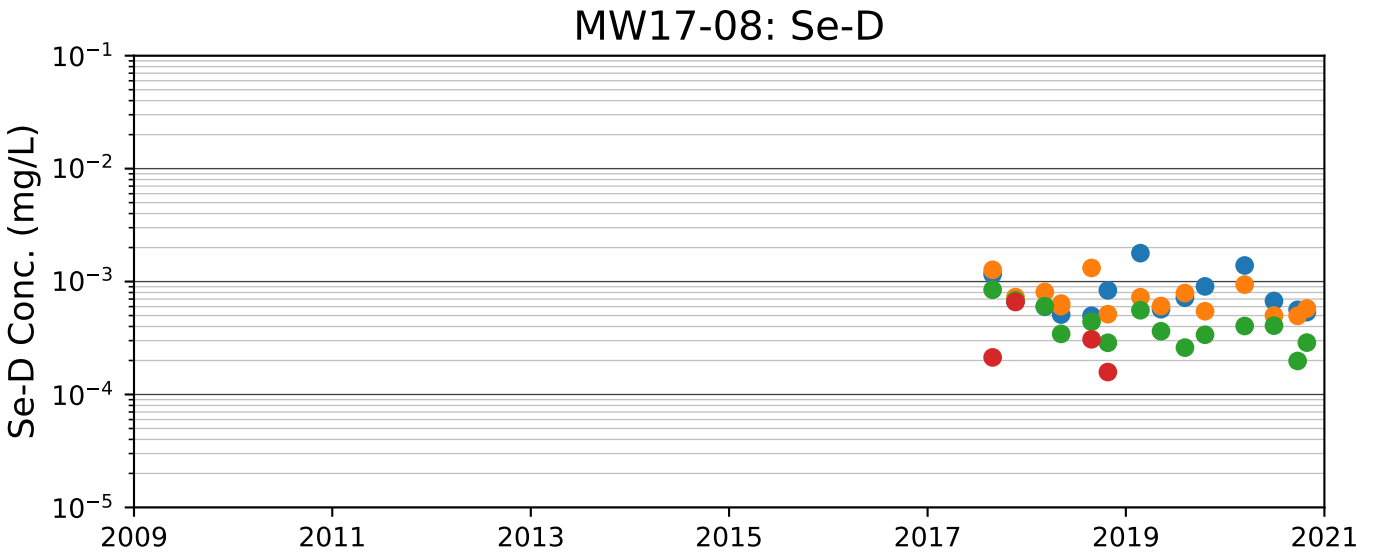

MW17-08: Chlord
Chlord Conc. (mg/L)
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
2009
2011
2013
2015
2017
2019
2021
MW17-08: Cd-D
Cd-D Conc. (mg/L)
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-7}
MW17-08: Cr-D
Cr-D Conc. (mg/L)
10^{-2}
10^{-3}
10^{-4}
10^{-5}
MW17-08-01
MW17-08-02
MW17-08-03
MW17-08-04

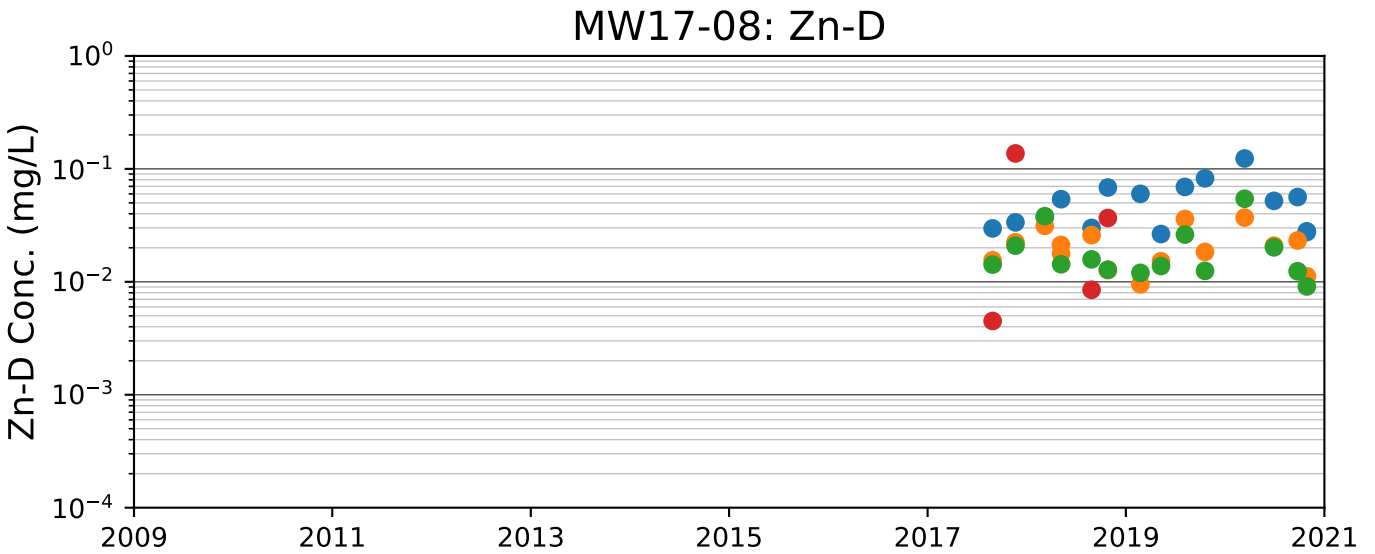

MW17-08: Cu-D
Cu-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021

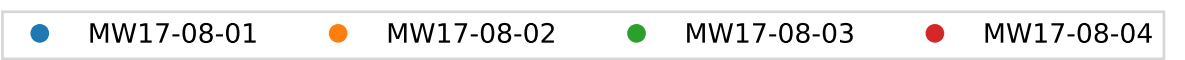

MW17-08: Pb-D
Pb-D Conc. (mg/L)
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021

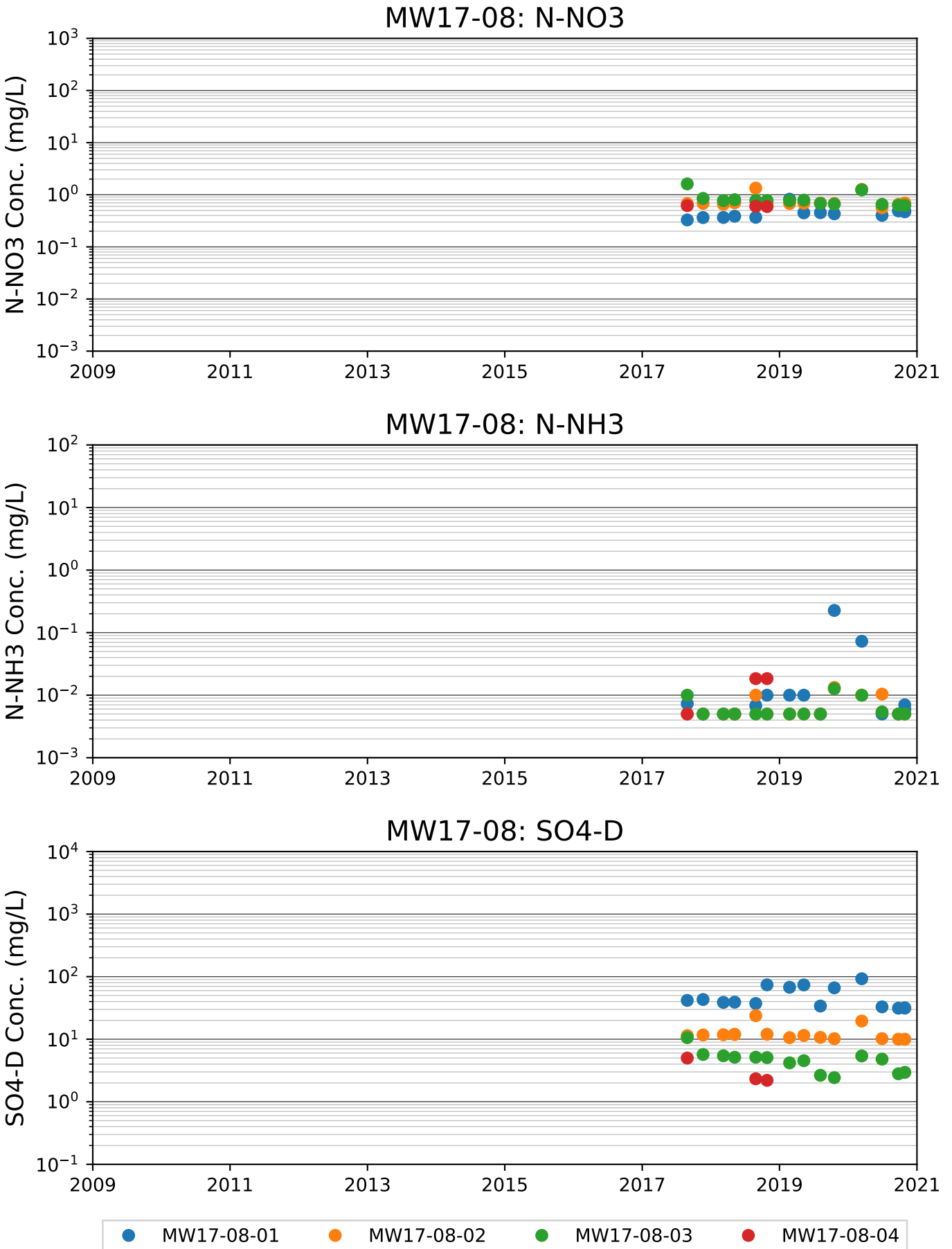

MW17-08: Mo-D
Mo-D Conc. (mg/L)
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021
MW17-08-01
MW17-08-02
MW17-08-03
MW17-08-04

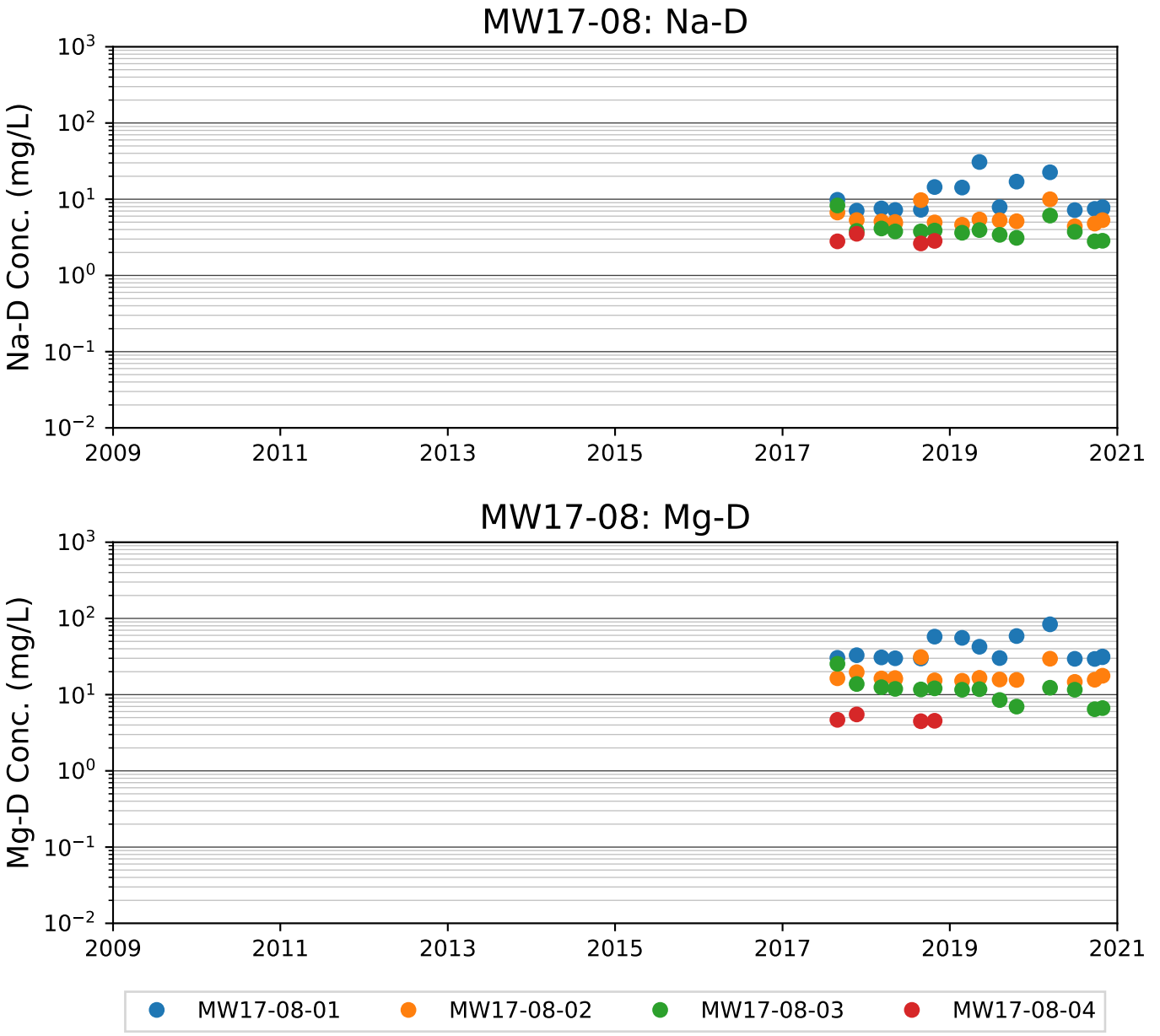

MW17-08: Ni-D
Ni-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
2009
2011
2013
2015
2017
2019
2021

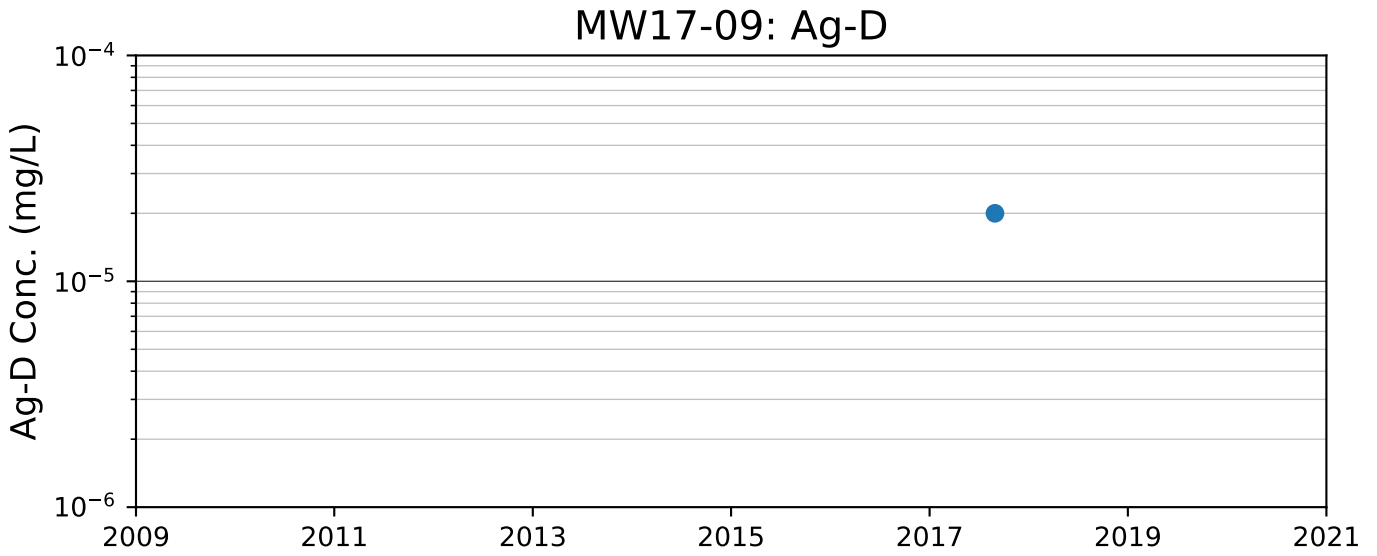

MW17-08: Se-D
Se-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021

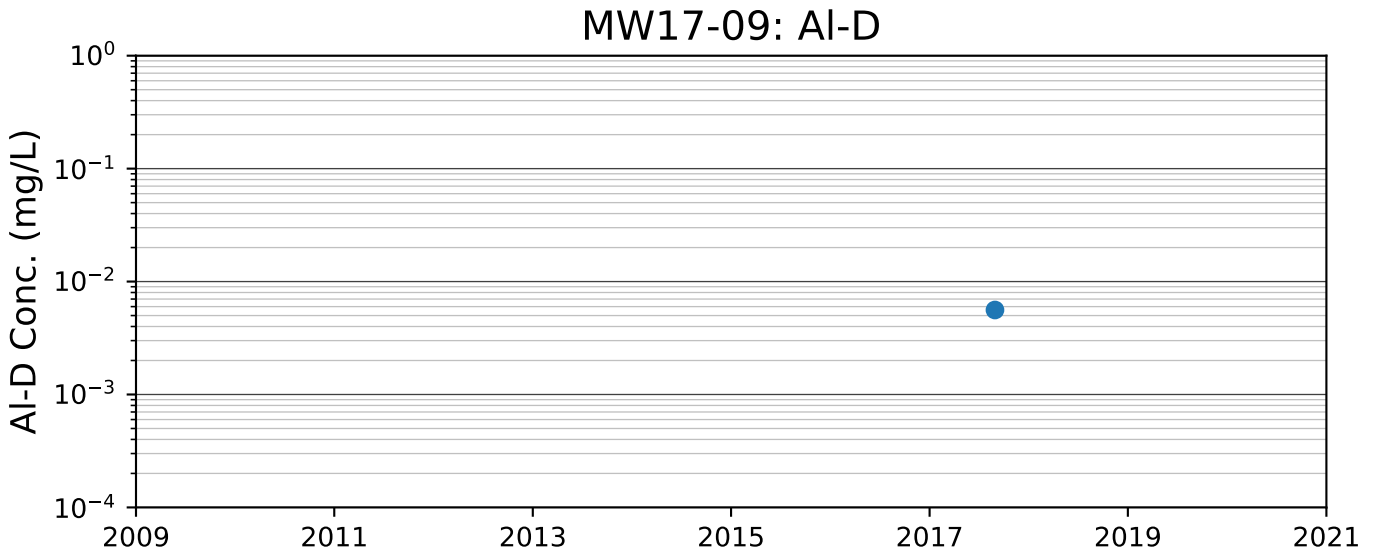

MW17-08: Zn-D
Zn-D Conc. (mg/L)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
2009
2011
2013
2015
2017
2019
2021

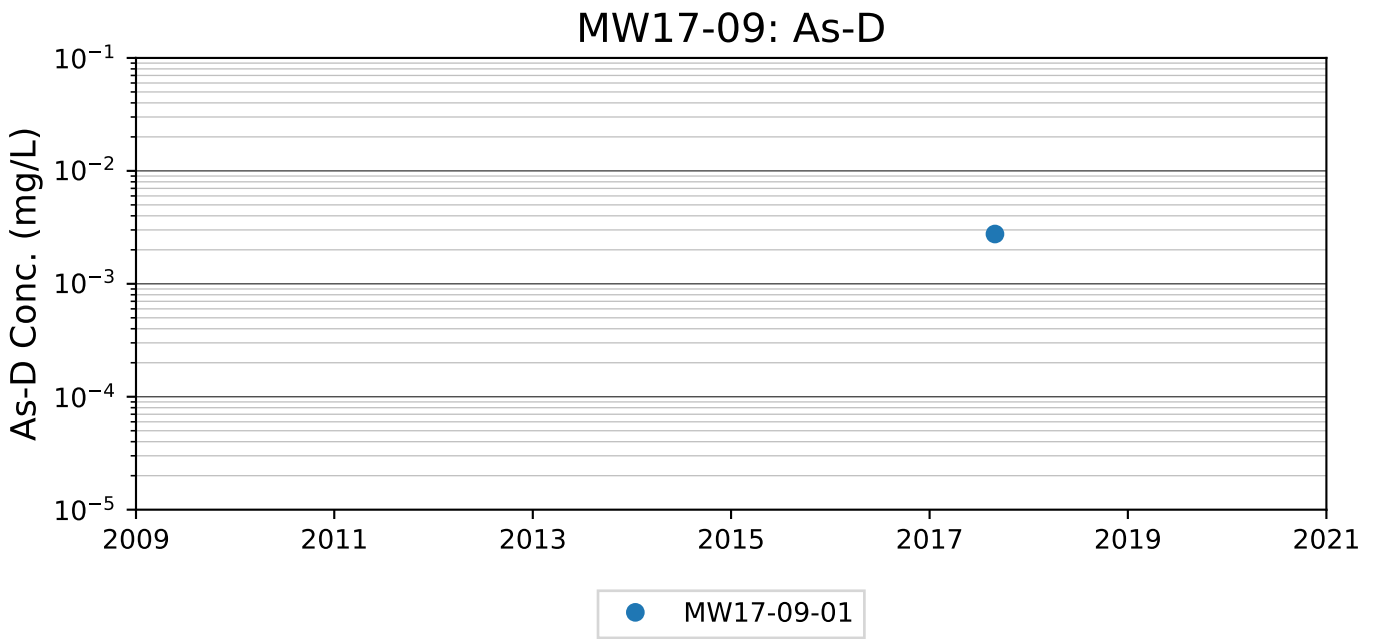

MW17-08-01
MW17-08-02
MW17-08-03
MW17-08-04

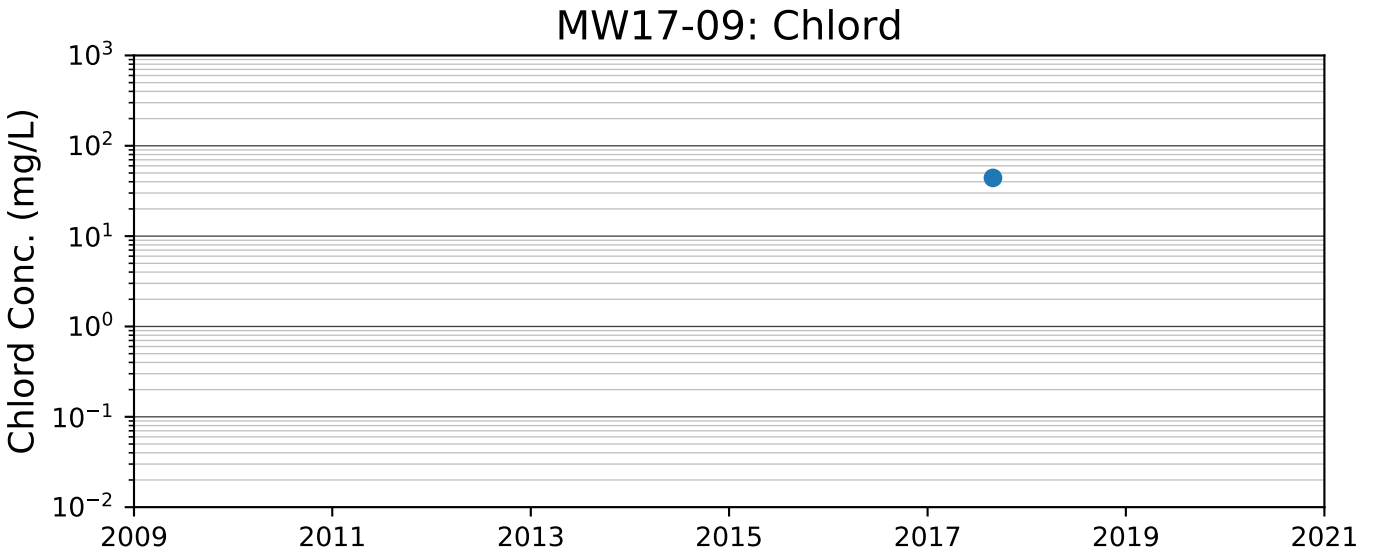

MW17-08: N-NO3
N-NO3 Conc. (mg/L)
MW17-08: N-NH3
N-NH3 Conc. (mg/L)
MW17-08: SO4-D
SO4-D Conc. (mg/L)
2009
2011
2013
2015
2017
2019
2021
MW17-08-01
MW17-08-02
MW17-08-03
MW17-08-04

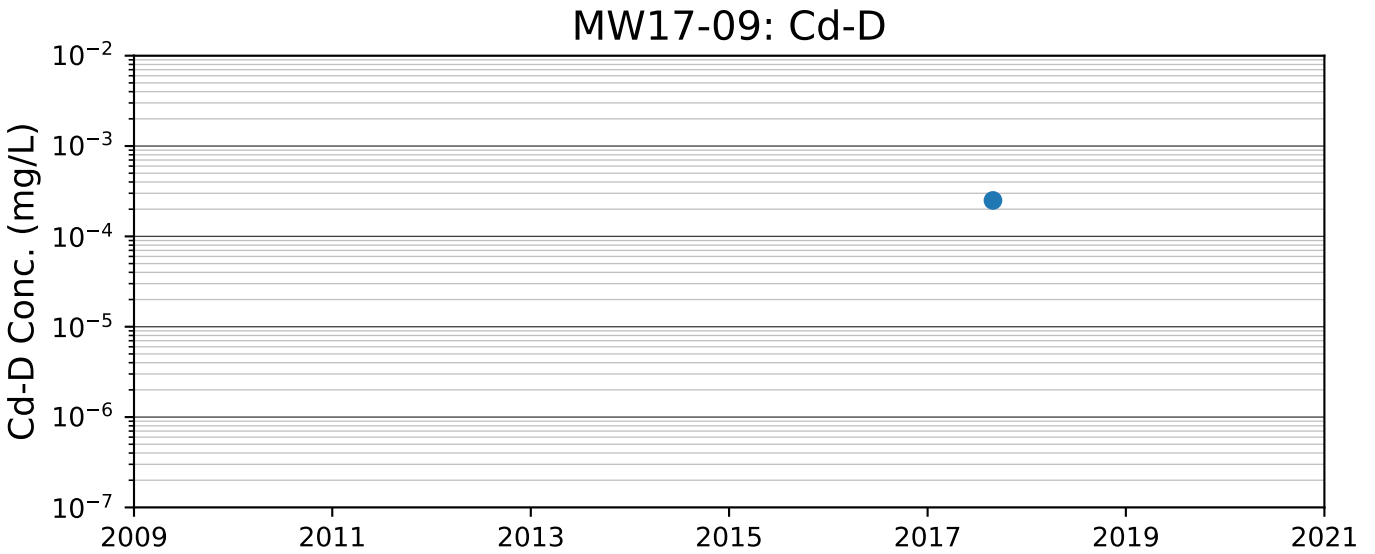

MW17-08: Na-D
Na-D Conc. (mg/L)
10^3
10^2
10^1
10^0
10^{-1}
10^{-2}
2009
2011
2013
2015
2017
2019
2021
MW17-08: Mg-D
Mg-D Conc. (mg/L)
MW17-08-01
MW17-08-02
MW17-08-03
MW17-08-04

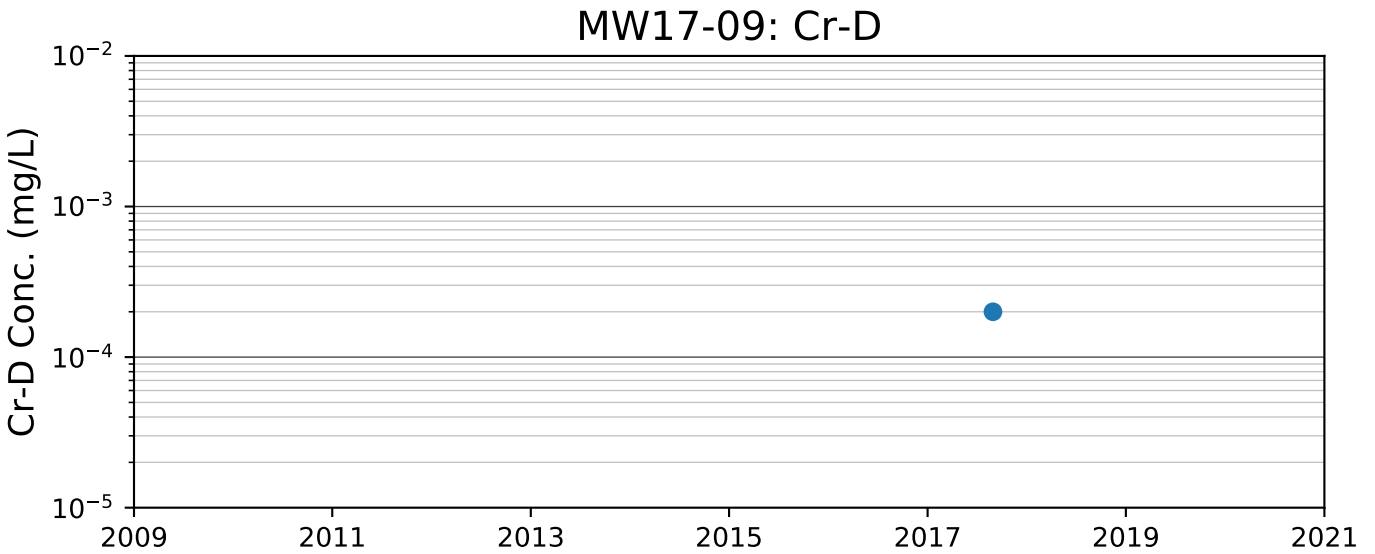

MW17-09: Ag-D
Ag-D Conc. (mg/L)
10^{-4}
10^{-5}
10^{-6}
2009
2011
2013
2015
2017
2019
2021

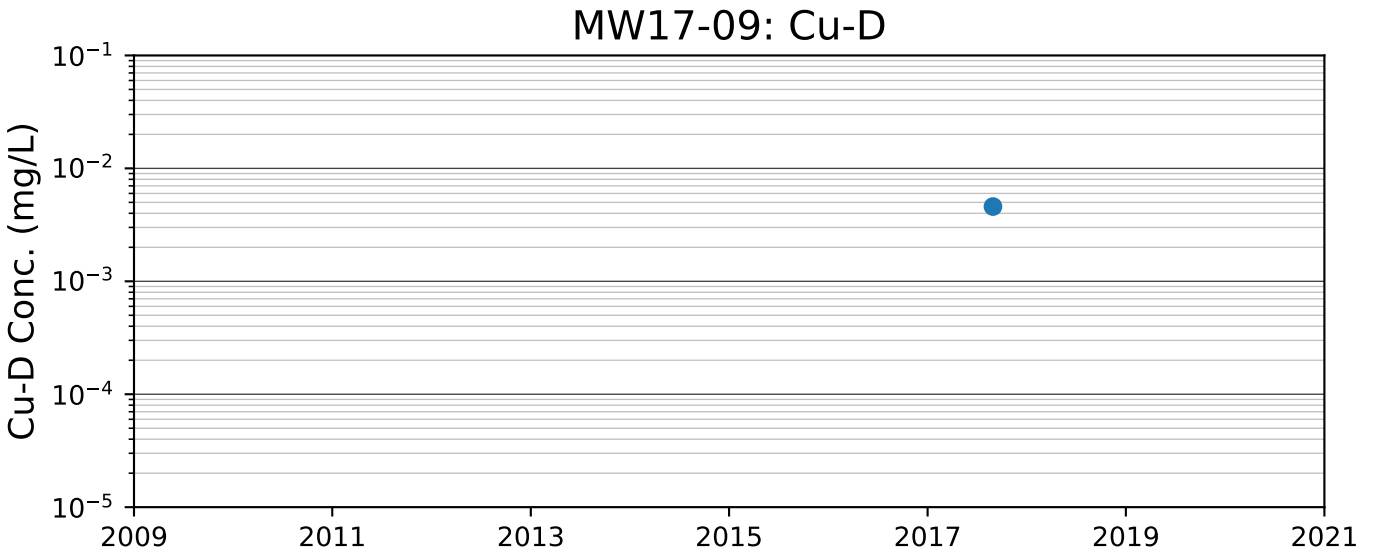

MW17-09: Al-D
Al-D Conc. (mg/L)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
2009
2011
2013
2015
2017
2019
2021

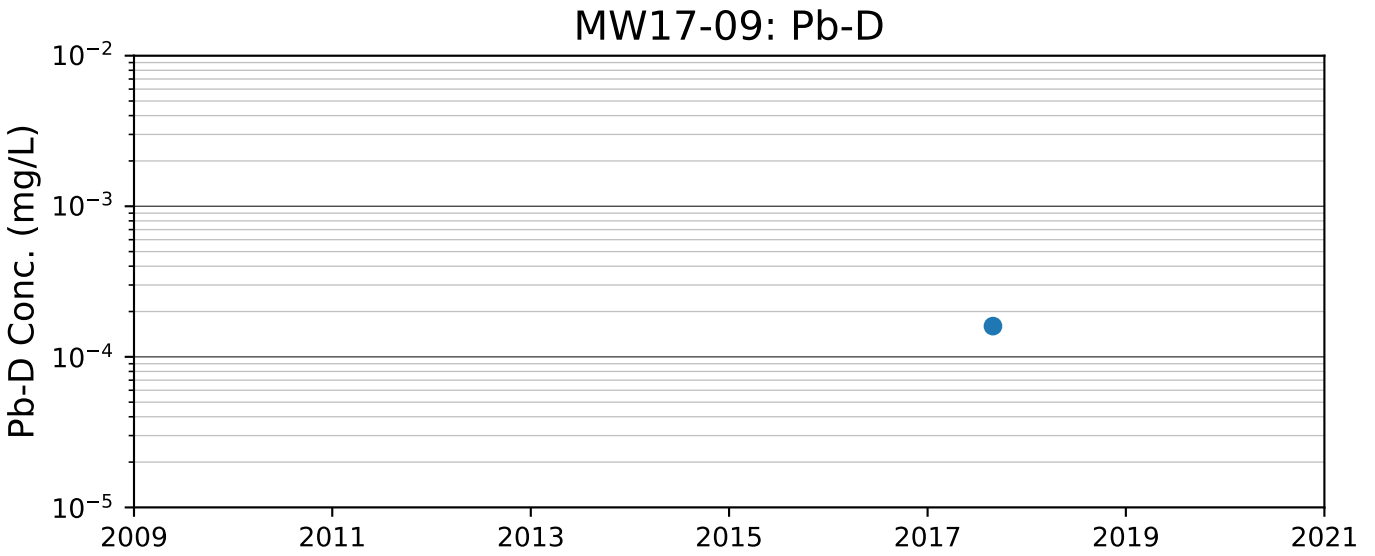

MW17-09: As-D
As-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021
MW17-09-01

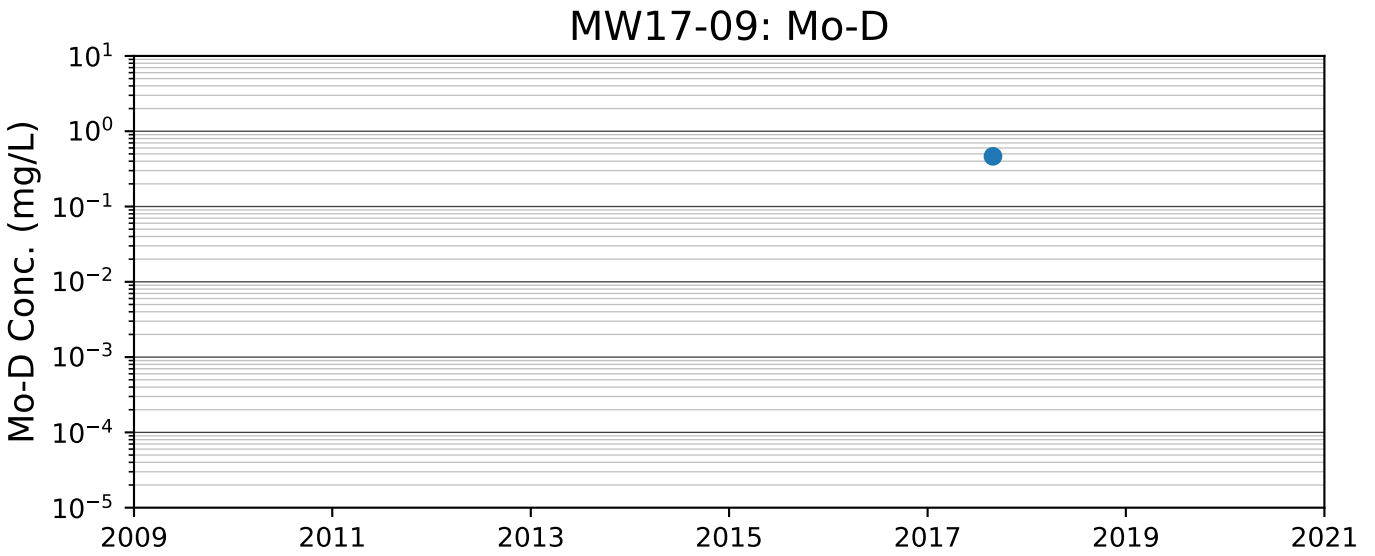

MW17-09: Chlord
Chlord Conc. (mg/L)
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
2009
2011
2013
2015
2017
2019
2021

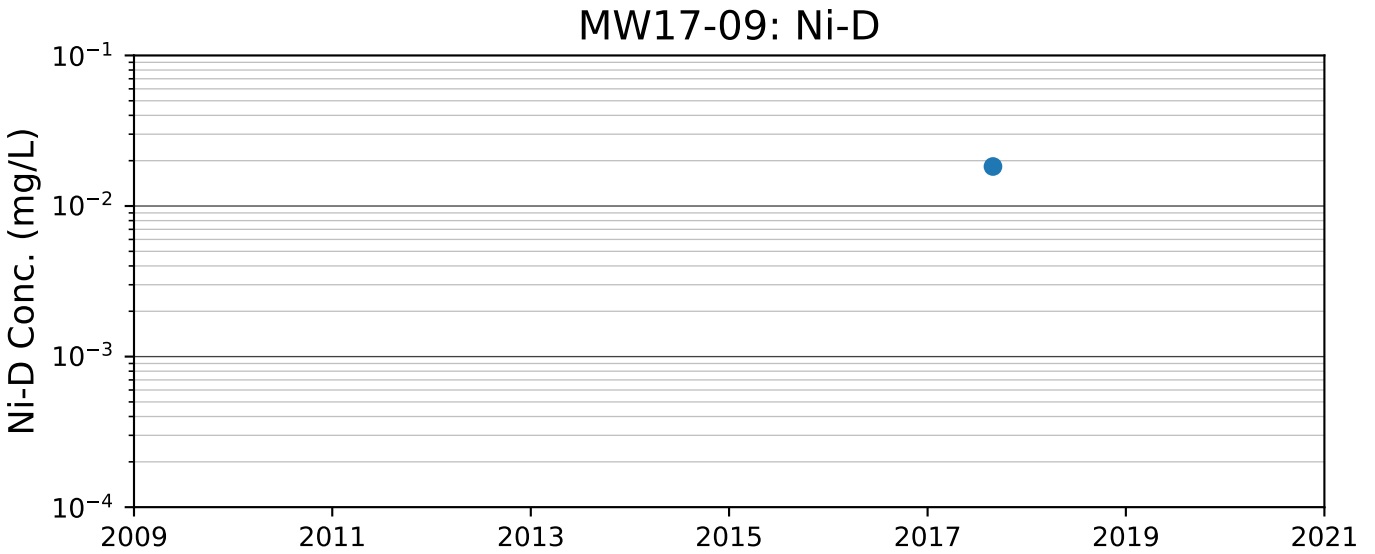

MW17-09: Cd-D
Cd-D Conc. (mg/L)
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-7}
2009
2011
2013
2015
2017
2019
2021

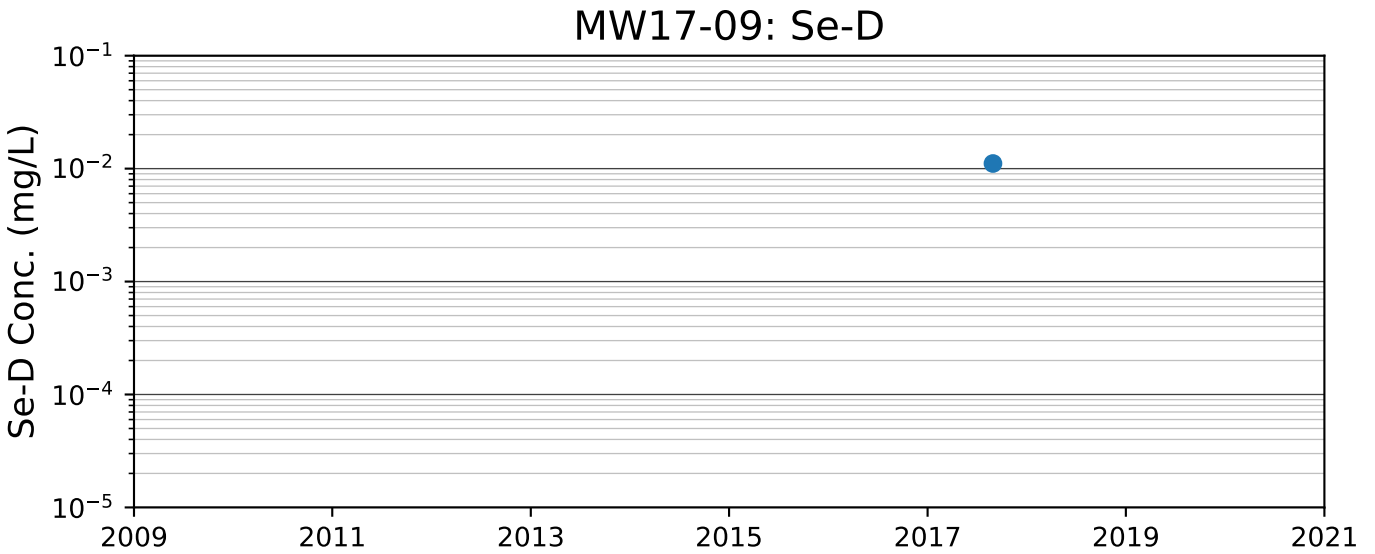

MW17-09: Cr-D
Cr-D Conc. (mg/L)
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021
MW17-09-01

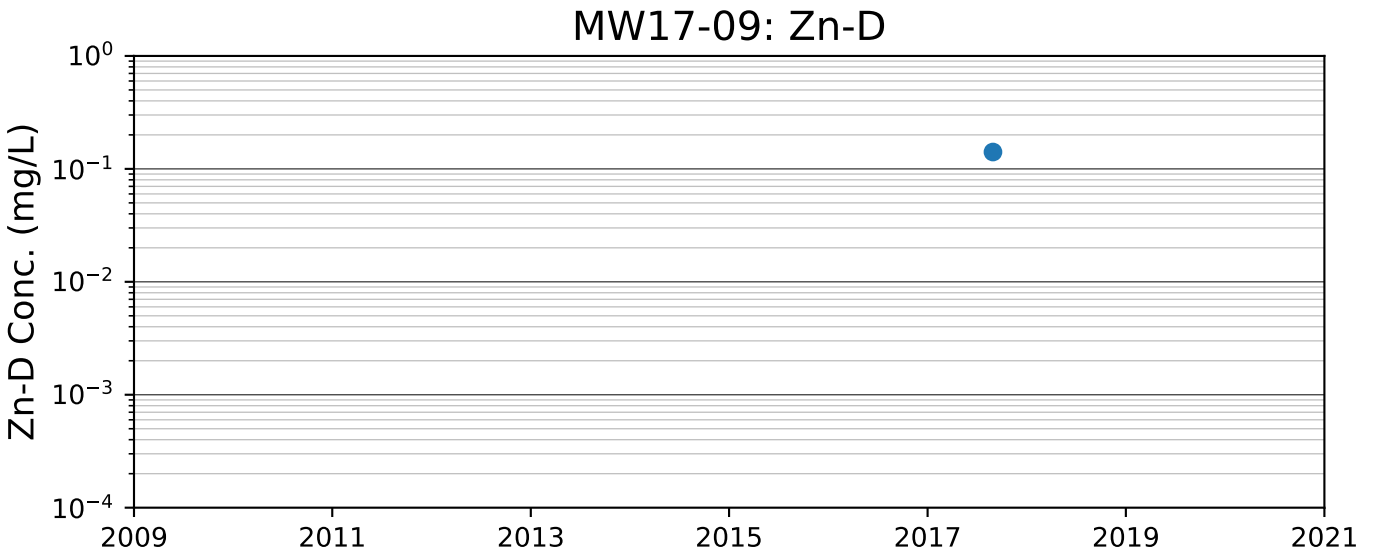

MW17-09: Cu-D
Cu-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021

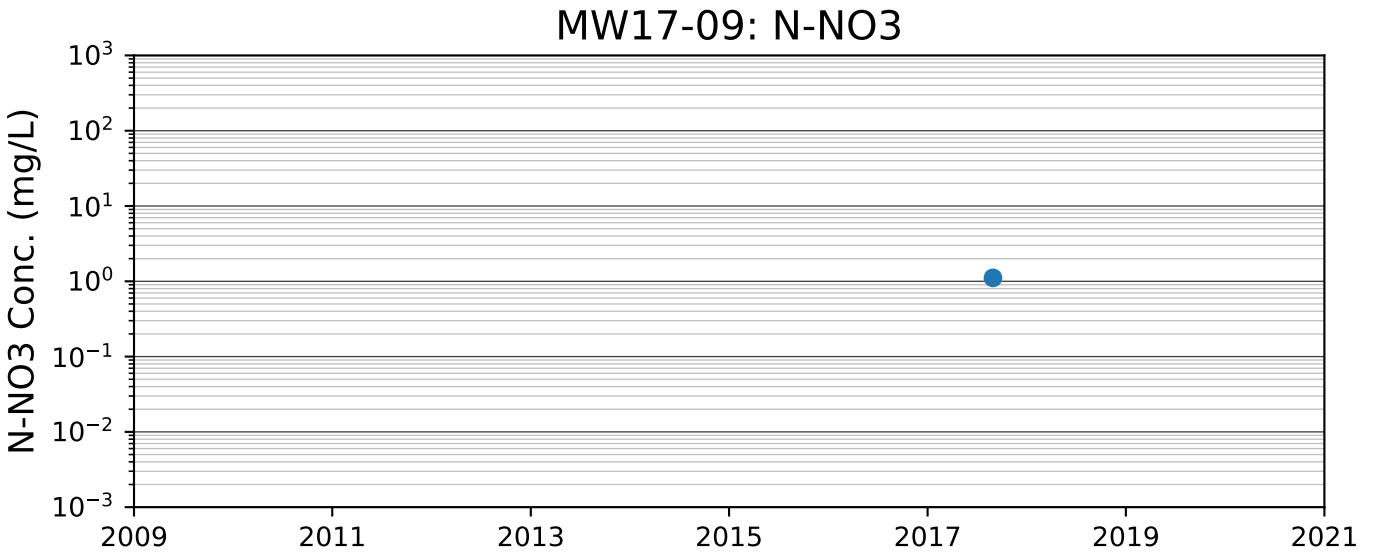

MW17-09: Pb-D
Pb-D Conc. (mg/L)
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021

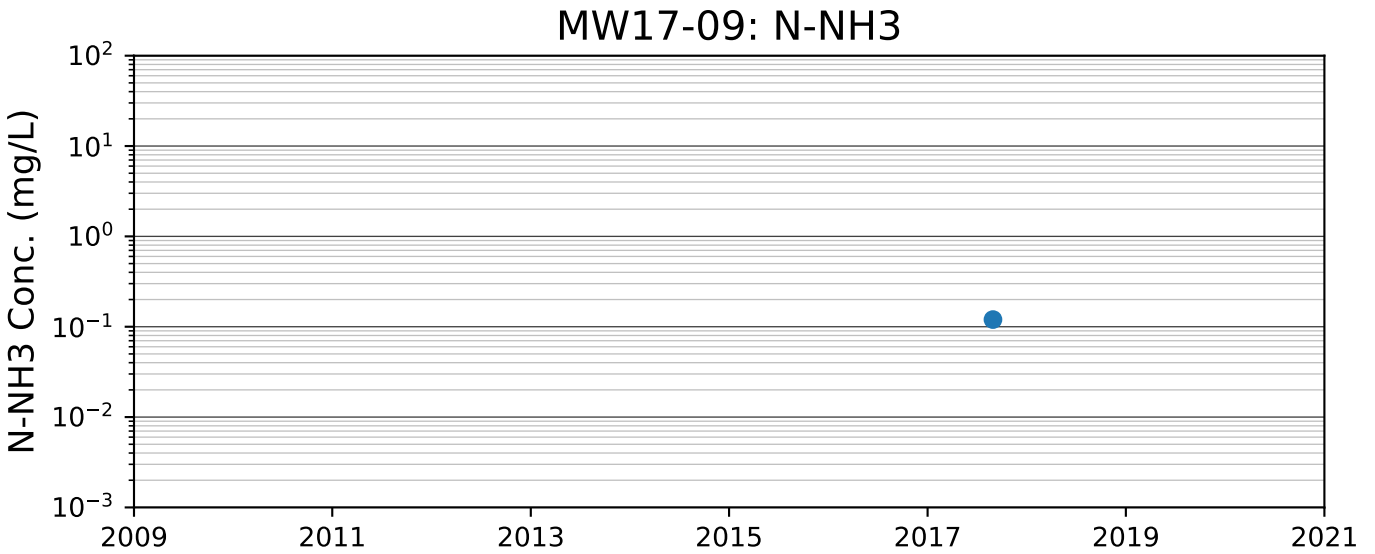

MW17-09: Mo-D
Mo-D Conc. (mg/L)
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021
MW17-09-01

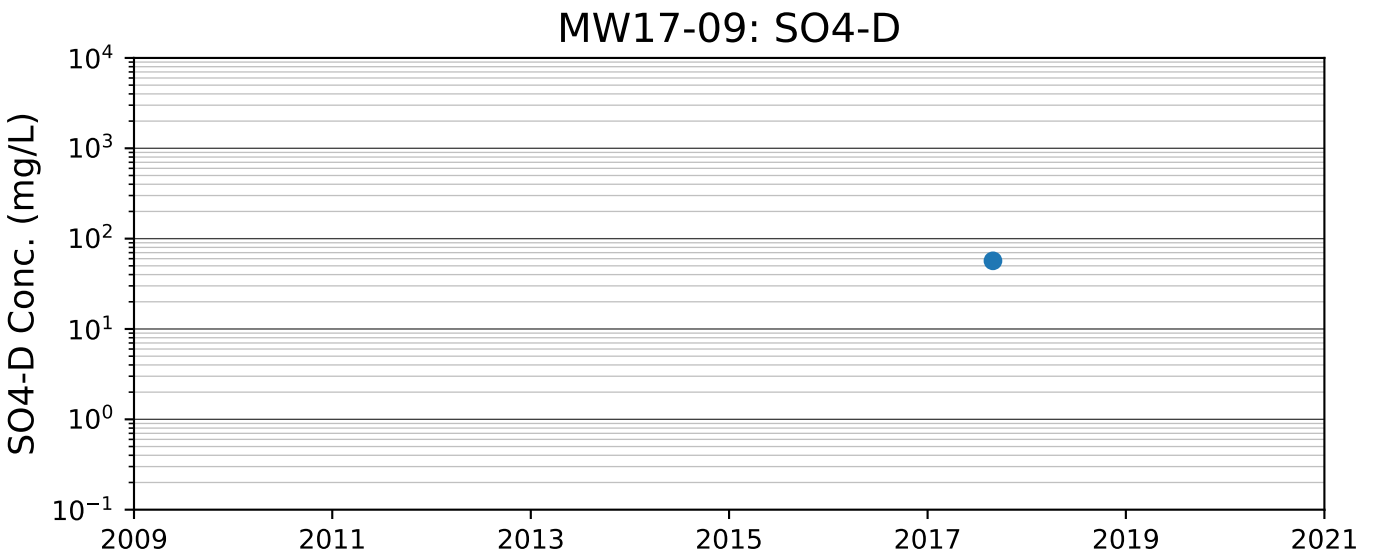

MW17-09: Ni-D
Ni-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
2009
2011
2013
2015
2017
2019
2021

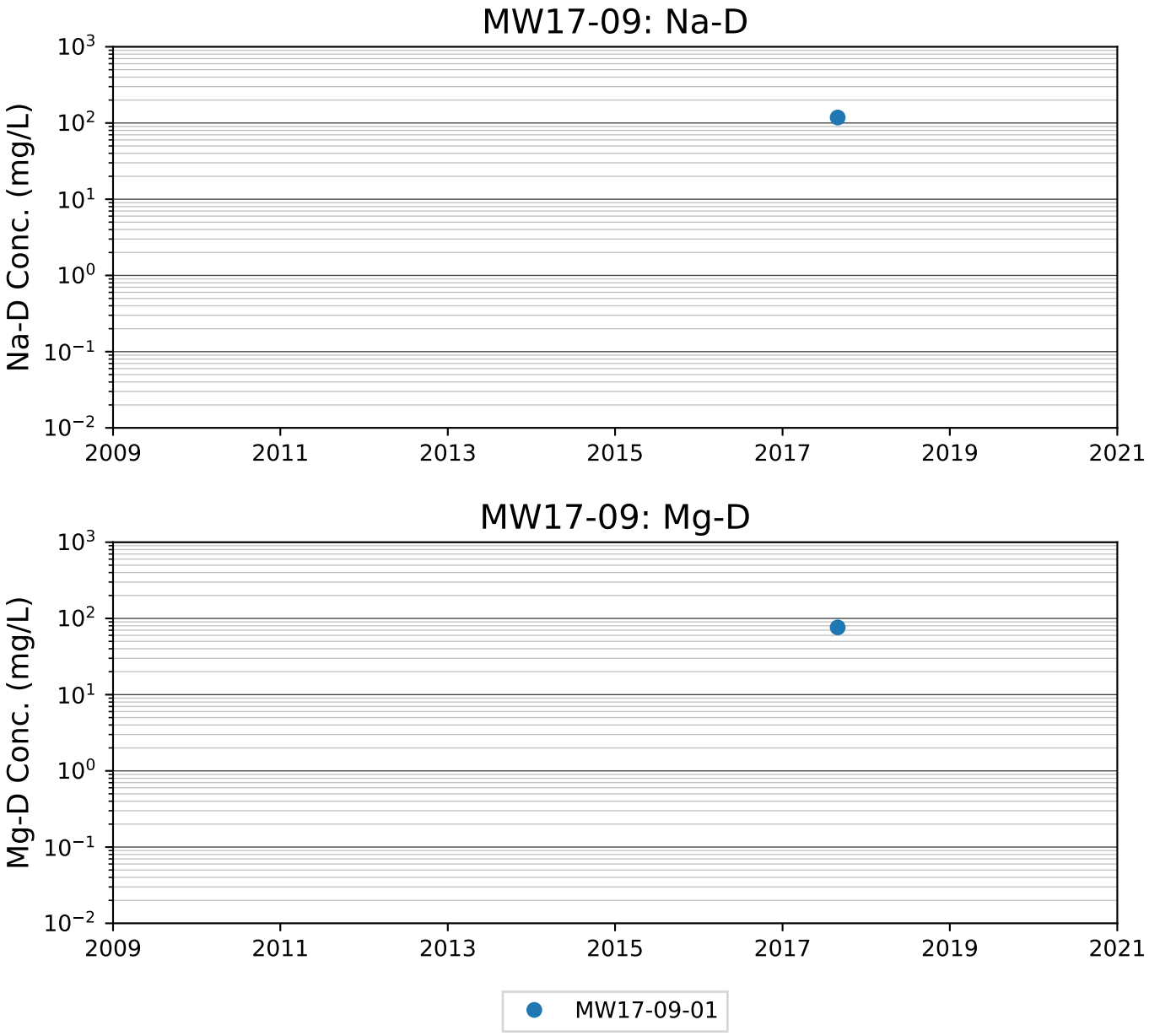

MW17-09: Se-D
Se-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021

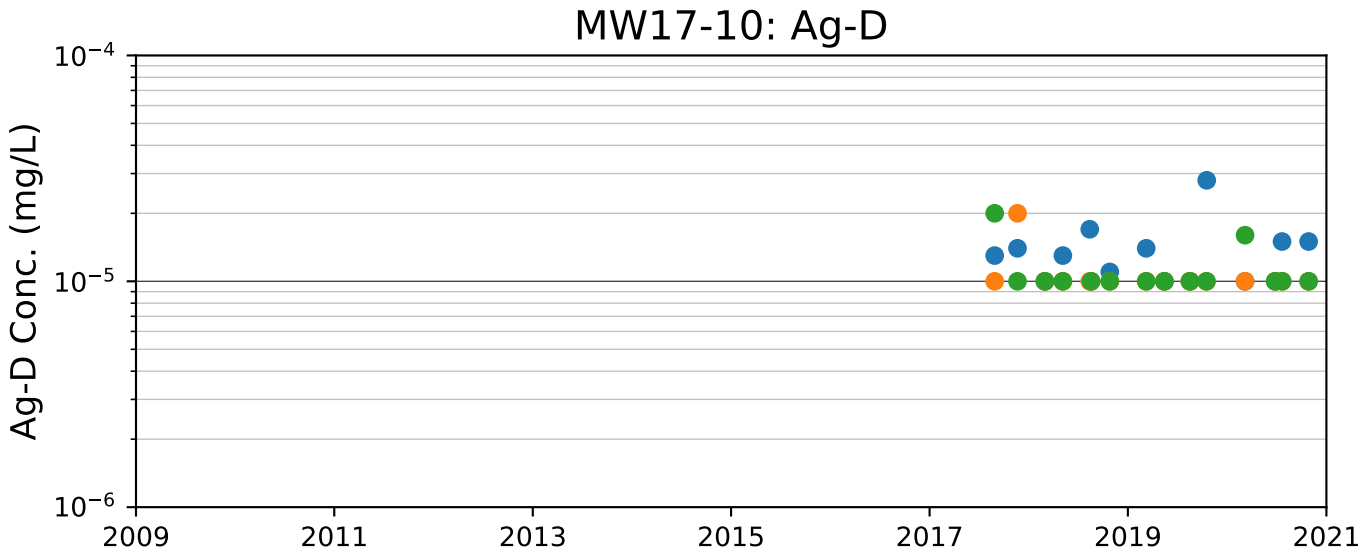

MW17-09: Zn-D
Zn-D Conc. (mg/L)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
2009
2011
2013
2015
2017
2019
2021
MW17-09-01

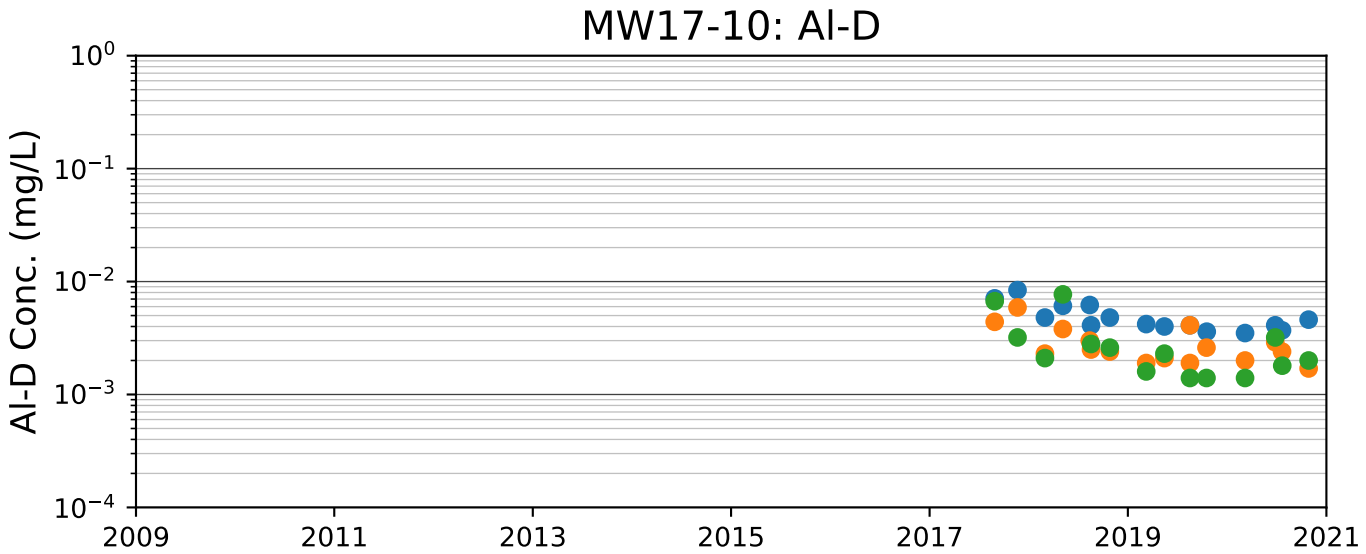

MW17-09: N-NO3
N-NO3 Conc. (mg/L)
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
2009
2011
2013
2015
2017
2019
2021

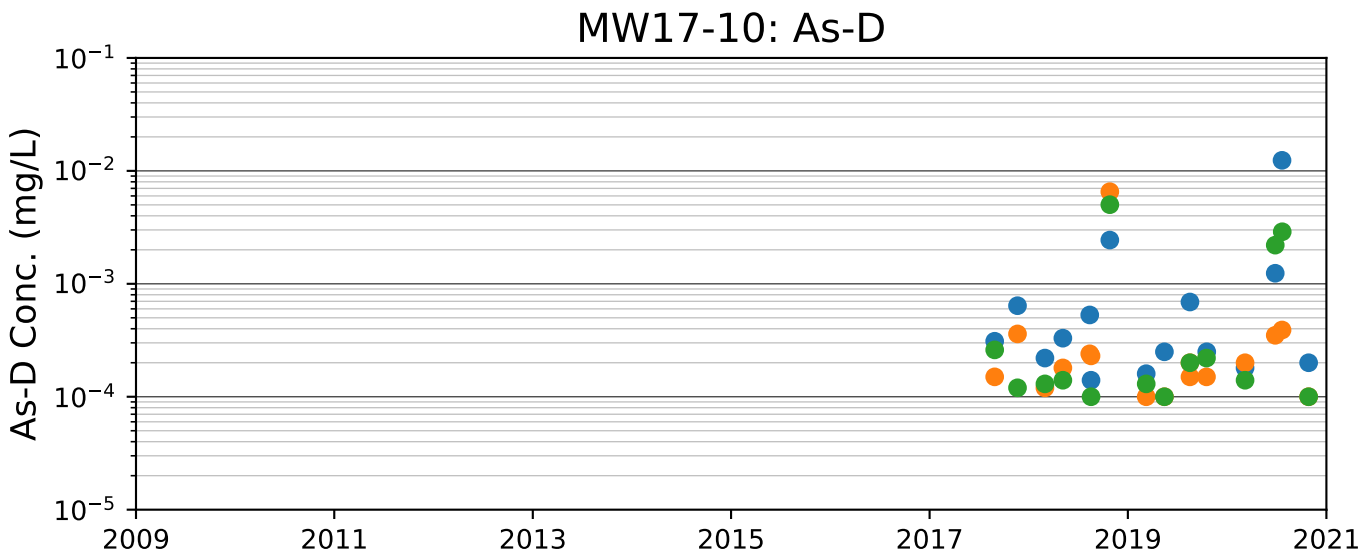

MW17-09: N-NH3
N-NH3 Conc. (mg/L)
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
2009
2011
2013
2015
2017
2019
2021

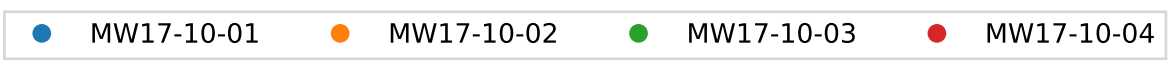

MW17-09: SO4-D
SO4-D Conc. (mg/L)
10^{4}
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
2009
2011
2013
2015
2017
2019
2021
MW17-09-01

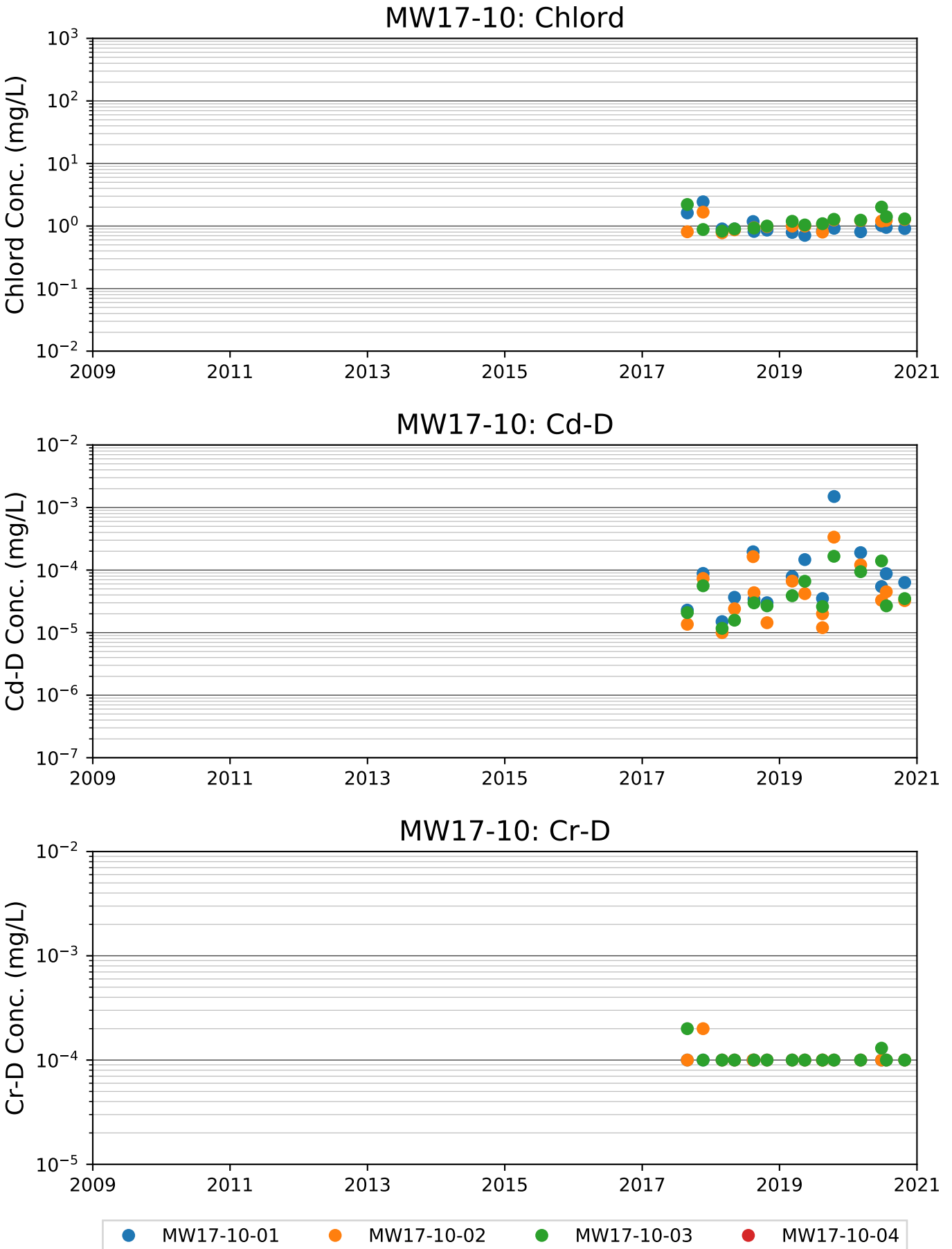

MW17-09: Na-D
Na-D Conc. (mg/L)
10^3
10^2
10^1
10^0
10^{-1}
10^{-2}
2009
2011
2013
2015
2017
2019
2021
MW17-09: Mg-D
Mg-D Conc. (mg/L)
10^3
10^2
10^1
10^0
10^{-1}
10^{-2}
2009
2011
2013
2015
2017
2019
2021
MW17-09-01

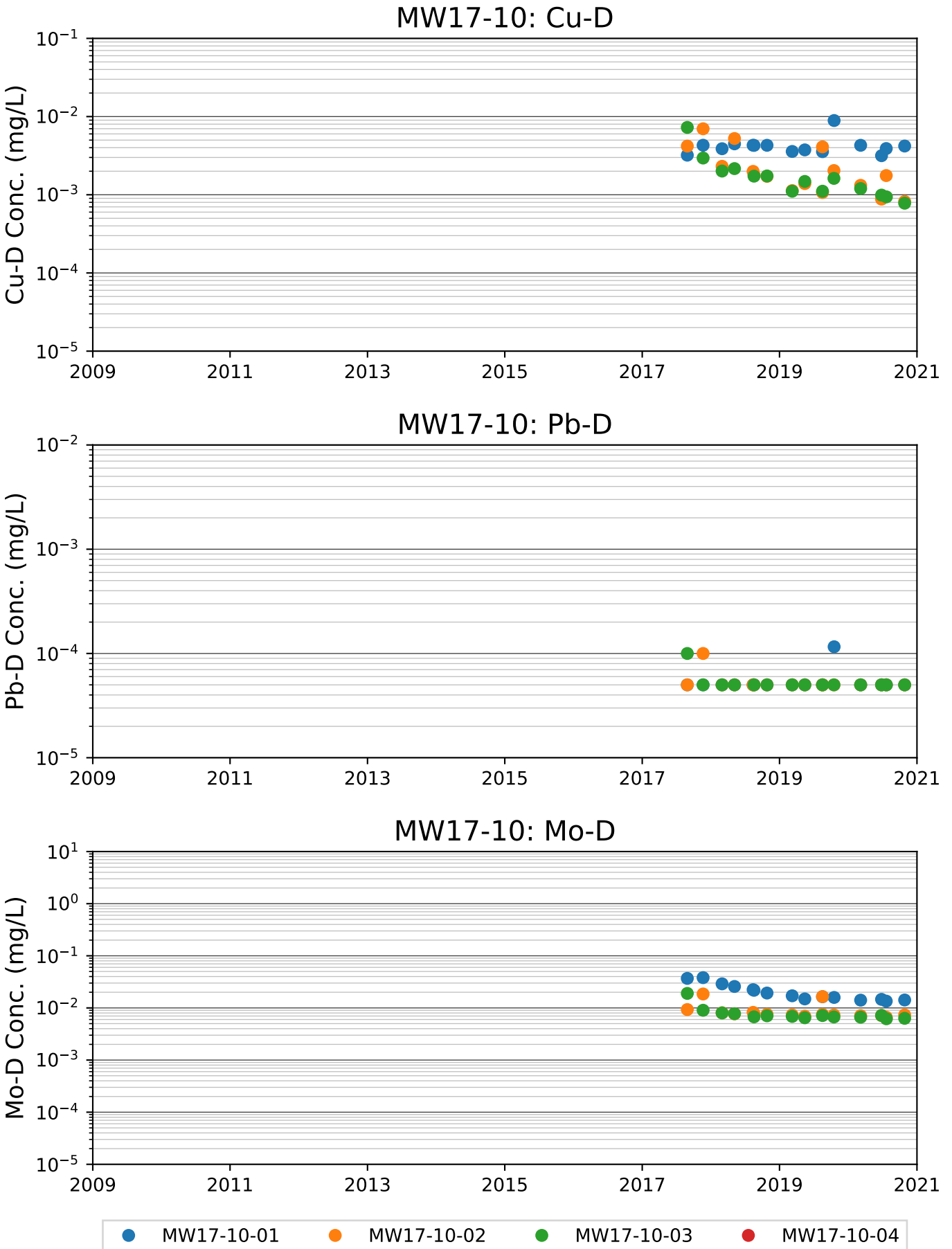

MW17-10: Ag-D
Ag-D Conc. (mg/L)
10^{-4}
10^{-5}
10^{-6}
2009
2011
2013
2015
2017
2019
2021

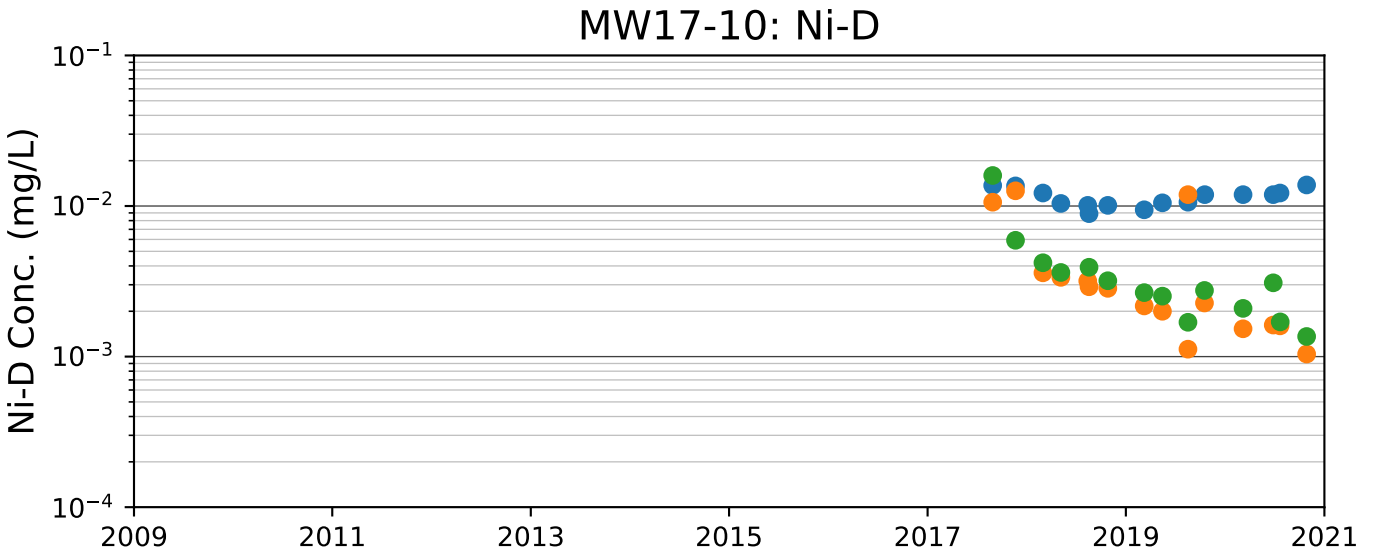

MW17-10: Al-D
Al-D Conc. (mg/L)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
2009
2011
2013
2015
2017
2019
2021

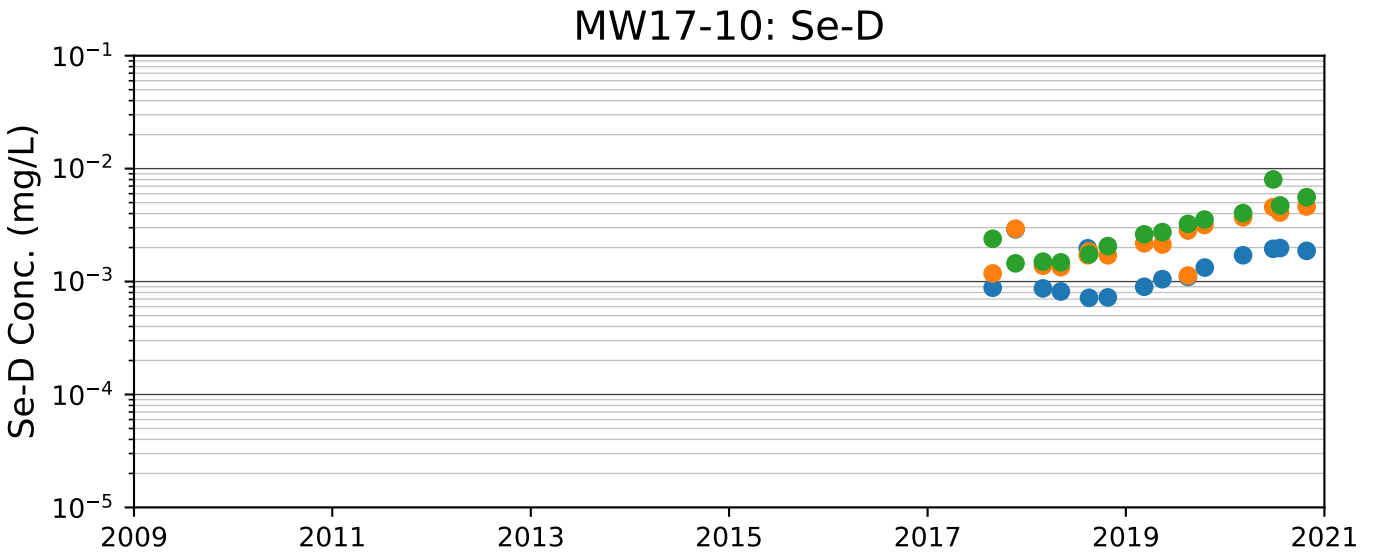

MW17-10: As-D
As-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021

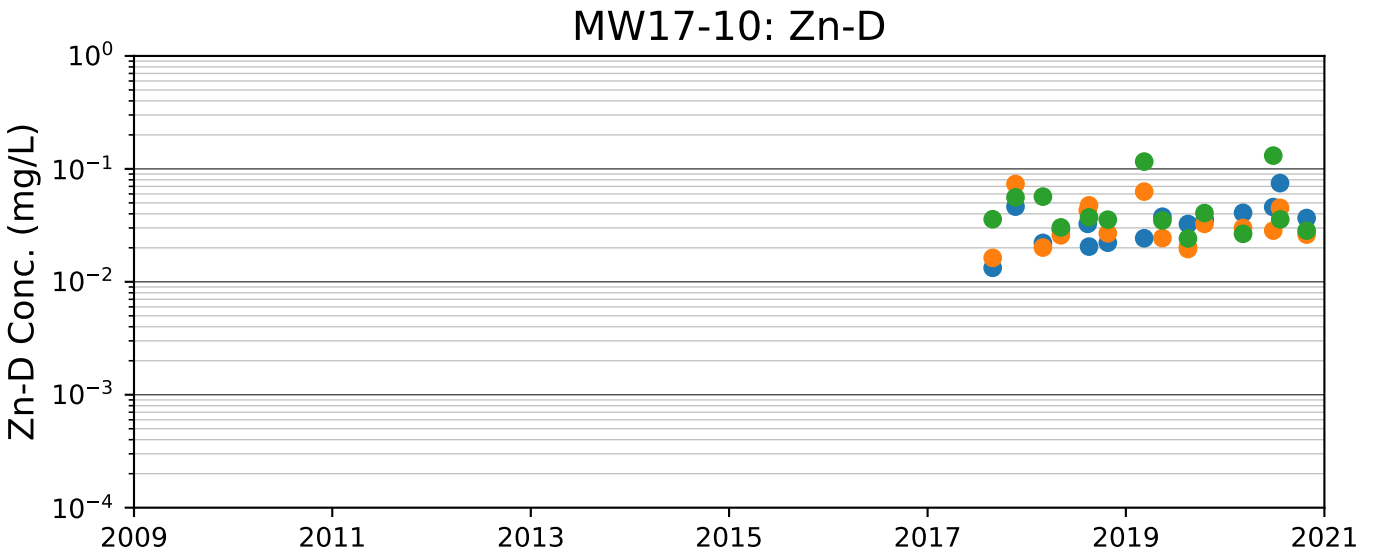

MW17-10-01
MW17-10-02
MW17-10-03
MW17-10-04

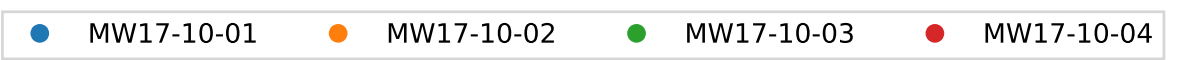

MW17-10: Chlord
Chlord Conc. (mg/L)
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
2009
2011
2013
2015
2017
2019
2021
MW17-10: Cd-D
Cd-D Conc. (mg/L)
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-7}
2009
2011
2013
2015
2017
2019
2021
MW17-10: Cr-D
Cr-D Conc. (mg/L)
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021
MW17-10-01
MW17-10-02
MW17-10-03
MW17-10-04

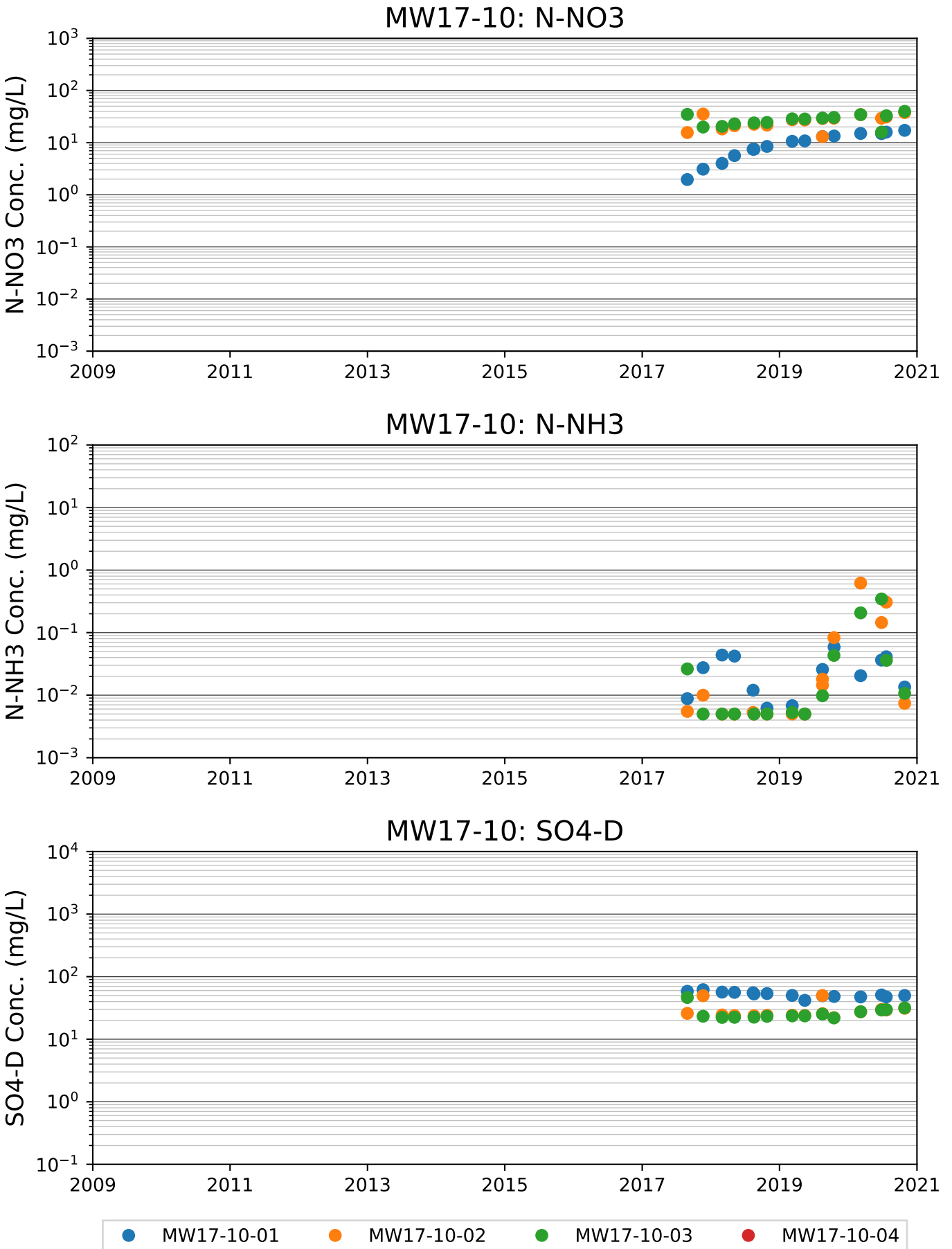

MW17-10: Cu-D
Cu-D Conc. (mg/L)
MW17-10: Pb-D
Pb-D Conc. (mg/L)
MW17-10: Mo-D
Mo-D Conc. (mg/L)
2009
2011
2013
2015
2017
2019
2021
MW17-10-01
MW17-10-02
MW17-10-03
MW17-10-04

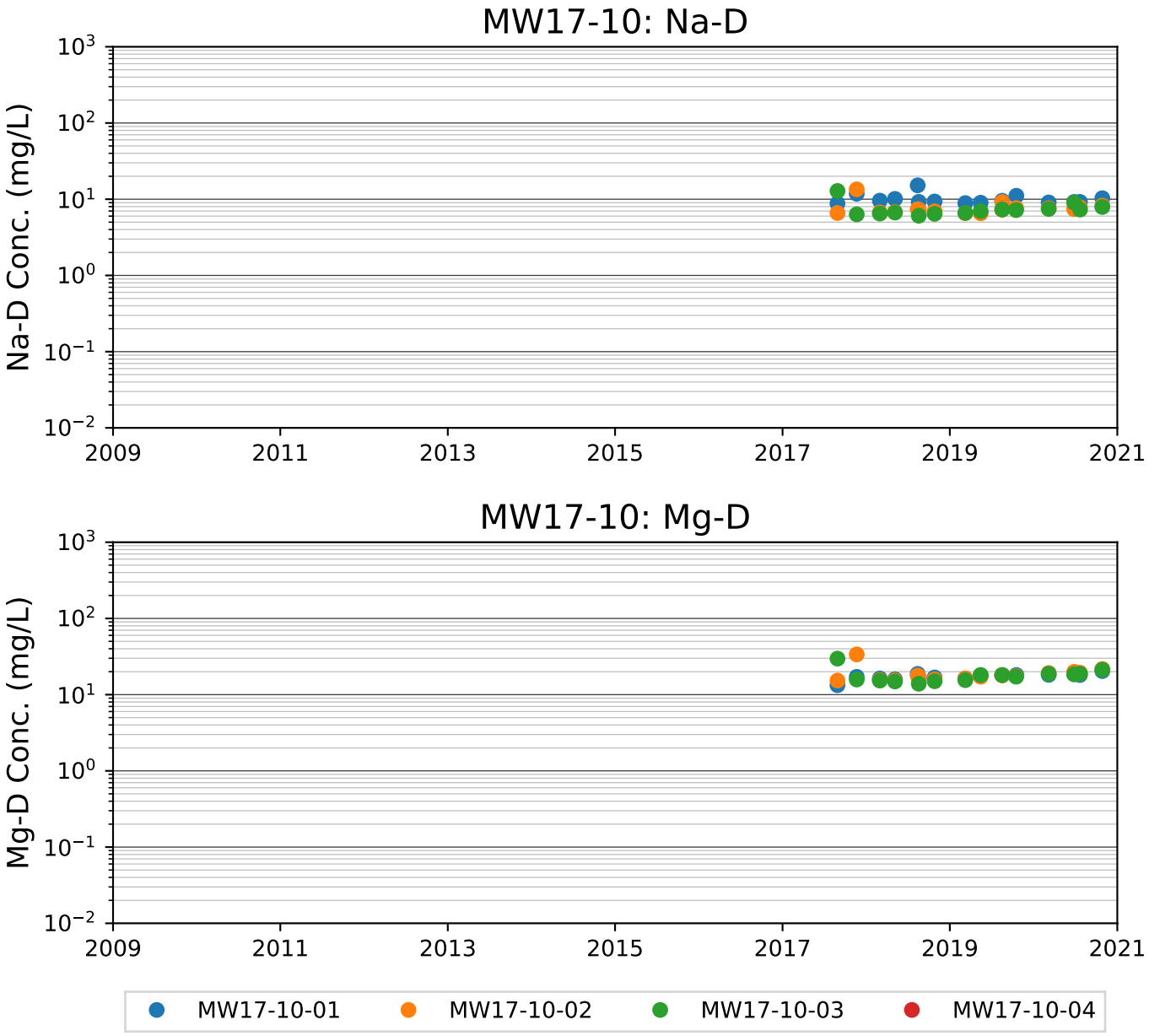

MW17-10: Ni-D
Ni-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
2009
2011
2013
2015
2017
2019
2021

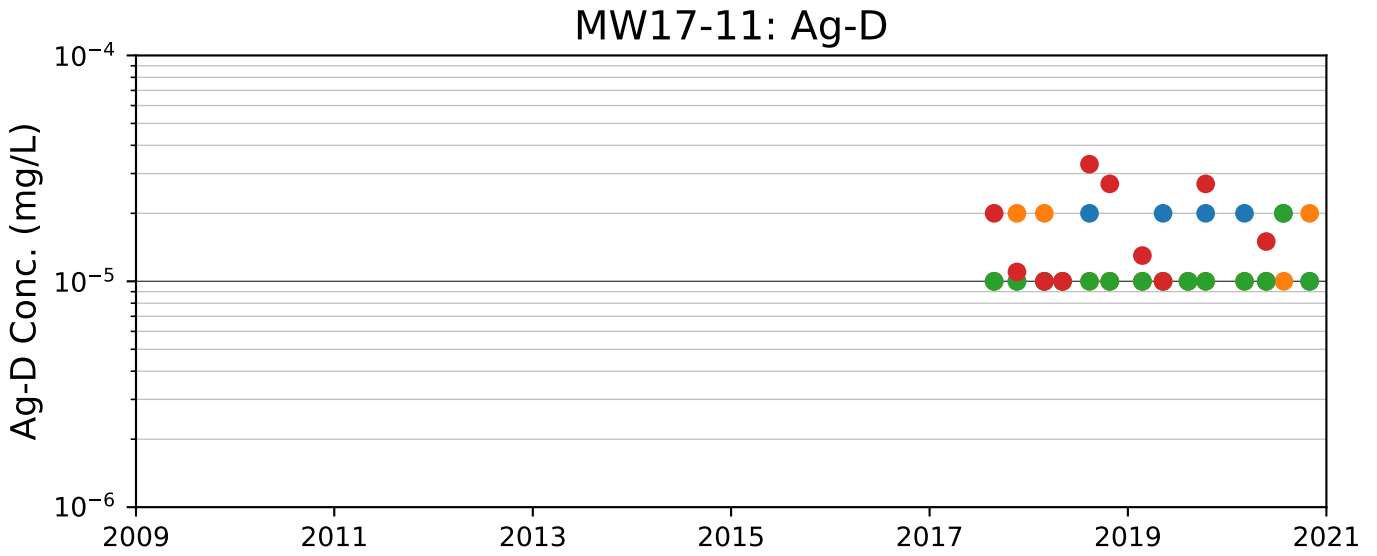

MW17-10: Se-D
Se-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021

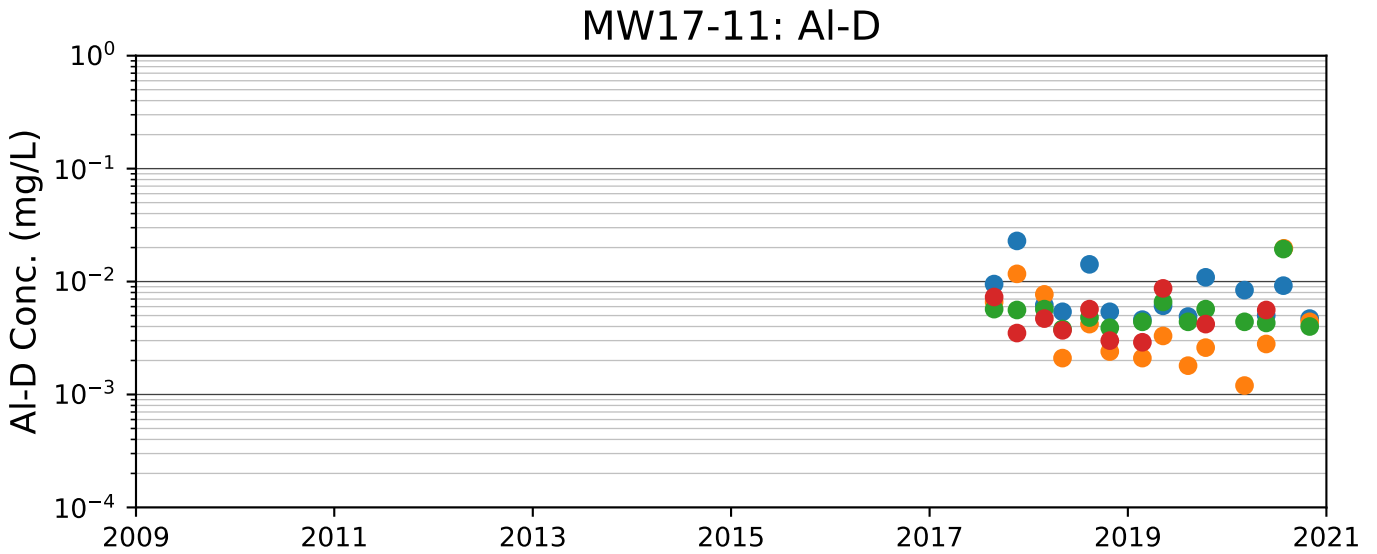

MW17-10: Zn-D
Zn-D Conc. (mg/L)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
2009
2011
2013
2015
2017
2019
2021

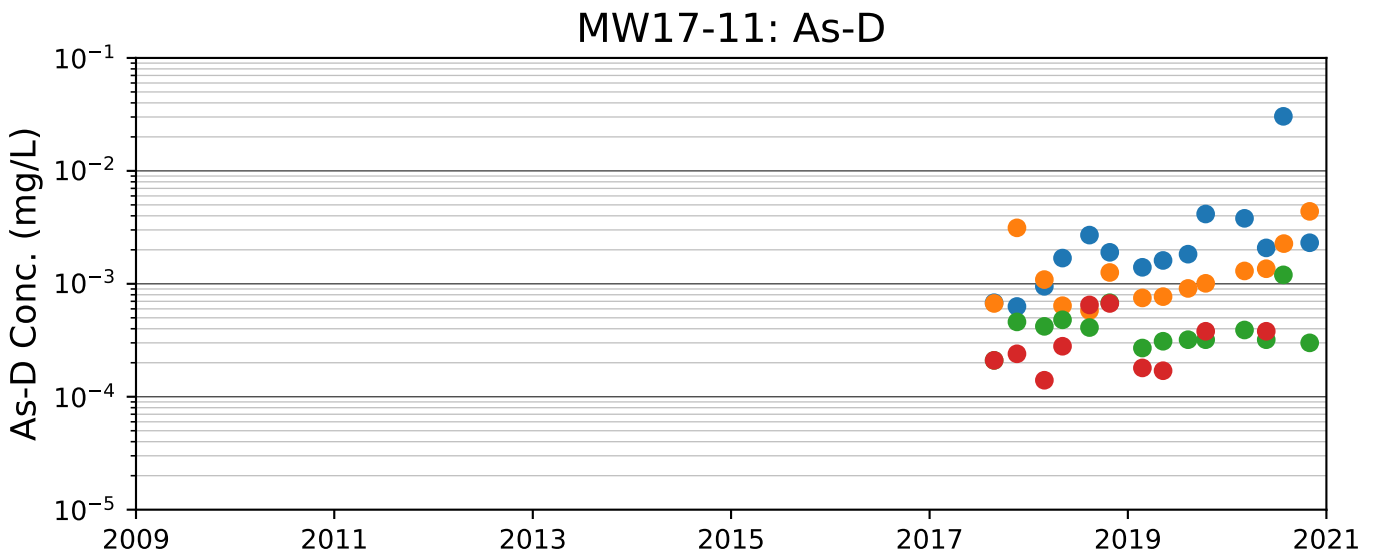

MW17-10-01
MW17-10-02
MW17-10-03
MW17-10-04


MW17-10: N-NO3
N-NO3 Conc. (mg/L)
MW17-10: N-NH3
N-NH3 Conc. (mg/L)
MW17-10: SO4-D
SO4-D Conc. (mg/L)
2009
2011
2013
2015
2017
2019
2021
MW17-10-01
MW17-10-02
MW17-10-03
MW17-10-04

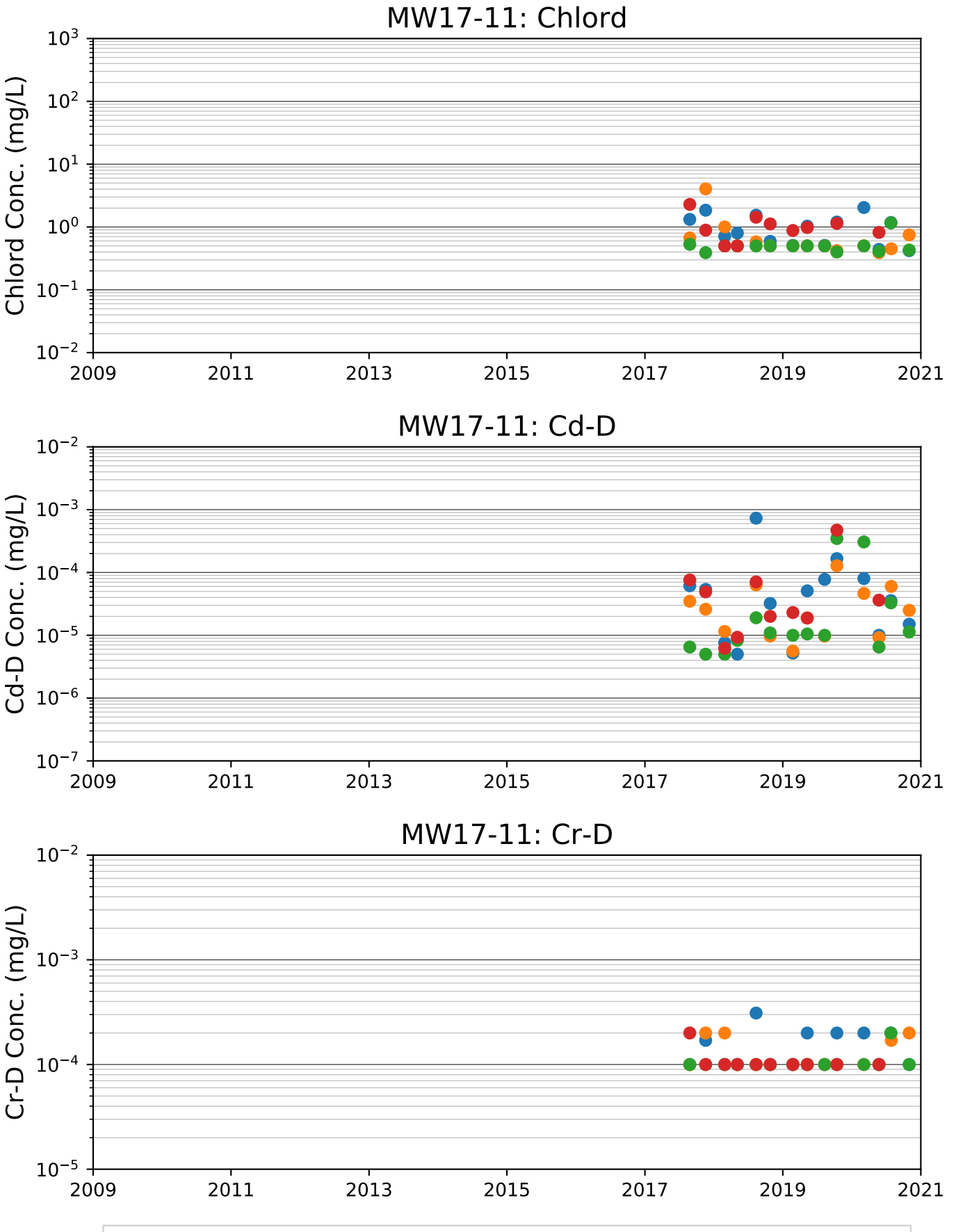

MW17-10: Na-D
Na-D Conc. (mg/L)
10^3
10^2
10^1
10^0
10^{-1}
10^{-2}
2009
2011
2013
2015
2017
2019
2021
MW17-10: Mg-D
Mg-D Conc. (mg/L)
MW17-10-01
MW17-10-02
MW17-10-03
MW17-10-04

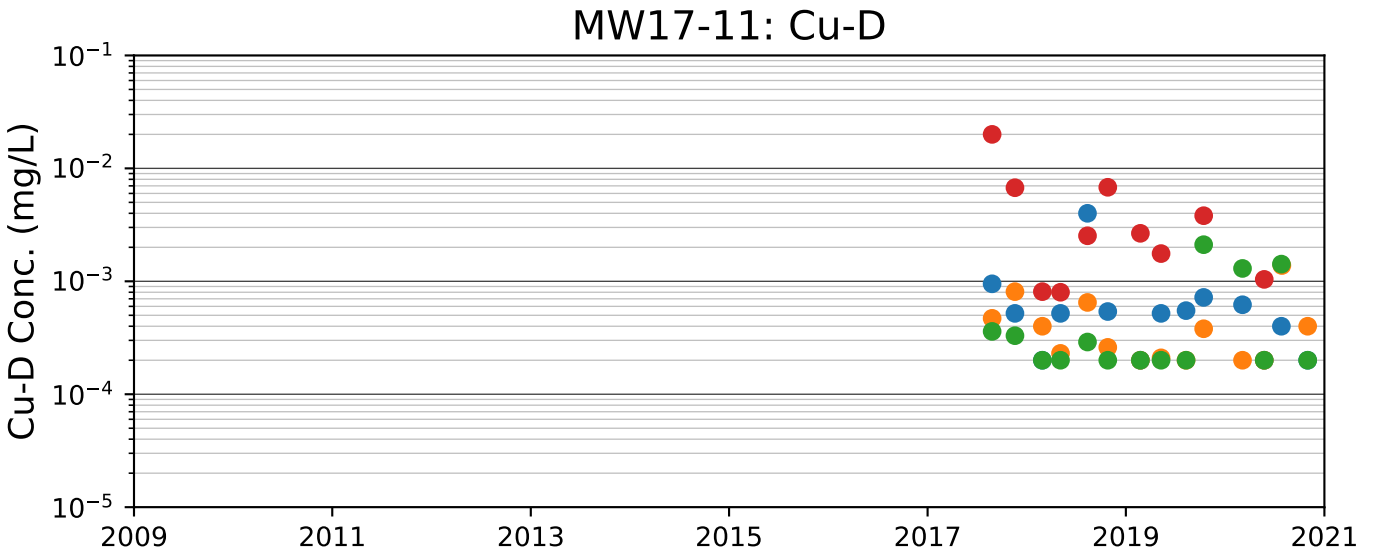

MW17-11: Ag-D
Ag-D Conc. (mg/L)
10^{-4}
10^{-5}
10^{-6}
2009
2011
2013
2015
2017
2019
2021

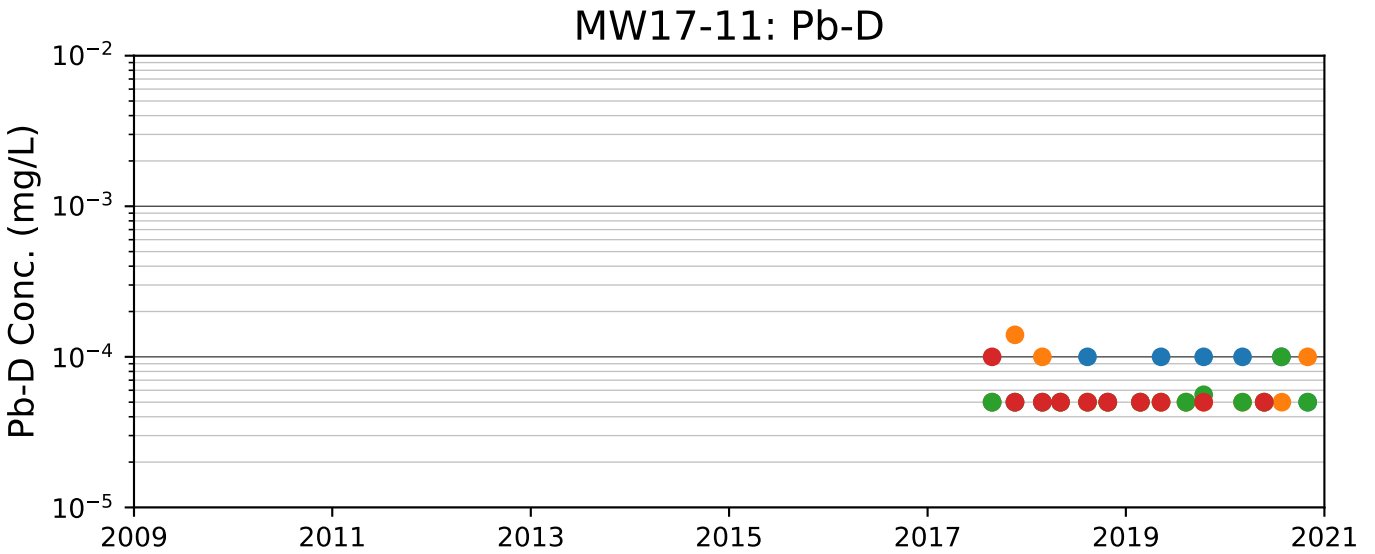

MW17-11: Al-D
Al-D Conc. (mg/L)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
2009
2011
2013
2015
2017
2019
2021

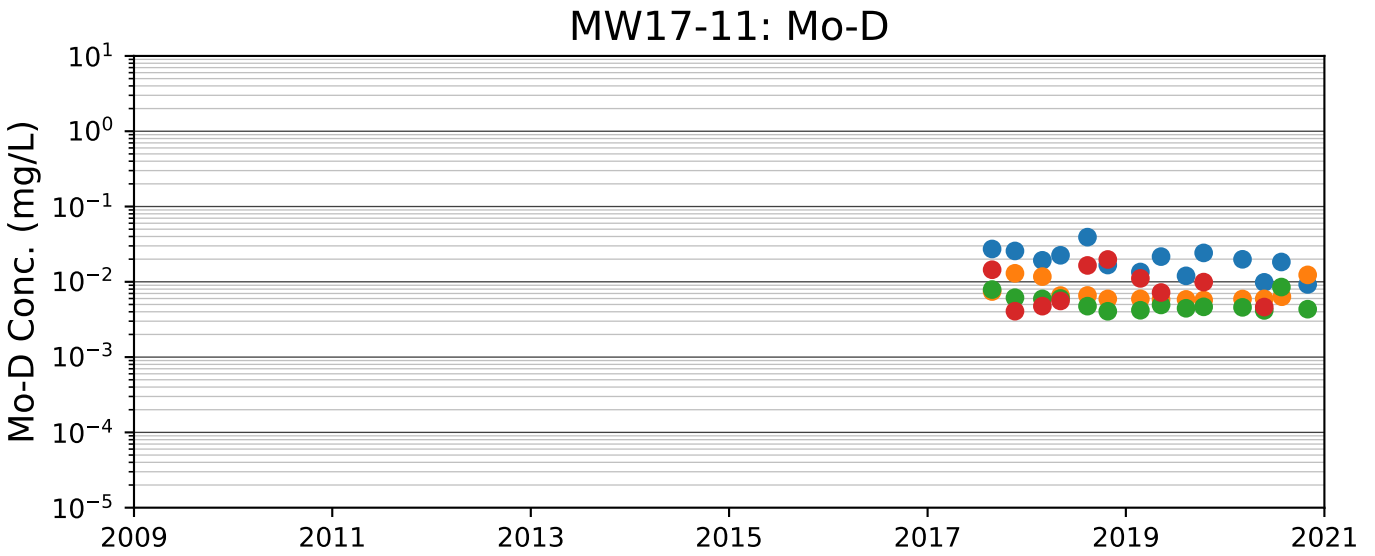

MW17-11: As-D
As-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021

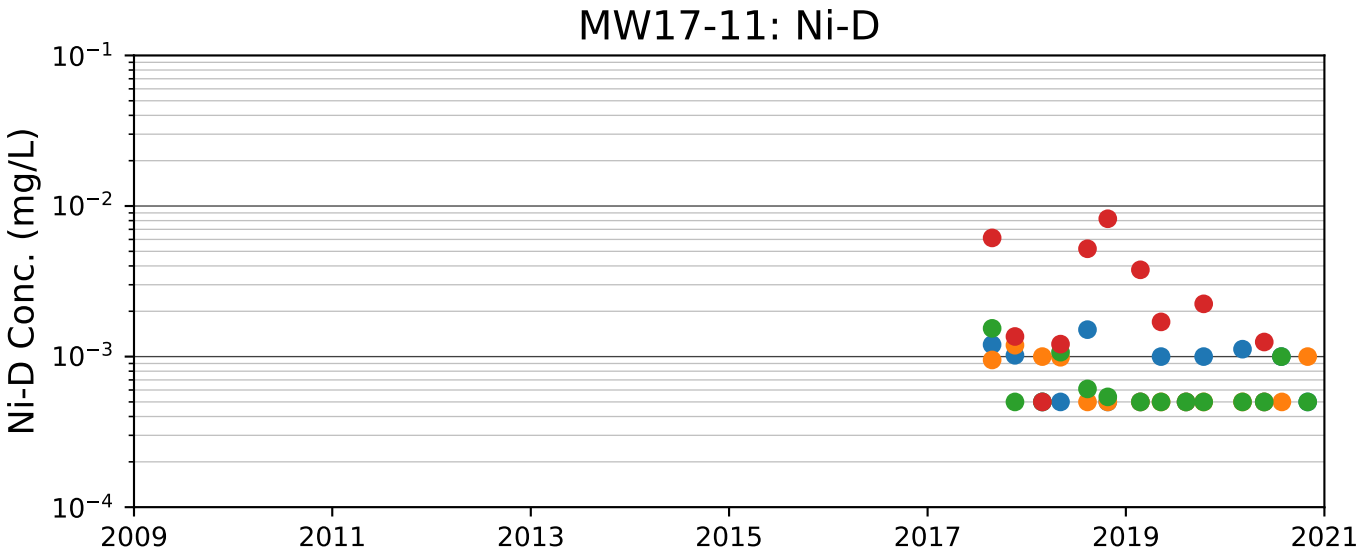

MW17-11-01
MW17-11-02
MW17-11-03
MW17-11-04

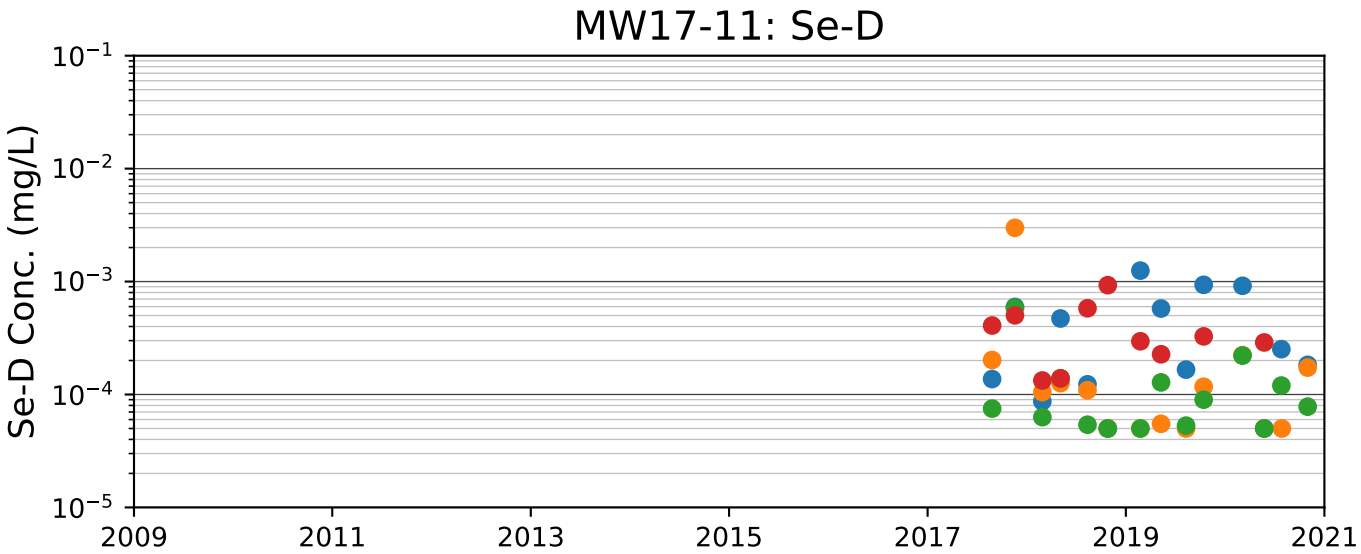

MW17-11: Chlord
Chlord Conc. (mg/L)
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
2009
2011
2013
2015
2017
2019
2021
MW17-11: Cd-D
Cd-D Conc. (mg/L)
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-7}
2009
2011
2013
2015
2017
2019
2021
MW17-11: Cr-D
Cr-D Conc. (mg/L)
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021
MW17-11-01
MW17-11-02
MW17-11-03
MW17-11-04

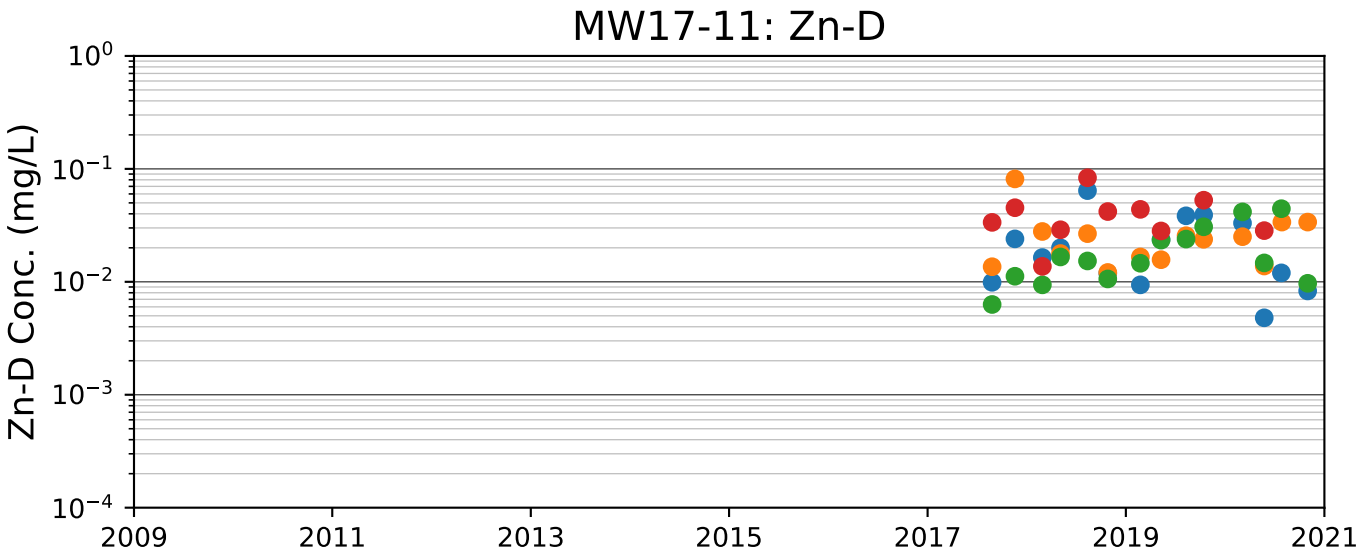

MW17-11: Cu-D
Cu-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021


MW17-11: Pb-D
Pb-D Conc. (mg/L)
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021

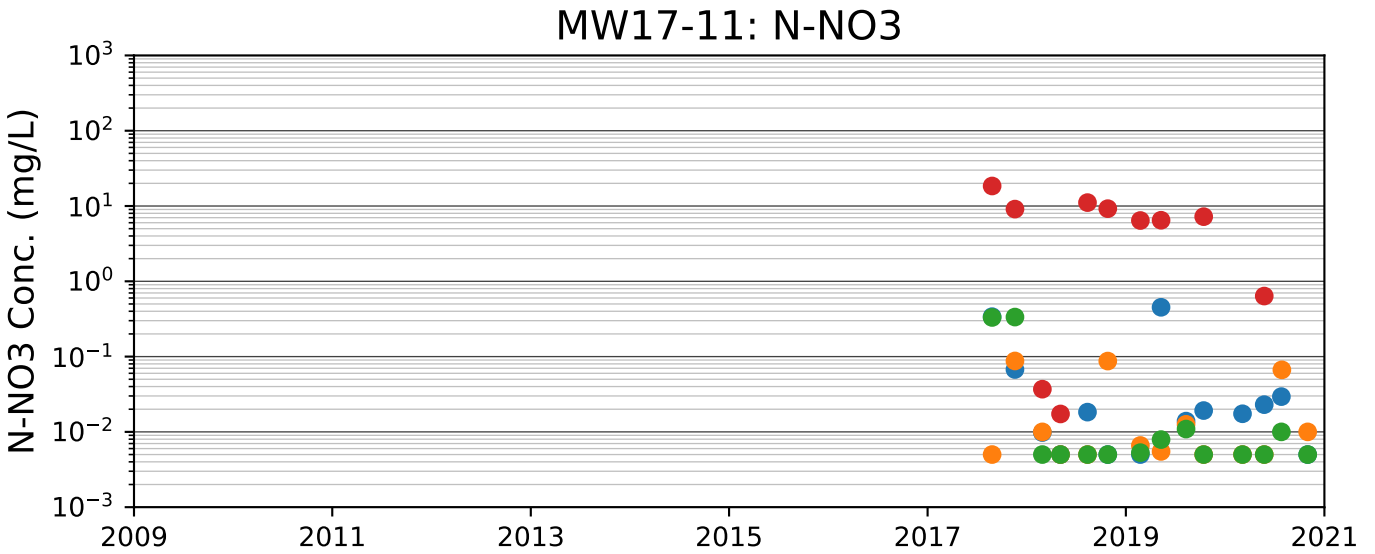

MW17-11: Mo-D
Mo-D Conc. (mg/L)
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021
MW17-11-01
MW17-11-02
MW17-11-03
MW17-11-04

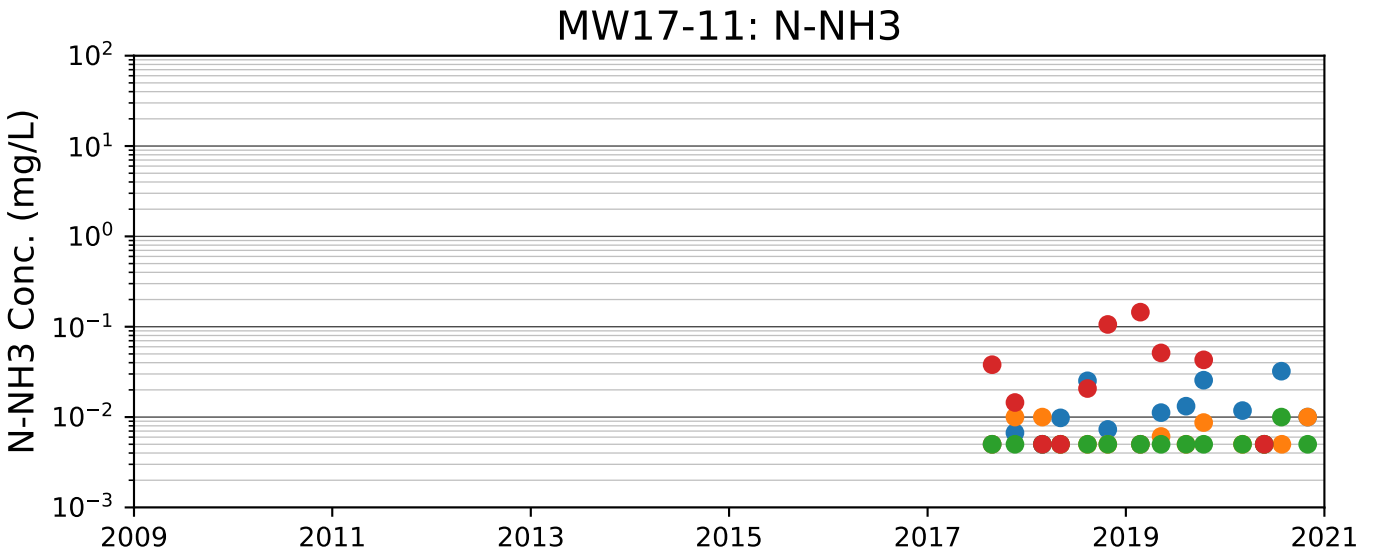

MW17-11: Ni-D
Ni-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
2009
2011
2013
2015
2017
2019
2021

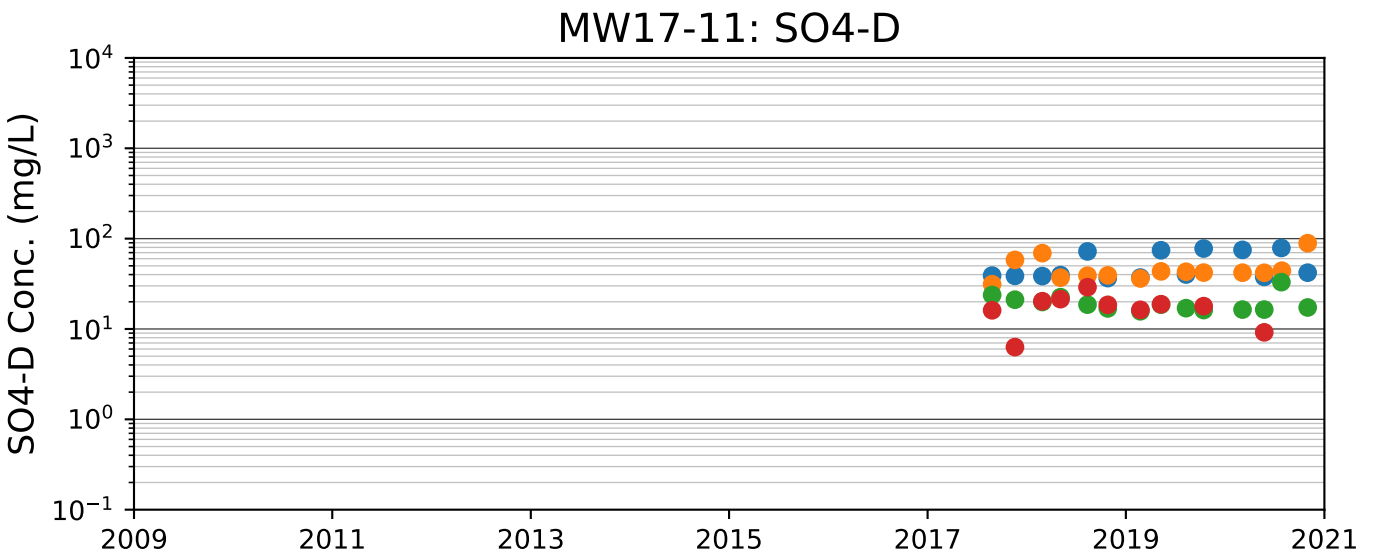

MW17-11: Se-D
Se-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021


MW17-11: Zn-D
Zn-D Conc. (mg/L)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
2009
2011
2013
2015
2017
2019
2021

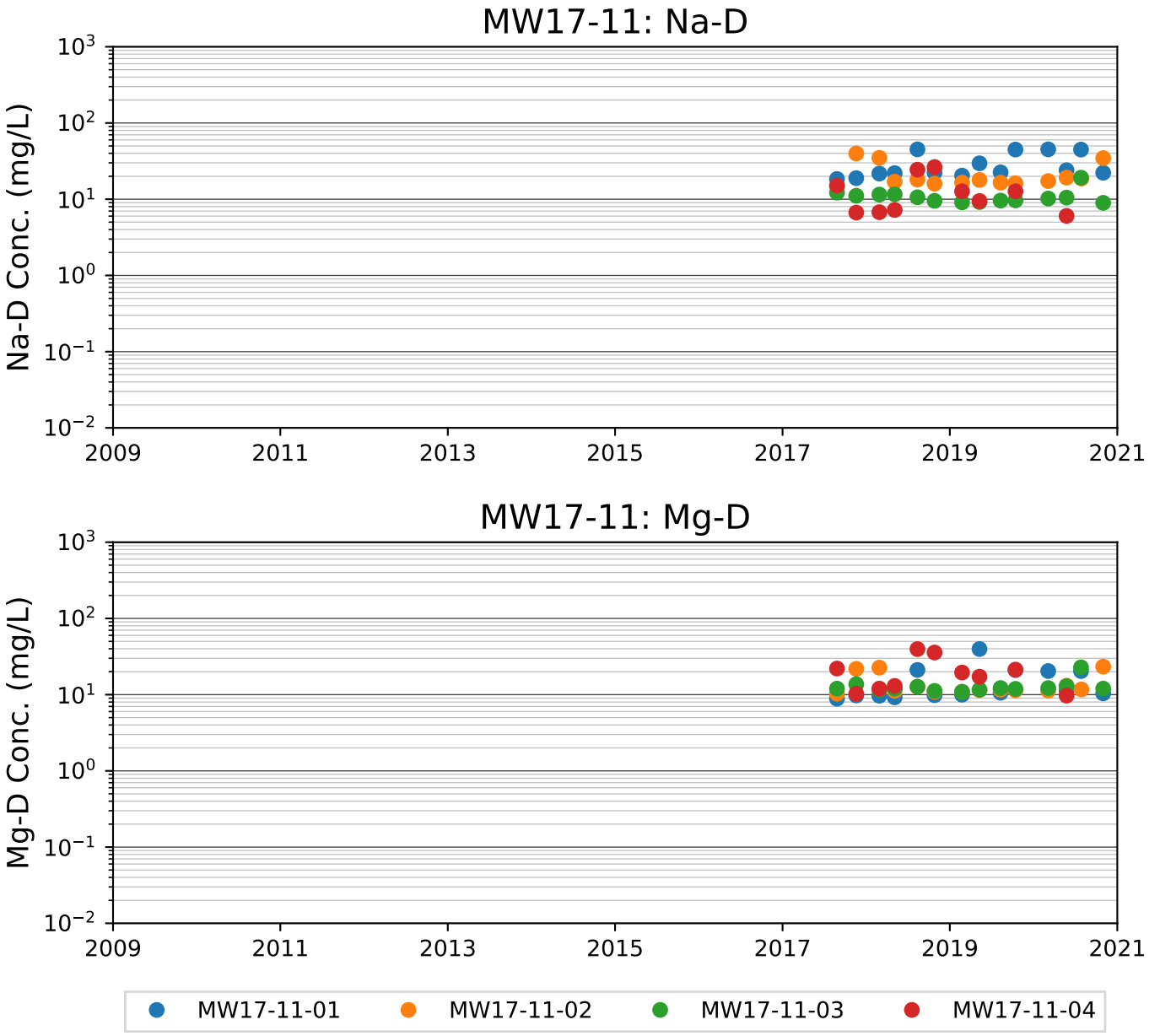

MW17-11-01
MW17-11-02
MW17-11-03
MW17-11-04

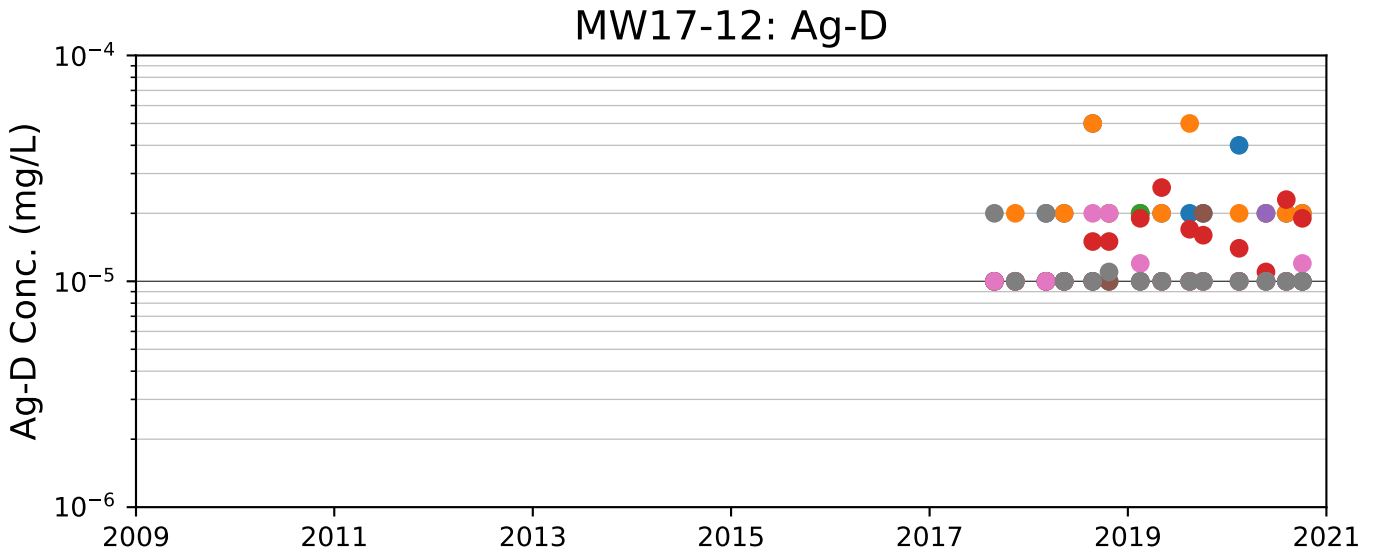

MW17-11: N-NO3
N-NO3 Conc. (mg/L)
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
2009
2011
2013
2015
2017
2019
2021

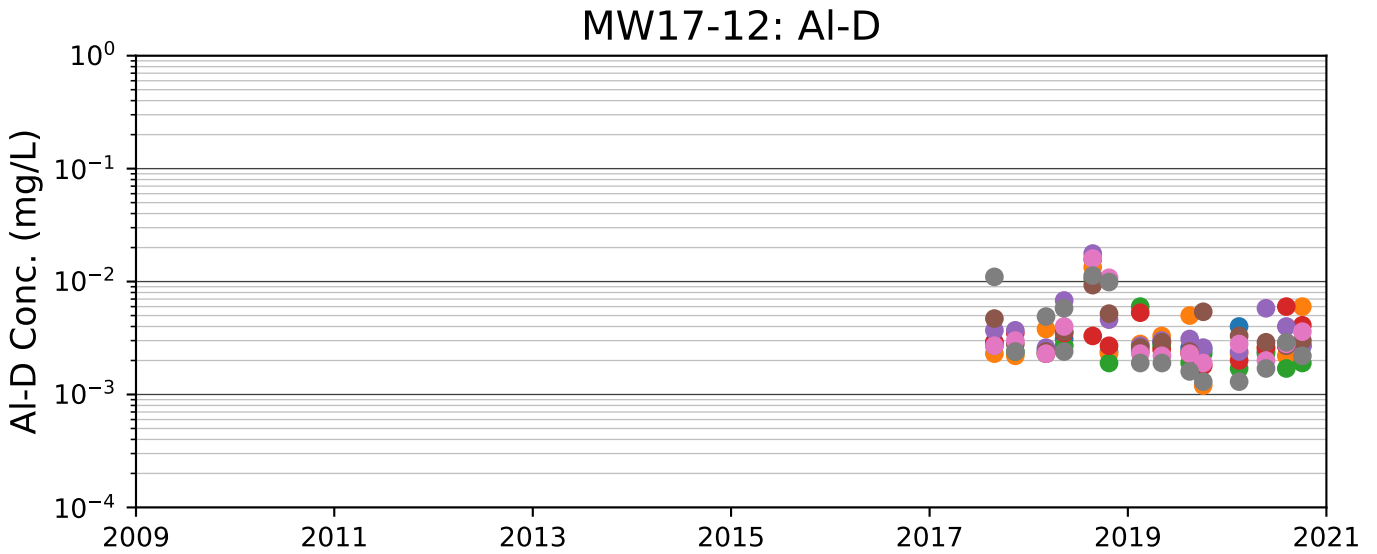

MW17-11: N-NH3
N-NH3 Conc. (mg/L)
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
2009
2011
2013
2015
2017
2019
2021

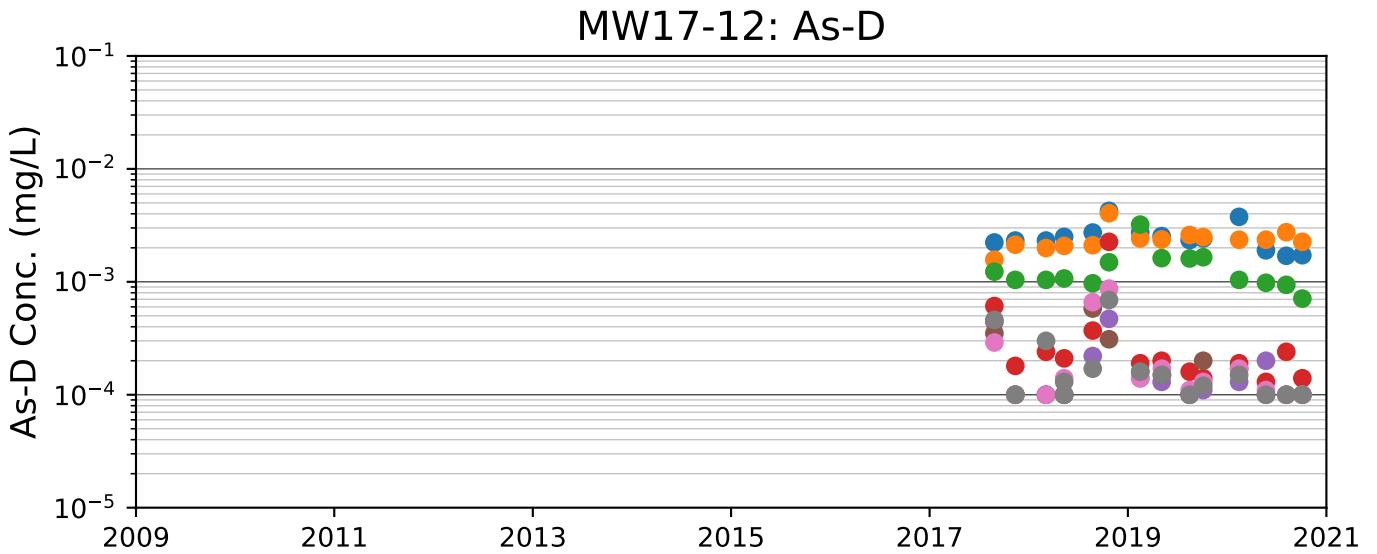

MW17-11: SO4-D
SO4-D Conc. (mg/L)
10^{4}
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
2009
2011
2013
2015
2017
2019
2021

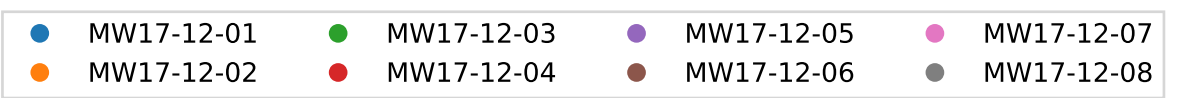

MW17-11-01
MW17-11-02
MW17-11-03
MW17-11-04

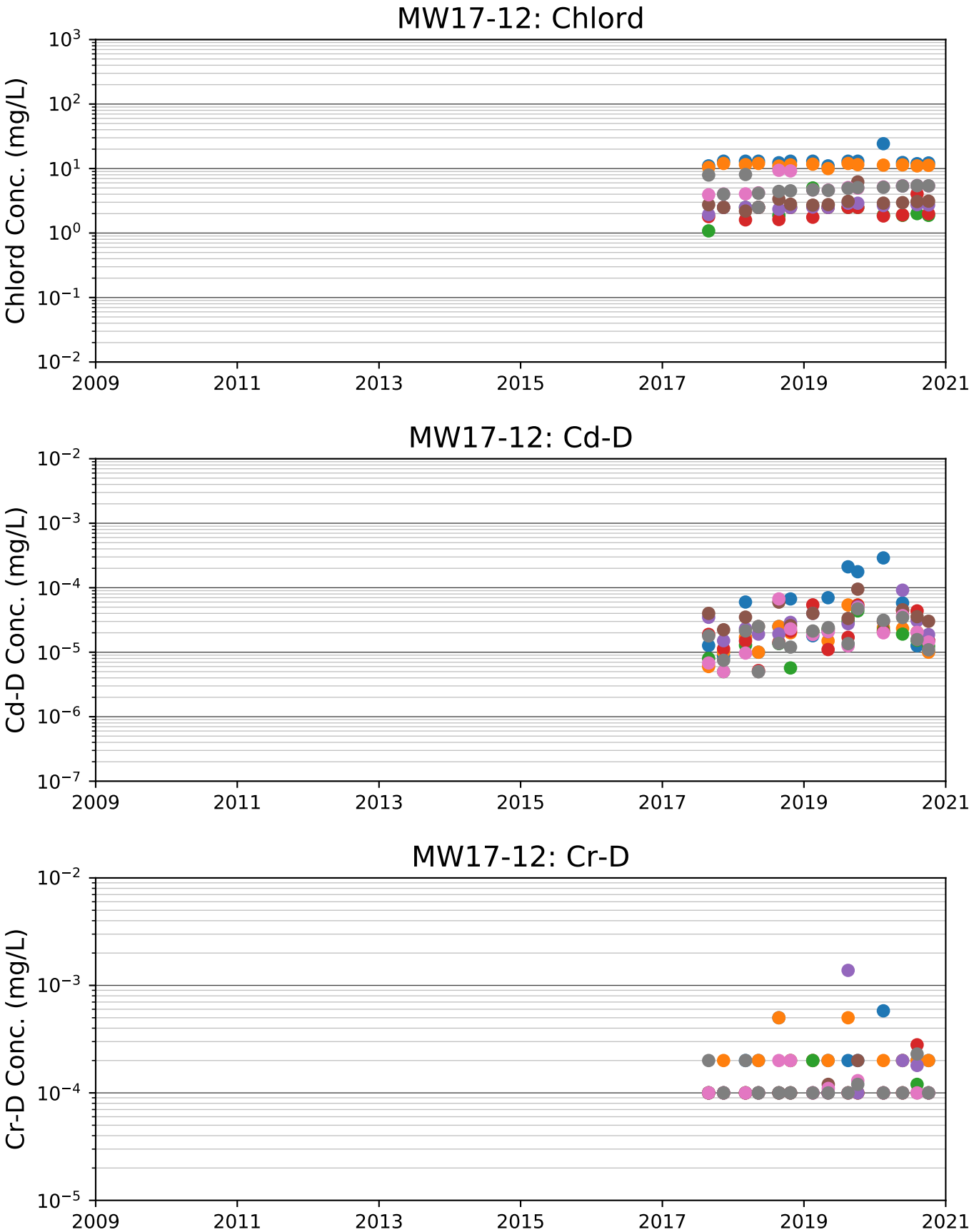

MW17-11: Na-D
Na-D Conc. (mg/L)
10^3
10^2
10^1
10^0
10^{-1}
10^{-2}
2009
2011
2013
2015
2017
2019
2021
MW17-11: Mg-D
Mg-D Conc. (mg/L)
MW17-11-01
MW17-11-02
MW17-11-03
MW17-11-04

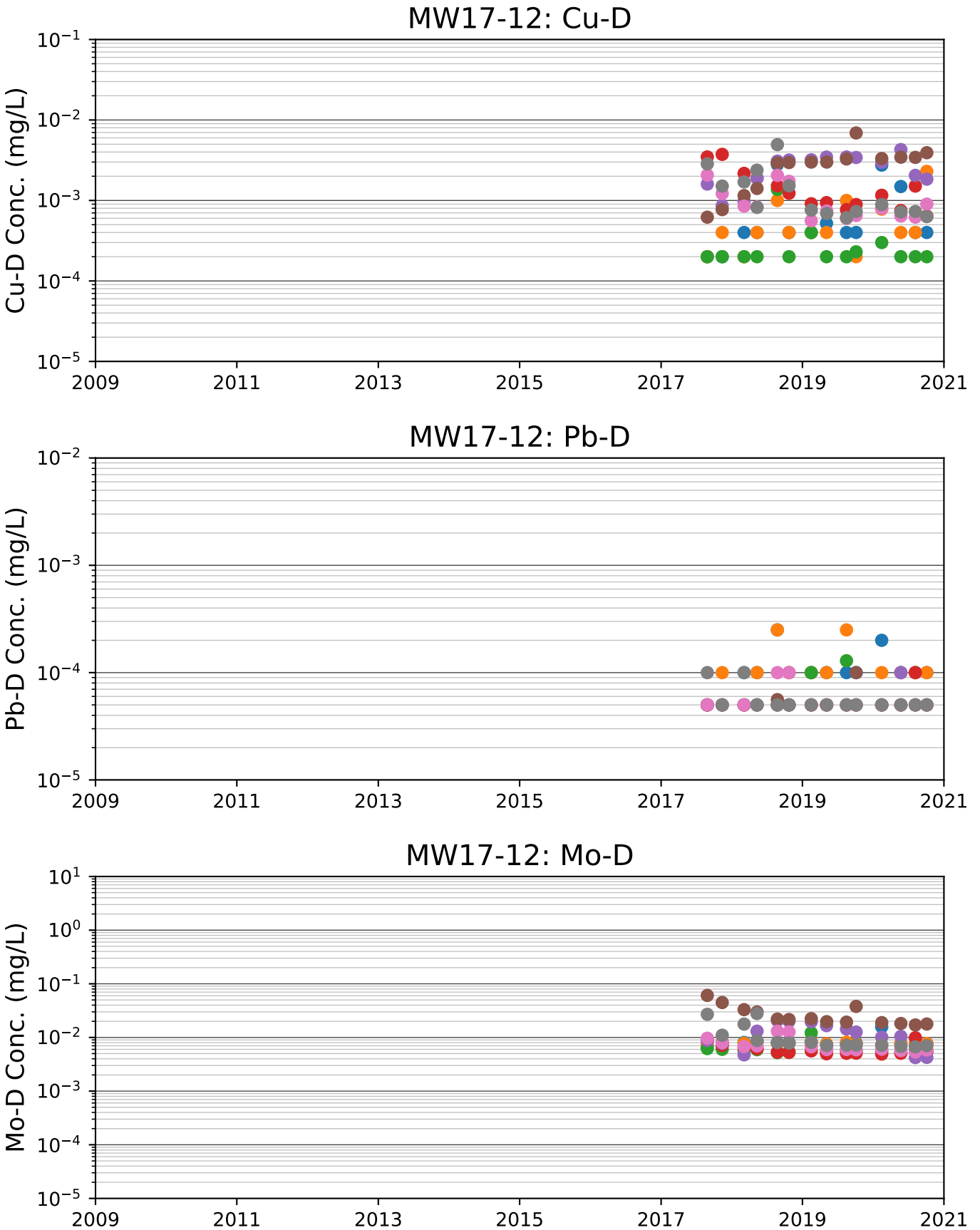

MW17-12: Ag-D
Ag-D Conc. (mg/L)
10^{-4}
10^{-5}
10^{-6}
2009
2011
2013
2015
2017
2019
2021

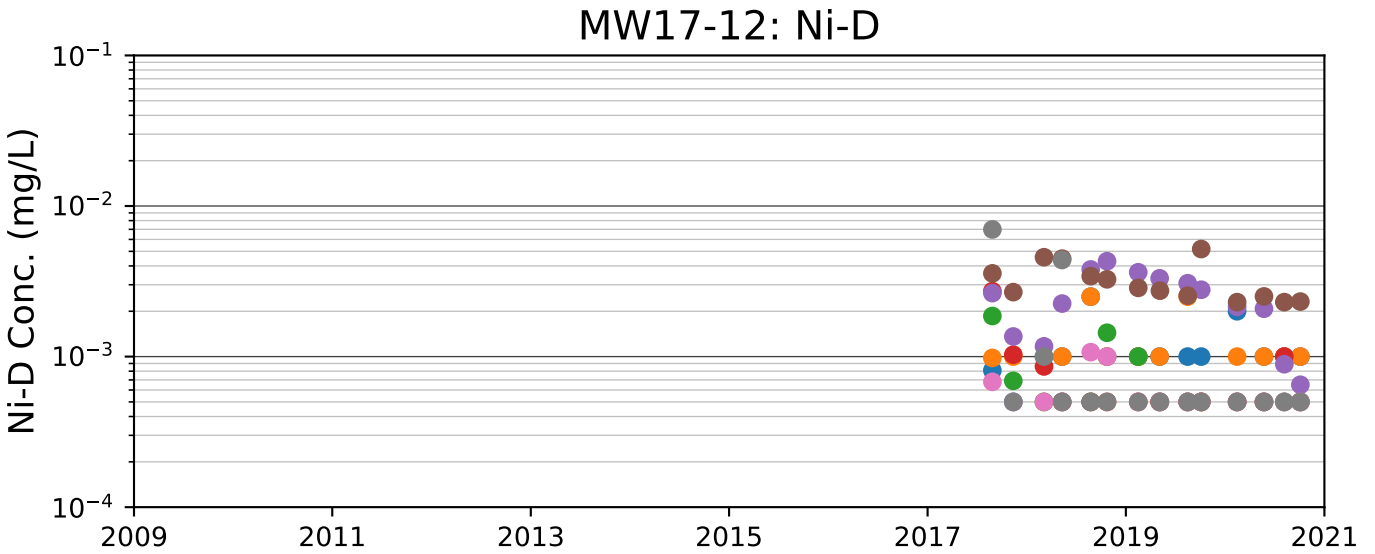

MW17-12: Al-D
Al-D Conc. (mg/L)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
2009
2011
2013
2015
2017
2019
2021

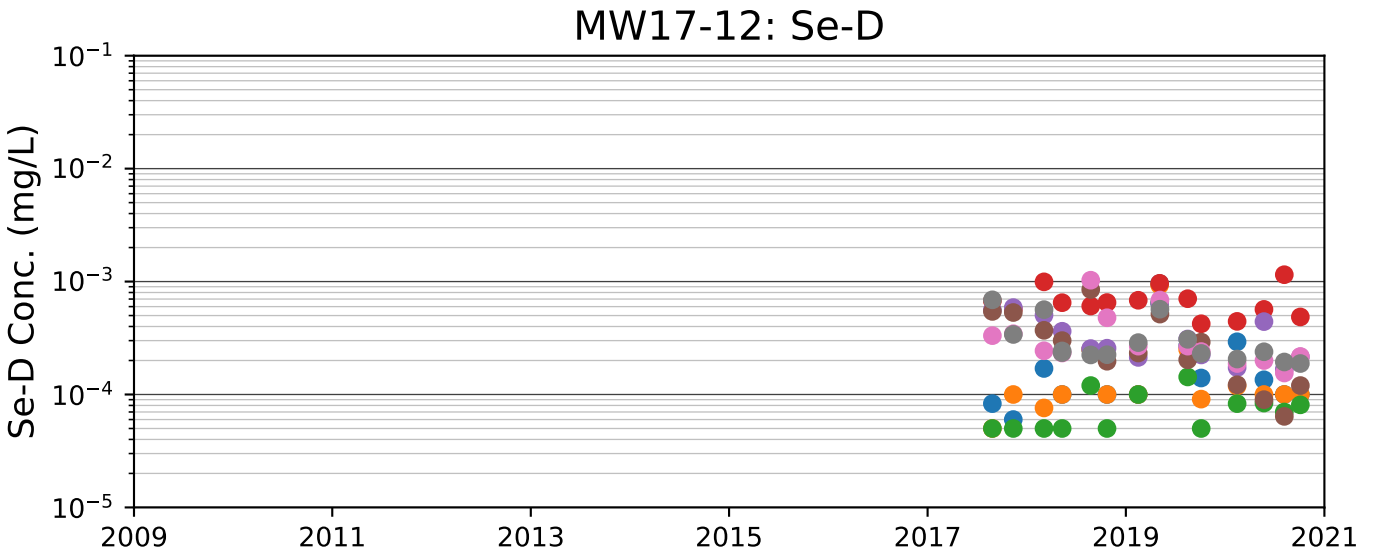

MW17-12: As-D
As-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021

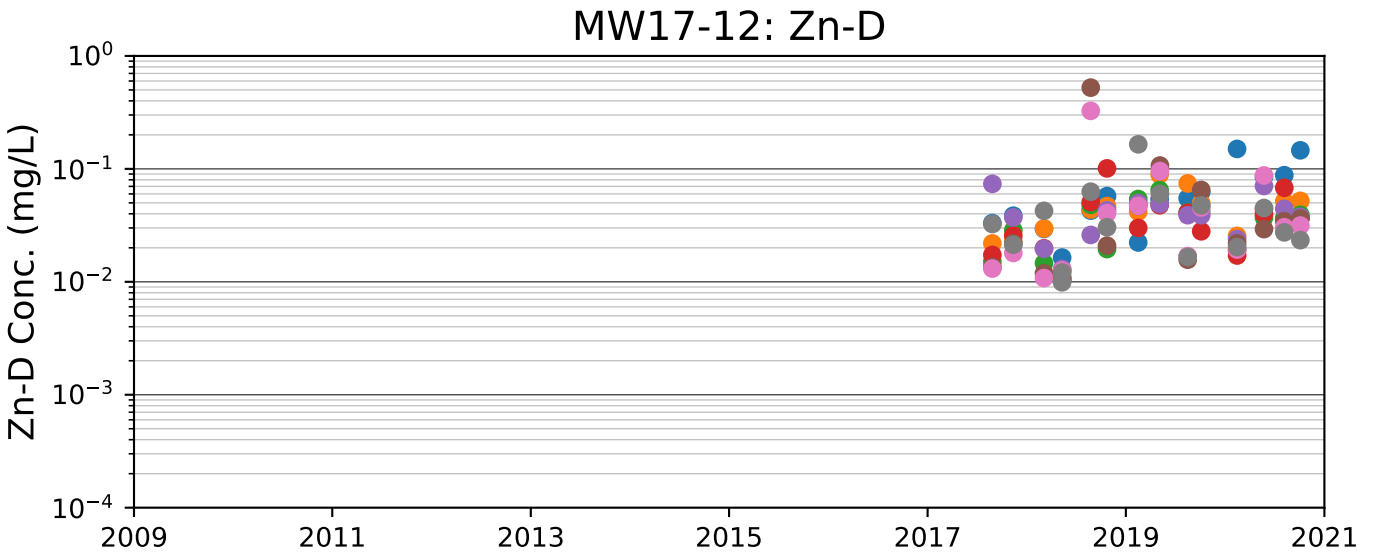

MW17-12-01
MW17-12-02
MW17-12-03
MW17-12-04
MW17-12-05
MW17-12-06
MW17-12-07
MW17-12-08

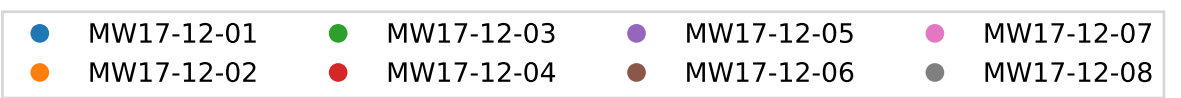

MW17-12: Chlord
Chlord Conc. (mg/L)
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
2009
2011
2013
2015
2017
2019
2021
MW17-12: Cd-D
Cd-D Conc. (mg/L)
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-7}
MW17-12: Cr-D
Cr-D Conc. (mg/L)
10^{-2}
10^{-3}
10^{-4}
10^{-5}
MW17-12-01
MW17-12-02
MW17-12-03
MW17-12-04
MW17-12-05
MW17-12-06
MW17-12-07
MW17-12-08

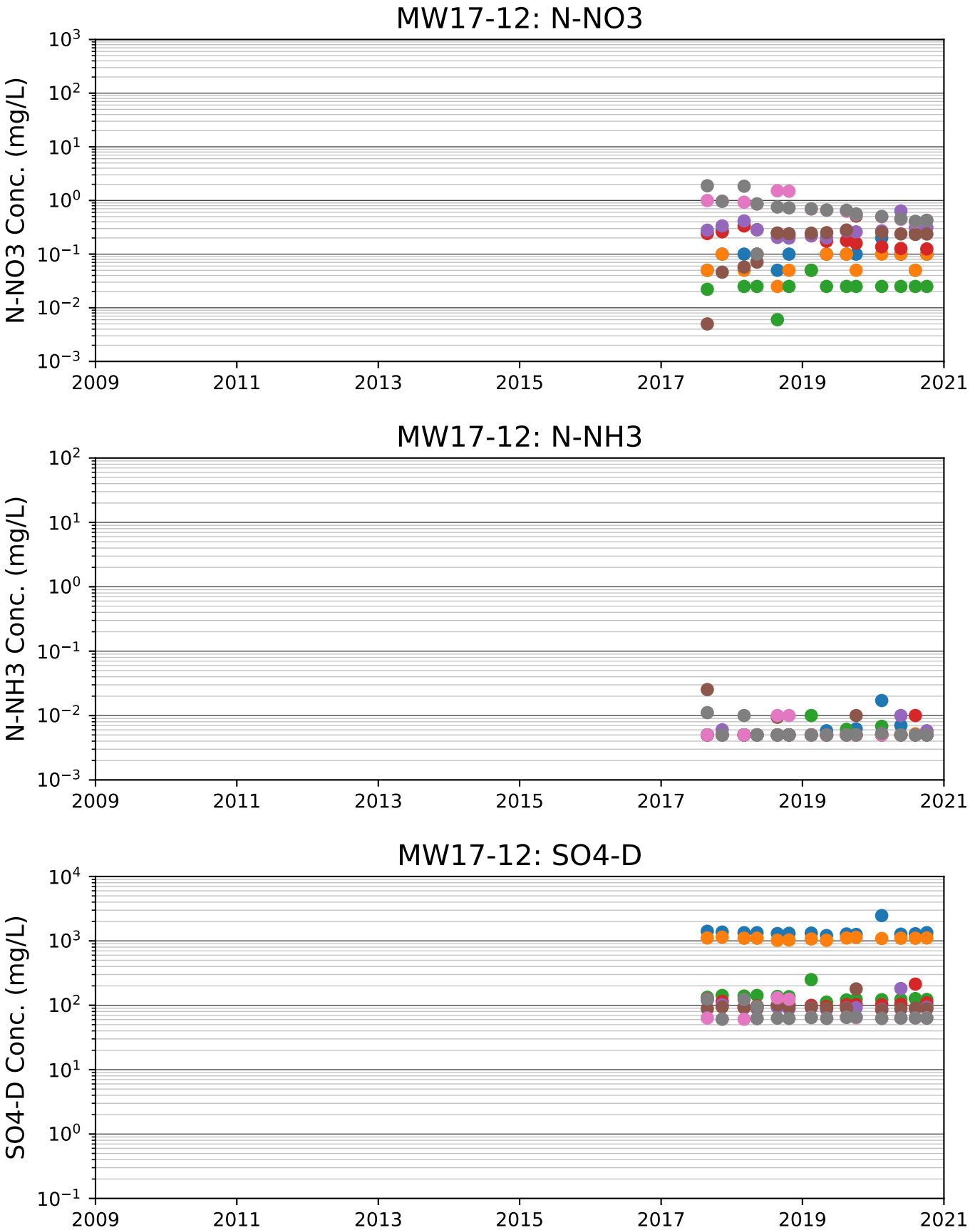

MW17-12: Cu-D
Cu-D Conc. (mg/L)
MW17-12: Pb-D
Pb-D Conc. (mg/L)
MW17-12: Mo-D
Mo-D Conc. (mg/L)
2009
2011
2013
2015
2017
2019
2021
MW17-12-01
MW17-12-02
MW17-12-03
MW17-12-04
MW17-12-05
MW17-12-06
MW17-12-07
MW17-12-08

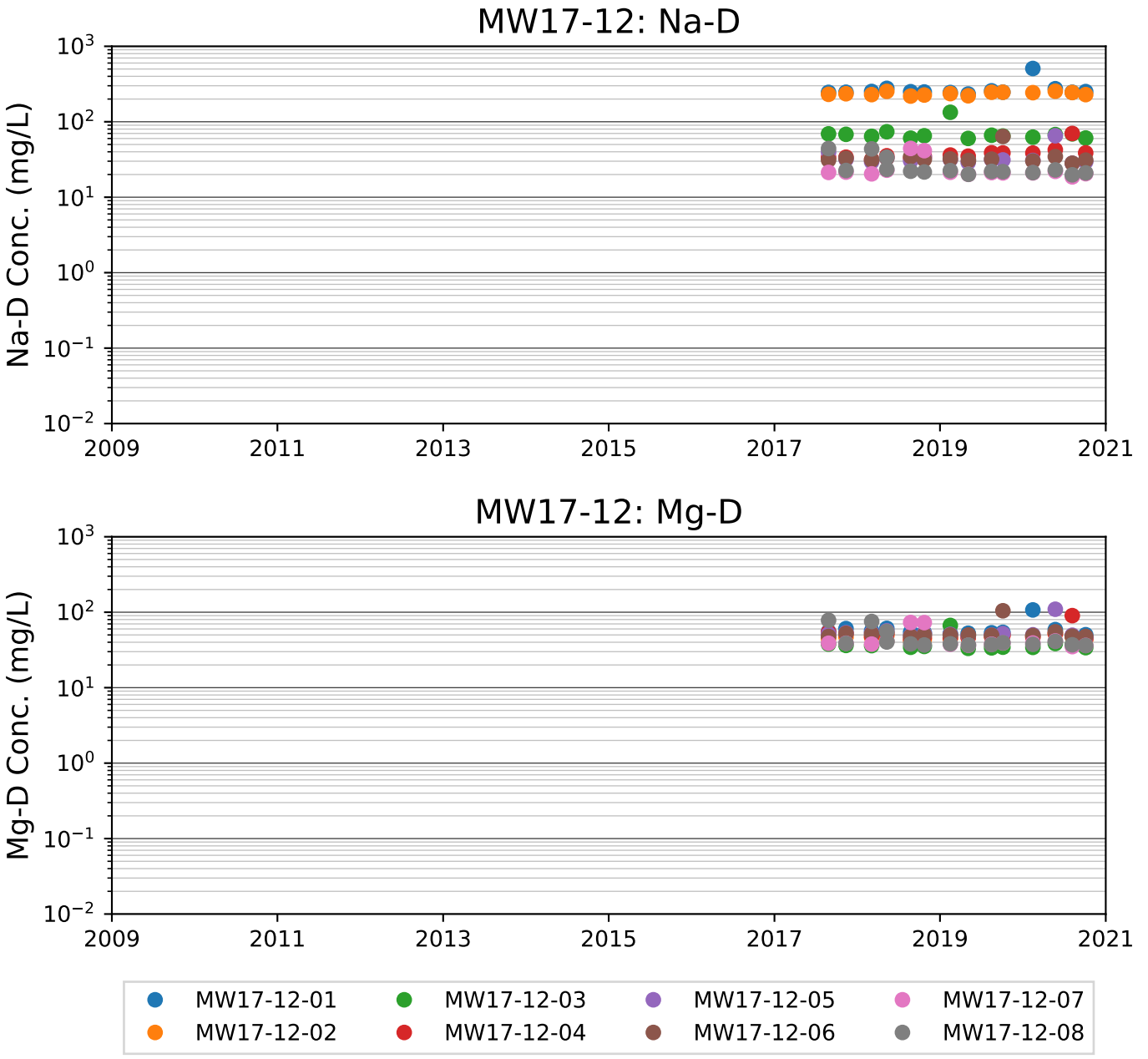

MW17-12: Ni-D
Ni-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
2009
2011
2013
2015
2017
2019
2021


MW17-12: Se-D
Se-D Conc. (mg/L)
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
2009
2011
2013
2015
2017
2019
2021


MW17-12: Zn-D
Zn-D Conc. (mg/L)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
2009
2011
2013
2015
2017
2019
2021


MW17-12-01
MW17-12-02
MW17-12-03
MW17-12-04
MW17-12-05
MW17-12-06
MW17-12-07
MW17-12-08


MW17-12: N-NO3
N-NO3 Conc. (mg/L)
MW17-12: N-NH3
N-NH3 Conc. (mg/L)
MW17-12: SO4-D
SO4-D Conc. (mg/L)
2009
2011
2013
2015
2017
2019
2021
MW17-12-01
MW17-12-02
MW17-12-03
MW17-12-04
MW17-12-05
MW17-12-06
MW17-12-07
MW17-12-08


MW17-12: Na-D
Na-D Conc. (mg/L)
10^3
10^2
10^1
10^0
10^{-1}
10^{-2}
2009
2011
2013
2015
2017
2019
2021
MW17-12: Mg-D
Mg-D Conc. (mg/L)
MW17-12-01
MW17-12-02
MW17-12-03
MW17-12-04
MW17-12-05
MW17-12-06
MW17-12-07
MW17-12-08

Attachment 3: Summary of Historic Chemistry Data

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | | | | | | | Dissolved Elements | | | | | | | | | | | |

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | | |

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | Anions & Nitrogen Species | | | | | Dissolved Elements | | | | | | |

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | Anions & Nitrogen Species | | | | | | Dissolved Elements | | | | | | |

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | | |

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | | | | | | | Dissolved Elements | | | | | | | | | | | |

Attachment 3: Sitewide Database

Station	Date / Time	General Parameters								Anions & Nitrogen Species								Dissolved Elements																							
		Alk-T	Cond-L	ORP	pH-F	TDS	TSS	Temp-F	O-DO-%	$N\text{-}NO_2$	$N\text{-}NO_3$	$N\text{-}NH_3$	SO_4-D	Chlord	Fluord	Ag-D	Al-D	As-D	Ba-D	B-D	Be-D	Bi-D	Ca-D	Cd-D	Co-D	Cr-D	Cu-D	Fe-D	Hg-D	K-D	Li-D	Mg-D	Mn-D	Mo-D	Na-D	Ni-D	Pb-D	Sb-D	S-D	Se-D	Si-D	Sn-D	Sr-D	Ti-D	Tl-D	U-D	V-D	Zn-D	Zr-D
		mg/L	µS/cm	mV	-	mg/L	mg/L	°C	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
MN-2.5	6/14/2012 0:00	56.9	116	-	-	94	260	-	-	0.05	0.2	0.029	5	5	0.16	0.000005	0.0283	0.000547	0.035	0.05	0.00001	0.000005	16.3	0.000012	0.000209	0.00036	0.00264	0.469	0.00001	0.453	0.0005	4.7	0.0365	0.000585	3.1	0.00147	0.00003335	0.000084	10	0.000094	5.78	0.0002	0.0736	0.00061	0.000002	0.0000747	0.00099	0.00097	0.00034
MN-2.5	7/12/2013 0:00	80	153	-	-	104	6.7	-	-	0.05	0.2	0.036	0.5	1.1	0.18	0.000005	0.0215	0.000656	0.0392	0.05	0.00001	0.000005	22.1	0.000018	0.000224	0.00036	0.0021	0.532	0.00001	0.466	0.00056	6.33	0.0937	0.000759	3.97	0.00132	0.000032	0.000079	10	0.0000102	6.27	0.0002	0.105	0.00086	0.000002	0.000117	0.00082	0.00083	0.00032
MN-2.5	8/6/2012 0:00	188.3	371	-	-	270	7.8	-	-	0.01	0.066	0.032	1	2.4	0.36	0.00001	0.0401	0.001512	0.09	0.1	0.000023	0.00001	51	0.00001	-	0.00062	0.00077	0.0035	1.699	-	1.13	0.00141	14.09	0.354	0.001775	8.5	0.00308	0.000036	0.000144	20	0.000207	13.6	0.00058	0.235	0.00153	0.000004	0.000302	0.00173	0.0018	0.00062
MN-2.5	9/7/2012 0:00	92.1	180	-	-	120	8.7	-	-	0.005	0.032	0.0098	0.5	1.5	0.18	0.00002	0.025	0.00073	0.0454	0.05	0.0001	0.001	25.1	0.00001	0.0005	0.001	0.00279	0.733	0.00001	0.508	0.005	7.35	0.157	0.001	4.63	0.0015	0.0002	0.0005	3	0.0001	6.82	0.005	0.116	0.005	0.00005	0.00017	0.005	0.005	0.0005
MN-2.5	10/1/2012 0:00	89	177	-	-	242	3.1	-	-	0.005	0.033	0.015	0.5	1.2	0.16	0.00002	0.0169	0.00068	0.0405	0.05	0.0001	0.001	23.2	0.00001	0.0005	0.001	0.00193	0.553	0.00001	0.496	0.005	6.91	0.146	0.001	4.2	0.0016	0.0002	0.0005	3	0.0001	6.42	0.005	0.113	0.005	0.00005	0.00018	0.005	0.005	0.0005
MN-2.5	5/27/2013 0:00	43.4	90.7	-	-	90	61.7	-	-	0.005	0.02	0.039	0.5	1.3	0.12	0.00002	0.0306	0.00038	0.0264	0.05	0.0001	0.001	12.3	0.00001	0.0005	0.001	0.00259	0.223	0.00001	1.13	0.005	3.6	0.0813	0.001	2.13	0.0011	0.0002	0.0005	3	0.0001	3.47	0.005	0.0608	0.005	0.00005	0.0001	0.005	0.005	0.0005
MN-2.5	6/17/2013 0:00	140.4	281	-	-	240	68.3	-	-	0.01	0.044	0.038	1	2.08	0.3	0.00004	0.028	0.0009	0.0706	0.1	0.0002	0.002	37.4	0.00002	0.001	0.002	0.00373	0.684	0.00002	1.301	0.01	10.74	0.0657	0.002	6.99	0.0025	0.0004	0.001	6	0.0002	11.46	0.01	0.1774	0.01	0.0001	0.00021	0.01	0.01	0.001
MN-2.5	7/15/2013 0:00	85.3	171	-	-	98	3.6	-	-	0.005	0.036	0.022	0.63	1	0.18	0.00002	0.0139	0.00042	0.0387	0.05	0.0001	0.001	23.7	0.00001	0.0005	0.001	0.00164	0.262	0.00001	0.661	0.005	6.26	0.0488	0.001	3.81	0.0019	0.0002	0.0005	3	0.0001	6.96	0.005	0.11	0.005	0.00005	0.00013	0.005	0.005	0.0005
MN-2.5	8/28/2013 0:00	78.5	161	-	-	114	10.1	-	-	0.002	0.0299	0.028	0.5	1.1	0.17	0.00005	0.0217	0.000561	0.0392	0.05	0.0001	0.000005	22.2	0.00001	0.000055	0.00038	0.00309	0.334	0.00001	0.477	0.00057	6.04	0.00131	0.000741	3.91	0.00164	0.000039	0.000092	3	0.000099	6.57	0.0002	0.105	0.00107	0.000002	0.000134	0.00083	0.00227	0.00038
MN-2.5	9/11/2013 14:00	85.3	171	-	-	128	2.4	-	-	0.05	0.2	0.039	1.04	1.3	0.17	0.00002	0.0197	0.00063	0.0418	0.05	0.0001	0.001	22.3	0.00001	0.0005	0.001	0.00201	0.543	0.00001	0.582	0.005	6.53	0.115	0.001	3.96	0.0015	0.0002	0.0005	3	0.0001	5.97	0.005	0.108	0.005	0.00005	0.00015	0.005	0.005	0.0005
MN-2.5	10/16/2013 14:45	82.7	167	12.5	7.48	144	3	0	94.7	0.005	0.041	0.022	0.93	1.4	0.16	0.00002	0.0148	0.0005	0.0361	0.05	0.0001	0.001	22.4	0.00001	0.0005	0.001	0.00178	0.322	0.00001	0.488	0.005	6.08	0.105	0.001	3.94	0.0013	0.0002	0.0005	3	0.0001	6.49	0.005	0.103	0.005	0.00005	0.00015	0.005	0.005	0.0005
MN-2.5	5/16/2014 13:50	52.5	112	64.5	8	82	120	0	96.2	0.005	0.02	0.037	0.5	0.98	0.16	0.00002	0.0182	0.00039	0.0314	0.05	0.0001	0.001	14.5	0.00001	0.0005	0.001	0.00253	0.194	0.00001	0.891	0.005	4.38	0.057	0.001	2.67	0.0014	0.0002	0.0005	3	0.00012	4.1	0.005	0.0722	0.005	0.00005	0.0001	0.005	0.005	0.0005
MN-2.5	6/3/2014 11:30	66.3	136	41.3	6.86	114	11.5	0.5	117.9	0.005	0.036	0.014	0.5	1	0.17	0.00002	0.0139	0.00042	0.0302	0.05	0.0001	0.001	17.9	0.00001	0.0005	0.001	0.00222	0.218	0.00001	0.592	0.005	5.32	0.026	0.001	3.54	0.0014	0.0002	0.0005	3	0.0001	4.98	0.005	0.0839	0.005	0.00005	0.0001	0.005	0.005	0.0005
MN-2.5	7/26/2014 12:45	85.4	177	24.2	8.24	112	15.1	3.6	92.7	0.005	0.035	0.013	0.5	0.78	0.18	0.00002	0.0104	0.00039	0.036	0.05	0.0001	0.001	21.9	0.00001	0.0005	0.001	0.00147	0.214	0.00001	0.611	0.005	6.77	0.048	0.001	4.05	0.0011	0.0002	0.0005	3	0.0001	5.99	0.005	0.105	0.005	0.00005	0.00012	0.005	0.005	0.0005
MN-2.5	8/17/2014 13:15	90	182	37.3	7.64	124	3.3	3.3	94.3	0.005	0.043	0.021	1.7	0.95	0.19	0.00002	0.0083	0.00037	0.0394	0.05	0.0001	0.001	25.3	0.00001	0.0005	0.001	0.00129	0.166	0.00001	0.841	0.005	6.61	0.0683	0.001	3.81	0.001	0.0002	0.0005	3	0.0001	6.72	0.005	0.123	0.005	0.00005	0.00017	0.005	0.005	0.0005
MN-2.5	9/20/2014 13:10	91.8	181	57.5	7.63	111	1	1.6	92	0.005	0.02	0.02	0.92	0.95	0.17	0.00002	0.0102	0.00038	0.0375	0.05	0.0001	0.001	23.5	0.00001	0.0005	0.001	0.00137	0.187	0.00001	0.757	0.005	6.69	0.0728	0.001	4.13	0.0011	0.0002	0.0005	3	0.0001	6.28	0.005	0.115	0.005	0.00005	0.00015	0.005	0.005	0.0005
MN-2.5	10/11/2014 11:45	84.4	175	67.8	7.94	116	1.3	-1.3	81.4	0.005	0.045	0.018	1.17	1.6	0.17	0.00002	0.011	0.00043	0.0347	0.05	0.0001	0.001	22.9	0.00001	0.0005	0.001	0.00151	0.193	0.00001	0.542	0.005	6.7	0.0672	0.001	4.17	0.0011	0.0002	0.0005	3	0.0001	6.07	0.005	0.109	0.005	0.00005	0.00015	0.005	0.005	0.0005
MN-2.5	12/4/2014 14:45	129	255	-	-	172	1	-	-	0.005	0.079	0.011	3.8	1.6	0.22	0.00002	0.0086	0.00029	0.0629	0.05	0.0001	0.001	35.1	0.00001	0.0005	0.001	0.00174	0.023	0.00001	1.84	0.005	10.1	0.0155	0.001	5.86	0.001	0.0002	0.0005	3	0.0001	8.32	0.005	0.194	0.005	0.00005	0.0003	0.005	0.005	0.0005
MN-2.5	5/26/2015 14:15	64.5	137	138.4	7.79	92	3.6	0.8	96.7	0.005	0.02	0.055	0.5	1.5	0.16	0.00002	0.0097	0.00029	0.0295	0.05	0.0001	0.001	18.6	0.00001	0.0005	0.001	0.00161	0.0665	0.00001	0.865	0.005	4.99	0.0532	0.001	3.48	0.0011	0.0002	0.0005	3	0.0001	4.59	0.005	0.0862	0.005	0.00005	0.00013	0.005	0.005	0.0005
MN-2.5	6/23/2015 0:00	99.1	199	-	-	128	1	-	-	0.005	0.044	0.045	3.87	0.77	0.22	0.00002	0.0062	0.00029	0.0416	0.05	0.0001	0.001	28.3	0.00001	0.0005	0.001	0.00133	0.871	0.00001	0.871	0.005	7.49	0.0188	0.001	4.04	0.001	0.0002	0.0005	3	0.0001	6.94	0.005	0.133	0.005	0.00005	0.00025	0.005	0.005	0.0005
MN-2.5	6/23/2015 16:25	100	200	78	7.48	122	3.5	4.2	85.7	0.005	0.041	0.017	3.78	1	0.21	0.00002	0.0065	0.0003	0.0426	0.05	0.0001	0.001	27.9	0.00001	0.0005	0.001	0.00107	0.054	0.00001	0.889	0.005	7.02	0.0186	0.001	3.92	0.001	0.0002	0.0005	3	0.0001	6.93	0.005	0.133	0.005	0.00005	0.00025	0.005	0.005	0.0005
MN-2.5	7/13/2015 13:50	82.1	165	112.8	7.72	98	2.6	4.9	91.8	0.005	0.025	0.14	0.87	0.68	0.17	0.00002	0.0099	0.00032	0.0324	0.05	0.0001	0.001	22.1	0.00001	0.0005	0.001	0.00166	0.0838	0.00001	0.65	0.005	6.07	0.0207	0.001	3.88	0.001	0.0002	0.0005	3	0.0001	6.32	0.005	0.103	0.005	0.00005	0.00012	0.005	0.005	0.0005
MN-2.5	8/30/2015 14:30	63.5	136	51.9	7.36	116	341	2.1	91	0.005	0.02	0.04	0.5	1.5	0.17	0.00002	0.0351	0.00049	0.0376	0.05	0.0001	0.001	18.3	0.00001	0.0005	0.001	0.00338	0.288	0.00001	0.363	0.005	5.6	0.0862	0.001	3.95	0.0015	0.0002	0.0005	3	0.0001	6.29	0.005	0.0844	0.005	0.00005	0.0001	0.005	0.005	0.0005
MN-2.5	9/20/2015 13:48	86	173	44.3	7.63	122	2.3	1.8	90.1	0.005	0.02	0.025	0.58	1.4	0.18	0.00002	0.0147	0.0004	0.0341	0.05	0.0001	0.001	22.8	0.00001	0.0005	0.001	0.00191	0.194	0.00001	0.578	0.005	6.55	0.0621	0.001	4.14	0.0012	0.0002	0.0005	3	0.0001	6.28	0.005	0.107	0.005	0.00005	0.00014	0.005	0.005	0.0005
MN-2.5	10/18/2015 15:15	85.5	176	-0.2	7.52	96	10.1	0	88.5	0.005	0.034	0.021	0.58	1.4	0.17	0.00002	0.0171	0.00039	0.0344	0.05	0.0001	0.001	24.6	0.00001	0.0005	0.001	0.00159	0.187	0.00001	0.57	0.005	6.5	0.0649	0.001	4.24	0.001	0.0002	0.0005	3	0.0001	6.9	0.005	0.109	0.005	0.00005	0.00017	0.005	0.005	0.0005
MN-2.5	11/26/2015 13:55	121	277	98.6	8.58	172	2.5	-0.1	6.6	0.005	0.122	0.0098	15	0.57	0.39	0.00002	0.0093	0.00032	0.0622	0.05	0.0001	0.001	37.9	0.00001	0.0005	0.001	0.00071	0.0225	0.00001	0.98	0.005	9.73	0.0054	0.001	7.53	0.001	0.0002	0.0005	3	0.0001	9.7	0.005	0.275	0.005	0.00005	0.0007	0.005	0.005	0.0005
MN-2.5	12/19/2015 15:40	129	253	-	8.6	134	44.7	-0.1	4.9	0.005	0.046	0.013	5.04	1.3	0.21	0.00002	0.0121	0.0003	0.0618	0.05	0.0001	0.001	32.8	0.00001	0.0005	0.001	0.00208	0.0228	0.00001	1.22	0.005	9.96	0.0071	0.001	5.76	0.001	0.0002	0.0005	3	0.0001	7.7	0.005	0.162	0.005	0.00005	0.00014	0.005	0.005	0.0005
MN-2.5	4/29/2016 17:45	48.5	101	122.9	7.57	53.3	60	0	92.3	0.001	0.005	0.0126	1.44	0.5	-	0.00001	0.0357	0.00041	0.0264	0.01	0.00002	0.00005	15	0.0000064	0.00012	0.00036	0.00349	0.158	0.0000073	0.96	0.001	4.27	0.0214	0.000412	2.27	0.00135	0.00005	0.0001	0.7	0.000093	4.88	0.0001	0.064	0.00095	0.00001	0.000049	0.0005	0.0013	0.00035
MN-2.5	5/28/2016 16:35	74.9	149	43.1	7.76	79.1	24	1.9	94.9	0.001	0.0204	0.0158	2.33	0.57	-	0.00001	0.0127	0.00035	0.0357	0.01	0.00002	0.00005	20.7	0.000005	0.00014	0.00026	0.00183	0.124	0.000005	0.64	0.001	5.76	0.0359	0.000625	3.82	0.00138	0.00005	0.0001	0.99	0.000087	5.27	0.0001	0.0961	0.00043	0.00001	0.000126	0.0005	0.0031	0.0003
MN-2.5	6/21/2016 16:10	95.3	189	9.3	7.71	101	72	4.5	95.1	0.001	0.0211	0.0174	3.55	0.6	-	0.00001	0.0112	0.0004	0.0478	0.01	0.00002	0.00005	26.8	0.000005	0.00017	0.0002	0.00181	0.121	0.000005	0.74	0.001	7.23	0.0488	0.000765	4.62	0.00119	0.00005	0.0001	1.36	0.000083	5.87	0.0001	0.126	0.00037	0.00001	0.000211	0.0007	0.0019	0.0003
MN-2.5	7/4/2016 13:25	100	198	40.4	7.73	108	24	4	92.3	0.001	0.0179	0.0083	4.21	0.51	-	0.00001	0.0071	0.00032	0.0433	0.01	0.00002	0.00005	30.4	0.000005	0.00011	0.00017	0.00121	0.06	0.000005	0.87	0.001	7.64	0.0448	0.000868	4.13	0.00086	0.00005	0.0001	1.64	0.000065	6.33	0.0001	0.133	0.0003	0.00001	0.000225	0.0005	0.001	0.0003
MN-2.5	8/4/2016 16:05	97.1	191	-	7.9	102	71.3	5.3	-	0.001	0.022	0.0165	2.71	0.64	-	0.00001	0.0115	0.00042	0.0472	0.01	0.00002	0.00005	26.9	0.000005	0.00014	0.00027	0.00181	0.109	0.000005	0.76	0.001	7.29	0.0801	0.000802	4.77	0.00119	0.00005	0.0001	1.16	0.000072	6.42	0.0001	0.131	0.00032	0.00001	0.000178	0.0005	0.00055	0.0001
MN-2.5	9/3/2016 16:30	97.7	184	71.8	7.26	102	165	3.9	90.9	0.001	0.0091	0.016	2.34	0.95	-	0.00001	0.0128	0.00046	0.0459	0.01	0.00002	0.00005	26.9	0.000005	0.00019	0.00029	0.0016	0.159	0.000005	0.59	0.001	7.54	0.0652	0.000679	4.59	0.00132	0.00005	0.0001	1	0.000113	6.51	0.0001	0.12	0.00043	0.00001	0.000168	0.0006	0.0064	0.0016	0.0003
MN-2.5	10/10/2016 16:25	114	199	60.2	7.43	113	22	-0.1	78.8	0.001	0.0596	0.015	3.81	0.77	-	0.00001	0.0086	0.00032	0.0486	0.01	0.00002	0.00005	26.9	0.0000052	0.00014	0.00022	0.002	0.112	0.000005	0.95	0.001	7.34	0.104	0.000757	4.31	0.00111	0.00005	0.0001	1.25	0.000083	6.73	0.0001	0.136	0.00042	0.00001	0.00015	0.0005	0.001	0.0003
MN-2.5	11/10/2016 13:34	-	-	41.8	7.38	-	-	-0.1	85.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MN-2.5	11/12/2016 11:05	117	218	14.3	7.93	117	3	0	91	0.001	0.049	0.0483	4.49	0.73	-	0.00001	0.006	0.00055	0.061	0.01	0.00002	0.00005	26.9	0.000007	0.00041	0.0002	0.00131	0.332	0.000005	0.95	0.001	8.16	0.421	0.000949	4.92	0.00143	0.00005	0.0001	1.6	0.000056	6.74	0.0001	0.139	0.0003	0.00001	0.000172	0.0005	0.001	0.0003
MN-2.5	5/26/2017 16:20	51	102	203.7	7.62	55.1	226	0.5	96.2	0.001	0.005	0.0248	1.15	0.62	-	0.00001	0.028	0.00044	0.031	0.01	0.00002	0.00005	14.5	0.0000066	0.00023	0.00032	0.0021	0.208	0.000005	0.63	0.001	4.46	0.0485	0.000417	2.86	0.00171	0.00005	0.0001	0.5	0.000102	3.97	0.0001	0.0465	0.00065	0.00001	0.000137	0.0005	0.0051	0.0001	0.00037
MN-2.5	6/24/2017 16:10	78.1	150	103.6	7.66	81.6	11.2	4.6	124	0.001	0.026	0.0122	2.7	0.5	-	0.00001	0.0131	0.00037	0.0377	0.01	0.00002	0.00005	21.4	0.000005	0.00012	0.0002	0.0022	0.076	0.000005	0.56	0.001	5.87	0.0159	0.000627	3.98	0.00134	0.00005	0.0001	0.88	0.000095	5.65	0.0001	0.0997	0.00033	0.00001	0.000099	0.0005	0.0019	0.0003
MN-2.5	7/7/2017 13:45	94.9	179	149.9	7.67	95	21.6	4.9	116.9	0.001	0.0247	0.0106	3.01	0.57	-	0.00001	0.0099	0.00034	0.0409	0.01	0.00002	0.00005	22.6	0.0000062	0.00011	0.00022	0.00173	0.058	0.000005	0.57	0.001	7.06	0.0192	0.000669	4.08	0.00133	0.00005	0.0001	0.94	0.00008	5.55	0.0001	0.11	0.0003	0.00001	0.000148	0.00055	0.001	0.0003
MN-2.5	8/21/2017 15:50	105	200	-	-	108	3	-	-	0.001	0.0293	0.005	4	0.51	-	0.00001	0.005	0.00029	0.0419	0.01	0.00002	0.00005	27.5	0.00005	0.0001	0.00013	0.00117	0.039	0.00005	0.82	0.0015	7.27	0.0276	0.000772	4.08	0.00086	0.00005	0.0001	1.36	0.000065	5.89	0.0001	0.131	0.0003	0.00001	0.000205	0.0005	0.001	0.0003
MN-2.5	9/16/2017 12:50	104	191	180.8	7.1	103	11.8	1.2	93.3	0.001	0.0167	0.0067	3.29	0.85	-	0.00001	0.0081	0.00035	0.0385	0.01	0.00002	0.00005	24.4	0.00005	0.0001	0.0002	0.00128	0.044	0.00005	0.76	0.001	7.04	0.0249	0.000691	3.94	0.00101	0.00005	0.0001	1.16	0.000062	5.91	0.0001	0.121	0.00037	0.00001	0.000166	0.0005	0.001	0.0003
MN-2.5	10/21/2017 13:30	108	202	192	7.45	111	29.6	0	87.5	0.001	0.0455	0.0073	4.38	0.81	0.195	0.00001	0.0052	0.00016	0.0416	0.01	0.00002	0.00005	27.1	0.00005	0.0001	0.00017	0.00118	0.032	0.00005	0.92	0.001	7.68	0.0573	0.000865	4.36	0.00085	0.00005	0.0001	1.44	0.000055	6.44	0.0001	0.138	0.0003	0.00001	0.000197	0.0005	0.001	0.0003
MN-2.5	11/10/2017 16:10	252	455	161.4	7.64	252	6	0	42.4	0.002	0.0525	0.01	10	1.91	-	0.00002	0.0148	0.00058	0.112	0.02	0.00004	0.0001	65	0.000186	0.0002	0.00042	0.00338	0.077	0.00001	2.54	0.0021	19.82	0.0834	0.001324	11.5	0.00206	0.0001	0.0002	3.21	0.000156	14.64	0.0002	0.303	0.0006	0.00002	0.000357	0.001	0.0034	0.0006
MN-2.5	4/30/2018 0:00	50	109	-	-	58.7	3	-	-	0.001	0.005	0.0093	2.75	1.27	-	0.00001	0.0177	0.00036	0.0244	0.01	0.00002	0.00005	14.1	0.00001	0.0001	0.00257	0.06	0.0000079	2.46	0.001	4.94	0.00589	0.000384	3.11	0.00103	0.00005	0.0001	1.18	0.000122	5.66	0.0001	0.0669	0.0004	0.00001	0.000221	0.0005	0.0018	0.0003
MN-2.5	4/30/2018 14:30	50.7	109	204.7	7.34	60	3	0	102.8	0.001	0.005	0.0093	2.74	1.26	-	0.00001	0.0185	0.00038	0.024	0.01	0.00002	0.00005	15	0.00013	0.0001	0.00022	0.00263	0.063	0.00006	0.68	0.001	4.8	0.0062	0.000289	3.15	0.00107	0.00005	0.0001	0.96	0.00009	4.04	0.0001	0.064	0.00044	0.00001	0.000222	0.0005	0.0021	0.0003
MN-2.5	5/26/2018 17:00	60.8	120	132.7	7.83	65.4	45.8	0.8	102.8	0.001	0.005	0.0097	2.19	0.51	-	0.00001	0.0178	0.00034	0.0287	0.01	0.00002	0.00005	16.9	0.00005	0.0001	0.00018	0.00234	0.047	0.00005	0.9	0.001	5.08	0.0178	0.00057	3.28	0.0012	0.00005	0.0001	0.78	0.000076	4.47	0.0001	0.0775	0.00069	0.00001	0.000072	0.0005	0.001	0.0003
MN-2.5	6/11/2018 15:50	71.4	146	162.7	7.82	76.1	10.6	2.3	100.3	0.001	0.0123	0.0081	2.6	0.52	-	0.00001	0.0106	0.00031	0.0326	0.01	0.00002	0.00005	19.7	0.00005	0.0001	0.00013	0.00218	0.04	0.000196	0.66	0.001	5.78	0.00716	0.000622	3.82	0.00136	0.00005	0.0001	0.91	0.000092	4.81	0.0001	0.0911	0.00039	0.00001	0.000101	0.0005	0.001	0.0003
MN-2.5	7/6/2018 16:25	96.7	191	148.6	7.69	99.6	41.9	4.2	94.1	0.001	0.0201	0.005	3.73	0.88	-	0.00001	0.0083	0.00032	0.0444	0.01	0.00002	0.00005	24.5	0.00005	0.00013	0.0002	0.00162	0.048	0.00005	0.68	0.001	7.2	0.0285	0.000674	4.51	0.0012	0.00005	0.0001	0.93	0.000083	5.5	0.0001	0.12	0.0003	0.00001	0.000161	0.0005	0.001	0.0003
MN-2.5	8/29/2018 15:30	87.8	175	131	7.51	89.7	55.9	3.7	123.6	0.001	0.0086	0.0106	2.58	0.71	-	0.00001	0.017	0.00035	0.035	0.01	0.00002	0.00005	22.7	0.00005	0.0001	0.00014	0.0003	0.0211	0.085

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | | | Dissolved Elements | | | | | | | |

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | | | Dissolved Elements | | | | | | | |

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | | | Dissolved Elements | | | | | | | |

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| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | | | Dissolved Elements | | | | | | | |

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| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | | | Dissolved Elements | | | | | | | |

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| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | | | | | Dissolved Elements | | | | | | | | | |

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| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | | | Dissolved Elements | | | | | | | |

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| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | | | | | Dissolved Elements | | | | | | | | | |

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| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | | | Dissolved Elements | | | | | | | |

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| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | Dissolved Elements | | | | | | | |

Attachment 3: Sitewide Database

Station	Date / Time	General Parameters								Anions & Nitrogen Species							Dissolved Elements																												
		Alk-T	Cond-L	ORP	pH-F	TDS	TSS	Temp-F	O-DO-%	$N\text{-}NO_2$	$N\text{-}NO_3$	$N\text{-}NH_3$	SO_4-D	Chlord	Fluord	Ag-D	Al-D	As-D	Ba-D	B-D	Be-D	Bi-D	Ca-D	Cd-D	Co-D	Cr-D	Cu-D	Fe-D	Hg-D	K-D	Li-D	Mg-D	Mn-D	Mo-D	Na-D	Ni-D	Pb-D	Sb-D	S-D	Se-D	Si-D	Sn-D	Sr-D	Ti-D	Tl-D	U-D	V-D	Zn-D	Zr-D
		mg/L	µS/cm	mV		mg/L	mg/L	°C	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
W12	5/6/2014 15:30	193	878	46.1	8.11	562	3.2	6.3	3	0.131	10.4	1.3	185	15	1.4	0.00002	0.0185	0.00038	0.0895	0.124	0.0001	0.001	67.2	0.000021	0.0005	0.001	0.00302	0.0706	0.00005	30.6	0.0107	23.5	0.141	0.0511	56.4	0.0014	0.0002	0.0005	66	0.00472	2.6	0.005	6.13	0.005	0.00005	0.00062	0.005	0.005	0.0005
W12	6/14/2014 10:45	195	897	207.7	8.2	580	1.1	12	43.3	0.191	10.1	1.5	190	17	1.4	0.00002	0.0184	0.00045	0.0922	0.124	0.0001	0.001	68.7	0.000015	0.0005	0.001	0.00805	0.0228	0.00001	34	0.0107	24.1	0.134	0.0527	58.8	0.0036	0.0002	0.0005	63	0.00512	2.63	0.005	6.22	0.005	0.00005	0.00108	0.005	0.005	0.0005
W12	7/3/2014 11:10	188	921	153.5	8.32	614	6.1	14.5	82.6	0.216	11.6	1.3	215	17	1.5	0.00002	0.0332	0.00049	0.0976	0.139	0.0001	0.001	68.7	0.000023	0.0005	0.001	0.00432	0.0069	0.00001	34	0.0117	23.3	0.1	0.0576	62.5	0.0026	0.0002	0.0005	72.5	0.00495	2.88	0.005	6.34	0.005	0.00005	0.00117	0.005	0.005	0.0005
W12	7/23/2014 8:30	-	-	134.8	8.66	-	-	14.5	48.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W12	8/9/2014 10:02	191	970	211.4	16.16	876	20.8	28	141.4	0.217	12.3	1.6	237	18	1.5	0.00002	0.0221	0.00037	0.0874	0.126	0.0001	0.001	73.1	0.00001	0.0005	0.002	0.00335	0.0112	0.00001	30.3	0.0101	25.1	0.0937	0.0502	58.4	0.0029	0.0002	0.0005	84.3	0.0063	3.24	0.005	5.84	0.005	0.00005	0.00106	0.005	0.005	0.0005
W12	8/15/2014 15:50	-	-	135.3	8.03	-	-	14.6	48.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W12	8/19/2014 11:30	-	-	134.1	8.12	-	-	13.3	68	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W12	8/26/2014 11:45	-	-	154.1	8.11	-	-	13	65.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W12	9/7/2014 10:00	184	978	335.2	16.06	618	10.1	22.6	113.2	0.202	13.2	1.6	174	20	1.5	0.00002	0.0299	0.00059	0.108	0.159	0.0001	0.001	86.6	0.000011	0.0005	0.002	0.00324	0.0064	0.00001	37.7	0.0118	27.7	0.0992	0.0635	72.1	0.0026	0.0002	0.0005	84.4	0.00763	3.65	0.005	7.1	0.005	0.00005	0.00101	0.005	0.005	0.0005
W12	9/12/2014 13:20	185	978	307.6	16.12	792	3.7	23	114.8	0.197	13.6	1.4	179	19	1.5	0.00002	0.0274	0.00052	0.0947	0.132	0.0001	0.001	79.4	0.00002	0.0005	0.002	0.0062	0.0172	0.00001	35.9	0.0115	24.8	0.0967	0.0638	65.2	0.0023	0.0002	0.0005	85	0.0069	3.09	0.005	7.05	0.005	0.00005	0.00102	0.005	0.005	0.0005
W12	9/15/2014 16:10	186	992	266.6	12.02	767	5.6	23.2	79.8	0.197	13.7	1.7	186	19	1.6	0.00002	0.0284	0.00062	0.0958	0.135	0.0001	0.001	77.1	0.000018	0.0005	0.002	0.00699	0.005	0.00001	35.9	0.0108	25.8	0.104	0.0645	68.1	0.0023	0.0002	0.0005	77.5	0.00617	3.23	0.005	7.06	0.005	0.00005	0.00107	0.005	0.005	0.0005
W12	9/25/2014 11:45	-	-	156.8	8	-	-	8.7	47.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W12	10/3/2014 11:45	-	-	-	8.4	-	-	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W12	10/8/2014 16:05	-	-	170	8.18	-	-	8.4	78.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W12	10/9/2014 13:45	175	1010	183.6	8.16	652	19.9	7.4	70.3	0.194	14.1	1	235	20	1.5	0.00002	0.0215	0.00054	0.1	0.166	0.0001	0.001	79.9	0.000022	0.0005	0.001	0.00809	0.0157	0.00001	36.5	0.0132	25.5	0.145	0.0725	67.2	0.0021	0.0002	0.0005	82.5	0.00641	3.15	0.005	7.17	0.005	0.00005	0.00102	0.005	0.005	0.0005
W12	10/13/2014 16:05	-	-	154.4	7.9	-	-	7.3	56.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W12	11/2/2014 14:10	181	1020	174.5	7.99	642	7.5	5.2	51.6	0.174	15.6	1.2	211	20	1.6	0.00002	0.0201	0.00057	0.0958	0.156	0.0001	0.001	83.1	0.000025	0.0005	0.001	0.0123	0.0098	0.00001	35	0.0125	23.9	0.151	0.0655	66.5	0.0017	0.0002	0.0005	77.8	0.00704	3.17	0.005	7.44	0.005	0.00005	0.00183	0.005	0.005	0.0005
W12	11/23/2014 17:40	182	1050	157.1	7.89	686	24.7	3.7	87.6	0.198	16.1	0.96	198	22	0.17	0.00002	0.0198	0.00054	0.0977	0.183	0.0001	0.001	80.7	0.000027	0.0005	0.001	0.00686	0.013	0.00001	36.7	0.0144	25.8	0.157	0.0729	75.2	0.002	0.0002	0.0005	91.6	0.00725	3.21	0.005	7.32	0.005	0.00005	0.00185	0.005	0.005	0.0005
W12	12/11/2014 15:50	184	1060	33.9	7.84	684	6.6	2.7	13.6	0.457	14.9	1.4	255	22	1.5	0.00002	0.0126	0.00048	0.0936	0.162	0.0001	0.001	81.6	0.000019	0.00055	0.001	0.00302	0.107	0.00001	35.9	0.0136	26	0.212	0.0732	76.1	0.0029	0.0002	0.0005	94.7	0.00749	3.02	0.005	7.34	0.005	0.00005	0.00167	0.005	0.005	0.0005
W12	1/5/2015 9:45	163	1160	37.7	7.76	686	-	2.1	30.4	1.87	16.4	1.4	265	30	1.4	0.00002	0.0152	0.00046	0.1	0.174	0.0001	0.001	83	0.00001	0.00064	0.001	0.00098	0.231	0.00001	39.1	0.0148	25	0.321	0.0782	83.3	0.0022	0.0002	0.0005	97.6	0.00819	2.86	0.005	7.19	0.005	0.00005	0.00142	0.005	0.005	0.0005
W12	1/17/2015 10:40	186	1060	-	698	15.2	-	8.4	78.3	1.49	13.6	1.4	243	24	1.3	0.00002	0.0107	0.00049	0.106	0.149	0.0001	0.001	74.4	0.00002	0.00123	0.001	0.00247	0.0484	0.00001	37.3	0.0146	27.2	0.438	0.0758	84	0.0021	0.0002	0.00052	93.1	0.00877	2.58	0.005	6.99	0.005	0.00005	0.00128	0.005	0.0062	0.0005
W12	1/18/2015 13:45	-	-	8.8	8.26	-	-	0.6	6.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W12	2/20/2015 13:30	420	2210	185.9	7.89	1406	94.8	7.2	84.1	0.1136	17.02	3.4	566	65	3	0.00004	0.0324	0.00088	0.202	0.318	0.0002	0.002	150.8	0.000045	0.00171	0.002	0.0229	0.0284	0.00002	76.2	0.0325	50.5	1.126	0.1665	170.4	0.0039	0.0004	0.001	196.1	0.01813	5	0.01	12.08	0.01	0.0001	0.00336	0.01	0.01	0.001
W12	3/8/2015 16:20	215	1140	153.6	8.09	722	14.8	3.2	40.1	0.749	8.31	2.2	264	29	1.4	0.00002	0.0141	0.00044	0.1	0.182	0.0001	0.001	73	0.00001	0.00094	0.001	0.0117	0.0063	0.00001	40.7	0.0159	28.1	0.687	0.088	103	0.0019	0.0002	0.0005	104	0.00952	2.51	0.005	5.74	0.005	0.00005	0.00214	0.005	0.005	0.0005
W12	4/2/2015 10:20	213	1140	136	8.19	732	6.9	2.7	40.2	1.85	9.11	2.8	277	29	1.3	0.00002	0.0132	0.00044	0.1	0.179	0.0001	0.001	73.5	0.000018	0.00066	0.001	0.0163	0.0054	0.00001	39.4	0.0159	26.7	0.63	0.0941	99	0.0015	0.0002	0.0005	105	0.0105	2.63	0.005	6.02	0.005	0.00005	0.00211	0.005	0.005	0.0005
W12	5/11/2015 16:40	195	1060	179.5	7.92	638	15.5	12.1	84.5	1.66	8.2	2.7	223	26	1.3	0.00002	0.0095	0.00045	0.0882	0.148	0.0001	0.001	72.2	0.00044	0.00055	0.001	0.03	0.0095	0.00001	32.9	0.0153	25.8	0.548	0.0796	87.5	0.0015	0.0002	0.0005	96.3	0.00975	2.69	0.005	5.74	0.005	0.00005	0.00224	0.005	0.005	0.0005
W12	6/11/2015 17:15	196	1090	127.6	8.14	676	5.6	13.4	66.1	1.79	11.8	2.9	236	25	1.3	0.00002	0.0084	0.00043	0.0842	0.173	0.0001	0.001	80.7	0.000055	0.0005	0.001	0.0373	0.0096	0.00001	32.3	0.0132	30.4	0.329	0.0747	90.4	0.0015	0.0002	0.0005	89.6	0.00969	3.33	0.005	5.15	0.005	0.00005	0.00246	0.005	0.005	0.0005
W12	7/3/2015 16:40	193	1230	67.2	8.19	788	38.3	14.8	65.8	2.83	13.6	3.9	286	28	1.4	0.00002	0.0277	0.00037	0.089	0.214	0.0001	0.001	74.8	0.000045	0.0005	0.001	0.0049	0.005	0.00001	39.9	0.0143	28.6	0.264	0.0945	116	0.0018	0.0002	0.0005	112	0.0151	3.26	0.005	4.81	0.005	0.00005	0.00181	0.005	0.005	0.0005
W12	8/20/2015 9:45	176	1250	175.3	8.28	850	4.6	13.3	71.4	1.98	19.6	4.3	312	28	1.5	0.00002	0.0235	0.00055	0.095	0.233	0.0001	0.001	69.7	0.00002	0.0005	0.001	0.0117	0.005	0.00001	42.7	0.0138	28.4	0.124	0.0972	129	0.0011	0.0002	0.0005	113	0.0207	2.81	0.005	4.78	0.005	0.00005	0.00208	0.005	0.005	0.0005
W12	9/16/2015 15:00	169	1250	191.8	8.22	812	3.4	10.1	76.6	1.1	21.2	3.5	313	27	1.3	0.00002	0.0203	0.00047	0.0856	0.2	0.0001	0.001	69.6	0.00001	0.0005	0.001	0.0211	0.005	0.00001	39.6	0.0117	28.4	0.12	0.0873	112	0.001	0.0002	0.0005	113	0.0165	3.66	0.005	4.31	0.005	0.00005	0.00234	0.005	0.005	0.0005
W12	10/16/2015 0:00	171	1280	-	-	856	3.7	-	-	0.692	23.6	3.2	294	26	1.4	0.00002	0.0175	0.0004	0.0828	0.231	0.0001	0.001	82.1	0.000061	0.0005	0.001	0.0303	0.0072	0.00001	38.5	0.0114	29.7	0.118	0.0844	117	0.0012	0.0002	0.0005	111	0.0168	3.59	0.005	4.12	0.005	0.00005	0.00266	0.005	0.005	0.0005
W12	10/16/2015 15:55	174	1280	146.5	7.9	822	2	4.5	73.8	0.693	23.8	3.2	329	27	1.4	0.00002	0.0129	0.00035	0.0841	0.227	0.0001	0.001	82.1	0.000052	0.0005	0.001	0.029	0.005	0.00001	37.9	0.0112	28.9	0.117	0.0825	115	0.001	0.0002	0.0005	116	0.0157	3.41	0.005	4.18	0.005	0.00005	0.00227	0.005	0.005	0.0005
W12	11/7/2015 0:00	0.84	1.3	-	-	10	1	-	-	0.005	0.02	0.005	0.88	0.5	0.012	0.00002	0.0037	0.0001	0.001	0.05	0.0001	0.001	0.05	0.00001	0.0005	0.001	0.00279	0.005	0.00001	0.05	0.005	0.05	0.001	0.001	0.05	0.001	0.002	0.0005	3	0.0001	0.1	0.005	0.001	0.005	0.00005	0.0001	0.005	0.005	0.0005
W12	11/7/2015 11:40	172	1290	64.5	8.26	878	46.9	3.9	86.4	0.529	24	3	309	27	1.4	0.00002	0.027	0.00047	0.0861	0.208	0.0001	0.001	83.3	0.000054	0.0005	0.001	0.0253	0.0085	0.00001	39.8	0.0125	31.1	0.133	0.0829	130	0.001	0.0002	0.0005	119	0.0163	3.57	0.005	4.24	0.005	0.00005	0.00257	0.005	0.0062	0.0005
W12	12/11/2015 17:15	171	1330	-226.5	8.2	866	5	4.4	92.2	0.552	26	3.1	333	30	1.3	0.00002	0.0191	0.00041	0.092	0.206	0.0001	0.001	91.9	0.000025	0.0005	0.001	0.0194	0.0124	0.00001	39.9	0.0122	30.4	0.143	0.0882	120	0.0038	0.0002	0.0005	121	0.0174	3.64	0.005	4.05	0.005	0.00005	0.0025	0.005	0.005	0.0005
W12	1/3/2016 15:35	169	1350	68.6	7.91	884	67.2	2.8	73	0.641	27	2.8	332	31	1.4	0.00002	0.0156	0.00032	0.0949	0.2	0.0001	0.001	91.1	0.00016	0.0005	0.001	0.0191	0.0097	0.00001	36.5	0.0143	25.8	0.152	0.083	116	0.0014	0.0002	0.0005	116	0.0168	2.95	0.005	3.86	0.005	0.00005	0.00252	0.005	0.005	0.0005
W12	2/1/2016 16:50	171	1350	29	7.97	870	2.2	3.3	91.4	0.709	29.4	2.5	324	32	1.4	0.00002	0.0176	0.00043	0.0902	0.17	0.0001	0.001	93.2	0.00001	0.0005	0.001	0.0241	0.0164	0.00001	36.7	0.0129	28.2	0.163	0.0863	119	0.0015	0.0002	0.0005	113	0.0164	3.37	0.005	4.35	0.005	0.00005	0.00254	0.005	0.0061	0.0005
W12	3/5/2016 17:10	173	1340	88	7.79	862	5.9	5.1	87	0.653	27.3	2.6	333	31	1.3	0.00002	0.0158	0.0004	0.0906	0.202	0.0001	0.001	97	0.000025	0.0005	0.001	0.0265	0.0176	0.00001	37.1	0.0136	28.7	0.182	0.0856	116	0.0014	0.0002	0.0005	130	0.0171	3.51	0.005	4.19	0.005	0.00005	0.00274	0.005	0.0056	0.0005
W12	4/19/2016 16:25	179	1290	-	9	840	41.3	7.2	-	0.836	26.4	2.65	322	34	-	0.00001	0.0076	0.00042	0.0931	0.136	0.00002	0.00005	93.7	0.0000342	0.00031	0.0001	0.0526	0.022	0.000005	32.1	0.0102	29.1	0.235	0.069	97.9	0.00153	0.00005	0.00022	104	0.0143	3.45	0.0001	3.79	0.0003	0.00001	0.00287	0.005	0.0036	0.0003
W12	5/19/2016 16:10	157	1180	167.7	7.85	822	3.3	12.3	77.4	1.06	25.3	2.32	321	30.8	-	0.00001	0.0073	0.00045	0.11	0.139	0.00002	0.00005	103	0.0000311	0.00024	0.0001	0.0486	0.01	0.0000063	30.5	0.011	24.8	0.199	0.069	99.4	0.00179	0.00005	0.00023	105	0.0134	3.12	0.0001	3.99	0.0003	0.00001	0.00243	0.005	0.0037	0.0003
W12	6/27/2016 16:15	145	1330	54.2	7.79	952	7.3	17.6	50.1	1.23	29.1	2.83	398	36	-	0.00001	0.0119	0.00049	0.118	0.171	0.00002	0.00005	124	0.0000292	0.00015	0.0001	0.0205	0.01	0.000005	40.7	0.013	23	0.171	0.0866	107	0.00219	0.000052	0.00025	132	0.0154	2.79	0.0001	4.59	0.0003	0.00001	0.00185	0.0005	0.0036	0.0003
W12	7/25/2016 14:40	149	1420	110.2	7.69	994	6	15.7	69	1.84	28.1	3.11	419	36.4	-	0.00001	0.0137	0.00045	0.108	0.165	0.00002	0.00005	127	0.000016	0.00011	0.0001	0.0196	0.01	0.000005	44.1	0.0118	24.4	0.183	0.082	120	0.00172	0.00005	0.00023	145	0.0149	2.78	0.0001	4.64	0.0003	0.00001	0.00177	0.005	0.0024	0.0003
W12	8/22/2016 14:50	164	1400	77.5	8.07	967	3.3	14.5	76.5	2.7	25.3	3.2	425	1	-	0.00001	0.0137	0.00047	0.106	0.19	0.00002	0.00005	134	0.0000179	0.00015	0.0001	0.0252	0.01	0.000005	38.7	0.0124	25.4	0.222	0.0773	121	0.0017	0.00005	0.00023	143	0.0129	3.15	0.0001	4.59	0.0003	0.00001	0.00235	0.0005	0.0022	0.0003
W12	9/17/2016 16:40	166	1450	97.4	7.91	1030	5.3	11.3	74.3	3.97	23.6	4.72	457	33.8	-	0.00001	0.009	0.00046	0.118	0.166	0.00002	0.00005	147	0.0000145	0.00017	0.0001	0.0305	0.01	0.000005	36.5	0.0121	24.5	0.228	0.0831	106	0.00169	0.00005	0.00024	147	0.0135	3.14	0.0001	4.56	0.0003	0.00001	0.00214	0.005	0.0024	0.0003
W12	10/15/2016 11:15	170	1490	57.5	7.74	1150	3.2	4.8	73.3	4.33	24.6	4.07	530	34.8	-	0.00001	0.0094	0.0005	0.11	0.189	0.00002	0.00005	168	0.0000063	0.00017	0.0001	0.0271	0.014	0.000005	38.6	0.0115	27.6	0.219	0.0758	119	0.00202	0.00005	0.00028	194	0.0138	3.32	0.0001	4.52	0.0003	0.00001	0.00278	0.005	0.0041	0.0003
W12	11/4/2016 13:40	171	1590	67.3	7.89	1210	9.6	4.2	34.5	4.12	25	4.26	567	36.4	-	0.00001	0.0058	0.00049	0.111	0.21	0.00002	0.00005	180	0.000005	0.00016	0.0001	0.0213	0.01	0.000005	41.2	0.0104	28.7	0.212	0.0807	122	0.00222	0.00005	0.00028	198	0.0152	3.45	0.0001	4.87	0.0003	0.00001	0.00283	0.0005	0.0032	0.0003
W12	12/1/2016 16:10	169	1770	60	15.68	1320	4.2	7.2	124	3.58	25.7	4.31	653	36.2	-	0.00001	0.0074	0.00042	0.103	0.191	0.00002	0.00005	204	0.000005	0.0004	0.0001	0.0174	0.011	0.000005	40.9	0.0115	28.9	0.286	0.0775	123	0.00253	0.00005	0.00023	228	0.0139	3.47	0.0001	4.81	0.0003	0.00001	0.00288	0.0005	0.0038	0.0003
W12	1/2/2017 14:25	171	2000	31.8	7.69	1570	4.3	5.1	89	2.65	27.3	5.4	834	35.6	-	0.00001	0.0056	0.00048	0.0962	0.207	0.00002	0.00005	262	0.0000142	0.00057	0.0001	0.0117	0.024	0.000005	46.2	0.017	33.6	0.366	0.0775	121	0.00268	0.000061	0.0003	278	0.0153	3.09	0.0001	5.13	0.0003	0.00001	0.00341	0.0005	0.0031	0.0003
W12	2/5/2017 17:05	170	2210	75.8	7.73	1820	36.2	3	49.4	1.8	28.9	6.04	1050	37	1.45	0.00002	0.0052	0.00043	0.114	0.224	0.00004	0.0001	328	0.000052	0.00059	0.0002	0.025	0.031	0.000005	47.7	0.0114	36.3	0.409	0.0756	123	0.003	0.00016	0.00036	366	0.015	3.14	0.0002	5.91	0.0006	0.00002	0.00389	0.001	0.0022	0.0006
W12	3/6/2017 16:30	166	2270	237.7	7.81	1910	3.5	2.2	82.6	1.84	27.2	6.94	1090	35	-	0.00005	0.0065	0.00042	0.117	0.223	0.00004	0.0001	366	0.00005	0.00064	0.0002	0.026	0.031	0.000005	47.7	0.0124	41	0.472	0.0835	133	0.003	0.00015	0.00035	383	0.0138	3.12	0.0002	7.11	0.0006	0.00002	0.00465	0.001	0.0022	0.0006
W12	4/4/2017 16:30	167	2440	112.9	7.84	1980	4.7	3	81.7	2.04	25.8	6.66	1160	36	-	0.00002	0.0057	0.00039	0.11	0.214	0.00004	0.0001	362	0.000077	0.00091	0.0002	0.0256	0.047	0.000005	44.9	0.0124	44.1	0.705	0.0801	122	0.0034	0.00021	0.00028	431	0.0132	3.15	0.0002	7.57	0.0006	0.00002	0.00526	0.001	0.0052	0.0006
W12	5/8/2017 8:50	173	1980	231.9	7.31	1600	18	6.4	120.2	2.14	19.6	4.55	902	30.4	-	0.000012	0.0043	0.0004	0.0838	0.173	0.00002	0.00005	284	0.00011	0.00081	0.0001	0.0352	0.012	0.000005	34.4	0.0112	42.4	0.571	0.0645	98.6	0.00262	0.00005	0.00023	326	0.0123	3.26	0.0001	6.34	0.0003	0.00001	0.00523	0.0005	0.0068	0.0003
W12	6/12/2017 0:00	149	2330	-	-	2130	15.7	-	-	2.5	20.4	3.3	1300	34	-	0.00002	0.008	0.00046	0.12	0.205	0.00004	0.0001	380	0.00016	0.00184	0.0002	0.0425	0.02	0.000005	44.1	0.018	47.7	1.28	0.0697	123	0.0038	0.0001	0.00026	415	0.0108	3.46	0.0002	6.94	0.0006	0.00002	0.006	0.001	0.0062	0.0003
W12	6/12/2017 17:00	152	2330	105.7	7.78	2060	13.9	16	79.7	2.34	19.2	3.73	1230	33	-	0.00002	0.0124	0.00046	0.122	0.211	0.00004	0.0001	387	0.00016	0.00188	0.0002	0.0453	0.02	0.000005	44.3	0.0184	47.7	1.28	0.0716	123	0.0038	0.0001	0.00028	426	0.0109	3.39	0.0002	7.08	0.0006	0.00002	0.0062	0.001	0.0062	0.0003
W12	7/3/2017 14:25	157	2560	159.3	7.81	2300	9.1	17.1	69.1	5.77	15.1	3.68	1430	36	-	0.00002	0.0036	0.00041	0.122	0.231	0.

Attachment 3: Sitewide Database

Station	Date / Time	General Parameters								Anions & Nitrogen Species							Dissolved Elements																												
		Alk-T	Cond-L	ORP	pH-F	TDS	TSS	Temp-F	O-DO-%	$N\text{-}NO_3$	$N\text{-}NO_3$	$N\text{-}NH_3$	SO_4-D	Chlord	Fluord	Ag-D	Al-D	As-D	Ba-D	B-D	Be-D	Bi-D	Ca-D	Cd-D	Co-D	Cr-D	Cu-D	Fe-D	Hg-D	K-D	Li-D	Mg-D	Mn-D	Mo-D	Na-D	Ni-D	Pb-D	Sb-D	S-D	Se-D	Si-D	Sn-D	Sr-D	Ti-D	Tl-D	U-D	V-D	Zn-D	Zr-D
		mg/L	µS/cm	mV		mg/L	mg/L	°C	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
W12	3/11/2019 14:50	233	1850	191.9	7.95	1560	7.4	0.5	81	0.099	4.98	0.249	906	32.4	-	0.00001	0.0084	0.001	0.0302	0.133	0.00002	0.00005	321	0.000217	0.0003	0.0001	0.191	0.01	0.000005	7.16	0.0085	54.2	0.147	0.0206	78	0.00066	0.00005	0.0001	331	0.00295	7.7	0.0001	6.28	0.0003	0.00001	0.00799	0.0005	0.0132	0.0003
W12	4/22/2019 9:05	88.9	873	183.4	7.55	567	4.7	0.2	75	0.0624	3.32	0.125	323	12.4	-	0.00001	0.0042	0.00032	0.0234	0.05	0.00002	0.00005	114	0.0000492	0.00013	0.0001	0.0262	0.022	0.000005	3.32	0.0033	19.7	0.0699	0.00626	26.6	0.0005	0.00005	0.0001	112	0.00166	2.68	0.0001	2.42	0.0003	0.00001	0.00242	0.0005	0.0038	0.0003
W12	5/7/2019 16:35	159	1430	213.7	8.2	1130	3	8.1	104.2	0.0859	5.19	0.005	653	23	-	0.00001	0.0101	0.00068	0.0231	0.095	0.00002	0.00005	231	0.0000145	0.00018	0.0001	0.0237	0.01	0.000005	5.57	0.0066	41.6	0.0807	0.0163	55.2	0.00067	0.00005	0.0001	238	0.00297	5.69	0.0001	4.56	0.0003	0.00001	0.0053	0.0005	0.001	0.0003
W12	6/12/2019 10:45	159	1490	179.3	7.63	1210	3	14.8	109.5	0.11	6.06	0.082	698	24.4	-	0.00001	0.0058	0.00066	0.0374	0.111	0.00002	0.00005	247	0.00004	0.00014	0.0001	0.0387	0.01	0.000005	8.69	0.0071	48.2	0.0682	0.02	61.6	0.0008	0.00005	0.0001	243	0.00353	5.39	0.0001	5.25	0.0003	0.00001	0.00626	0.0005	0.001	0.0003
W12	7/4/2019 0:00	149	1540	-	-	1210	3.2	-	-	0.0689	5.99	0.0093	711	24.3	-	0.00002	0.002	0.00057	0.0361	0.103	0.00004	0.0001	237	0.00001	0.0002	0.0002	0.026	0.02	0.000005	8.62	0.0071	47.1	0.0442	0.0204	60.7	0.001	0.0001	0.0002	268	0.0034	3.9	0.0002	5.28	0.0006	0.00002	0.00671	0.001	0.002	0.0004
W12	7/4/2019 9:05	150	1540	98.7	8.18	1220	4.4	17.9	78.8	0.0691	6.11	0.0098	720	24.6	-	0.00002	0.002	0.00056	0.0352	0.103	0.00004	0.0001	238	0.00001	0.0002	0.0002	0.026	0.02	0.000005	8.51	0.0069	47.2	0.0438	0.0204	59.6	0.001	0.0001	0.0002	264	0.00329	3.88	0.0002	5.21	0.0006	0.00002	0.00668	0.001	0.002	0.0004
W12	8/10/2019 0:00	163	1580	-	-	1270	3	-	-	0.102	7.48	0.131	718	24.9	0.94	0.00001	0.0018	0.0006	0.0429	0.109	0.00002	0.00005	223	0.00007	0.0001	0.00012	0.0482	0.01	0.000005	10.1	0.0076	48.1	0.0423	0.0273	61.2	0.0007	0.00005	0.00012	251	0.0045	4.32	0.0001	5.47	0.0003	0.00001	0.00634	0.0005	0.0014	0.0003
W12	8/10/2019 8:30	176	1600	172.7	7.85	1270	3	14.9	68.1	0.1	7.54	0.136	722	24.7	0.91	0.00001	0.0028	0.00059	0.0424	0.108	0.00002	0.00005	229	0.00006	0.0001	0.0001	0.0488	0.01	0.000005	10.5	0.0075	49.1	0.0428	0.0271	62.2	0.00072	0.00005	0.00012	252	0.00472	4.47	0.0001	5.57	0.0003	0.00001	0.00612	0.0005	0.0012	0.0003
W12	9/9/2019 9:35	171	1770	141.3	8.11	1300	3	12	89.6	0.207	6.88	0.353	764	24.7	-	0.00002	0.0024	0.00049	0.0419	0.134	0.00004	0.0001	251	0.000056	0.0002	0.0002	0.0463	0.02	0.000005	13	0.0089	48.9	0.0742	0.0286	64	0.0011	0.0001	0.0002	270	0.00424	4.38	0.0002	5.59	0.0006	0.00002	0.00701	0.001	0.002	0.0004
W12	10/18/2019 14:50	200	1790	198.5	8.01	1400	3	2.9	81.4	0.289	7.55	0.522	823	26.1	-	0.00002	0.0032	0.00041	0.0473	0.144	0.00004	0.0001	258	0.000076	0.0002	0.0002	0.059	0.02	0.000005	16.9	0.0095	51.3	0.0905	0.0316	74.1	0.0014	0.0001	0.0002	305	0.00478	4.83	0.0002	5.53	0.0006	0.00002	0.00636	0.001	0.0025	0.0004
W12	11/25/2019 0:00	215	1670	-	-	1250	3	-	-	0.205	13.2	0.35	673	22.1	-	0.00001	0.0021	0.00052	0.0487	0.114	0.00002	0.00005	239	0.0000935	0.00012	0.00012	0.0936	0.01	0.000005	13.7	0.0082	51.5	0.081	0.0295	61.1	0.00118	0.00005	0.00021	264	0.0069	5.51	0.0001	5.1	0.0003	0.00001	0.00644	0.0005	0.0028	0.0003
W12	11/25/2019 10:25	215	1720	191.8	7.77	1260	3	1.8	67.4	0.205	12.5	0.365	674	22.2	-	0.00001	0.002	0.00052	0.0483	0.123	0.00002	0.00005	250	0.0000838	0.00011	0.00014	0.0938	0.01	0.000005	14	0.009	51	0.0817	0.0306	61.3	0.00119	0.00005	0.00022	262	0.00661	5.46	0.0001	5.2	0.0003	0.00001	0.00652	0.0005	0.0025	0.0003
W12	12/16/2019 0:00	193	1820	-	-	1450	3.5	-	-	0.01	9.28	0.529	829	28	-	0.00001	0.0025	0.00059	0.0486	0.143	0.00002	0.00005	286	0.000104	0.00013	0.00014	0.0645	0.01	0.000005	16.1	0.0099	57	0.107	0.034	77	0.00152	0.00005	0.00021	293	0.00814	5.81	0.0001	6.07	0.0003	0.00001	0.00662	0.0005	0.005	0.0003
W12	12/16/2019 9:35	202	1810	169.2	7.78	1450	3.5	1.7	64.1	0.01	9.28	0.52	828	27.9	-	0.00001	0.0025	0.00057	0.0482	0.142	0.00002	0.00005	281	0.000102	0.00012	0.00018	0.0648	0.01	0.000005	16	0.0099	58	0.105	0.0327	78.1	0.00152	0.00005	0.00019	302	0.00755	5.87	0.0001	5.85	0.0003	0.00001	0.00656	0.0005	0.0055	0.0003
W12	1/13/2020 13:50	227	1960	138.5	7.53	1500	4.5	1.4	25.6	0.63	7.29	1.41	812	23.5	-	0.00001	0.0021	0.00046	0.0502	0.208	0.00002	0.00005	310	0.00011	0.00028	0.00011	0.0549	0.01	0.000005	18.2	0.0108	60.3	0.21	0.0338	86.6	0.00241	0.00005	0.00021	345	0.00466	5.48	0.0001	6	0.0003	0.00001	0.0068	0.0005	0.005	0.0002
W12	2/17/2020 11:20	184	2310	146.9	7.46	1920	3	1.5	33.2	1.78	8.08	3	1130	26.9	1.11	0.00002	0.0022	0.00034	0.0492	0.234	0.00004	0.0001	412	0.000106	0.0005	0.0002	0.041	0.02	0.000005	23.4	0.0128	66.2	0.366	0.0384	96.7	0.00366	0.0001	0.0003	400	0.00433	5.21	0.0002	6.89	0.0006	0.00002	0.00766	0.001	0.0046	0.0004
W12	3/9/2020 10:45	245	1590	38.9	7.44	1210	3	1.3	3.7	0.702	19.2	0.984	601	16.5	0.687	0.00001	0.002	0.00039	0.0434	0.112	0.00002	0.00005	221	0.000229	0.00024	0.0001	0.107	0.01	0.000005	13.1	0.008	51.7	0.2	0.035	48.2	0.00166	0.00005	0.00022	196	0.00718	5.17	0.0001	4.78	0.0003	0.00001	0.00634	0.0005	0.0053	0.0002
W12	4/13/2020 11:20	246	1940	17.8	7.79	1610	12.6	1.6	11.7	1.13	10.8	2.21	916	22.8	-	0.00001	0.0028	0.00044	0.0419	0.177	0.00002	0.00005	302	0.00013	0.00036	0.0001	0.0641	0.01	0.000005	17.9	0.0097	56.3	0.345	0.0307	78.5	0.00237	0.00005	0.00023	333	0.00527	5.42	0.0001	5.5	0.0003	0.00001	0.00667	0.0005	0.0041	0.0002
W12	5/25/2020 13:40	138	1350	160.8	7.7	1030	8.4	13.3	57.1	0.672	8.69	1.18	578	12.6	-	0.000034	0.0133	0.0005	0.0582	0.113	0.000069	0.00005	207	0.0000878	0.00031	0.0001	0.113	0.058	0.000005	13.2	0.0067	36.5	0.219	0.0199	49.2	0.00242	0.000119	0.00032	218	0.00523	3.67	0.0001	3.43	0.00179	0.00005	0.00401	0.0005	0.0025	0.00021
W12	6/16/2020 2:50	151	1720	210.4	7.75	1360	3	16.3	44	1.02	10.1	1.77	807	16.6	-	0.000014	0.0049	0.00039	0.0621	0.148	0.00002	0.00005	268	0.0000794	0.00028	0.0001	0.0972	0.033	0.000005	15	0.0074	42	0.26	0.0255	58.4	0.00242	0.00005	0.00029	277	0.00525	4.19	0.0001	4.11	0.00066	0.00001	0.00423	0.0005	0.0029	0.0002
W12	6/24/2020 7:00	155	-	238.5	7.77	1620	-	13.4	59.6	1.04	10.5	1.81	836	31.4	-	0.00001	0.0045	0.0004	0.0626	0.152	0.00002	0.00005	307	0.000111	0.00024	0.0001	0.0963	0.023	-	17	0.0077	47.1	0.255	0.0256	68.4	0.00251	0.000338	0.00028	290	0.00541	4.31	0.0001	4.52	0.00033	0.00001	0.00461	0.0005	0.0049	0.0002
W12	7/18/2020 14:55	179	1900	161.2	7.54	1640	5.2	19.2	47.7	1.75	9.66	2.04	943	19.6	-	0.00001	0.0038	0.00045	0.0658	0.179	0.00002	0.00005	367	0.000116	0.00023	0.00014	0.0731	0.014	0.000005	18.6	0.0089	47.4	0.266	0.0294	72	0.00252	0.00005	0.0003	316	0.00509	4.18	0.0001	5.21	0.0003	0.00001	0.005	0.0005	0.0034	0.0002
W12	8/26/2020 14:50	348	4310	233.4	7.1	3790	19	14.9	62.1	4.95	20.07	4.83	2200	43.8	-	0.00004	0.0081	0.00044	0.1324	0.428	0.00008	0.0002	849	0.0002077	0.0004	0.0004	0.1038	0.04	0.00001	44	0.0176	121.9	0.565	0.068	186.6	0.00486	0.0002	0.00062	802	0.01106	9.2	0.0004	11.3	0.0012	0.00004	0.00863	0.002	0.0061	0.0008
W12	9/2/2020 13:40	178	2120	210.4	7.26	1780	5	12.7	52.9	2.84	9.55	2.72	1080	21.5	-	0.00002	0.0036	0.00038	0.0644	0.202	0.00004	0.0001	357	0.000103	0.0002	0.0002	0.0522	0.02	0.000005	20.4	0.0093	52.5	0.31	0.0331	75.5	0.00239	0.0001	0.00033	382	0.00518	4.18	0.0002	5.14	0.0006	0.00002	0.00485	0.001	0.0036	0.0004
W12	10/11/2020 14:10	199	1930	223.5	7.39	1640	4.5	4.5	59.7	1.64	13.6	2.21	927	19.2	-	0.00001	003	0.00053	0.0928	0.19	0.00002	0.00005	341	0.00013	0.00028	0.0001	0.0806	0.01	0.000005	17.8	0.0083	60.1	0.271	0.0293	69.9	0.00157	0.00005	0.00029	322	0.00836	4.8	0.0001	5.52	0.0003	0.00001	0.00525	0.0005	0.0037	0.0002
W12	11/3/2020 10:25	438	3700	162.9	7.34	2970	6	1.8	58.7	2.48	35.3	5.57	1658	36.8	-	0.00002	0.0063	0.00111	0.213	0.288	0.00004	0.0001	567	0.000286	0.00056	0.0002	0.1916	0.02	0.00001	28.9	0.014	109.7	0.431	0.0517	115.6	0.00235	0.0001	0.00077	573	0.01848	10.11	0.0002	9.82	0.0006	0.00002	0.01175	0.00149	0.0156	0.0004
W12	12/2/2020 13:35	215	1720			1730	3			0.741	16.7	1.87	933	21.7	-	0.00001	0.0024	0.0004	0.0761	0.2	0.00002	0.00005	400	0.000178	0.00032	0.0001	0.0994	0.01	0.000005	17.4	0.0107	59	0.265	0.0344	72.8	0.00157	0.00005	0.00032	372	0.009	5.34	0.0001	6.19	0.0003	0.00001	0.00711	0.0005	0.0045	0.0002
W12N	5/6/2010 0:00	89	417	-	-	310	50	-	-	0.37	11.7	2.3	75	3.3	0.53	0.00002	0.023	0.0009	0.045	0.05	0.0001	0.001	57.7	0.00005	0.0005	0.001	0.106	0.092	0.00002	3.21	0.005	11.6	0.109	0.017	15.1	0.001	0.0002	0.0005	25	0.0036	3.42	0.005	1.65	0.005	0.00005	0.0027	0.005	0.005	0.0005
W12N	6/23/2010 0:00	97	488	-	8.16	340	15	15.37	98.6	0.098	15.1	1.2	86	2.4	0.75	0.0001	0.028	0.0008	0.051	0.1	0.0002	0.001	50	0.0001	0.0005	0.002	0.216	0.045	0.0002	3	0.01	12	0.102	0.022	19	0.001	0.0002	0.0005	60	0.0043	3.3	0.005	1.94	0.01	0.00005	0.0032	0.005	0.01	0.002
W12N	6/24/2010 0:00	96	487	-	8.17	340	8	17.36	105.9	0.098	15.2	1.5	85	2.4	0.75	0.0001	021	0.0008	0.05	0.1	0.0002	0.001	52	0.0001	0.0005	0.002	0.216	0.049	0.0002	3	0.01	12	0.102	0.022	19	0.001	0.0002	0.0005	60	0.0043	3.52	0.005	2.06	0.01	0.00005	0.0031	0.005	0.01	0.002
W12N	6/27/2010 0:00	98	494	-	8.11	380	12	17.22	86.3	0.096	15.5	1.8	96	2.5	0.78	0.0001	0.014	0.0008	0.05	0.1	0.0002	0.001	51	0.0001	0.0005	0.002	0.223	0.033	0.0002	3	0.01	12	0.098	0.023	20	0.001	0.0002	0.0005	60	0.004	3.96	0.005	2.07	0.01	0.00005	0.003	0.005	0.01	0.002
W12N	7/13/2010 0:00	110	574	-	8.39	390	17	20.02	98.8	0.203	17.9	1.2	98	2.9	0.84	0.0001	0.011	0.0014	0.102	0.1	0.0002	0.001	59	0.0001	0.0005	0.002	0.074	0.022	0.0002	4	0.01	14	0.115	0.028	24	0.001	0.0002	0.0007	60	0.0076	3.58	0.005	2.23	0.01	0.00005	0.0037	0.005	0.01	0.002
W12N	7/14/2010 0:00	110	552	-	8.43	410	17	15.74	93.7	0.197	18.1	1.5	100	2.8	0.89	0.0001	0.01	0.0014	0.097	0.1	0.0002	0.001	58	0.0001	0.0005	0.002	0.07	0.022	0.0002	4	0.01	14	0.104	0.027	25	0.001	0.0002	0.0006	60	0.0075	3.54	0.005	2.12	0.01	0.00005	0.0035	0.005	0.01	0.002
W12N	7/19/2010 0:00	110	532	-	8.49	370	15	17.7	85.6	0.186	15.3	1.1	89	2.5	0.7	0.0001	0.021	0.0012	0.097	0.1	0.0002	0.001	57	0.0001	0.0005	0.002	0.066	0.036	0.0002	4	0.01	14	0.092	0.024	23	0.001	0.0002	0.0006	60	0.0068	4.13	0.005	1.96	0.01	0.00005	0.0031	0.005	0.01	0.002
W12N	8/7/2010 0:00	120	522	-	8.01	340	36	16.04	55.8	0.189	14.3	3.3	86	2.6	0.59	0.0001	0.01	0.0013	0.111	0.1	0.0002	0.001	58	0.0001	0.0005	0.002	0.062	0.038	0.0002	3	0.01	16	0.12	0.02	19	0.001	0.0002	0.0006	60	0.006	4.43	0.005	1.69	0.01	0.00005	0.0027	0.005	0.01	0.002
W12N	8/13/2010 0:00	-	541	-	8.04	370	7	16.87	71.9	0.203	15.6	0.57	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W12N	8/17/2010 0:00	-	-	-	-	-	-	-	-	-	-	0.09	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W12N	8/20/2010 0:00	110	572	-	7.81	370	18	10.27	65.7	0.241	16.3	1.1	100	2.7	0.74	0.0001	0.01	0.0011	0.098	0.1	0.0002	0.001	60	0.0002	0.0005	0.002	0.079	0.02	0.0002	4	0.01	15	0.131	0.025	22	0.001	0.0002	0.0007	60	0.0075	3.69	0.005	2.04	0.01	0.00005	0.0036	0.005	0.01	0.002
W12N	8/21/2010 0:00	-	-	-	-	-	-	-	-	-	-	0.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W12N	8/27/2010 0:00	110	551	-	8.1	380	17	12.66	76.5	0.243	14.7	1.45	110	2.8	0.57	0.0001	0.013	0.0011	0.115	0.1	0.0002	0.001	63	0.0001	0.0005	0.002	0.063	0.147	0.0002	4	0.01	17	0.107	0.024	24	0.001	0.0002	0.0007	60	0.0065	4.16	0.005	1.94	0.01	0.00005	0.0036	0.005	0.01	0.002
W12N	8/28/2010 0:00	-	-	-	-	-	-	-	-	-	-	0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W12N	8/30/2010 0:00	-	-	-	-	-	-	-	-	-	-	0.52	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W12N	8/31/2010 0:00	-	-	-	-	-	-	-	-	-	-	0.54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W12N	9/7/2010 0:00	120	567	-	7.99	420	17	11.87	63	0.205	13	0.5	96	2.9	0.65	0.0001	0.01	0.0012	0.119	0.1	0.0002	0.001	61	0.0001	0.0005	0.002	0.063	0.02	0.0002	4	0.01	17	0.118	0.022	21	0.001	0.0002	0.0006	60	0.0063	4.32	0.005	1.78	0.01	0.00005	0.0032	0.005	0.01	0.002
W12N	9/10/2010 0:00	120	566	-	8.01	390	17	12.63	71.6	0.225	15.9	0.41	100	3	-	0.0001	0.01	0.0013	0.118	0.1	0.0002	0.001	61	0.0001	0.0005	0.002	0.061	0.02	0.0002	4	0.01	17	0.128	0.025	23	0.001	0.0002	0.0008	60	0.0073	4.04	0.005	1.92	0.01	0.00005	0.0034	0.005	0.01	0.002
W12N	9/11/2010 0:00	-	-	-	-	-	-	-	-	-	-	0.56	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W12N	9/15/2010 0:00	120	574	-	8.07	410	21	9.95	74.8	0.319	17.2	0.6	100	2.5	0.75	0.0001	0.01	0.0012	0.121	0.1	0.0002	0.001	64	0.0001	0.0005	0.002	0.066	0.02	0.0002	4	0.01	17	0.142	0.026	25	0.001	0.0002	0.0007	60	0.0071	4.27	0.005	2.03	0.01	0.00005	0.0036	0.005	0.01	0.002
W12N	9/20/2010 0:00	120	587	-	8.06	410	21	8.28	60.8	0.245	17.1	0.7	110	2.8	0.71	0.0001	0.01	0.0011	0.12	0.1	0.0002	0.001	65	0.0001	0.0005	0.002	0.063	0.02	0.0002	4	0.01	17	0.138	0.025	23	0.001	0.0002	0.0009	60	0.007	4.13	0.005	2.12	0.01	0.00005	0.0038	0.005	0.01	0.002
W12N	9/27/2010 0:00	120	623	-	7.89	430	19	4.02	57.7	0.221	18.7	1.37	120	2.7	0.75	0.00002	0.005	0.0013	0.11	0.071	0.0001	0.001	67.8	0.00014	0.0005	0.001	0.071	0.001	0.0002	4.28	0.005	19.1	0.161	0.026	26.5	0.001	0.0002	0.0007	60	0.0076	3.97	0.005	2.25	0.005	0.00005	0.004	0.005	0.005	0.0005
W12N	1/8/2011 0:00	110	1070	-	8.31	690	540	-0.34	87.4	3.49	67	4.9	140	5	3.18	0.00002	0.024	0.0005	0.031	0.282	0.0001	0.001	145	0.00001	0.0005	0.001	0.146	0.286	0.00002	4.54	0.012	12.7	0.016	0.02	131	0.001	0.0002	0.0005	50	0.0047	1.62	0.005	3.09	0.005	0.00005	0.0056	0.005	0.005	0.0005
W12N	2/3/2011 0:00	200	1550	-	7.9	1100	37	0.4	61.7	0.75	45	8.7	400	4.2	1.8	0.00002	0.009	0.0006	0.043	0.308	0.0001	0.001	145	0.00001	0.0005	0.001	0.038	0.047	0.00002	6.02	0.016	39	0.055	0.031	116	0.001	0.0002	0.0005	147	0.0069	3.1	0.005	7.66	0.005	0.00005	0.0083	0.005	0.005	0.0005
W12S	5/6/2010 0:00	57	191	-	-	180	39	-	-	0.161	3.9	0.36	17	4.2	0.23	0.00002	0.067	0.0005	0.037	0.05	0.0001	0.001	26.2	0.0001	0.0005	0.001	0.101	0.233	0.00002	2.32	0.005	5.78	0.175	0.007	6.04	0.001	0.0002	0.0005	7	0.0013	3.14	0.005	0.459	0.005	0.00005	0.0007	0.005	0.005	0.0005
W12S	6/23/2010 0:00	93	455	-	8.27	330	6	15.79	98.8	0.111	11.8	0.74	90	2.7	0.65	0.0001	023	0.0009	0.06	0.1	0.0002	0.001	50	0.0001	0.0005	0.002	0.221	0.058	0.0002	3	0.01	12	0.091	0.018	16	0.001	0.0002	0.0005	60	0.0046	3.41	0.005	1.97	0.01	0.00005	0.003	0.005	0.01	0.002
W12S	6/24/2010 0:00	95	458	-	8.26	340	4	15.82	106.4	0.113	11.6	0.83	91	2.8	0.64	0.0001	019	0.0008	0.057	0.1	0.0002	0.001	52	0.0001	0.0005	0.002	0.201	0.055	0.0002	3	0.01	12	0.078	0.018	16	0.001	0.0002	0.0005	60	0.0047	3.62	0.005	1.96	0.01	0.00005	0.0028	0.005	0.01	0.002
W12S	6/27/2010 0:00	95	464	-	8.5	350	5	15.73	107	0.103	12	0.95	90	2.6	0.64	0.0001	016	0.0008	0.057	0.1	0.0002	0.001	50	0.0001	0.0005	0.002	0.196	0.

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | Dissolved Elements | | | | | | | |

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | Dissolved Elements | | | | | | | |

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | Dissolved Elements | | | | | | | |

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | Dissolved Elements | | | | | | | |

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | | | | | Dissolved Elements | | | | | | | | | |

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | | | Dissolved Elements | | | | | | | |

Attachment 3: Sitewide Database

Station	Date / Time	General Parameters								Anions & Nitrogen Species						Dissolved Elements																														
		Alk-T	Cond-L	ORP	pH-F	TDS	TSS	Temp-F	O-DO-%	$N\text{-}NO_2$	$N\text{-}NO_3$	$N\text{-}NH_3$	SO_4-D	Chlord	Fluord	Ag-D	Al-D	As-D	Ba-D	B-D	Be-D	Bi-D	Ca-D	Cd-D	Co-D	Cr-D	Cu-D	Fe-D	Hg-D	K-D	Li-D	Mg-D	Mn-D	Mo-D	Na-D	Ni-D	Pb-D	Sb-D	S-D	Se-D	Si-D	Sn-D	Sr-D	Ti-D	Tl-D	U-D	V-D	Zn-D	Zr-D
		mg/L	µS/cm	mV		mg/L	mg/L	°C	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
W16	5/19/2018 7:50	134	365	162	8.05	207	5.4	10.8	94.5	0.0075	0.769	0.0058	46.8	5.44	-	0.00001	0.0192	0.0004	0.0712	0.014	0.00002	0.00005	43.2	0.0000169	0.00012	0.00017	0.0459	0.133	0.0000054	2.44	0.0011	14.9	0.148	0.00226	10.3	0.00095	0.00005	0.0001	16.3	0.000532	3.49	0.0001	0.441	0.0009	0.00001	0.000969	0.0005	0.0043	0.0003
W16	5/21/2018 9:50	135	366	146	8.2	215	4.4	11.4	87.2	0.0085	0.892	0.0123	48.6	5.5	-	0.00001	0.0203	0.00038	0.0742	0.015	0.00002	0.00005	48.4	0.000018	0.00012	0.00013	0.0453	0.127	0.0000054	2.52	0.0012	13.7	0.136	0.00216	10.2	0.00085	0.00005	0.0001	16	0.000555	3.53	0.0001	0.447	0.00084	0.00001	0.000955	0.0005	0.001	0.0003
W16	5/22/2018 9:15	-	-	151.4	8.24	-	-	10.5	88.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W16	5/23/2018 9:50	-	-	163.3	8.24	-	-	11.2	79.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W16	5/24/2018 7:50	134	362	191.7	8.26	219	3.8	11.5	88.6	0.0091	1	0.0086	49.5	5.43	-	0.00001	0.0344	0.00057	0.083	0.013	0.00002	0.00005	46.4	0.0000332	0.00017	0.0002	0.052	0.103	0.0000005	3.07	0.001	17.3	0.112	0.00226	12.1	0.00128	0.00005	0.0001	16.4	0.000604	3.7	0.0001	0.477	0.00128	0.00001	0.000923	0.00056	0.0021	0.0003
W16	5/25/2018 8:30	-	-	126.2	8.17	-	-	11.2	91.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W16	5/26/2018 8:20	-	-	148.3	8.27	-	-	11.3	92.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W16	5/27/2018 9:00	-	-	161.7	8.33	-	-	12.3	102.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W16	5/28/2018 8:50	134	362	156	8.39	224	4.8	12	93.9	0.0111	1.16	0.0103	52.3	5.53	-	0.00001	0.0141	0.0004	0.0702	0.014	0.00002	0.00005	50.7	0.0000149	0.0001	0.00015	0.0441	0.078	0.0000005	2.71	0.0012	16	0.052	0.00232	10.9	0.00099	0.00005	0.0001	17.6	0.000678	3.48	0.0001	0.477	0.00032	0.00001	0.00108	0.0005	0.001	0.0003
W16	5/31/2018 9:00	-	-	140	8.64	-	-	12.8	127.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W16	6/1/2018 8:45	-	-	141.5	8.69	-	-	13.2	106.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W16	6/2/2018 8:40	-	-	142.5	8.58	-	-	12.6	90.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W16	6/3/2018 8:15	-	-	145	8.61	-	-	12.8	85.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W16	6/4/2018 10:15	142	407	141.7	8.06	234	10.1	14	112	0.0115	1.53	0.0065	55.3	5.31	-	0.00001	0.0126	0.00042	0.0679	0.015	0.00002	0.00005	51.3	0.00001	0.0001	0.0001	0.0398	0.056	0.0000005	2.68	0.0012	15.7	0.0263	0.00262	10.9	0.00088	0.00005	0.0001	17.8	0.000809	3.26	0.0001	0.503	0.00036	0.00001	0.00114	0.0005	0.001	0.0003
W16	6/5/2018 11:00	140	403	110.9	8.67	295	-	15.4	95	0.0126	1.54	0.009	56.2	5.3	-	0.00001	0.0162	0.00042	0.0696	0.014	0.00002	0.00005	51.3	0.0000148	0.0001	0.00013	0.0445	0.059	0.0000005	2.81	0.0012	14.2	0.0254	0.00254	11.5	0.00084	0.00005	0.0001	19.7	0.000829	3.29	0.0001	0.493	0.00074	0.00001	0.00117	0.00053	0.001	0.0003
W16	6/6/2018 9:25	-	-	115.6	8.66	-	-	14.6	82.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W16	6/7/2018 9:20	-	-	92.1	8.13	-	-	14.6	112	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W16	6/8/2018 9:00	-	-	123.8	8.61	-	-	14.4	83.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W16	6/9/2018 8:50	-	-	131.2	8.58	-	-	14.7	98.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W16	6/10/2018 8:05	-	-	131.8	8.54	-	-	14.9	105.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W16	6/12/2018 10:15	143	404	145	8.02	242	3.8	14.8	96	0.0106	1.91	0.014	59.4	5.05	-	0.00001	0.0208	0.00045	0.0689	0.014	0.00002	0.00005	53.1	0.0000105	0.0001	0.0001	0.0373	0.069	0.0000006	2.7	0.0012	16.5	0.0207	0.00252	11.2	0.00101	0.00005	0.0001	19	0.000961	3.43	0.0001	0.5	0.00079	0.00001	0.00116	0.0005	0.0019	0.0003
W16	6/18/2018 17:00	151	416	156.1	8.26	246	4.4	18	77.9	0.0102	2	0.0202	61.5	5.12	-	0.00001	0.0118	0.00036	0.0671	0.014	0.00002	0.00005	51.6	0.0000114	0.0001	0.0001	0.0347	0.056	0.0000005	2.56	0.0012	15.5	0.0256	0.00264	10.7	0.00085	0.00005	0.0001	20.1	0.000901	3.21	0.0001	0.493	0.00047	0.00001	0.00122	0.0005	0.001	0.0003
W16	6/25/2018 16:00	302	852	181.9	8.1	508	12.6	17.8	66.5	0.0191	3.94	0.0589	127.3	10.54	-	0.00002	0.02	0.00082	0.1495	0.026	0.00004	0.0001	109.3	0.0000204	0.0002	0.00031	0.0694	0.117	0.00001	5.66	0.0043	34.4	0.0659	0.00538	22.6	0.00175	0.0001	0.0002	39.7	0.001818	6.33	0.0002	1.075	0.00085	0.00002	0.00253	0.001	0.002	0.0006
W16	7/2/2018 8:00	152	420	149.1	8.1	253	123	15.5	82.1	0.0088	1.99	0.0354	62.7	4.87	-	0.00001	0.0167	0.00046	0.0729	0.014	0.00002	0.00005	54.4	0.0000085	0.0001	0.0001	0.0329	0.082	0.0000005	2.59	0.0011	17.1	0.04	0.00265	11.3	0.00097	0.00005	0.0001	20.8	0.000894	3.39	0.0001	0.507	0.00075	0.00001	0.00123	0.00052	0.001	0.0003
W16	7/9/2018 8:00	152	423	121	8.12	259	3	19	76.7	0.0089	1.96	0.0358	63.3	4.77	-	0.00001	0.0148	0.00045	0.0761	0.014	0.00002	0.00005	59.6	0.0000074	0.0001	0.00015	0.0316	0.079	0.0000005	2.54	0.0011	17.3	0.0435	0.00279	11.3	0.00102	0.00005	0.0001	20.8	0.000848	3.33	0.0001	0.549	0.00057	0.00001	0.00127	0.00056	0.001	0.0003
W16	7/11/2018 13:35	157	433	183.5	8	257	3	17.5	82.7	0.0072	1.88	0.0404	62.2	4.76	-	0.00001	0.0171	0.00044	0.0728	0.012	0.00002	0.00005	56.5	0.0000113	0.0001	0.00018	0.0332	0.091	0.0000005	2.47	0.0011	17.1	0.0446	0.00256	10.8	0.00099	0.00005	0.0001	19.4	0.000821	3.29	0.0001	0.521	0.00091	0.00001	0.00119	0.00056	0.001	0.0003
W16	7/16/2018 11:15	158	429	146.5	8.16	256	3	15.8	88.9	0.0093	1.85	0.0498	63.7	4.8	-	0.00001	0.0141	0.00044	0.071	0.013	0.00002	0.00005	54.2	0.0000062	0.0001	0.00019	0.0299	0.081	0.0000005	2.52	0.0012	16.5	0.0392	0.00255	11	0.001	0.00005	0.0001	21.8	0.000859	3.35	0.0001	0.506	0.00064	0.00001	0.00125	0.0005	0.001	0.0003
W16	7/23/2018 15:10	192	464	122.2	8.29	282	6.3	20.1	81.9	0.0097	1.72	0.0411	64.6	4.97	0.221	0.00001	0.0129	0.00046	0.0731	0.016	0.00002	0.00005	56.8	0.000011	0.0001	0.0002	0.0307	0.065	0.0000005	2.69	0.0013	17.4	0.0259	0.00282	11.8	0.001	0.00005	0.0001	23.8	0.000936	3.22	0.0001	0.528	0.00064	0.00001	0.00125	0.0005	0.001	0.0003
W16	7/30/2018 9:05	163	452	135.1	8.28	269	3	19.9	59.1	0.0109	1.64	0.0154	65.4	5.09	-	0.00001	0.0052	0.00046	0.077	0.014	0.00002	0.00005	59.9	0.0000052	0.0001	0.00013	0.0295	0.032	0.0000005	2.73	0.0012	18.6	0.00278	0.00281	12.1	0.00094	0.00005	0.0001	21.4	0.000847	3.22	0.0001	0.555	0.0003	0.00001	0.00132	0.0005	0.001	0.0003
W16	8/6/2018 9:40	171	445	122.4	8.37	272	3.4	18.8	71.6	0.0111	1.53	0.0094	66.3	5.13	-	0.00001	0.0041	0.00048	0.0748	0.015	0.00002	0.00005	59	0.0000068	0.0001	0.00012	0.0275	0.016	0.0000005	2.65	0.0013	18	0.00179	0.00289	12	0.00092	0.00005	0.0001	23.4	0.000831	3.32	0.0001	0.54	0.0003	0.00001	0.00137	0.0005	0.001	0.0003
W16	8/9/2018 8:35	-	-	164.6	8.19	-	-	16.7	77.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W16	8/10/2018 9:30	-	-	192.6	8.14	-	-	15.6	86.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W16	8/13/2018 13:50	167	467	172.6	7.96	285	5.2	18.7	86.7	0.0107	1.7	0.0119	70.9	5.31	-	0.00001	0.0042	0.00047	0.0812	0.014	0.00002	0.00005	64.7	0.0000005	0.0001	0.0001	0.0312	0.02	0.0000005	2.91	0.0012	20.6	0.00318	0.00296	13.3	0.00097	0.00005	0.0001	22.3	0.000789	3.24	0.0001	0.605	0.0003	0.00001	0.00127	0.0005	0.001	0.0003
W16	8/20/2018 10:00	336	946	163.9	8.12	559	6	14.8	57.9	0.0185	3.44	0.0368	140.2	10.22	-	0.00002	0.0169	0.00091	0.1524	0.031	0.00004	0.0001	121.8	0.0000178	0.0002	0.00041	0.059	0.058	0.00001	5.46	0.0024	38.6	0.00342	0.00595	25.1	0.00173	0.0001	0.0002	49.3	0.001641	6.79	0.0002	1.181	0.00132	0.00002	0.00277	0.001	0.002	0.0006
W16	8/27/2018 11:00	162	451	122.2	8.05	264	6.6	13.8	68.4	0.0084	1.66	0.0102	70.5	5.3	-	0.00001	0.0122	0.00045	0.0799	0.01	0.00002	0.00005	48.6	0.000009	0.0001	0.0001	0.0288	0.023	0.0000005	2.82	0.001	18.9	0.00247	0.00227	12.9	0.0008	0.00005	0.0001	25.1	0.000767	3.51	0.0001	0.445	0.0003	0.00001	0.00099	0.0005	0.001	0.0003
W16	9/3/2018 9:35	173	478	151.1	7.87	278	3	11	60.4	0.0097	1.64	0.0248	69.8	5.67	-	0.00001	0.0046	0.00041	0.0708	0.014	0.00002	0.00005	59.1	0.0000068	0.0001	0.00013	0.0269	0.023	0.0000005	2.53	0.0012	18.1	0.0739	0.00284	12.1	0.00076	0.00005	0.0001	23	0.000752	3.52	0.0001	0.554	0.00037	0.00001	0.00129	0.0005	0.001	0.0003
W16	9/12/2018 16:20	178	465	144.5	8.04	280	3	11.6	97	0.0082	1.48	0.0069	68	5.51	-	0.00001	0.0019	0.00038	0.0758	0.014	0.00002	0.00005	60.9	0.000005	0.0001	0.0001	0.0251	0.011	0.0000005	2.58	0.0013	17.5	0.00191	0.00296	12	0.0009	0.00005	0.0001	21.2	0.000571	3.32	0.0001	0.61	0.0003	0.00001	0.00144	0.0005	0.001	0.0003
W16	9/17/2018 16:50	182	478	127.4	7.99	285	5.6	10.1	80.7	0.0067	1.39	0.0084	69.6	5.85	-	0.00001	0.0024	0.00043	0.0699	0.015	0.00002	0.00005	60.3	0.000005	0.0001	0.00011	0.0262	0.016	0.0000005	2.47	0.0012	18.4	0.0176	0.00293	12.5	0.00074	0.00005	0.0001	23.2	0.000732	3.67	0.0001	0.56	0.0003	0.00001	0.00132	0.0005	0.001	0.0003
W16	9/24/2018 10:40	128	470	156.7	7.95	255	5.3	7.1	73.6	0.0055	1.33	0.0162	68.9	5.88	-	0.00001	0.0029	0.00041	0.0743	0.016	0.00002	0.00005	63	0.0000051	0.0001	0.0001	0.0264	0.014	0.0000005	2.96	0.0013	19.2	0.00378	0.00304	12.8	0.00089	0.00005	0.0001	23.2	0.00067	3.67	0.0001	0.595	0.0003	0.00001	0.00135	0.0005	0.001	0.0003
W16	10/1/2018 9:25	367	981	177.7	7.77	574	6.6	6.1	77.7	0.0113	2.5	0.0226	135.2	11.96	-	0.00002	0.019	0.00087	0.1477	0.029	0.00004	0.0001	123	0.0000114	0.0002	0.00026	0.0505	0.054	0.00001	5.49	0.0026	39	0.0298	0.00563	26.7	0.00161	0.0001	0.0002	47.4	0.00138	7.72	0.0002	1.127	0.00186	0.00002	0.00246	0.001	0.0022	0.0006
W16	10/8/2018 10:30	187	484	137.8	8.06	295	5.2	1.5	80.7	0.0059	1.24	0.0127	70.7	6.33	-	0.00001	0.0021	0.00042	0.0802	0.015	0.00002	0.00005	62.5	0.000006	0.0001	0.00012	0.0248	0.018	0.0000005	2.89	0.0013	20.8	0.00255	0.00314	13.8	0.00081	0.00005	0.0001	24.3	0.00071	4.07	0.0001	0.635	0.0003	0.00001	0.00131	0.0005	0.0021	0.0003
W16	10/15/2018 15:00	157	446	147.4	8.12	238	13.3	2.2	86.8	0.0048	1.09	0.008	65.1	5.74	-	0.00001	0.0141	0.00028	0.0515	0.01	0.00002	0.00005	42.5	0.000005	0.0001	0.0001	0.0201	0.026	0.0000005	1.91	0.001	14	0.00257	0.00207	9.54	0.00053	0.00005	0.0001	16.1	0.000401	2.52	0.0001	0.422	0.00117	0.00001	0.000939	0.0005	0.001	0.0003
W16	11/19/2018 14:30	197	489	205.1	8.21	303	3	3.3	67.6	0.003	1.15	0.0251	71.7	6.49	-	0.00001	0.0021	0.00039	0.0737	0.017	0.00002	0.00005	63.9	0.0000057	0.0001	0.00013	0.0231	0.015	0.0000005	2.77	0.0014	21.1	0.00256	0.00303	13.8	0.0011	0.00005	0.0001	24.3	0.000727	4.06	0.0001	0.603	0.0003	0.00001	0.00145	0.0005	0.009	0.0003
W16	12/1/2018 11:00	196	509	181.3	8.1	312	3	1.2	98.9	0.0025	1.13	0.0276	70.8	6.51	0.262	0.00001	0.0047	0.0004	0.0812	0.016	0.00002	0.00005	71.2	0.0000094	0.0001	0.0001	0.0242	0.015	0.0000005	3.15	0.0014	22.2	0.00255	0.00334	15.1	0.00078	0.00005	0.0001	25.6	0.000873	4.3	0.0001	0.701	0.0003	0.00001	0.00154	0.0005	0.004	0.0003
W16	1/4/2019 11:40	196	505	211.1	7.79	309	16.4	0	63.1	0.01	1.06	0.0322	72.1	6.79	-	0.00001	0.0016	0.00036	0.0773	0.016	0.00002	0.00005	70.5	0.0000099	0.0001	0.00011	0.0238	0.014	0.0000005	2.91	0.0016	20.6	0.0041	0.00337	13.7	0.00074	0.00005	0.0001	24.6	0.000618	4.35	0.0001	0.686	0.0003	0.00001	0.00153	0.0005	0.0067	0.0003
W16	2/11/2019 15:45	207	527	262.2	7.69	319	3.7	0.1	6.8	0.002	1.03	0.0389	72.4	7.48	-	0.00001	0.0018	0.00042	0.0801	0.02	0.00002	0.00005	70.4	0.000175	0.0001	0.00015	0.0233	0.016	0.0000005	3.23	0.0015	21.8	0.00836	0.00355	14.7	0.00083	0.00005	0.00011	25.2	0.000744	4.57	0.0001	0.681	0.0003	0.00001	0.00169	0.0005	0.0249	0.0003
W16	3/11/2019 15:15	207	525	-	7.91	320	3	0.4	37.1	0.0023	0.967	0.0233	74.6	7.34	-	0.00001	0.0022	0.00044	0.0842	0.018	0.00002	0.00005	68.2	0.0000685	0.0001	0.00019	0.0228	0.019	0.0000005	3.34	0.0015	22.1	0.0164	0.00342	15.5	0.00085	0.00005	0.0001	26	0.000629	4.9	0.0001	0.637	0.0003	0.00001	0.00166	0.0005	0.0171	0.0003
W16	4/22/2019 11:15	53.7	150	179	7.55	76.1	4.1	4.5	64.5	0.0012	0.214	0.0059	15.1	2.15	-	0.00001	0.0085	0.0001	0.0224	0.01	0.00002	0.00005	16.2	0.0000076	0.0001	0.0001	0.00754	0.014	0.0000005	0.99	0.001	4.78	0.0274	0.000781	3.63	0.0005	0.00005	0.0001	5.42	0.000211	1.22	0.0001	0.145	0.0003	0.00001	0.00026	0.0005	0.0019	0.0003
W16	4/24/2019 9:25	-	-	215.2	8.11	-	-	2.5	56.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W16	4/30/2019 10:35	-	-	208	7.64	-	-	6.1	73.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W16	5/6/2019 15:40	175	454	283.6	7.55	264	3	7.9	140.5	0.0022	0.368	0.0072	58.8	6.14	-	0.00001	0.0014	0.00034	0.06	0.015	0.00002	0.00005	58.5	0.000005	0.0001	0.0001	0.0181	0.013	0.0000005	2.43	0.0012	18.8	0.00971	0.00267	12.5	0.00054	0.00005	0.0001	21.3	0.000433	3.42	0.0001	0.53	0.0003	0.00001	0.00131	0.0005	0.001	0.0003
W16	5/13/2019 9:35	-	-	201.7	7.72	-	-	9.3	98.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W16	5/20/2019 13:10	-	-	169.4	8.29	-	-	13.5	111.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W16	6/3/2019 13:30	185	459	142.9	8.56	276	3.7	14.8	88.6	0.001	0.005	0.0087	63.3	6.83	-	0.00001	0.002	0.00037	0.0656	0.015	0.00002	0.00005	60.1	0.0000051	0.0001	0.0001	0.0164	0.017	0.0000005	2.84	0.0012	19.7	0.00572	0.00316	12.6	0.00053	0.00005	0.0001	22.6	0.000382	1.82	0.0001	0.567	0.0003	0.00001	0.00146	0.0005	0.001	0.0003
W16	6/10/2019 11:00	-	-	134.9	8.6	-	-	15.4	117	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W16	6/17/2019 8:50	-	-	158.5	8.27	-	-	16.5	85.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W16	6/24/2019 11:20	-	-	111.3	8.51	-	-	21.1	88.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W16	7/1/2019 13:25	-	-	140.1	8.41	-	-	21.4	79.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W16	7/8/2019 8:50	201	482	125.9	8.44	298	3	20	72.8	0.001	0.005	0.005	64.7	7.42	-	0.00001	0.0014	0.00051	0.0759	0.016	0.00002	0.00005	65.9	0.000005	0.0001	0.0001	0.0137	0.01	0.0000005	3.2	0.0013	21.4	0.00247	0.00376	14.4	0.00065	0.00005	0.0001	23.4	0.000424	1.89	0.0001	0.65	0.0003	0.00001	0.00161	0.0005	0.001	0.0003
W16	7/15/2019 8:50	-	-	93.9	8.51	-	-	18.2	66.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W16	7/22/2019 7:20	-	-	35.7	7.85	-	-	18.6	65.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W16	7/30/2019 14:00	-	-	115.3	8.03	-	-	18	63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W16	8/6/2019 8:30	225	-	96.2	8.19	321	3	18.3	69.3	0.001	0.0101	0.0199	65.4	7.81	-	0.00001	0.002	0.0006	0.0749	0.017	0.00002	0.00005	69.9	0.000005	0.0001	0.0001	0.0134	0.01	0.0000005	3	0.0013	23.9	0.00153	0.00375	15.7	0.0005	0.00005	0.0001	23.9	0.000455	2.39	0.0001	0.615	0.0003	0.00001	0.0013	0.0005	0.0013	0.0003
W16	8/13/2019 11:50	212	498	148.9	8.03	303	6	16.2	58.6	0.001	0.0141	0.0187	65.7	7.96	0.304	0.00001	0.0021	0.00062	0.0765	0.017	0.00002	0.00005	62.1	0.000005	0.0001	0.0001	0.0132	0.01	0.0000005	2.92	0.0013	20.2	0.00509	0.00385	14.5	0.00061	0.00005	0.0001	22.7	0.000484	2.35	0.0001	0.632	0.0003	0.00001	0.00142	0.0005	0.001

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | Dissolved Elements | | | | | | | |

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | Dissolved Elements | | | | | | | |

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | Dissolved Elements | | | | | | | |

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | Dissolved Elements | | | | | | | |

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | | | | Dissolved Elements | | | | | | | | |

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | Dissolved Elements | | | | | | | |

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | Dissolved Elements | | | | | | | |

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | Dissolved Elements | | | | | | | |

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | Dissolved Elements | | | | | | | |

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | | | Dissolved Elements | | | | | | | |

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | Dissolved Elements | | | | | | | |

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | Dissolved Elements | | | | | | | |

Attachment 3: Sitewide Database

Station	Date / Time	General Parameters								Anions & Nitrogen Species						Dissolved Elements																																
		Alk-T	Cond-L	ORP	pH-F	TDS	TSS	Temp-F	O-DO-%	$N\text{-}NO_2$	$N\text{-}NO_3$	$N\text{-}NH_3$	SO_4-D	Chlord	Fluord	Ag-D	Al-D	As-D	Ba-D	B-D	Be-D	Bi-D	Ca-D	Cd-D	Co-D	Cr-D	Cu-D	Fe-D	Hg-D	K-D	Li-D	Mg-D	Mn-D	Mo-D	Na-D	Ni-D	Pb-D	Sb-D	S-D	Se-D	Si-D	Sn-D	Sr-D	Ti-D	Tl-D	U-D	V-D	Zn-D	Zr-D
		mg/L	µS/cm	mV		mg/L	mg/L	°C	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
W2	9/10/2009 0:00	-	399	-	8.14	260	8	6.31	106.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	9/11/2009 0:00	-	398	-	8.2	260	7	7.73	108.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	9/12/2009 0:00	-	400	-	8.39	270	7	7.08	111.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	9/13/2009 0:00	110	383	-	8.19	270	6	7.45	109.6	0.019	4.6	0.005	-	-	-	0.00002	0.048	0.0003	0.095	0.05	0.0001	0.001	46.8	0.00001	0.0005	-	0.0015	0.032	0.00002	2.47	0.005	12.8	0.01	0.009	14.5	0.001	0.0002	0.0005	16	0.0011	4.4	0.005	0.542	0.005	0.00005	0.0006	0.005	0.005	0.0005
W2	9/14/2009 0:00	-	400	-	8.22	250	6	6.4	109.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	9/15/2009 0:00	-	404	-	8.12	260	7	5.49	110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	9/16/2009 0:00	-	404	-	8.25	260	4	6.84	106.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	9/17/2009 0:00	-	406	-	8.02	250	6	7.06	105.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	9/18/2009 0:00	-	404	-	8.45	250	6	5.23	107.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	9/19/2009 0:00	-	408	-	8.21	250	4	5.77	110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	9/20/2009 0:00	-	410	-	8.24	230	4	5.93	109.8	0.014	5.1	0.005	-	-	-	0.00002	0.038	0.0004	0.093	0.05	0.0001	0.001	46.8	0.00002	0.0005	-	0.0015	0.029	0.00006	2.53	0.005	12.7	0.013	0.01	14.5	0.001	0.0002	0.0005	17	0.0013	4.4	0.005	0.565	0.005	0.00005	0.0006	0.005	0.005	0.0005
W2	9/21/2009 0:00	-	405	-	7.93	270	4	5.94	110.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	9/22/2009 0:00	-	408	-	8.08	240	4	4.41	108	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	9/23/2009 0:00	-	402	-	8.28	250	4	6.04	110.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	9/24/2009 0:00	-	396	-	8.09	240	5	5.51	108.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	9/25/2009 0:00	-	400	-	8.12	250	5	5.71	107.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	9/26/2009 0:00	-	403	-	8.24	230	4	5.95	110.3	0.012	5.3	0.005	-	-	-	0.00002	0.033	0.0004	0.095	0.05	0.0001	0.001	45.9	0.00002	0.0005	-	0.0015	0.03	0.00003	2.52	0.005	12.9	0.013	0.01	13.6	0.001	0.0002	0.0005	17	0.0012	4.87	0.005	0.562	0.005	0.00005	0.0006	0.005	0.005	0.0005
W2	9/27/2009 0:00	-	398	-	8.13	270	5	4.07	113	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	9/28/2009 0:00	-	406	-	8.11	240	5	2.78	112.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	9/29/2009 0:00	-	427	-	8.33	240	4	1.45	77.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	9/30/2009 0:00	-	428	-	8.02	260	4	2.17	40.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	10/1/2009 0:00	-	420	-	7.82	250	5	3.53	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	10/2/2009 0:00	-	378	-	7.79	240	4	2.38	99.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	10/3/2009 0:00	-	423	-	7.65	190	6	2.16	114.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	10/4/2009 0:00	-	416	-	7.7	270	5	2.79	105.5	0.014	4.9	0.005	-	-	-	0.00002	0.032	0.0004	0.092	0.05	0.0001	0.001	47.8	0.00002	0.0005	-	0.0013	0.025	0.00006	2.51	0.005	13.2	0.017	0.011	13.7	0.001	0.0002	0.0005	19	0.0013	4.31	0.005	0.589	0.005	0.00005	0.0007	0.005	0.005	0.0005
W2	10/5/2009 0:00	-	418	-	7.8	270	4	2.63	118	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	10/6/2009 0:00	-	408	-	8.03	270	7	3.08	119	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	10/7/2009 0:00	-	422	-	8.1	280	4	1.95	119.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	10/8/2009 0:00	-	419	-	8.03	270	5	2.22	117.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	10/9/2009 0:00	-	423	-	8	270	5	2.29	118.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	10/10/2009 0:00	-	427	-	8.05	260	4	2.25	96.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	10/11/2009 0:00	-	429	-	8.11	270	4	1.75	96.3	0.013	5.7	0.005	-	-	-	0.00002	0.039	0.0004	0.094	0.05	0.0001	0.001	51.2	0.00001	0.0005	-	0.0014	0.029	0.00002	2.62	0.005	14.1	0.032	0.011	14.9	0.001	0.0002	0.0005	20	0.0014	4.68	0.005	0.606	0.005	0.00005	0.0006	0.005	0.005	0.0005
W2	10/12/2009 0:00	-	431	-	8.16	260	6	0.99	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	10/13/2009 0:00	-	447	-	8.13	260	9	-0.08	117.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	10/14/2009 0:00	-	453	-	8.43	240	9	-0.08	133.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	10/15/2009 0:00	-	458	-	8.4	270	4	-0.08	132	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	10/16/2009 0:00	-	457	-	7.7	240	9	-0.07	132.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	10/17/2009 0:00	-	456	-	8.2	240	12	0	137.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	10/18/2009 0:00	-	449	-	8.3	240	4	1.14	140	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	10/19/2009 0:00	-	446	-	8.3	200	4	1.38	133.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	10/20/2009 0:00	130	422	-	8.25	180	4	0.08	124.6	0.005	4.6	0.005	-	-	0.32	0.00002	0.018	0.0003	0.09	0.05	0.0001	0.001	51.2	0.00001	0.0005	-	0.0016	0.029	0.00002	2.34	0.005	13.9	0.013	0.008	13.3	0.001	0.0002	0.0005	17	0.0013	5.62	0.005	0.623	0.005	0.00005	0.001	0.005	0.005	0.0005
W2	10/21/2009 0:00	-	401	-	8.21	220	4	0.73	116.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	10/22/2009 0:00	-	396	-	8.25	200	47	0.84	99.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	10/23/2009 0:00	-	398	-	8.13	200	4	1.28	100.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	10/24/2009 0:00	-	393	-	8.09	210	4	0.57	93.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	10/25/2009 0:00	130	395	-	8.11	220	4	0.52	98	0.01	13.3	0.01	-	-	-	0.00002	0.014	0.0003	0.08	0.05	0.0001	0.001	48.3	0.00001	0.0005	-	0.0016	0.026	0.00002	2.11	0.005	13.4	0.009	0.007	12.1	0.001	0.0002	0.0005	15	0.0008	4.85	0.005	0.537	0.005	0.00005	0.001	0.005	0.005	0.0005
W2	10/26/2009 0:00	-	396	-	8.16	230	4	1.23	95.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	10/27/2009 0:00	130	395	-	8.05	220	4	0.83	92.9	0.005	3.8	0.005	-	-	-	0.00002	0.014	0.0004	0.081	0.05	0.0001	0.001	48	0.00002	0.0005	-	0.0015	0.042	0.00007	2.01	0.005	13.1	0.01	0.007	11.7	0.001	0.0002	0.0005	14	0.0009	5.44	0.005	0.529	0.005	0.00005	0.001	0.005	0.005	0.0005
W2	10/28/2009 0:00	-	388	-	8.12	210	4	0.66	94.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	10/29/2009 0:00	-	389	-	7.79	240	4	0.16	115.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	10/30/2009 0:00	-	395	-	7.81	230	4	-0.05	113.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	11/5/2009 0:00	-	-	-	7.65	-	-	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W2	11/6/2009 0:00	134	313	-	-	230	2	-	-	-	0.95	-	25	6.01	-	0.00001	0.009	0.0004	0.065	0.011	0.00004	0.001	39.5	0.00002	0.00011	0.0004	0.002	0.03	0.00008	1.5	0.002	12.2	0.0086	0.0022	9.2	0.002	0.0001	0.0007	8.3	0.0006	5.13	0.0001	0.448	0.01	0.00001	0.0012	0.0004	0.002	0.0002
W2	4/7/2010 0:00	500	1167	-	7.81	764	69	1	-	-	-	-	101.4	9.95	-	0.00001	0.005	0.0004	0.097	0.006	0.00004	0.001	66.7	0.00005	0.00032	0.0006	0.008	0.04	0.00001	4	0.003	27.5	0.0337	0.0014	18.8	0.001	0.0002	0.0021	17.3	0.0006	9	0.0001	0.642	0.01	0.00001	0.0016	0.0004	0.004	0.0003
W2	4/19/2010 0:00	92	189	-	7.69	174	49	1.1	-	-	0.02	-	10	1.49	-	0.00001	0.012	0.0004	0.035	0.004	0.00004	0.001	23.4	0.00001	0.00041	0.0004	0.005	0.06	0.00001	2.5	0.001	7.8	0.0468	0.0006	5.2	0.001	0.0002	0.0024	3.4	0.0006	4.24	0.0001	0.193	0.01	0.00001	0.0004	0.0003	0.005	0.0001
W2	4/20/2010 0:00	64	134	-	7.76	148	12	1	-	-	0.04	-	6.5	1.26	-	0.00001	0.07	0.0005	0.024	0.006	0.00004	0.001	17.9	0.00001	0.00046	0.0004	0.009	0.15	0.00002	1.9	0.001	5.2	0.0268	0.0002	2.4	0.001	0.0004	0.0041	1.5	0.0006	2.58	0.0001	0.083	0.01	0.00001	0.0004	0.0004	0.007	0.0002
W2	4/21/2010 0:00	38	86	-	6.88	130	19	1	-	-	0.02	-	4.5	0.97	-	0.00001	0.07	0.0005	0.024	0.006	0.00004	0.001	12.3	0.00001	0.00055	0.0004	0.009	0.15	0.00002	1.9	0.001	3.6	0.0268	0.0002	2.4	0.001	0.0004	0.0041	1.5	0.0006	2.58	0.0001	0.083	0.01	0.00001	0.0004	0.0004	0.008	0.0003
W2	4/22/2010 0:00	43	98	-	6.93	130	8	1	-	-	0.06	-	3.7	1.01	-	0.00001	0.039	0.0004	0.025	0.004	0.00004	0.001	14	0.00001	0.00002	0.0004	0.005	0.14	0.00002	1.9	0.001	4.1	0.002	0.0002	2.6	0.002	0.0001	0.0002	1.2	0.0006	2.8	0.0002	0.096	0.01	0.00001	0.0004	0.0004	0.008	0.0003
W2	4/23/2010 0:00	45	96	-	7.64	114	5	0	152.7	-	-	-	4	0.95	-	0.00001	0.047	0.0004	0.026	0.004	0.00004	0.001	14.3	0.00002	0.00007	0.0004	0.005	0.15	0.00001	1.8	0.001	4.2	0.0011	0.0003	2.7	0.001	0.0002	0.0002	1.3	0.0006	2.98	0.0001	0.099	0.01	0.00001	0.0004	0.0004	0.001	0.0002
W2	4/24/2010 0:00	45	97	-	7.53	120	3	-	111.3	-	-	-	3.9	0.97	-	0.00001	0.048	0.0004	0.026	0.004	0.00004	0.001	14.2	0.00001	0.00007	0.0004	0.004	0.19	0.00001	1.7	0.001	4.2	0.0014	0.0004	2.7	0.001	0.0001	0.0002	1.3	0.0006	3.07	0.0001	0.101	0.01	0.00001	0.0004	0.0005	0.002	0.0003
W2	4/25/2010 0:00	41	89	-	7.78	110	15	0	81.1	-	-	-	3.5	0.77	-	0.00001	0.057	0.0004	0.025	0.004	0.00004	0.001	12.4	0.00001	0.00006	0.0004	0.004	0.21	0.00001	1.4	0.001	3.7	0.0009	0.0003	2.4	0.001	0.0001	0.0002	1.2	0.0006	2.77	0.0001	0.093	0.01	0.00001	0.0004	0.0006	0.001	0.0003
W2	4/26/2010 0:00	42	83	-	7.23	90	21	0.01	151.6	0.03	0.1	0.045	0.5	1.8	0.12	0.00002	0.063	0.0004	0.027	0.05	0.0001	0.001	13.2	0.00001	0.00002	0.0004	0.004	0.23	0.00002	1.38	0.005	3.53	0.001	0.001	2.32	0.001	0.0002	0.0005	3	0.0001	3.43	0.0001	0.09	0.005	0.00005	0.0001	0.005	0.005	0.0005
W2	4/27/2010 0:00	38	77	-	7.63	70	31	0	122.2	0.009	0.08	0.025	0.5	1.5	0.11	0.00002	0.075	0.0005	0.025	0.05	0.0001	0.001	11.3	0.00001	0.0005	-	0.0038	0.322	0.00002	1.25	0.005	2.97	0.001	0.001	2.02	0.001	0.0002	0.0005	3	0.0001	3.06	0.005	0.076	0.005	0.00005	0.0001	0.005	0.005	0.0005
W2	4/28/2010 0:00	36	73	-	7.87	70	41	0	17	0.03	0.1	0.55	0.5	1	0.1	0.00002	0.1	0.0005	0.025	0.05	0.0001	0.001	10.9	0.00003	0.0005	-	0.0047	0.374	0.00002	1.21	0.005	2.88	0.001	0.001	2.1	0.001	0.0002	0.0005	3	0.0001	3.1	0.005	0.072	0.005	0.00005	0.0001	0.005	0.005	0.0005
W2	4/29/2010 0:00	39	78	-	7.87	74	37	-0.02	11.5	0.02	0.04	0.026	0.5	1.1	0.11	0.00002	0.103	0.0005	0.027	0.05	0.0001	0.001	11.4	0.00017	0.0005	-	0.0046	0.505	0.00002	1.13	0.005	3.02	0.002	0.001	2.18	0.002	0.0002	0.0005	3	0.0001	3.12	0.005	0.081	0.005	0.00005	0.0001	0.005	0.005	0.0005
W2	4/30/2010 0:00	39	79	-	7.9	70	71	0.18	54	-	0.2	0.005	0.5	1.7	0.12	0.00002	0.094	0.0006	0.03	0.05	0.0001	0.001	10.5	0.00001	0.0005	-	0.0037	0.481	0.00002	0.96	0.005	2.97	0.001	0.001	2.16	0.002	0.0002	0.0005	3	0.0001	2.83	0.005	0.075	0.005	0.00005	0.0001	0.005	0.005	0.0005
W2	5/1/2010 0:00	48	102	-	7.11	98	38	0	89.2	0.006	0.03	0.035	0.5	1.6	0.14	0.00002	0.064	0.0005	0.031	0.05	0.0001	0.001	13.6	0.00002	0.0005	-	0.0035	0.38	0.00002	1.02	0.005	3.87	0.001	0.001	2.66	0.002	0.0002	0.0005	3	0.0001	3.31	0.005	0.099	0.005	0.00005	0.0001	0.005	0.005	0.0005
W2	5/2/2010 0:00	58	129	-	7.88	94	27	0	45.6	0.006	0.09	0.022	0.5	1.4	0.15	0.00002	0.053	0.0005	0.034	0.05	0.0001	0.001	16.3	0.00001	0.0005	-	0.0031	0.37	0.00002	1.11	0.005	4.74	0.001	0.001	3.17	0.001	0.0002	0.0005	3	0.0001	3.76	0.005	0.118	0.005	0.00005	0.0002	0.005	0.005	0.0005
W2	5/3/2010 0:00	58	122	-	7.98	68	25	0.35	17.5	0.006	0.02	0.024	0.5	1.5	0.17	0.00002	0.043	0.0006	0.034	0.05	0.0001	0.001	15.8	0.00001	0.0005	-	0.0028	0.385	0.00002	1.02	0.005	4.61	0.001	0.001	3.17	0.001	0.0002	0.0005	3	0.0001	3.47	0.005	0.117	0.005	0.00005	0.0002	0.005	0.005	0.0005
W2	5/4/2010 0:00	64	133	-	7.89	72	11	0	101.2	-	0.2	0.028	0.5	1.6	0.17	0.00002	0.032	0.0005	0.034	0.05	0.0001	0.001	17.2	0.00002	0.0005	-	0.0029	0.352	0.00002	1.02	0.005	5	0.001	0.001	3.45	0.001	0.0002	0.0005	3	0.0001	3.79	0.005	0.131	0.005	0.00005	0.0002	0.005	0.005	0.0005
W2	5/5/2010 0:00	69	144	-	7.95	100	6	0	74.8	0.005	0.02	0.01	3.3	1.3	0.18	0.00002	0.026	0.0006	0.036	0.05	0.0001	0.001	19.9	0.00001	0.0005	-	0.0029	0.312	0.00002	1.11	0.005	5.67	0.001	0.001	3.74	0.001	0.0002	0.0005	3	0.0001	4.26	0.005	0.148	0.005	0.00005	0.0003	0.005	0.005	0.0005
W2	5/6/2010 0:00	74	155	-	8.09	130	5	0	132.3	0.005	0.03	0.05	5.5	1.1	0.17	0.00002	0.024	0.0005	0.036	0.05	0.0001	0.001	21.1	0.00001	0.0005	-	0.0026	0.324	0.00002	1.09	0.005	6.1	0.001	0.001	4.01	0.001	0.0002	0.0005	4	0.0001	4.61	0.005	0.161	0.005	0.00005	0.0004	0.005	0.005	0.0005
W2	5/7/2010 0:00	78	160	-	8.13	120	4	0	64.8	0.005	0.02	0.01	7.9	1.2	0.19	0.00002	0.021	0.0005	0.038	0.05	0.0001	0.001	21.1	0.00001	0.0005	-	0.0026	0.273	0.00002	1.09	0.005	6.32	0.001	0.001	4.23	0.004	0.0002	0.0005	4	0.0001	4.36	0.005	0.163	0.005	0.00005	0.0004	0.005	0.005	0.0005
W2	5/8/2010 0:00	81	160	-	8.04	120	4	0	127.2	0.005	0.02	0.018	8.1	1.1	0.2	0.00002	0.019	0.0006	0.041	0.05	0.0001	0.001	22.4	0.00001	0.0005	-	0.0025	0.235	0.00002	1.14	0.005	6.85	0.001	0.001	4.62	0.001	0.0002	0.0005	4	0.0001	4.37	0.005	0.174	0.005	0.00005	0.0004	0.005	0.005	0.0005
W2	5/9/2010 0:00	81	159	-	8.01	140	4	0.08	142.1	0.007	0.12	0.01	2.7	0.5	0.2	0.00002	0.016	0.0005	0.039	0.05	0.0001	0.001	23.3	0.00001	0.0005	-	0.0028	0.214	0.00002	1.12	0.005	7.05	0.001	0.001	4.74	0.001	0.0002	0.0005	3	0.0001	4.46	0.005	0.186	0.005	0.00005	0.0005	0.005	0.005	0.0005
W2	5/10/2010 0:00	89	192	-	8.18	130	4	0.04	142.5	0.009	0.11	0.034	13	1.9	0.23	0.00002	0.016	0.0004	0.042	0.05	0.0001	0.001	24.7	0.00004	0.0005	-	0.003	0.199	0.00002	1.18	0.005	7.81	0.001	0.001	5.24	0.001	0.0002	0.0005	5	0.0001	4.44	0.005	0.199	0.005	0.00005	0.0006	0.005	0.005	0.0005
W2	5/11/2010 0:00	93	199	-	-	110	4	-	-	0.005	0.04	0.12	13	3.9	0.17	0.00002

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | Dissolved Elements | | | | | | | |

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | Dissolved Elements | | | | | | | |

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | | | | | | | | | Dissolved Elements | | | | | | | | | | | | | |

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| Station | Date / Time | General Parameters | | | | | | | Anions & Nitrogen Species | | | | | Dissolved Elements | | | | | | |

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| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | | Dissolved Elements | | | | | | | |

Attachment 3: Sitewide Database

Station	Date / Time	General Parameters								Anions & Nitrogen Species						Dissolved Elements																																				
		Alk-T	Cond-L	ORP	pH-F	TDS	TSS	Temp-F	O-DO-%	$N\text{-}NO_2$	$N\text{-}NO_3$	$N\text{-}NH_3$	$SO_4\text{-}D$	Chlord	Fluord	Ag-D	Al-D	As-D	Ba-D	B-D	Be-D	Bi-D	Ca-D	Cd-D	Co-D	Cr-D	Cu-D	Fe-D	Hg-D	K-D	Li-D	Mg-D	Mn-D	Mo-D	Na-D	Ni-D	Pb-D	Sb-D	S-D	Se-D	Si-D	Sn-D	Sr-D	Ti-D	Tl-D	U-D	V-D	Zn-D	Zr-D
		mg/L	µS/cm	mV		mg/L	mg/L	°C	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
W3	5/6/2006 0:00	-	76	-	-	102	82.9	-	-	0.001	0.005	-	-	0.5	0.069	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/8/2006 0:00	-	69	-	-	122	18.4	-	-	0.001	0.005	0.02	-	0.5	0.063	0.00001	0.124	0.00031	0.027	0.01	0.0005	0.0005	11.1	-	0.0002	0.0005	0.0185	0.22	-	2	0.005	3.8	0.0255	0.00032	2	-	0.00136	0.000052	0.0001	-	0.01	2.51	0.0001	0.057	0.01	0.0001	0.000067	0.001	0.0057	-
W3	5/10/2006 0:00	29.9	82.2	-	-	118	13.8	-	-	0.001	0.005	-	5.48	0.5	0.078	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/14/2006 14:30	35.5	93	-	-	116	46.8	-	-	0.001	0.005	0.049	6.85	0.5	0.158	0.00001	0.0846	0.0004	0.0323	0.01	0.0005	0.0005	13.8	-	0.00026	0.0005	0.0146	0.285	-	2	0.005	4.32	0.0901	0.000572	2.3	0.00159	0.00007	0.0001	-	0.001	2.95	0.00027	0.0843	0.01	0.0001	0.000123	0.001	0.0024	-
W3	5/17/2006 15:00	43.2	105	-	-	131	7.1	-	-	0.001	0.005	-	7.66	0.5	0.105	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/20/2006 16:00	55.4	125	-	-	126	6.1	-	-	0.001	0.005	-	10.3	0.5	0.136	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/23/2006 16:00	68.4	161	-	-	133	17.8	-	-	0.001	0.005	0.012	15.4	0.5	0.149	0.00001	0.0383	0.00043	0.0367	0.01	0.0005	0.0005	19	-	0.00011	0.0005	0.0102	0.167	-	2	0.005	8.52	0.0292	0.00101	5.3	0.00152	0.00005	0.0001	-	0.001	3.58	0.0001	0.134	0.01	0.0001	0.000286	0.001	0.001	-
W3	5/26/2006 16:00	74	166	-	-	139	5.9	-	-	0.0015	0.013	-	19	0.5	0.143	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/29/2006 16:00	55.2	120	-	-	120	13.4	-	-	0.001	0.0075	-	11.9	0.5	0.122	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	6/2/2006 16:00	68.7	136	-	-	129	26.4	-	-	0.001	0.005	0.022	12.2	0.5	0.127	0.00001	0.0507	0.00049	0.0351	0.01	0.0005	0.0005	19.1	-	0.0001	0.0005	0.0116	0.198	-	2	0.005	7.63	0.00826	0.000854	4.9	0.00204	0.00005	0.0001	-	0.001	3.94	0.0001	0.124	0.01	0.0001	0.00019	0.001	0.0013	-
W3	6/7/2006 16:57	69.7	143	-	-	134	7.1	-	-	0.0011	0.0179	0.043	14.3	0.5	0.126	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	6/15/2006 0:00	134	323	-	-	196	2	-	-	-	0.12	0.013	34	-	-	-	0.009	0.0004	0.061	0.004	0.0001	0.0005	40.7	0.00001	0.0001	0.0005	0.005	0.04	-	0.6	0.001	16.3	0.005	0.001	10.8	0.0009	0.0001	0.0002	11.7	0.0002	5.73	0.001	0.323	0.0008	0.00005	0.0009	0.0012	0.001	-
W3	6/23/2006 0:00	164	382	-	-	266	4	-	-	-	0.03	0.007	47	-	-	-	0.006	0.0004	0.065	0.004	0.0001	0.0005	46.6	0.00001	0.0001	0.0006	0.003	0.03	-	1.4	0.001	18	0.006	0.002	11	0.001	0.0001	0.0002	13.8	0.0002	5.77	0.001	0.405	0.0007	0.00005	0.0014	0.0009	0.003	-
W3	6/28/2006 0:00	138	334	-	-	212	4	-	-	-	0.025	0.002	-	-	-	-	0.005	0.0004	0.056	0.004	0.0001	0.0005	39	0.00001	0.0001	0.0005	0.008	0.03	-	1.4	0.001	16.9	0.005	0.002	10.2	0.0012	0.0001	0.0002	12.9	0.0002	6.49	0.001	0.304	0.0009	0.00005	0.0008	0.0009	0.002	-
W3	7/7/2006 0:00	158	319	-	-	249	14	-	-	-	0.086	-	38	-	-	-	0.005	0.0004	0.067	0.007	0.0001	0.0007	40.9	0.00001	0.0001	0.0014	0.005	0.03	-	1.2	0.002	18.8	0.005	0.002	11.3	0.0014	0.0001	0.0002	14.6	0.0002	7	0.001	0.387	0.0013	0.00005	0.001	0.0012	0.001	-
W3	7/12/2006 0:00	164	372	-	-	-	2	-	-	-	0.11	0.006	39	-	-	-	0.005	0.0004	0.07	0.007	0.0001	0.0007	42.6	0.00001	0.0001	0.0014	0.004	0.02	-	1.5	0.002	18.6	0.005	0.002	11	0.0005	0.0001	0.0002	14.4	0.0002	5.86	0.001	0.408	0.001	0.00005	0.0008	0.002	0.001	-
W3	7/20/2006 0:00	174	378	-	-	-	16	-	-	-	0.03	0.006	42	-	-	-	0.007	0.0003	0.084	0.004	0.0001	0.0005	48.6	0.00001	0.0001	0.0005	0.004	0.04	-	1.6	0.001	21.2	0.01	0.001	13.1	0.0005	0.0001	0.0002	16.8	0.0002	6.88	0.001	0.294	0.001	0.00005	0.0011	0.0013	0.001	-
W3	7/26/2006 0:00	171	405	-	-	-	2	-	-	-	0.04	0.007	45	-	-	-	0.005	0.0002	0.082	0.002	0.0001	0.0005	51.5	0.00001	0.0001	0.0005	0.002	0.03	-	1.7	0.001	19.6	0.012	0.001	13	0.0005	0.0001	0.0002	16.7	0.0002	6.02	0.001	0.301	0.0007	0.00005	0.001	0.0007	0.001	-
W3	8/2/2006 0:00	182	422	-	-	-	18	-	-	-	0.12	0.016	40	-	-	-	0.017	0.0005	0.086	0.006	0.0001	0.0005	45.7	0.00001	0.0002	0.0007	0.003	0.08	-	2.1	0.001	11.9	0.135	0.001	13.6	0.0008	0.0001	0.0002	50.1	0.0002	4.57	0.001	0.284	0.0018	0.00005	0.0021	0.0022	0.002	-
W3	8/10/2006 0:00	183	430	-	-	-	6	-	-	-	0.12	0.013	45	-	-	-	0.021	0.0006	0.078	0.008	0.0001	0.0005	50.1	0.00001	0.0001	0.0011	0.006	0.04	-	1.7	0.002	18.8	0.085	0.002	13.3	0.0007	0.0001	0.0002	15.8	0.0002	6.02	0.001	0.389	0.0016	0.00005	0.0018	0.0021	0.003	-
W3	8/25/2006 0:00	175	413	-	-	282	4	-	-	-	0.03	0.02	43	-	-	-	0.009	0.0004	0.082	0.004	0.0001	0.0005	48.1	0.00001	0.0002	0.0007	0.003	0.04	-	1.5	0.002	20.4	0.041	0.001	12.2	0.0009	0.0001	0.0002	15.7	0.0002	6.7	0.001	0.31	0.0005	0.00005	0.0009	0.002	0.003	-
W3	8/30/2006 0:00	178	406	-	-	294	2	-	-	-	0.03	0.004	39	-	-	-	0.007	0.0004	0.07	0.005	0.0001	0.0005	46.9	0.00001	0.0002	0.0016	0.004	0.05	-	1.4	0.002	18.1	0.027	0.002	11.4	0.0007	0.0001	0.0002	13.5	0.0002	6.15	0.001	0.322	0.0005	0.00005	0.0011	0.0018	0.002	-
W3	9/6/2006 0:00	186	416	-	-	-	2	-	-	-	0.03	0.003	38	-	-	-	0.005	0.0004	0.074	0.005	0.0001	0.0005	51.7	0.00001	0.0001	0.0008	0.004	0.05	-	1.6	0.002	19.7	0.03	0.002	12.7	0.001	0.0001	0.0002	14.6	0.0002	6.44	0.001	0.4	0.001	0.00005	0.0011	0.0018	0.002	-
W3	9/13/2006 0:00	183	407	-	-	-	4	-	-	-	0.008	0.006	42.9	-	-	-	0.006	0.0003	0.071	0.007	0.0001	0.0005	50.6	0.00001	0.0001	0.002	0.003	0.05	-	1.6	0.002	20.3	0.018	0.002	13.4	0.0008	0.0001	0.0002	14.3	0.0002	6.02	0.001	0.372	0.0012	0.00005	0.0012	0.0016	0.002	-
W3	9/20/2006 0:00	190	423	-	-	-	2	-	-	-	0.03	0.004	42	-	-	-	0.006	0.0003	0.074	0.006	0.0001	0.0005	52.2	0.00001	0.0001	0.0007	0.003	0.06	-	1.6	0.002	20.9	0.021	0.002	12.1	0.0005	0.0001	0.0002	15.5	0.0002	6.4	0.001	0.379	0.0005	0.00005	0.0013	0.0019	0.002	-
W3	9/29/2006 0:00	191	434	-	-	-	4	-	-	-	0.03	0.006	43	-	-	-	0.009	0.0004	0.077	0.004	0.0001	0.0005	51.3	0.00001	0.0001	0.0006	0.003	0.03	-	1.6	0.002	20	0.032	0.002	13.2	0.0005	0.0001	0.0002	15	0.0002	6.49	0.001	0.401	0.0011	0.00005	0.0011	0.0006	0.002	-
W3	10/4/2006 0:00	180	413	-	-	-	2	-	-	-	0.03	0.073	43	-	-	-	0.005	0.0005	0.071	0.004	0.0001	0.0005	49.4	0.00001	0.0001	0.0006	0.002	0.06	-	1.6	0.002	19.3	0.038	0.002	12.7	0.0006	0.0001	0.0002	14.8	0.0002	6.2	0.001	0.384	0.0012	0.00005	0.0011	0.0012	0.001	-
W3	10/12/2006 0:00	184	430	-	-	280	2	-	-	-	0.03	0.006	42	-	-	-	0.007	0.0004	0.072	0.006	0.0001	0.0005	51.7	0.00001	0.0001	0.0005	0.003	0.05	-	1.4	0.002	19.6	0.046	0.002	12.6	0.0006	0.0001	0.0002	14.8	0.0004	6.37	0.001	0.392	0.0018	0.00005	0.0011	0.001	0.002	-
W3	10/18/2006 0:00	152	335	-	-	247	1	-	-	0.005	0.05	0.05	-	0.9	-	-	0.005	0.0004	0.083	0.007	0.0001	0.0005	54.8	0.00001	0.0001	0.0005	0.003	0.03	-	1.4	0.002	19.2	0.069	0.001	11.9	0.001	0.0001	0.0002	15	0.0002	6.33	0.001	0.424	0.0009	0.00005	0.0012	0.0011	0.002	-
W3	10/28/2006 0:00	205	456	-	-	130	14	-	-	0.03	0.25	0.029	42	1.12	-	-	0.005	0.0004	0.078	0.017	0.0001	0.0005	48.4	0.00003	0.0002	-	0.001	0.06	0.0001	1.7	0.004	25	0.27	0.002	14	0.0005	0.0001	0.0002	15.5	0.0004	6.48	0.001	0.574	0.0012	0.00005	0.0019	0.0031	0.001	-
W3	11/1/2006 0:00	210	445	-	-	290	2	-	-	0.03	0.23	0.05	42	1.06	-	-	0.006	0.0003	0.078	0.016	0.0001	0.0005	48.5	0.00001	0.0002	0.0008	0.002	0.05	0.0001	1.8	0.004	25.6	0.307	0.002	13.9	0.0025	0.0001	0.0002	14.6	0.0002	6.31	0.001	0.654	0.0013	0.00005	0.0022	0.0007	0.005	-
W3	11/8/2006 0:00	214	469	-	-	304	2	-	-	0.03	0.23	0.071	42	1.21	-	-	0.005	0.0002	0.069	0.02	0.0001	0.0005	51.6	0.00001	0.0001	0.0014	0.001	0.01	0.0001	1.9	0.003	25.6	0.334	0.002	15.4	0.0009	0.0001	0.0002	15.2	0.0006	6.36	0.001	0.634	0.0013	0.00005	0.0016	0.0029	0.002	-
W3	11/16/2006 0:00	248	518	-	-	324	2	-	-	0.03	0.03	0.1	40	1.46	-	-	0.006	0.0006	0.095	0.011	0.0001	0.0005	63.1	0.00002	0.0008	0.0009	0.002	0.29	0.0001	1.7	0.003	26.5	2.16	0.003	15.3	0.0008	0.0001	0.0002	14.9	0.0002	6.98	0.001	0.566	0.0012	0.00005	0.0024	0.0034	0.002	-
W3	11/23/2006 0:00	202	480	-	-	320	2	-	-	0.1	0.31	0.032	46	-	-	-	0.011	0.0005	0.146	0.036	0.0002	0.001	106	0.00005	0.0002	0.0021	0.005	0.13	0.0002	4	0.006	53.6	0.271	0.004	32.5	0.0015	0.0003	0.0004	30.3	0.0006	12.84	0.002	1.255	0.0024	0.0001	0.0049	0.0049	0.004	-
W3	11/30/2006 0:00	215	480	-	-	296	12	-	-	0.005	0.39	0.05	44	-	-	-	0.005	0.0003	0.056	0.019	0.0001	0.0005	49.3	0.00005	0.0001	0.0014	0.004	0.01	0.0001	2	0.004	26	0.006	0.002	15.9	0.0005	0.0005	0.0002	15.4	0.0004	6.34	0.001	0.652	0.0012	0.00005	0.0022	0.0026	0.005	-
W3	12/6/2006 0:00	204	478	-	-	240	5	-	-	0.03	0.37	0.017	41	1.13	-	-	0.006	0.0004	0.056	0.022	0.0001	0.0005	50.9	0.00004	0.0001	0.0018	0.003	0.01	-	2	0.004	26.2	0.006	0.003	15.8	0.0005	0.0001	0.0002	17.4	0.0004	6.49	0.001	0.638	0.0021	0.00005	0.0016	0.0053	0.004	-
W3	12/13/2006 0:00	208	469	-	-	320	30	-	-	0.1	0.46	0.002	42	1.28	-	-	0.005	0.0004	0.058	0.019	0.0001	0.0005	47.6	0.00001	0.0001	0.0006	0.001	0.01	0.0001	1.9	0.003	26.8	0.008	0.002	15.2	0.0002	6.53	0.001	0.661	0.0019	0.00005	0.0023	0.0015	0.012	-
W3	12/20/2006 0:00	210	485	-	-	308	3	-	-	0.1	0.5	0.002	42	1.5	-	-	0.005	0.0003	0.056	0.017	0.0001	0.0005	47	0.00001	0.0001	0.0012	0.001	0.01	0.0001	1.9	0.003	25.6	0.007	0.002	14.2	0.0005	0.0001	0.0002	15	0.0004	6.3	0.001	0.656	0.0012	0.00005	0.0023	0.0022	0.003	-
W3	12/28/2006 0:00	206	460	-	-	308	14	-	-	0.1	0.5	0.002	43	1.9	-	-	0.005	0.0003	0.058	0.021	0.0001	0.0005	50.2	0.00001	0.0001	0.0005	0.001	0.01	0.0001	1.5	0.004	26.9	0.016	0.002	16.6	0.0005	0.0001	0.0002	15.4	0.0006	6.36	0.001	0.659	0.0018	0.00005	0.0022	0.0012	0.001	-
W3	1/4/2007 0:00	193	463	-	-	298	18	-	-	0.03	0.56	0.05	43	2.18	-	-	0.005	0.0003	0.06	0.016	0.0001	0.0005	48.8	0.00001	0.0001	0.0005	0.001	0.01	0.0001	2	0.004	27	0.007	0.002	14.7	0.0005	0.0001	0.0002	15.7	0.0004	6.58	0.001	0.661	0.0014	0.00005	0.0024	0.0007	0.006	-
W3	1/10/2007 0:00	204	482	-	-	288	4	-	-	0.03	0.59	0.05	42	2.39	-	-	0.005	0.0002	0.062	0.017	0.0001	0.0005	51	0.00001	0.0001	0.0008	0.001	0.01	0.0001	2	0.004	26.9	0.008	0.002	15.1	0.0005	0.0002	0.0002	16.2	0.0002	6.7	0.001	0.646	0.0014	0.00005	0.0023	0.0019	0.001	-
W3	4/17/2007 0:00	203	461	-	-	332	24	-	-	0.05	0.2	-	48	4	-	-	0.026	0.0011	0.092	0.014	0.0001	0.0005	59.3	0.00001	0.0006	0.0008	0.008	0.27	-	2.8	0.002	23.8	0.785	0.001	14.1	0.0014	0.0001	0.0002	17	0.0002	6.55	0.001	0.432	0.0034	0.00005	0.0013	0.0025	0.003	-
W3	4/27/2007 0:00	130	313	-	-	274	2	-	-	0.05	1.6	0.05	31	2.5	-	-	0.041	0.0005	0.066	0.007	0.0001	0.0005	46.1	0.00002	0.0002	0.0005	0.007	0.09	0.0001	2.6	0.002	12.6	0.05	0.002	9.6	0.0015	0.0001	0.0002	10.8	0.0002	5.24	0.001	0.287	0.0005	0.00005	0.0024	0.001	0.004	-
W3	5/4/2007 0:00	106	264	-	-	252	6	-	-	0.16	2.9	0.07	22.1	1.7	-	-	0.045	0.0007	0.058	0.009	0.0001	0.0005	38.6	0.00003	0.0002	0.0009	0.014	0.08	0.0001	2.2	0.001	11.1	0.048	0.002	7.2	0.0011	0.0001	0.0002	7.6	0.0002	5.27	0.001	0.238	0.002	0.00005	0.0021	0.001	0.003	-
W3	5/11/2007 0:00	118	317	-	-	280	2	-	-	0.19	4	0.05	25.9	1.9	-	-	0.026	0.0005	0.061	0.013	0.0001	0.0005	45.7	0.00001	0.0003	0.0008	0.018	0.07	0.0001	2.2	0.002	12.9	0.057	0.003	8.3	0.0006	0.0001	0.0002	9.6	0.0002	5.57	0.001	0.299	0.0017	0.00005	0.0022	0.0014	0.005	-
W3	5/19/2007 0:00	128	352	-	-	250	10	-	-	0.06	4.5	0.05	27.4	2	-	-	0.009	0.0007	0.069	0.012	0.0001	0.0005	45.8	0.00001	0.0004	0.0008	0.016	0.11	0.0001	2	0.002	14.2	0.094	0.002	8.6	0.0005	0.0001	0.0002	9.7	0.0003	5.69	0.001	0.315	0.0015	0.00005	0.0018	0.0017	0.003	-
W3	5/25/2007 0:00	127	314	-	-	236	34	-	-	0.05	4.6	0.05	25	1.8	-	-	0.017	0.0004	0.064	0.011	0.0001	0.0005	45.1	0.00001	0.0003	0.001	0.014	0.05	0.0001	1.9	0.001	13.1	0.058	0.002	8.9	0.0005	0.0002	0.0002	9.3	0.0002	5.22	0.001	0.324	0.0015	0.00005	0.0014	0.0021	0.002	-
W3	5/30/2007 0:00	126	341	-	-	260	13	-	-	0.05	4.8	0.06	25	1.7	-	-	0.009	0.0004	0.071	0.01	0.0001	0.0005	43.9	0.00001	0.0003	0.0012	0.012	0.06	0.0001	1.9	0.001	12.7	0.05	0.002	9.6	0.0005	0.0001	0.0002	9.1	0.0002	5.11	0.001	0.314	0.0018	0.00005	0.0014	0.0018	0.003	-
W3	6/5/2007 0:00	384	993	-	-	716	24	-	-	0.23	15.6	0.15	79	5.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	6/13/2007 0:00	144	316	-	-	232	6	-	-	0.05	4.8	0.05	26	1.9	-	0.0001	0.014	0.0004	0.066	0.012	0.0001	0.0005	47	0.00001	0.0003	0.0008	0.014	0.04	0.0001	1.9	0.002	13.8	0.031	0.002	9.7	0.0005	0.0001	0.0002	9.5	0.0002	5.38	0.001	0.333	0.0018	0.00005	0.0016	0.0018	0.002	-
W3	6/20/2007 0:00	147	346	-	-	244	6	-	-	0.05	4.4	0.05	26	1.7	-	-	0.013	0.0006	0.069	0.017	0.0001	0.0005	49.2	0.00001	0.0003	0.0008	0.014	0.04	0.0001	2	0.002	13.5	0.038	0.003	9.6	0.0009	0.0001	0.0002	9.7	0.0002	5.27	0.001	0.368	0.0014	0.00005	0.0018	0.0024	0.004	-
W3	6/28/2007 0:00	153	328	-	-	256	7	-	-	0.08	3.5	0.05	27	1.9	-	-	0.006	0.0008	0.073	0.02	0.0001	0.0005	49.8	0.00001	0.0002	0.001	0.013	0.03	0.0001	2	0.002	14.4	0.005	0.003	10	0.0005	0.0001	0.0002	9.6	0.0002	5.37	0.001	0.367	0.0011	0.00005	0.0017	0.003	0.002	-
W3	7/5/2007 0:00	159	339	-	-	258	6	-	-	0.05	3	-	27	1.8	-	-	0.011	0.0005	0.075	0.015	0.0001	0.0005	47.7	0.00001	0.0002	0.0005	0.013	0.03	0.0001	2	0.002	13.5	0.033	0.003	9.6	0.0014	0.0001	0.0002	9.3	0.0002	5.34	0.001	0.361	0.0014	0.00005	0.002	0.0015	0.003	-
W3	7/11/2007 0:00	162	369	-	-	248	2	-	-	0.05	3	0.05	28	1.8	-	-	0.01	0.0006	0.075	0.014	0.0001	0.0005	48.8	0.00001	0.0002	0.0005	0.011	0.03	0.0001	1.8	0.002	14	0.031	0.003	9.8	0.0005	0.0001	0.0002	9.7	0.0002	5.47	0.001	0.37	0.0012	0.00005	0.002	0.0014	0.002	-
W3	7/18/2007 0:00	505	1141	-	-	868	6	-	-	0.15	8.7	0.15	87	1.2	-	-	0.034	0.0014	0.226	0.046	0.0003	0.0015	154.2	0.00004	0.0006	0.0015	0.036	0.09	0.0003	5.8	0.006	46.4	0.096	0.01	30.7	0.0015	0.0004	0.0006	30.6	0.0008	17.52	0.003	1.179	0.0038	0.00015	0.0063	0.0031	0.007	-
W3	7/25/2007 0:00	175	387	-	-	270	4	-	-	0.05	2.4	0.05	30	5	-	-	0.009	0.0005	0.074	0.014	0.0001	0.0005	54.3	0.00001	0.0004	0.0005	0.01	0.04	0.0001	2.2	0.002	15.4	0.044	0.003	11.4	0.0005	0.0001	0.0002	10.3	0.0002	5.87	0.001	0.408	0.0015	0.00005	0.002	0.0014	0.002	-
W3	7/26/2007 0:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.009	0.0005	0.08	0.012	0.0001	0.0005	53.6	0.00002	0.0002	0.0009	0.01	0.04	0.0001	2.2	0.002	15.1	0.043	0.003	10.8	0.0005	0.0001	0.0002	10.6	0.0005	5.88	0.001	0.411	0.0012	0.00005	0.002	0.0022	0.003	-
W3	8/1/2007 0:00	175	366	-	-	304	2	-	-	0.05	2	0.05	31	2	-	-	0.009	0.0002	0.077	0.014	0.0001	0.0005	50.6	0.00001	0.0003	0.0005	0.01	0.04	0.0001	2	0.002	14.8	0.058	0.003	10.8	0.0034	0.0001	0.0002	10.3	0.0004	6.2	0.001	0.391	0.0012	0.00005	0.002	0.0016	0.007	-
W3	8/9/2007 0:00	183	395	-	-	262	10	-	-	0.05	1.5	0.05	32	2	-	-	0.005	0.0004	0.079	0.014	0.0001	0.0005	53.9	0.00001	0.0001	0.0005	0.007	0.03	0.0001	1.8	0.002	15.7	0.044	0.002	11.1	0.0005	0.0001	0.0002	11	0.0002	6.04	0.001	0.408	0.001	0.00005	0.0019	0.0014	0.008	-
W3	8/15/2007 0:00	191

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | Dissolved Elements | | | | | | | |

Attachment 3: Sitewide Database

Station	Date / Time	General Parameters								Anions & Nitrogen Species						Dissolved Elements																																					
		Alk-T	Cond-L	ORP	pH-F	TDS	TSS	Temp-F	O-DO-%	$N\text{-}NO_2$	$N\text{-}NO_3$	$N\text{-}NH_3$	SO_4-D	Chlord	Fluord	Ag-D	Al-D	As-D	Ba-D	B-D	Be-D	Bi-D	Ca-D	Cd-D	Co-D	Cr-D	Cu-D	Fe-D	Hg-D	K-D	Li-D	Mg-D	Mn-D	Mo-D	Na-D	Ni-D	Pb-D	Sb-D	S-D	Se-D	Si-D	Sn-D	Sr-D	Ti-D	Tl-D	U-D	V-D	Zn-D	Zr-D
		mg/L	µS/cm	mV		mg/L	mg/L	°C	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
W3	8/21/2009 0:00	100	407	-	8.03	260	5	11.79	-	0.185	5.4	0.246	44	17	0.26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	8/22/2009 0:00	100	411	-	7.98	250	7	11.9	-	0.191	5.6	0.264	45	17	0.26	0.00002	0.062	0.0005	0.122	0.05	0.0001	0.001	47.6	0.00002	0.0005	0.001	0.0057	0.021	0.00002	3.66	0.005	12.1	0.211	0.015	14.6	0.001	0.0002	0.0007	19	0.0019	3.65	0.005	0.64	0.005	0.00005	0.0006	0.005	0.005	0.0005
W3	8/23/2009 0:00	100	414	-	7.98	250	7	11.74	-	0.005	0.19	0.273	45	19	0.26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	8/24/2009 0:00	100	417	-	7.96	240	6	11.68	90.4	0.219	5.4	0.257	45	20	0.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	8/25/2009 0:00	-	416	-	7.88	280	6	11.35	76.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	8/26/2009 0:00	-	417	-	7.96	270	5	11.8	110.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	8/27/2009 0:00	-	420	-	7.92	270	4	11.4	101.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	8/28/2009 0:00	-	427	-	7.86	280	6	11.45	99.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	8/29/2009 0:00	-	429	-	7.86	290	5	11.31	98.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	8/30/2009 0:00	88	431	-	7.89	280	6	11.4	98.7	0.29	6.7	0.266	51	30	0.21	0.00002	0.109	0.0003	0.131	0.05	0.0001	0.001	49.1	0.00001	0.0005	0.001	0.0073	0.007	0.00002	3.46	0.005	13.2	0.252	0.013	18.8	0.001	0.0002	0.0007	22	0.0018	3.53	0.005	0.669	0.005	0.00005	0.0004	0.005	0.005	0.0005
W3	8/31/2009 0:00	-	436	-	7.86	280	5	11.11	99.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	9/1/2009 0:00	-	437	-	7.85	280	4	11.51	100.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	9/2/2009 0:00	-	439	-	7.89	280	4	11.17	100.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	9/3/2009 0:00	-	444	-	7.88	280	4	10.86	100.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	9/4/2009 0:00	-	441	-	8.06	270	4	10.62	101	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	9/5/2009 0:00	-	442	-	7.96	280	4	10.9	102.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	9/6/2009 0:00	86	442	-	7.97	290	4	10.73	102.1	0.321	6.2	0.265	53	31	0.23	0.00002	0.074	0.0004	0.131	0.05	0.0001	0.001	47.3	0.00001	0.0005	0.001	0.0019	0.007	0.00002	3.23	0.005	12.2	0.25	0.014	17.4	0.001	0.0002	0.0008	20	0.0018	3.37	0.005	0.669	0.005	0.00005	0.0003	0.005	0.005	0.0005
W3	9/7/2009 0:00	-	440	-	7.99	280	4	10.84	101.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	9/8/2009 0:00	-	448	-	8.09	290	4	10.85	102.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	9/9/2009 0:00	-	444	-	8.15	270	4	10.35	104.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	9/10/2009 0:00	-	446	-	8.1	280	4	9.97	103.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	9/11/2009 0:00	-	448	-	8.14	270	4	9.95	102.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	9/12/2009 0:00	-	446	-	8.33	280	4	9.89	106.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	9/13/2009 0:00	87	432	-	8.16	300	5	9.54	103.7	0.347	7	0.216	-	-	-	0.00002	0.072	0.0003	0.129	0.05	0.0001	0.001	53.3	0.00001	0.0005	0.001	0.0012	0.007	0.00003	3.4	0.005	13	0.275	0.015	18.3	0.001	0.0002	0.0008	21	0.002	3.51	0.005	0.686	0.005	0.00005	0.0003	0.005	0.005	0.0005
W3	9/14/2009 0:00	-	455	-	8.2	290	4	9.63	106	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	9/15/2009 0:00	-	450	-	8.03	250	4	9.42	105.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	9/16/2009 0:00	-	451	-	8.24	290	4	9.42	102.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	9/17/2009 0:00	-	457	-	8.05	270	4	9.31	103	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	9/18/2009 0:00	-	461	-	8.27	300	4	9.13	102.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	9/19/2009 0:00	-	461	-	8.16	260	4	9.13	103.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	9/20/2009 0:00	-	462	-	8.28	260	4	8.84	105.4	0.253	6.9	0.118	-	-	-	0.00002	0.082	0.0004	0.133	0.05	0.0001	0.001	52.3	0.00012	0.0005	0.001	0.0035	0.011	0.00004	3.38	0.005	13	0.292	0.016	18.4	0.001	0.0002	0.0008	25	0.0022	3.16	0.005	0.747	0.005	0.00005	0.0004	0.005	0.006	0.0005
W3	9/21/2009 0:00	-	460	-	8.25	280	4	8.97	103.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	9/22/2009 0:00	-	461	-	8.46	270	5	8.75	105.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	9/23/2009 0:00	-	462	-	8.18	250	5	8.62	108.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	9/24/2009 0:00	-	457	-	8.07	270	4	8.21	106	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	9/25/2009 0:00	-	463	-	8.09	270	4	8.73	105.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	9/26/2009 0:00	-	467	-	8.17	290	4	8.08	108.8	0.162	8.1	0.105	-	-	-	0.00002	0.054	0.0003	0.134	0.05	0.0001	0.001	52.3	0.00002	0.0005	0.001	0.0014	0.006	0.00004	3.33	0.005	13.3	0.284	0.017	17.3	0.001	0.0002	0.0007	24	0.002	3.55	0.005	0.757	0.005	0.00005	0.0004	0.005	0.005	0.0005
W3	9/27/2009 0:00	-	469	-	8.02	320	4	7.66	109.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	9/28/2009 0:00	-	470	-	8.06	270	4	7.14	108.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	9/29/2009 0:00	-	461	-	8.18	280	4	6.63	84.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	9/30/2009 0:00	-	479	-	8.04	300	5	6.3	42.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	10/1/2009 0:00	-	486	-	7.96	330	7	5.19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	10/2/2009 0:00	-	483	-	7.88	320	4	5.05	102.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	10/3/2009 0:00	-	480	-	7.78	270	4	5.69	114	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	10/4/2009 0:00	-	480	-	7.9	300	4	5.23	110	0.1	8.2	0.123	-	-	-	0.00002	0.063	0.0004	0.131	0.05	0.0001	0.001	52.8	0.00003	0.0005	0.001	0.0013	0.006	0.0001	3.32	0.005	13.5	0.276	0.018	17	0.001	0.0002	0.0008	25	0.0021	3.16	0.005	0.797	0.005	0.00005	0.0005	0.005	0.005	0.0005
W3	10/5/2009 0:00	-	484	-	7.8	300	4	4.9	111.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	10/6/2009 0:00	-	482	-	7.93	320	4	5.22	117.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	10/7/2009 0:00	-	471	-	7.79	310	4	4.66	116	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	10/8/2009 0:00	95	491	-	7.97	310	4	4.25	105.2	-	18.7	-	252	6.1	-	0.00001	0.02	0.0011	0.12	0.091	0.00004	0.001	63.5	0.00021	0.00029	0.0004	0.014	0.01	0.00001	50	0.016	17	0.13	0.103	94.4	0.002	0.0001	0.0006	84	0.0348	2.28	0.0001	2.08	0.0004	0.00001	0.0004	0.0004	0.001	0.0001
W3	10/9/2009 0:00	-	493	-	7.85	310	4	4.36	110.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	10/10/2009 0:00	-	495	-	7.81	330	4	3.88	92.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	10/11/2009 0:00	-	489	-	7.99	310	4	3.68	96.3	0.099	8.6	0.174	-	-	-	0.00002	0.062	0.0003	0.128	0.05	0.0001	0.001	57	0.00002	0.0005	0.001	0.0014	0.01	0.0002	3.48	0.005	14.4	0.301	0.018	18.3	0.001	0.0002	0.0007	27	0.0021	3.57	0.005	0.804	0.005	0.00005	0.0004	0.005	0.005	0.0005
W3	10/12/2009 0:00	-	495	-	8.11	300	4	3.64	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	10/13/2009 0:00	-	496	-	8.03	280	4	3.25	116.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	10/14/2009 0:00	-	499	-	8.07	270	4	2.67	128.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	10/15/2009 0:00	-	503	-	8.13	270	4	2.69	131.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	10/16/2009 0:00	-	504	-	7.8	250	4	2.97	139	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	10/17/2009 0:00	-	507	-	7.97	270	4	2.57	143.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	10/18/2009 0:00	-	509	-	8.05	260	4	2.92	148	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	10/19/2009 0:00	-	509	-	8.04	270	4	2.79	138.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	10/20/2009 0:00	110	512	-	8.01	270	4	2.31	141.1	0.092	8.8	0.224	-	-	0.33	0.00002	0.032	0.0003	0.13	0.05	0.0001	0.001	61.4	0.00002	0.0005	0.001	0.0026	0.008	0.00008	3.65	0.005	15.2	0.296	0.017	18.6	0.001	0.0002	0.0006	26	0.0023	3.41	0.005	0.893	0.005	0.00005	0.0007	0.005	0.005	0.0005
W3	10/21/2009 0:00	-	500	-	7.92	280	4	2.57	131.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	10/22/2009 0:00	-	502	-	7.98	280	4	2.59	109.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	10/23/2009 0:00	-	505	-	7.99	290	4	2.81	96.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	10/24/2009 0:00	-	481	-	8.05	270	4	2.11	97	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	10/25/2009 0:00	110	508	-	16.24	260	4	5.4	211.4	0.08	8.5	0.206	-	-	-	0.00002	0.029	0.0003	0.13	0.05	0.0001	0.001	62.6	0.00004	0.0005	0.001	0.0023	0.018	0.00002	3.51	0.005	14.9	0.309	0.017	18	0.001	0.0002	0.0007	25	0.0021	3.77	0.005	0.839	0.005	0.00005	0.0007	0.005	0.005	0.0005
W3	10/26/2009 0:00	-	509	-	7.82	290	4	2.68	91.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	10/27/2009 0:00	120	512	-	7.7	310	4	2.26	89.2	0.08	8.5	0.211	-	-	-	0.00002	0.021	0.0003	0.128	0.05	0.0001	0.001	60.9	0.00003	0.0005	0.001	0.0027	0.02	0.00009	3.53	0.005	14.5	0.298	0.016	17.6	0.001	0.0002	0.0006	25	0.0021	3.85	0.005	0.825	0.005	0.00005	0.0007	0.005	0.005	0.0005
W3	10/28/2009 0:00	-	503	-	7.9	300	4	2.32	90.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	10/29/2009 0:00	-	507	-	8.09	310	4	2	93.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	10/30/2009 0:00	-	507	-	8.01	290	5	2.1	91.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	11/5/2009 0:00	172	463	-	7.53	340	2	2.1	-	-	1.85	-	55.7	14.9	-	0.00001	0.017	0.0003	0.091	0.022	0.00004	0.001	56.3	0.00002	0.00026	0.0004	0.002	0.07	0.00001	2.1	0.002	20.2	0.328	0.0037	15.5	0.002	0.0001	0.0008	18.6	0.0006	4.98	0.0001	0.607	0.01	0.00001	0.0019	0.0004	0.002	0.0002
W3	11/9/2009 0:00	175	512	-	7.56	132	2	1.1	-	-	1.57	-	59.6	14.3	-	0.00001	0.005	0.0003	0.091	0.018	0.00004	0.001	61.6	0.00001	0.00027	0.0004	0.002	0.09	0.00001	2	0.002	21.7	0.323	0.0034	19.6	0.003	0.0001	0.0009	19.9	0.0006	5.73	0.0001	0.599	0.01	0.00001	0.0017	0.0004	0.003	0.0001
W3	11/16/2009 0:00	186	512	-	8.34	358	3	0.04	67.5	-	1.38	-	50.7	16.6	-	0.00001	0.015	0.0004	0.091	0.014	0.00004	0.001	57.4	0.00004	0.00034	0.001	0.004	0.09	0.00001	2	0.002	21	0.33	0.0033	16	0.002	0.0001	0.0016	16.9	0.0006	5.03	0.0001	0.598	0.01	0.00001	0.0018	0.0006	0.004	0.0001
W3	11/25/2009 0:00	184	487	-	7.39	340	4	1.1	-	-	1.15	-	56	16.1	-	0.00001	0.007	0.0004	0.091	0.02	0.00004	0.001	59.7	0.00011	0.00032	0.0005	0.003	0.09	0.00001	2	0.002	22	0.33	0.003	16.9	0.002	0.0004	0.0011	18.6	0.0006	5.22	0.0001	0.594	0.01	0.00001	0.0019	0.0006	0.004	0.0002
W3	12/2/2009 0:00	182	504	-	7.71	336	2	1.1	-	-	1.12	-	56.5	13	-	0.00001	0.007	0.0002	0.089	0.014	0.00004	0.001	59.6	0.00001	0.00036	0.0004	0.003	0.13	0.00001	2	0.002	22.2	0.363	0.0029	15.3	0.001	0.0001	0.002	18.8	0.0006	5.18	0.0001	0.598	0.01	0.00001	0.002	0.0005	0.004	0.0002
W3	12/4/2009 12:50	205	526	-	-	291	-	-	-	0.005	1.13	-	58.9	11	-	0.00001	0.004	0.0005	0.094	0.016	0.0001	0.0005	61.6	0.00001	0.0003	0.0005	0.002	0.14	-	2	0.002	22.2	0.391	0.003	16.7	0.0008	0.0001	0.0002	19.9	0.0002	5.55	0.001	0.598	0.0009	0.00005	0.0023	0.0011	0.003	-
W3	12/9/2009 0:00	199	539	-	7.67	356	5	1.1	-	-	1.33	-	60.7	12.5	-	0.00001	0.007	0.0004	0.091	0.025	0.00004	0.001	63.4	0.00001	0.00034	0.0004	0.003	0.12	0.00001	2.2	0.002	24.5	0.355	0.003	17.9	0.002	0.0003	0.0011	20.2	0.0006	5.64	0.0001	0.631	0.01	0.00001	0.002	0.0004	0.003	0.0001
W3	12/15/2009 0:00	194	535	-	7.41	298	3	1.1	-	-	1.07	-	59	12.7	-	0.00001	0.014	0.0003	0.097	0.015	0.00004	0.001	47.4	0.0125	0.0003	0.0004	0.004	0.13	0.00001	2.2	0.002	17.8	0.386	0.0026	13	0.002	0.0005	0.0014	19.6	0.0006	4.92	0.0001	0.592	0.01	0.00001	0.0018	0.0004	0.009	0.0002
W3	1/1/2010 0:00	203	590	-	7.94	346	7	0.47	-	-	1.47	-	95.2	16.4	-	0.00001	0.005	0.0002	0.101	0.017	0.00004	0.001	72	0.00001	0.00016	0.0006	0.004	0.03	0.00001	4.3	0.002	23.2	0.0261	0.0026	22.4	0.002	0.0003	0.0007	31.7	0.0006	5.25	0.0001	0.62	0.01	0.00001	0.0021	0.0005	0.01	0.0001
W3	1/5/2010 0:00	172	634	-	7.99	404	5	-	-	-	6.83	-	90.7	19.6	-	0.00001	0.014	0.0004	0.104	0.026	0.00004	0.001	70.9	-	0.00023	0.0004	0.005	0.02	0.00001	4.2	0.002	23.1	0.37	0.0056	20.4	0.002	0.0002	0.0021	30.2	0.0011	4.95	0.0001	0.728	0.01	0.00001	0.0025	0.0004	0.008	0.0001
W3	1/11/2010 0:00	210	607	-	7.25	396	8	1	-	-	1.54	-	82.4	17.5	-	0.00001	0.297	0.0005	0.536	0.011	0.00004	0.001	130	0.565	0.00043	0.001	0.02	0.16	0.00001	2.8	0.002	27.4	0.0294	0.0024	22.1	0.004	0.0603	0.0026	27.4	0.0006	5.63	0.0001	0.711	0.01	0.00001	0.0018	0.001	0.091	0.0002
W3	1/19/2010 0:00	1190	2950	-	7.05	2220	16	1	-	-	3.73	-	451	9.81	-	0.00001	0.005	0.0012	0.307	0.045	0.00004	0.001	197	0.0006	0.00094	0.0016	0.01	0.13	0.00001	7.6	0.006	73.6	1.29	0.0094	56.1	0.006	0.0007	0.0015	73.2	0.0006	15.7	0.0001	1.99	0.01	0.00001	0.0056	0.0012	0.01	0.0004
W3	1/27/2010 0:00	503	1402	-	7.05	918	35	1	-	-	0.72	-	186.8	50.9	-	0.00001	0.005	0.0011	0.12	0.014	0.00004	0.001	79.2	0.00021	0.00072	0.0008	0.007	0.31	0.00001	2.9	0.002	32.7	1.7	0.0032	23	0.002	0.0003	0.0012	29.5	0.0006	6.36	0.0001	0.772	0.01	0.00001	0.0022	0.0007	0.006	0.0002
W3	2/1/2010 0:00	259	705	-	6.82	468	14	1	-	-

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | Anions & Nitrogen Species | | | | | | Dissolved Elements | | | | | | |

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | Dissolved Elements | | | | | | | |

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | Dissolved Elements | | | | | | | |

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | Dissolved Elements | | | | | | | |

Attachment 3: Sitewide Database

Station	Date / Time	General Parameters								Anions & Nitrogen Species						Dissolved Elements																																			
		Alk-T	Cond-L	ORP	pH-F	TDS	TSS	Temp-F	O-DO-%	$N\text{-}NO_2$	$N\text{-}NO_3$	$N\text{-}NH_3$	SO_4-D	Chlord	Fluord	Ag-D	Al-D	As-D	Ba-D	B-D	Be-D	Bi-D	Ca-D	Cd-D	Co-D	Cr-D	Cu-D	Fe-D	Hg-D	K-D	Li-D	Mg-D	Mn-D	Mo-D	Na-D	Ni-D	Pb-D	Sb-D	S-D	Se-D	Si-D	Sn-D	Sr-D	Ti-D	Tl-D	U-D	V-D	Zn-D	Zr-D
		mg/L	µS/cm	mV		mg/L	mg/L	°C	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
W3	3/18/2014 14:40	-	-	69.2	7.85	-	-	0.6	99.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	3/19/2014 10:20	-	-	62.2	7.77	-	-	0.7	121	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	3/20/2014 17:15	-	-	73.1	7.7	-	-	0.8	118.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	3/21/2014 9:40	-	-	106.8	7.69	-	-	0.6	96.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	3/22/2014 9:15	-	-	77.1	7.76	-	-	0.7	131.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	3/23/2014 9:30	-	-	66.3	7.8	-	-	0.6	113.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	3/24/2014 9:50	-	-	75.1	7.85	-	-	0.5	96.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	3/25/2014 8:40	-	-	71.4	7.9	-	-	0.5	124.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	3/26/2014 8:15	-	-	8	-	-	-	1.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	3/27/2014 8:15	201	480	72.1	7.74	286	4.3	0.5	105.1	0.005	0.226	0.022	40.4	7.9	0.47	0.00002	0.0034	0.00034	0.0797	0.05	0.0001	0.001	53.2	0.00001	0.0005	0.001	0.00345	0.0173	0.00001	2.64	0.005	22.1	0.036	0.0056	15.2	0.001	0.0002	0.0005	13.9	0.00031	5.82	0.005	0.642	0.005	0.00005	0.00257	0.005	0.005	0.0005
W3	3/28/2014 9:00	-	-	80.1	7.83	-	-	0.5	100.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	3/29/2014 7:45	-	-	86.8	7.8	-	-	0.5	96.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	3/30/2014 9:15	-	-	62.3	7.77	-	-	0.6	99.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	3/31/2014 7:30	-	-	69.9	7.79	-	-	0.7	89.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/1/2014 8:00	-	-	150.1	7.53	-	-	0.8	102.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/2/2014 8:30	-	-	90.9	7.72	-	-	0.6	95.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/2/2014 13:30	210	488	81.6	7.71	292	5.8	0.6	103.2	0.005	0.212	0.019	40.2	8.3	0.46	0.00002	0.0032	0.00034	0.075	0.05	0.0001	0.001	52.7	0.00001	0.0005	0.001	0.00337	0.0175	0.00001	2.56	0.005	21.4	0.0373	0.0053	15.3	0.001	0.0002	0.0005	14.6	0.00034	5.6	0.005	0.617	0.005	0.00005	0.00233	0.005	0.005	0.0005
W3	4/3/2014 7:30	-	-	90.5	7.75	-	-	0.7	104	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/4/2014 8:05	-	-	116.6	7.8	-	-	1.4	121.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/5/2014 8:25	-	-	137.2	7.91	-	-	1.5	83.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/6/2014 8:15	-	-	86.1	7.86	-	-	0.4	87.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/7/2014 6:45	344	874	118.2	7.91	536	28.4	1.8	92.9	0.0194	1.202	0.132	68	20	0.62	0.00004	0.0068	0.00082	0.1416	0.1	0.0002	0.002	110	0.00002	0.001	0.002	0.0208	0.0574	0.000028	6.16	0.01	34.6	0.0164	0.009	27.8	0.0022	0.0004	0.001	23.8	0.00094	9.62	0.01	1.128	0.01	0.0001	0.00286	0.01	0.01	0.001
W3	4/8/2014 7:20	-	-	104.3	7.82	-	-	1.9	91.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/9/2014 7:45	-	-	116.1	7.85	-	-	1.8	92.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/10/2014 8:50	-	-	220.5	7.9	-	-	1.7	92.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/11/2014 8:30	-	-	104	7.97	-	-	1.6	94.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/12/2014 13:05	-	-	103	8.02	-	-	2	93.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/13/2014 8:30	-	-	80.6	7.92	-	-	1.8	94.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/14/2014 8:40	-	-	91.8	7.95	-	-	1.1	87.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/15/2014 8:30	-	-	78.1	7.96	-	-	0.8	86.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/16/2014 8:30	-	-	109.6	7.97	-	-	1.9	92.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/17/2014 8:45	185	463	217.4	7.89	272	13	1.9	92.4	0.0124	0.95	0.13	37.1	11	0.31	0.00002	0.0056	0.00038	0.076	0.05	0.0001	0.001	54.5	0.000013	0.0005	0.001	0.0183	0.049	0.00001	3.37	0.005	17.5	0.0929	0.0044	14.2	0.001	0.0002	0.0005	13.1	0.00052	5.12	0.005	0.644	0.005	0.00005	0.00136	0.005	0.005	0.0005
W3	4/18/2014 9:15	-	-	101.9	8.01	-	-	2	91.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/19/2014 8:30	-	-	90.9	7.93	-	-	0.9	87	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/20/2014 8:40	-	-	105.7	7.98	-	-	1.7	93.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/21/2014 8:00	-	-	384.8	16.12	-	-	3.9	190.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/21/2014 13:30	176	439	-	-	264	13	-	-	0.0117	0.977	0.11	34.7	11	0.32	0.00002	0.0055	0.00035	0.0724	0.05	0.0001	0.001	51.3	0.000015	0.0005	0.001	0.0216	0.0443	0.00001	3.34	0.005	16.5	0.107	0.0046	13.9	0.001	0.0002	0.0005	12	0.0006	4.85	0.005	0.631	0.005	0.00005	0.00128	0.005	0.005	0.0005
W3	4/22/2014 8:00	-	-	125.9	8.1	-	-	1.7	92.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/23/2014 9:40	-	-	133.4	7.82	-	-	0.8	86.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/24/2014 10:00	-	-	172	7.96	-	-	1.7	91.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/25/2014 9:30	-	-	114.2	7.95	-	-	1.9	94.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/26/2014 8:45	-	-	151.4	7.95	-	-	1.8	92.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/27/2014 8:45	-	-	127.1	7.86	-	-	1.8	87.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/28/2014 8:30	116	322	-	-	214	12.9	2	-	0.0138	1.66	0.13	30.6	6.9	0.29	0.00002	0.016	0.00033	0.0554	0.05	0.0001	0.001	34.5	0.000011	0.0005	0.001	0.0227	0.0714	0.00001	3.83	0.005	10.9	0.0587	0.0052	12.7	0.001	0.0002	0.0005	11	0.00077	3.47	0.005	0.65	0.005	0.00005	0.00077	0.005	0.005	0.0005
W3	4/29/2014 8:15	-	-	101.4	8.25	-	-	2	115.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/30/2014 8:00	-	-	207.7	8.22	-	-	2.3	93.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/1/2014 8:10	-	-	139.4	8.44	-	-	2.5	95.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/2/2014 8:15	-	-	224.5	8.21	-	-	2.6	95.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/3/2014 8:00	-	-	98.6	8.27	-	-	3	94.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/4/2014 8:00	-	-	116.5	8	-	-	2.9	94.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/5/2014 6:45	136	334	75.9	8.16	218	6.5	2.4	88.7	0.0062	0.743	0.041	28.9	5	0.3	0.00002	0.0209	0.00031	0.06	0.05	0.0001	0.001	36.7	0.000012	0.0005	0.001	0.014	0.0765	0.00001	2.68	0.005	13.6	0.0296	0.0041	10.9	0.0012	0.0002	0.0005	9.9	0.00044	4.27	0.005	0.554	0.005	0.00005	0.00132	0.005	0.005	0.0005
W3	5/6/2014 7:25	-	-	131.1	7.97	-	-	2.6	98.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/7/2014 7:50	-	-	81.2	8.19	-	-	4.1	90.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/8/2014 8:20	-	-	61.2	8.08	-	-	4.8	95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/9/2014 9:00	-	-	79.5	8.16	-	-	5.6	95.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/10/2014 10:15	-	-	159.2	8.21	-	-	5.6	105.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/11/2014 8:35	-	-	80.9	8.15	-	5.9	5.7	96.3	0.034	1.8	0.088	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/12/2014 8:45	-	-	100.9	8.25	-	-	2.8	105.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/13/2014 9:40	-	-	82.1	8.02	-	-	4.3	95.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/14/2014 9:35	99.2	290	118.5	8.16	208	15.6	6.2	94.1	0.0314	1.75	0.15	32.9	4.9	0.26	0.00002	0.0294	0.00038	0.0518	0.05	0.0001	0.001	33.5	0.000018	0.0005	0.001	0.0254	0.152	0.00001	3.24	0.005	9.67	0.108	0.0037	9.57	0.001	0.0002	0.0005	11.7	0.00067	3.41	0.005	0.566	0.005	0.00005	0.00066	0.005	0.005	0.0005
W3	5/15/2014 8:45	-	-	103.9	8.16	-	-	6.5	95.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/16/2014 9:40	-	-	-	7.2	-	-	7.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/17/2014 8:30	113	317	121.8	7.22	230	9.3	6.2	91.6	0.0304	1.85	0.051	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/18/2014 9:05	-	-	103.7	7.34	-	-	6.4	94.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/19/2014 9:45	-	-	92.3	7.34	-	-	6.6	88.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/20/2014 8:30	-	-	121.1	7.26	-	-	5.1	95.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/21/2014 7:35	-	-	116.3	7.23	-	-	5.6	92.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/22/2014 0:00	97.4	311	-	-	228	20	-	-	0.0364	2.85	0.16	40	5.5	0.27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/22/2014 7:30	95.4	309	96	7.4	224	14	5.6	92.3	0.0351	3.22	0.17	40.7	5.3	0.27	0.00002	0.0329	0.00056	0.0677	0.05	0.0001	0.001	36.5	0.000017	0.0005	0.002	0.0262	0.257	0.00001	3.86	0.005	10.7	0.208	0.0057	11	0.0012	0.00021	0.0005	12.8	0.00089	3.56	0.005	0.751	0.005	0.00005	0.00077	0.005	0.005	0.0005
W3	5/23/2014 7:45	-	-	84	7.5	-	-	6.4	89.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/24/2014 7:45	-	-	128.2	7.52	-	-	5.7	91.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/25/2014 8:15	-	-	120.7	7.4	-	-	6.5	92	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/26/2014 8:15	113	361	131.5	7.5	224	14.6	6.9	93.4	0.0287	2.69	0.18	44	5.3	0.61	0.00002	0.0219	0.00055	0.0728	0.05	0.0001	0.001	41.3	0.000019	0.0005	0.001	0.0232	0.265	0.00001	4.1	0.005	12.6	0.273	0.0053	11.6	0.0011	0.0002	0.0005	15.7	0.0009	3.76	0.005	0.843	0.005	0.00005	0.00083	0.005	0.005	0.0005
W3	5/27/2014 8:15	-	-	93.7	7.26	-	-	2.8	94.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/28/2014 14:45	-	-	122	8.2	-	-	4.6	87.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/29/2014 8:15	-	-	101.2	8.15	-	-	2.1	87.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/30/2014 8:00	-	-	114.2	8.21	-	-	2.2	84.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/31/2014 8:45	-	-	117.6	8.17	-	-	2.8	87.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	6/4/2014 13:25	213	491	75.4	7.27	300	1	3.8	81	0.005	0.272	0.025	44.3	5.1	0.55	0.00002	0.0235	0.00027	0.0744	0.05	0.0001	0.001	50.3	0.000011	0.0005	0.001	0.00474	0.0414	0.00001	2.2	0.005	24.1	0.034	0.005	16.5	0.001	0.0002	0.0005	14.5	0.00036	5.74	0.005	0.683	0.005	0.00005	0.00256	0.005	0.005	0.00082
W3	6/6/2014 9:30	-	-	103.1	7.98	-	-	2.2	92.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	6/8/2014 10:20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	6/11/2014 10:45	-	-	138.8	8.22	-	-	2.8	85.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	6/11/2014 23:45	219	502	138.8	8.22	288	1	2.8	85.5	0.005	0.253	0.022	44.2	5.1	0.57	0.00002	0.0042	0.00026	0.0746	0.05	0.0001	0.001	50.1	0.00001	0.0005	0.001	0.00337	0.0178	0.00001	2.28	0.005	25.3	0.0312	0.005	17.5	0.001	0.0002	0.0005	15.4	0.00043	5.6	0.005	0.708	0.005	0.00005	0.0024	0.005	0.005	0.0005
W3	6/17/2014 9:00	-	-	66.7	7.91	-	-	2.8	86.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	6/17/2014 9:45	220	504	66.7	7.91	302	1	2.8	86.3	0.005	0.243	0.11	42.8	5.2	0.57	0.00002	0.0052	0.00025	0.0744	0.05	0.0001	0.001	49.2	0.00001	0.0005	0.001	0.00308	0.0113	0.00001	2.16	0.005	25.6	0.0328	0.0051	17.7	0.001	0.0002	0.0005	15.4	0.00037	5.5	0.005	0.666	0.005	0.00005	0.00268	0.005	0.005	0.0005
W3	6/24/2014 0:00	225	509	-	-	288	1	-	-	0.005	0.215	0.011	47.8	4.9	0.56	0.00002	0.0042	0.00025	0.0808	0.05	0.0001	0.001	51.8	0.00001	0.0005	0.001	0.00274	0.0122	0.00001	2.18	0.005	26.4	0.0357	0.005	17	0.001	0.0002	0.0005	15.4	0.00034	5.61	0.005	0.704	0.005	0.00005	0.00264	0.005	0.005	0.0005
W3	6/24/2014 6:45	224	504	75.1	8.25	298	1	3	88.3	0.005	0.205	0.019	45	5	0.55	0.00002	0.0042	0.00029	0.0782	0.05	0.0001	0.001	53	0.00001	0.0005	0.001	0.00251	0.0115	0.00001	2.21	0.005	25.5	0.0362	0.0049	16.8	0.001	0.0002	0.0005	15.3	0.00037	5.54	0.005	0.699	0.005	0.00005	0.00264	0.005	0.005	0.0005
W3	6/24/2014 9:30	-	-	75.1	8.25	-	-	3	88.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	6/30/2014 8:45	218	512	81.7	8.21	298	1	3.1	78.4	0.005	0.202	0.021	42.8	5.2	0.58	0.00002	0.0036	0.00022	0.0758	0.05	0.0001	0.001	51	0.00001	0.0005	0.002	0.00273	0.0127	0.00001	2.25	0.005	26.2	0.0384	0.0051	17.6	0.001	0.0002	0.0005	15.4	0.00034	5.22	0.005	0.704	0.005	0.00005	0.00258	0.005	0.005	0.0005
W3	7/9/2014 11:20	221	507	144.4	16.6	278	1	7.2	178.2	0.005	0.201	0.021	47.6	5	0.58	0.00002	0.0041	0.00026	0.0818	0.05	0.0001	0.001	51.5	0.00001	0.0005	0.002	0.00262	0.0155	0.00001	2.3	0.005	26.3	0.0412	0.005	16.9	0.001	0.0002	0.0005	16.1	0.00038	5.38	0.005	0.692	0.005	0.00005	0.00251	0.005	0.005	0.0005
W3	7/10/2014 13:25	-	-	156.7	8.23	-	-	6.3	88.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	7/15/2014 14:15	-	-	102.5	7.97	-	-	4.2	83.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	7/15/2014 14:50	228	515	102.5	7.97	296	1	4.2	83.4	0.005	0.203	0.034	46.2	4.6	0.56	0.00002	0.0101	0.00024	0.0776	0.05	0.0001	0.001	53.9	0.00001	0.0005	0.001	0.00248	0.0209	0.00001	2.15	0.005	27	0.0399

Attachment 3: Sitewide Database

Station	Date / Time	General Parameters								Anions & Nitrogen Species						Dissolved Elements																												
		Alk-T	Cond-L	ORP	pH-F	TDS	TSS	Temp-F	O-DO-%	$N\text{-}NO_2$	$N\text{-}NO_3$	$N\text{-}NH_3$	SO_4-D	Chlord	Fluord	Ag-D	Al-D	As-D	Ba-D	B-D	Be-D	Bi-D	Ca-D	Cd-D	Co-D	Cr-D	Cu-D	Fe-D	Hg-D	K-D	Li-D	Mg-D	Mn-D	Mo-D	Na-D	Ni-D	Pb-D	Sb-D	S-D	Se-D	Si-D	Sn-D	Sr-D	Ti-D	Tl-D	U-D	V-D	Zn-D	Zr-D
		mg/L	µS/cm	mV		mg/L	mg/L	°C	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
W3	12/3/2014 8:10	189	527	177.2	8.14	302	1.5	0.6	98.5	0.005	1.29	0.019	77.3	5.9	0.44	0.00002	0.006	0.00026	0.0795	0.05	0.0001	0.001	58.2	0.00001	0.0005	0.001	0.00322	0.0145	0.00001	3.1	0.005	21.8	0.0318	0.005	17	0.001	0.0002	0.0005	26.5	0.00037	4.82	0.005	0.709	0.005	0.00005	0.00214	0.005	0.005	0.0005
W3	12/4/2014 7:30	-	-	150.1	7.39	-	-	-1.2	89.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	12/5/2014 8:00	-	-	127.1	7.66	-	-	-1.3	84.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	12/6/2014 8:45	-	-	194.1	7.76	-	-	-1.2	88.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	12/7/2014 8:05	-	-	-26.2	7.71	-	-	-1.2	91.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	12/8/2014 8:15	-	-	166.1	7.72	-	-	-0.8	91.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	12/9/2014 7:00	304	993	42.6	7.98	628	7.4	1.1	96.8	0.0437	5.7	0.149	181.1	14.9	0.89	0.00004	0.0137	0.00082	0.1481	0.113	0.0002	0.002	112.6	0.00002	0.001	0.002	0.01381	0.0242	0.00002	12.88	0.01	36.2	0.043	0.0166	38.1	0.002	0.0004	0.001	63.2	0.00191	4.11	0.01	2.52	0.01	0.0001	0.00296	0.01	0.0107	0.001
W3	12/10/2014 7:25	-	-	72.2	7.79	-	-	1.3	91.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	12/11/2014 8:15	-	-	126.5	7.66	-	-	1.3	97.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	12/12/2014 8:20	-	-	248.3	7.93	-	-	1.3	96.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	12/13/2014 8:40	-	-	131.2	7.83	-	-	1.2	97.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	12/14/2014 8:00	-	-	211.7	7.85	-	-	1.2	113	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	12/15/2014 8:50	143	500	211	7.82	312	1.5	1.3	87.2	0.0209	2.99	0.074	88.9	7.5	0.43	0.00002	0.003	0.00037	0.0703	0.05	0.0001	0.001	55.7	0.00001	0.0005	0.001	0.0072	0.0103	0.00001	6.71	0.005	17.1	0.0098	0.009	17.8	0.001	0.0002	0.0005	30.4	0.00093	1.79	0.005	1.32	0.005	0.00005	0.00148	0.005	0.005	0.0005
W3	12/16/2014 9:30	142	501	131.4	7.83	308	1.7	1.2	83	0.019	3.16	0.068	92.7	7.4	0.43	0.00002	0.003	0.00037	0.0725	0.05	0.0001	0.001	57.7	0.00001	0.0005	0.001	0.00699	0.0214	0.00001	6.97	0.005	18.1	0.0117	0.0087	19.5	0.001	0.0002	0.0005	33.1	0.00089	2.05	0.005	1.32	0.005	0.00005	0.00148	0.005	0.008	0.0005
W3	12/19/2014 9:00	197	531	168.8	7.98	316	1.3	-1.7	91.6	0.005	1.19	0.013	74.9	6.6	0.47	0.00002	0.0041	0.00027	0.08	0.05	0.0001	0.001	61.3	0.00001	0.0005	0.001	0.00324	0.0104	0.00001	3.41	0.005	22.9	0.0305	0.0052	17.7	0.001	0.0002	0.0005	28.1	0.00037	5.38	0.005	0.864	0.005	0.00005	0.00224	0.005	0.005	0.0005
W3	12/20/2014 8:50	184	527	220.4	7.78	318	2.3	-1.9	100.6	0.005	1.21	0.016	78.1	6.1	0.47	0.00002	0.003	0.00027	0.0795	0.05	0.0001	0.001	62.5	0.00001	0.0005	0.001	0.00322	0.01	0.00001	3.4	0.005	23.8	0.0295	0.0051	17.9	0.001	0.0002	0.0005	28.8	0.00039	5.44	0.005	0.829	0.005	0.00005	0.00225	0.005	0.005	0.0005
W3	12/21/2014 9:25	-	-	112.9	7.99	-	-	-1.6	94.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	12/22/2014 14:05	212	539	143.5	7.86	302	1.1	-1.9	79.7	0.005	0.647	0.017	71.8	5.3	0.49	0.00002	0.003	0.00025	0.093	0.05	0.0001	0.001	61.5	0.00001	0.0005	0.001	0.00227	0.0078	0.00001	2.9	0.005	26.2	0.0328	0.0054	17.9	0.001	0.0002	0.0005	25.1	0.00039	6.4	0.005	0.882	0.005	0.00005	0.00282	0.005	0.005	0.0005
W3	1/2/2015 11:05	222	560	77.9	7.68	312	3.6	-2	76.9	0.005	0.407	0.029	76.4	4.8	0.54	0.00002	0.0078	0.00025	0.0849	0.05	0.0001	0.001	56.7	0.00001	0.0005	0.001	0.00224	0.0226	0.00001	2.15	0.005	25.7	0.0555	0.0051	16.8	0.001	0.0002	0.0005	22.8	0.00038	6.51	0.005	0.752	0.005	0.00005	0.00275	0.005	0.005	0.0005
W3	1/6/2015 9:10	463	1164	86.7	7.82	668	-	-2.1	49.1	0.01	1.079	0.07	147.3	10.4	1.12	0.00004	0.006	0.00046	0.1724	0.1	0.0002	0.002	126.7	0.00002	0.001	0.002	0.00379	0.0177	0.00002	5.27	0.01	54.9	0.0798	0.01	38.6	0.002	0.0004	0.001	53.5	0.00079	12.98	0.01	1.552	0.01	0.0001	0.00555	0.01	0.01	0.001
W3	1/13/2015 8:30	421	1103	59.8	7.46	660	2.6	-2.2	80.3	0.01	0.987	0.044	142.1	9.8	1.1	0.00004	0.0062	0.00051	0.1838	0.1	0.0002	0.002	113.7	0.00002	0.001	0.002	0.00383	0.0201	0.00002	4.73	0.01	54.4	0.0671	0.0107	35.7	0.002	0.0004	0.001	46.7	0.00077	12.28	0.01	1.662	0.01	0.0001	0.00611	0.01	0.01	0.001
W3	1/21/2015 13:15	220	551	102.1	8.01	320	1.7	-0.1	95.8	0.005	0.499	0.017	65.6	5	0.54	0.00002	0.003	0.00023	0.0847	0.05	0.0001	0.001	57	0.00001	0.0005	0.001	0.00162	0.0075	0.00001	2.32	0.005	28.9	0.0313	0.005	18.5	0.001	0.0002	0.0005	25.9	0.00039	6.07	0.005	0.75	0.005	0.00005	0.00251	0.005	0.005	0.0005
W3	1/29/2015 8:35	213	551	119.9	8.2	320	1.2	-1.2	77.2	0.005	0.506	0.016	71.7	5.3	0.59	0.00002	0.0063	0.00022	0.0856	0.05	0.0001	0.001	54.1	0.00001	0.0005	0.001	0.00179	0.0088	0.00001	2.34	0.005	28.3	0.0395	0.005	17.9	0.001	0.0002	0.0005	23	0.00035	5.83	0.005	0.735	0.005	0.00005	0.00262	0.005	0.005	0.0005
W3	2/3/2015 10:30	223	565	123.2	7.31	352	2.9	-2.4	69.1	0.005	0.528	0.046	70.1	5.2	0.53	0.00002	0.003	0.00022	0.0856	0.05	0.0001	0.001	58.1	0.00001	0.0005	0.001	0.0019	0.0128	0.00001	2.28	0.005	27.1	0.0546	0.0049	18.8	0.001	0.0002	0.0005	24.9	0.00042	6.13	0.005	0.762	0.005	0.00005	0.00275	0.005	0.005	0.0005
W3	2/11/2015 14:10	220	564	127.4	7.72	336	1	2.6	41.1	0.005	0.201	0.043	69.4	5.2	0.5	0.00002	0.003	0.00024	0.0958	0.05	0.0001	0.001	58.5	0.000012	0.0005	0.001	0.00324	0.0286	0.00001	2.37	0.005	27.4	0.292	0.0041	18	0.001	0.0002	0.0005	24.7	0.00021	6.22	0.005	0.716	0.005	0.00005	0.00255	0.005	0.005	0.0005
W3	2/18/2015 14:00	215	567	102.5	7.85	340	1	3.1	24.7	0.005	0.135	0.061	72.7	5.8	0.5	0.00002	0.003	0.00023	0.095	0.05	0.0001	0.001	58.9	0.000012	0.0005	0.001	0.00177	0.036	0.00001	2.22	0.005	27.5	0.351	0.0037	16.7	0.0013	0.0002	0.0005	24.5	0.00016	6.05	0.005	0.715	0.005	0.00005	0.00241	0.005	0.005	0.0005
W3	2/26/2015 8:25	218	551	124.6	7.85	304	1	0.4	37.6	0.0052	0.084	0.068	68.7	5.5	0.43	0.00002	0.0038	0.00024	0.104	0.05	0.0001	0.001	55.2	0.000013	0.0005	0.001	0.00204	0.0389	0.00001	2.2	0.005	26.8	0.398	0.0036	17.4	0.0022	0.0002	0.0005	21.5	0.0001	5.73	0.005	0.754	0.005	0.00005	0.00225	0.005	0.005	0.0005
W3	3/3/2015 10:00	216	546	109.6	7.59	286	1	0	20	0.005	0.096	0.066	67.4	5.5	0.46	0.00002	0.0173	0.00022	0.0961	0.05	0.0001	0.001	56.3	0.000016	0.0005	0.001	0.00582	0.0662	0.00001	2.02	0.005	27.3	0.392	0.0033	17.1	0.0012	0.0002	0.0005	22.8	0.0001	6.01	0.005	0.664	0.005	0.00005	0.00198	0.005	0.0056	0.0005
W3	3/9/2015 0:00	220	561	-	-	318	1	-	-	0.005	0.554	0.013	68.8	5.1	0.55	0.00002	0.0035	0.00022	0.0819	0.05	0.0001	0.001	59.7	0.00001	0.0005	0.001	0.00227	0.0082	0.00001	2.39	0.005	28.5	0.015	0.0048	18.3	0.001	0.0002	0.0005	24.5	0.00042	6.54	0.005	0.736	0.005	0.00005	0.00282	0.005	0.005	0.0005
W3	3/9/2015 7:00	222	564	177.6	7.68	326	1	0	70.6	0.005	0.542	0.011	73.7	5.1	0.55	0.00002	0.0032	0.0002	0.0806	0.05	0.0001	0.001	56.6	0.00001	0.0005	0.001	0.002	0.0074	0.00001	2.29	0.005	27.9	0.0156	0.0047	17.9	0.001	0.0002	0.0005	24.1	0.00041	6.05	0.005	0.735	0.005	0.00005	0.00271	0.005	0.005	0.0005
W3	3/16/2015 6:30	216	548	123.9	7.14	352	1	0.3	31.5	0.005	0.115	0.058	66.9	5.2	0.53	0.00002	0.003	0.00021	0.0971	0.05	0.0001	0.001	59	0.000011	0.0005	0.001	0.00168	0.0439	0.00001	2.08	0.005	25.2	0.414	0.0032	16.4	0.0011	0.0002	0.0005	22.4	0.0005	6.24	0.005	0.678	0.005	0.00005	0.0019	0.005	0.006	0.0005
W3	3/25/2015 14:30	201	526	63.1	7.4	304	1	1	26.2	0.005	0.143	0.081	64.4	5.7	0.46	0.00002	0.003	0.0002	0.0968	0.05	0.0001	0.001	56.5	0.00001	0.0005	0.001	0.00148	0.0429	0.00001	1.94	0.005	25.6	0.391	0.0035	16	0.0014	0.0002	0.0005	23	0.0001	6.05	0.005	0.678	0.005	0.00005	0.00198	0.005	0.005	0.0005
W3	3/30/2015 10:30	209	527	162.7	7.4	302	1	0.3	25.9	0.005	0.145	0.056	63.6	5.4	0.43	0.00002	0.0049	0.00022	0.0929	0.05	0.0001	0.001	56.7	0.000013	0.0005	0.001	0.00213	0.0412	0.00001	1.93	0.005	24.7	0.378	0.0034	15.6	0.0015	0.0002	0.0005	22.1	0.00011	5.93	0.005	0.638	0.005	0.00005	0.00184	0.005	0.005	0.0005
W3	4/4/2015 7:15	-	-	75.7	7.6	-	-	0	69.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/5/2015 7:20	-	-	110	7.93	-	-	1.8	119.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/6/2015 7:15	151	497	122	7.84	292	2.8	2.4	93.6	0.0157	2.76	0.076	79.7	7.6	0.39	0.00002	0.0041	0.00034	0.0708	0.056	0.0001	0.001	53.5	0.00001	0.0005	0.001	0.00687	0.0105	0.00001	5.96	0.005	16.3	0.0585	0.0079	18	0.001	0.0002	0.0005	25.2	0.00087	2.32	0.005	1.23	0.005	0.00005	0.00149	0.005	0.005	0.0005
W3	4/7/2015 7:00	-	-	169.8	7.89	-	-	2.5	89.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/8/2015 7:00	-	-	152.5	7.89	-	-	2.7	88.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/9/2015 7:40	-	-	161.5	7.88	-	-	2.6	88.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/10/2015 7:45	-	-	167.4	7.79	-	-	2.5	94.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/11/2015 7:40	-	-	114.6	7.91	-	-	0.6	81.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/13/2015 7:50	-	-	124.7	7.89	-	-	0.1	88.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/14/2015 0:00	155	504	-	-	268	5.1	-	-	0.014	2.93	0.061	79.4	8.9	0.38	0.00002	0.0031	0.00034	0.0689	0.054	0.0001	0.001	53.8	0.00001	0.0005	0.001	0.008	0.0098	0.00001	5.94	0.005	16.5	0.0109	0.0077	18.8	0.001	0.0002	0.0005	26.5	0.00105	2.57	0.005	1.2	0.005	0.00005	0.00138	0.005	0.005	0.0005
W3	4/14/2015 7:45	-	-	172.6	7.79	-	-	2.5	90.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/14/2015 16:00	154	501	205.3	7.83	272	4.3	2.8	81.7	0.0133	2.93	0.064	82.9	9.1	0.38	0.00002	0.003	0.00034	0.0688	0.051	0.0001	0.001	52.8	0.00001	0.0005	0.001	0.00728	0.0097	0.00001	5.91	0.005	16.8	0.0109	0.0076	18.9	0.001	0.0002	0.0005	25.7	0.00108	2.47	0.005	1.22	0.005	0.00005	0.00134	0.005	0.005	0.0005
W3	4/15/2015 7:45	-	-	225.8	7.82	-	-	2.7	89.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/16/2015 7:10	-	-	171.8	7.72	-	-	2.5	97.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/17/2015 7:20	-	-	165.1	7.96	-	-	2.6	119.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/18/2015 7:35	-	-	141.7	7.88	-	-	1.9	91.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/19/2015 7:35	-	-	170.7	7.84	-	-	2.6	108.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/20/2015 8:10	-	-	184.3	7.95	-	-	2.4	88.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/21/2015 7:30	114	391	203.8	7.86	192	9.4	2.6	97.3	0.0474	2.55	0.059	58.1	8	0.27	0.00002	0.0053	0.00026	0.055	0.054	0.0001	0.001	36.5	0.00001	0.0005	0.001	0.0103	0.017	0.00001	5.09	0.005	12.4	0.0223	0.0066	19.7	0.001	0.0002	0.0005	20.1	0.00074	2.16	0.005	0.833	0.005	0.00005	0.001	0.005	0.005	0.0005
W3	4/22/2015 6:55	-	-	165.1	7.84	-	-	2.5	101.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/23/2015 7:15	-	-	185.7	7.81	-	-	2.6	99.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/24/2015 7:30	-	-	179.9	7.85	-	-	2.7	97.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/25/2015 7:30	-	-	113.8	7.91	-	-	2.5	94.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/26/2015 7:25	-	-	145.2	7.91	-	-	2.7	91.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/27/2015 7:40	106	355	132.4	7.91	240	4.2	2.7	93.3	0.0345	2.59	0.066	49.6	6.9	0.28	0.00002	0.0082	0.00027	0.052	0.05	0.0001	0.001	36	0.00001	0.0005	0.001	0.0151	0.0434	0.00001	4.21	0.005	11.8	0.0347	0.0051	15.5	0.001	0.0002	0.0005	18.9	0.00065	2.62	0.005	0.747	0.005	0.00005	0.00091	0.005	0.005	0.0005
W3	4/28/2015 7:20	-	-	142.8	7.87	-	-	2.8	82.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/29/2015 7:20	-	-	153.8	7.95	-	-	2.7	94.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	4/30/2015 7:15	-	-	177.4	7.9	-	-	2.7	93.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/1/2015 7:20	-	-	183.2	7.89	-	-	3	93.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/2/2015 7:20	-	-	-	7.87	-	-	3.3	94	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/3/2015 7:40	-	-	-66.5	6.94	-	-	3.1	97.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/4/2015 7:40	-	-	103.4	7.85	-	-	3.7	97.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/5/2015 7:20	-	-	73.4	7.63	-	-	4	94.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/6/2015 6:15	-	-	100.3	7.65	-	-	1.5	90.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/7/2015 7:25	-	-	90.1	7.67	-	-	2.2	90.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/8/2015 7:50	-	-	149.7	7.67	-	-	2.5	92.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/9/2015 7:45	-	-	111.4	7.44	-	-	2.6	96.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/10/2015 7:55	184	558	53.6	7.54	334	1	2.6	101.3	0.0086	2.79	0.1	82.3	11	0.41	0.00002	0.0109	0.00032	0.0772	0.05	0.0001	0.001	62.7	0.00001	0.0005	0.001	0.00865	0.0345	0.00001	5.05	0.005	20.6	0.0241	0.0057	19.1	0.001	0.0002	0.0005	26.2	0.00106	4.27	0.005	1.09	0.005	0.00005	0.00181	0.005	0.005	0.0005
W3	5/11/2015 7:40	-	-	92.6	7.45	-	-	8.5	99.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/12/2015 7:40	-	-	91.7	7.97	-	-	8.6	91.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/13/2015 7:50	-	-	81.4	7.64	-	-	9.3	91.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W3	5/14/2015 7:15	98.6	303	96.9	7.76	200	10.9	9.9	85.2	0.0408	1.49	0.049	36.2	5.9	0.23	0.00002	0.0116	0.00032	0.0484	0.05	0.0001	0.001	35.3	0.00001	0.0005	0.001	0.0177	0.14	0.00001	3.37	0.005	10.5	0.0523	0.0036	13.5	0.001	0.0002	0.0005	11	0.00066	2.75	0.005	0.549	0.005	0.00005	0.00075	0.005	0.005	0.0005
W3	5/15/2015 6:50	99.8	307	248.8	15.22	188	12.3	20	170.2	0.0427	1.49	0.026	35.4	6	0.23	0.00002	0.0103	0.00032	0.0469	0.05	0.0001	0.001	32.8	0.00001	0.0005	0.001	0.0169	0.131	0.00001	3.09	0.005	10.7	0.0582	0.0035	13.9	0.001	0.0002	0.0005	11	0.00063	2.49	0.005	0.521	0.005	0.00005	0.00072	0.005	0.005	0.0005
W3	5/16/2015 7:30	-	-	187.6	7.7	-	-	10.6	90.7	-	-	-	-	-	-	-	-	-

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | Dissolved Elements | | | | | | | |

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| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | Dissolved Elements | | | | | | | |

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| Station | Date / Time | General Parameters | | | | | | | Anions & Nitrogen Species | | | | | | Dissolved Elements | | | | | | |

Attachment 3: Sitewide Database

Station	Date / Time	General Parameters							Anions & Nitrogen Species						Dissolved Elements																															
		Alk-T	Cond-L	ORP	pH-F	TDS	TSS	Temp-F	O-DO-%	$N\text{-}NO_2$	$N\text{-}NO_3$	$N\text{-}NH_3$	SO_4-D	Chlord	Fluord	Ag-D	Al-D	As-D	Ba-D	B-D	Be-D	Bi-D	Ca-D	Cd-D	Co-D	Cr-D	Cu-D	Fe-D	Hg-D	K-D	Li-D	Mg-D	Mn-D	Mo-D	Na-D	Ni-D	Pb-D	Sb-D	S-D	Se-D	Si-D	Sn-D	Sr-D	Ti-D	Tl-D	U-D	V-D	Zn-D	Zr-D
		mg/L	µS/cm	mV		mg/L	mg/L	°C	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
W46	8/16/2016 14:35	171	357	-27.4	7.65	207	3.3	5.9	87.5	0.001	0.519	0.0119	25.2	2.47	-	0.00001	0.0058	0.00034	0.0555	0.014	0.00002	0.00005	48	0.000005	0.0001	0.00015	0.00198	0.135	0.000005	1.7	0.0015	16.8	0.0287	0.00224	8.24	0.0008	0.00005	0.0001	8.74	0.000231	6.25	0.0001	0.477	0.0003	0.00001	0.00135	0.00054	0.001	0.0003
W46	9/6/2016 14:40	123	289	58.3	7.75	170	24.7	9.1	86.3	0.0042	1.58	0.0078	27.5	2.53	-	0.00001	0.0063	0.00039	0.0639	0.02	0.00002	0.00005	35.9	0.000005	0.0001	0.00013	0.00394	0.064	0.000005	1.72	0.001	11.9	0.0205	0.00238	9.67	0.00081	0.00005	0.0001	9.24	0.000436	4.18	0.0001	0.383	0.0003	0.00001	0.000581	0.0007	0.0018	0.0003
W46	10/12/2016 15:05	172	420	26.7	7.73	258	8.3	0.6	88.1	0.004	3.28	0.0163	51.6	4.65	-	0.00001	0.0032	0.00035	0.0742	0.021	0.00002	0.00005	52	0.000005	0.0001	0.00011	0.00534	0.063	0.000005	2.31	0.0013	16.7	0.0344	0.00284	12.8	0.00068	0.00005	0.0001	16.6	0.000887	4.35	0.0001	0.566	0.0003	0.00001	0.00152	0.0005	0.001	0.0003
W46	11/3/2016 14:30	189	392	1.5	7.67	226	4.8	-0.1	85.8	0.0016	0.333	0.0194	32.1	2.91	-	0.00001	0.0035	0.0004	0.0724	0.012	0.00002	0.00005	45.4	0.000005	0.0001	0.00013	0.00176	0.141	0.000005	1.76	0.001	16.7	0.0857	0.00204	11.9	0.00079	0.00005	0.0001	10.5	0.000232	5.64	0.0001	0.534	0.0003	0.00001	0.00171	0.0005	0.001	0.0003
W46	12/27/2016 15:00	509	1137	118.9	7.38	661	6	-0.1	21.6	0.0029	0.0684	0.0234	104.1	11.02	-	0.00002	0.0101	0.00094	0.253	0.026	0.00004	0.0001	136.5	0.0000323	0.0003	0.00035	0.00723	0.145	0.0001	6.62	0.0043	55.2	0.1617	0.00336	40.9	0.00259	0.0001	0.0002	36.2	0.000265	16.59	0.0002	1.384	0.00067	0.00002	0.0033	0.001	0.0054	0.0006
W46	5/24/2017 15:55	106	237	48.2	7.09	131	693	1.6	85.4	0.0023	0.245	0.069	17.4	1.81	-	0.00001	0.0136	0.00058	0.0542	0.01	0.00002	0.00005	27.4	0.0000079	0.00029	0.00019	0.00483	0.313	0.0000005	1.49	0.0012	10.5	0.271	0.00169	7.49	0.0011	0.00005	0.00011	6.14	0.0002	4.16	0.0001	0.284	0.00084	0.00001	0.000895	0.00137	0.001	0.0003
W46	6/3/2017 15:30	112	243	68.4	7.26	133	691	1.1	87.4	0.0019	0.204	0.0653	16.8	1.71	-	0.00001	0.0131	0.00055	0.0535	0.01	0.00002	0.00005	26.9	0.0000053	0.00019	0.00022	0.00408	0.34	0.0000005	1.23	0.001	10.3	0.0847	0.00157	7.83	0.00129	0.00005	0.0001	5.53	0.000184	4.31	0.0001	0.283	0.00077	0.00001	0.000925	0.00122	0.0027	0.0003
W46	7/4/2017 15:40	158	322	47.1	7.8	182	32.5	4.8	99.6	0.001	0.159	0.0245	22.4	1.83	-	0.00001	0.0073	0.00047	0.0655	0.01	0.00002	0.00005	36.7	0.000005	0.00013	0.00018	0.00178	0.087	0.0000005	1.33	0.001	14.8	0.0603	0.00201	9.83	0.00105	0.00005	0.0001	7.65	0.000204	5.79	0.0001	0.411	0.0003	0.00001	0.00149	0.00096	0.001	0.0003
W46	8/3/2017 16:10	163	347	82.2	7.61	199	18.8	6.2	95.7	0.0014	0.203	0.0163	25.8	2.23	-	0.00001	0.012	0.0005	0.0764	0.011	0.00002	0.00005	43.5	0.0000054	0.0001	0.00018	0.00422	0.094	0.0000005	1.49	0.0015	16	0.0442	0.00208	10.8	0.00114	0.00005	0.0001	8.42	0.000199	5.87	0.0001	0.467	0.00036	0.00001	0.00133	0.00096	0.0012	0.0003
W46	9/8/2017 15:44	167	324	121.6	7.16	190	15.2	3.6	101.5	0.001	0.0503	0.0103	19	1.58	-	0.00001	0.0057	0.00048	0.0674	0.01	0.00002	0.00005	42.1	0.0000053	0.0001	0.00019	0.00161	0.107	0.0000005	1.34	0.001	15.7	0.0492	0.00173	10.1	0.00098	0.00005	0.0001	6.18	0.000115	6.05	0.0001	0.428	0.0003	0.00001	0.00129	0.00071	0.0014	0.0003
W46	10/7/2017 15:30	171	337	45.2	7.55	197	4.5	1.5	104.3	0.001	0.113	0.0108	22.5	1.86	-	0.00001	0.0066	0.00045	0.0695	0.01	0.00002	0.00005	40.7	0.000005	0.0001	0.00011	0.0014	0.132	0.0000005	1.34	0.0014	16.2	0.0546	0.00182	10.5	0.00095	0.00005	0.0001	7.77	0.000167	6.19	0.0001	0.457	0.0003	0.00001	0.00142	0.00055	0.0012	0.0003
W46	11/15/2017 13:40	238	468	217.3	7.6	292	3	0	29	0.001	0.0791	0.0081	40.2	3.58	-	0.00001	0.0043	0.00039	0.104	0.011	0.00002	0.00005	61.6	0.0000115	0.00011	0.00015	0.00229	0.059	0.0000005	2.14	0.0018	25.5	0.114	0.00175	15	0.00102	0.00005	0.0001	14.5	0.000183	7.55	0.0001	0.706	0.0003	0.00001	0.00185	0.00051	0.003	0.0003
W46	12/4/2017 14:20	297	624	270.1	7.51	375	3	0	47.6	0.0021	0.013	0.0144	57.8	5.78	-	0.00001	0.0066	0.00061	0.127	0.014	0.00002	0.00005	76.1	0.0000217	0.00022	0.00021	0.00299	0.095	0.0000005	2.94	0.0017	31.1	0.337	0.00171	21.7	0.00135	0.00005	0.0001	21.9	0.000216	9.43	0.0001	0.796	0.00047	0.00001	0.00194	0.0005	0.005	0.0003
W46	5/21/2018 15:10	110	229	121.2	7.89	129	3	0.2	90	0.001	0.025	0.0072	14.4	1.3	-	0.00001	0.0122	0.00043	0.0486	0.01	0.00002	0.00005	27.3	0.000005	0.0001	0.00015	0.00409	0.078	0.0000005	1.3	0.001	10.5	0.0238	0.00119	7.33	0.00089	0.00005	0.0001	4.82	0.000114	4.52	0.0001	0.275	0.00046	0.00001	0.000975	0.00078	0.001	0.0003
W46	6/20/2018 15:35	158	379	-	-	209	177	-	-	0.0063	0.338	0.0385	34.4	3.05	-	0.00001	0.0066	0.00055	0.0908	0.012	0.00002	0.00005	42.7	0.000005	0.00018	0.0001	0.00402	0.11	0.0000005	2.05	0.0015	18.2	0.173	0.00293	12.1	0.00119	0.00005	0.0001	10.8	0.000252	4.84	0.0001	0.501	0.00032	0.00001	0.00221	0.00137	0.001	0.0003
W46	7/23/2018 10:30	219	412	55.2	7.8	241	3.1	3.6	94.1	0.001	0.129	0.0154	30.3	2.46	0.443	0.00001	0.0046	0.00048	0.0765	0.01	0.00002	0.00005	44.2	0.000005	0.0001	0.0002	0.00174	0.104	0.0000005	1.5	0.0017	17.9	0.0507	0.00226	12	0.00085	0.00005	0.0001	10.6	0.000244	5.78	0.0001	0.498	0.0003	0.00001	0.00189	0.00081	0.001	0.0003
W46	8/14/2018 16:40	165	343	63	7.87	188	24.1	4.9	94.8	0.001	0.0845	0.01	20.1	1.53	-	0.00001	0.0074	0.00047	0.0715	0.01	0.00002	0.00005	40.2	0.000005	0.0001	0.0002	0.00206	0.092	0.0000005	1.28	0.0014	15.4	0.0351	0.00198	10.3	0.00102	0.00005	0.0001	6.74	0.000192	6.15	0.0001	0.444	0.0003	0.00001	0.00139	0.00078	0.001	0.0003
W46	9/3/2018 15:45	159	332	36.9	7.78	184	3.5	3.3	91	0.001	0.0843	0.0097	21.9	1.78	-	0.00001	0.005	0.00044	0.0661	0.01	0.00002	0.00005	39.5	0.000005	0.0001	0.00017	0.00186	0.103	0.0000005	1.25	0.0014	14.3	0.0421	0.00188	9.72	0.00106	0.00005	0.0001	6.74	0.000176	5.97	0.0001	0.409	0.0003	0.00001	0.00143	0.00062	0.001	0.0003
W46	10/8/2018 14:40	358	836	41.5	7.46	459	11.6	-0.1	70.3	0.0021	0.388	0.0399	68.6	5.9	-	0.00002	0.0285	0.00086	0.1627	0.022	0.00004	0.0001	94.7	0.00001	0.00023	0.0003	0.00365	0.414	0.00001	3.12	0.0032	42.8	0.159	0.00431	26.4	0.00166	0.0001	0.0002	22.4	0.00043	12.74	0.0002	1.179	0.00118	0.00002	0.00358	0.00111	0.0025	0.0006
W46	11/4/2018 13:40	416	857	104.9	7.19	497	9.2	0	87.2	0.002	0.29	0.0652	66.3	5.8	-	0.00002	0.0095	0.0009	0.1739	0.022	0.00004	0.0001	101.6	0.0000288	0.00026	0.00027	0.00313	0.598	0.00001	3.3	0.0039	41.8	0.272	0.00338	26.6	0.00171	0.0001	0.0002	22.8	0.00033	13.51	0.0002	1.14	0.00074	0.00002	0.00343	0.00105	0.0023	0.0006
W46	4/25/2019 14:05	193	400	-	-	235	3	-	-	0.001	0.0212	0.005	31.5	2.53	-	0.00001	0.0042	0.00035	0.0648	0.01	0.00002	0.00005	48.2	0.000005	0.0001	0.00013	0.00329	0.022	0.0000005	2.56	0.0022	22	0.00484	0.00221	12.4	0.0005	0.00005	0.0001	11.8	0.00033	7.32	0.0001	0.584	0.0003	0.00001	0.00201	0.0005	0.001	0.0003
W46	5/13/2019 15:35	112	238	179.6	7.32	149	4.2	0	93	0.001	0.005	0.0056	14.1	1.39	-	0.00001	0.0056	0.00038	0.0456	0.01	0.00002	0.00005	27.7	0.0000054	0.0001	0.00015	0.00327	0.058	0.0000005	1.32	0.001	11	0.0589	0.00125	6.42	0.00062	0.00005	0.0001	4.89	0.000198	4.64	0.0001	0.322	0.0003	0.00001	0.000988	0.00058	0.001	0.0003
W46	6/15/2019 0:00	159	325	-	-	193	3	-	-	0.001	0.0903	0.0065	24.9	2.12	-	0.00001	0.0047	0.00042	0.0629	0.01	0.00002	0.00005	40.9	0.000005	0.0001	0.00016	0.00178	0.072	0.0000005	1.39	0.0016	16.3	0.0432	0.00251	10.8	0.0009	0.00005	0.0001	8.96	0.000246	5.82	0.0001	0.48	0.0003	0.00001	0.00194	0.00072	0.001	0.0003
W46	6/15/2019 10:05	161	325	31.1	7.39	191	3	0.7	93.8	0.001	0.0898	0.0062	24.8	2.12	-	0.00001	0.0054	0.00046	0.0659	0.01	0.00002	0.00005	39	0.0000084	0.0001	0.00014	0.00196	0.088	0.0000005	1.39	0.0015	15.7	0.0442	0.00248	10.4	0.00093	0.00005	0.0001	8.9	0.00016	5.76	0.0001	0.468	0.00034	0.00001	0.00197	0.00074	0.001	0.0003
W46	7/6/2019 8:10	192	412	-6.4	7.78	237	3	2	95.1	0.001	0.158	0.0171	34.3	2.95	-	0.00001	0.0029	0.00044	0.0744	0.011	0.00002	0.00005	47.8	0.000005	0.0001	0.00011	0.00148	0.125	0.0000005	1.89	0.0018	20.8	0.0434	0.00275	13.2	0.0008	0.00005	0.0001	12	0.000232	5.72	0.0001	0.584	0.0003	0.00001	0.00272	0.00078	0.001	0.0003
W46	8/4/2019 14:50	191	402	168.2	7.79	227	3	4.7	96.2	0.001	0.104	0.013	31	2.53	-	0.00001	0.0034	0.00045	0.0785	0.016	0.00002	0.00005	44.8	0.000005	0.0001	0.00015	0.00149	0.083	0.0000005	1.57	0.0018	19.7	0.0251	0.00248	12.1	0.00073	0.00005	0.0001	11	0.000298	6.21	0.0001	0.544	0.0003	0.00001	0.00209	0.00071	0.001	0.0003
W46	9/20/2019 0:00	214	382	-	-	235	3	-	-	0.001	0.0248	0.0057	27.2	2.34	-	0.00001	0.0044	0.00043	0.0729	0.01	0.00002	0.00005	44.6	0.000005	0.0001	0.00011	0.00165	0.103	0.0000005	1.61	0.0015	18.6	0.0376	0.00213	12.3	0.00094	0.00005	0.0001	9.45	0.000166	6.3	0.0001	0.496	0.0003	0.00001	0.0017	0.00059	0.001	0.0003
W46	9/20/2019 15:00	195	383	86	7.84	223	3	1.9	91.8	0.001	0.0311	0.0057	27.2	2.34	-	0.00001	0.0034	0.00039	0.0699	0.01	0.00002	0.00005	45.3	0.000005	0.0001	0.00016	0.00151	0.103	0.0000005	1.54	0.0016	17.8	0.0347	0.00209	11.6	0.00094	0.00005	0.0001	9.37	0.000179	6.35	0.0001	0.488	0.0003	0.00001	0.00174	0.00054	0.001	0.0003
W46	10/7/2019 14:50	205	407	115.5	7.82	239	3	-	102.8	0.0015	0.0956	0.0073	33	2.8	-	0.00001	0.0027	0.0004	0.0697	0.01	0.00002	0.00005	45.7	0.000005	0.0001	0.00011	0.00137	0.117	0.0000005	1.56	0.0016	19.1	0.0434	0.00223	13.2	0.00062	0.00005	0.0001	11.4	0.000188	5.76	0.0001	0.554	0.0003	0.00001	0.00197	0.0005	0.001	0.0003
W46	11/4/2019 0:00	219	426	-	-	265	3	-	-	0.0021	0.0954	0.0163	37.5	3.33	-	0.00001	0.0033	0.00036	0.0824	0.012	0.00002	0.00005	51.6	0.0000216	0.0001	0.00011	0.00171	0.112	0.0000005	1.77	0.0018	23.9	0.0556	0.00202	14.4	0.00065	0.00005	0.0001	13	0.000214	6.48	0.0001	0.609	0.0003	0.00001	0.00202	0.0005	0.001	0.0003
W46	11/4/2019 10:45	234	418	92.8	7.41	276	3	0	51.5	0.0028	0.102	0.0157	39	3.44	-	0.00001	0.0049	0.00035	0.0809	0.012	0.00002	0.00005	51.4	0.0000238	0.0001	0.00014	0.00178	0.117	0.0000005	1.79	0.0018	24.1	0.0563	0.00208	14.6	0.00077	0.00005	0.0001	12.6	0.000218	6.44	0.0001	0.623	0.00031	0.00001	0.002	0.0005	0.0012	0.0003
W46	5/30/2020 10:15	221	633	66.9	7.61	413	172.2	0.1	88.1	0.002	0.01	0.0401	43.6	4.05	-	0.00002	0.0129	0.00105	0.1221	0.02	0.00004	0.0001	72.8	0.00001	0.0001	0.00025	0.00034	0.0499	0.304	0.00001	2.87	0.0028	30.8	0.1677	0.00397	19.68	0.00178	0.0001	0.0002	14.59	0.000404	10.42	0.0002	0.818	0.00068	0.00002	0.00319	0.00191	0.002	0.0004
W46	6/13/2020 6:00	306	664	29.9	7.73	415	66.2	0.2	91.1	0.002	0.0552	0.0372	46.4	4.34	-	0.00002	0.011	0.00117	0.1274	0.02	0.00004	0.0001	78.4	0.00001	0.00027	0.0003	0.00462	0.365	0.00001	2.62	0.0027	30.2	0.217	0.0043	19.88	0.00183	0.0001	0.0002	15.32	0.000494	10.54	0.0002	0.839	0.00066	0.00002	0.00325	0.00182	0.002	0.0004
W46	8/20/2020 16:25	141	284	90.6	7.45	189	19.9	3.7	91.6	0.001	0.0348	0.0143	13.7	1.12	-	0.00001	0.0069	0.00046	0.0611	0.01	0.00002	0.00005	35.6	0.000005	0.0001	0.00026	0.00221	0.071	0.0000005	0.968	0.001	14.3	0.017	0.00165	8.85	0.00102	0.00005	0.0001	5.04	0.000172	5.76	0.0001	0.359	0.00032	0.00001	0.000998	0.00078	0.001	0.00021
W46	9/11/2020 15:10	130	272	83.2	7.7	178	12.4	2.3	98.8	0.001	0.0281	0.0136	13.9	1.28	-	0.00001	0.0106	0.00046	0.0715	0.01	0.00002	0.00005	32	0.0000056	0.0001	0.00032	0.00244	0.109	0.0000005	0.889	0.001	12.3	0.0238	0.00148	8.14	0.00118	0.00005	0.0001	4.82	0.000131	6.42	0.0001	0.338	0.00047	0.00001	0.000833	0.00069	0.001	0.00024
W46	10/12/2020 10:55	310	692	173.6	7.86	465	6	0.7	92.3	0.002	0.507	0.0264	70.2	5.37	-	0.00002	0.0136	0.00094	0.131	0.02	0.00004	0.0001	86.7	0.00001	0.0002	0.00041	0.00847	0.165	0.00001	2.83	0.0029	32.9	0.0465	0.00453	21.5	0.00221	0.0001	0.0002	23.1	0.000602	11.68	0.0002	0.939	0.00069	0.00002	0.00232	0.00119	0.002	0.00041
W5	5/15/1994 0:00	-	158	-	-	101	61	-	-	0.001	0.022	0.005	-	0.9	0.1	0.0001	0.019	0.001	0.04	0.1	0.005	0.1	20.9	0.0002	0.001	0.001	0.002	0.044	0.91	-	5.66	0.007	0.001	2.1	0.001	0.001	-	0.0005	2.7	0.11	-	-	0.0007	0.03	0.005	-
W5	6/7/1994 0:00	-	144	-	-	88	52	-	-	0.004	0.023	0.005	-	0.5	0.1	0.0001	0.021	0.003	0.035	0.1	0.005	0.1	20.1	0.0002	0.001	0.001	0.001	0.096	-	0.72	-	5.43	0.006	0.001	2	0.001	0.001	-	0.0005	3.26	-	0.095	-	-	0.00065	0.03	0.005	-
W5	7/8/1994 0:00	-	141	-	-	91	14	-	-	0.003	0.006	0.005	-	0.5	0.09	0.0001	0.019	0.0002	0.033	0.1	0.005	0.1	20.1	0.0002	0.001	0.001	0.001	0.031	-	0.74	-	4.81	0.005	0.001	1.63	0.001	0.001	-	0.0005	3.04	-	0.088	-	-	0.00047	0.03	0.005	-
W5	8/10/1994 0:00	-	134	-	-	82	9	-	-	0.002	0.005	0.005	-	0.5	0.16	0.0001	0.018	0.0005	0.032	0.1	0.005	0.1	19.2	0.0002	0.001	0.001	0.001	0.03	-	0.69	-	4.42	0.005	0.001	1.44	0.001	0.001	-	0.0005	2.53	-	0.088	-	-	0.00057	0.03	0.005	-
W5	9/26/1994 0:00	-	136	-	-	79	5	-	-	0.002	0.006	0.005	-	0.5	0.11	0.0001	0.005	0.0003	0.029	0.1	0.005	0.1	20.5	0.0002	0.001	0.001	0.001	0.03	-	0.79	-	4.31	0.005	0.001	1.59	0.001	0.001	-	0.0005	2.38	-	0.086	-	-	0.00067	0.03	0.005	-
W5	5/27/2005 0:00	49.1	147	-	-	90	79.5	-	-	0.001	0.0346	0.02	7.62	0.5	-	0.00002	0.0117	0.0005	0.034	0.1	0.001	-	20.3	0.00005	0.0003	0.001	0.001	0.03	0.00002	2	0.005	5.4	0.00345	0.001	2	0.001	0.0005	-	0.001	-	0.0005	-	0.01	0.0002	0.00081	0.03	0.005	-
W5	6/30/2005 0:00	59.7	134	-	-	77	21.5	-	-	0.001	0.0074	0.02	8.9	0.5	-	0.00001	0.0148	0.00046	0.0305	0.01	0.0005	0.0005	19.3	0.00005	0.0003	0.001	0.00105	0.03	-	2	0.005	4.7	0.0197	0.00108	2	0.0005	0.00257	0.001	-	0.001	2.83	0.001	0.0774	0.01	0.0001	0.0069	0.001	0.005	-
W5	7/29/2005 0:00	-	133	-	-	80	6.2	-	-	0.001	0.0057	0.02	-	0.5	-	0.00001	0.008	0.00044	0.0307	0.01	0.0005	0.0005	19.5	0.00005	0.0003	0.001	0.00084	0.03	-	2	0.005	4.75	0.00139	0.00116	2	0.0005	0.00005	0.001	-	0.001	2.49	0.001	0.0878	0.01	0.0001	0.00076	0.001	0.001	-
W5	8/30/2005 0:00	69.1	142	-	-	90	7	-	-	0.001	0.0165	0.02	9.14	0.5	-	0.00002	0.0087	0.0005	0.039	0.1	0.001	-	19.7	0.00017	0.0003	0.001	0.001	0.03	0.00002	2	0.005	5.39	0.00296	0.0012	2.5	0.001	0.0005	0.0005	-	0.001	-	0.0005	-	0.01	0.0002	0.00086	0.03	0.005	-
W5	9/28/2005 0:00	73.1	154	-	-	93	10	-	-	0.001	0.0252	0.02	9.88	0.5	-	0.00002	0.009	0.0005	0.04	0.1	0.001	-	22.7	0.000017	0.0003	0.001	0.001	0.053	0.00002	2	0.005	6.1	0.0108	0.0011	2.5	0.001	0.0005	0.0005	-	0.001	-	0.0005	-	0.01	0.0002	0.0008	0.03	0.005	-
W5	10/15/2005 0:00	-	153	-	-	91	3.5	-	-	0.001	0.0353	0.02	-	0.5	-	0.00001	0.0072	0.00042	0.0378	0.01	0.0005	0.0005	22.4	0.00005	0.0001	0.0005	0.00071	0.031	-	2	0.005	6.19	0.00414	0.00112	2.5	0.0005	0.00005	0.0001	-	0.001	3.26	0.0001	0.121	0.01	0.0001	0.001	0.001	0.0014	-
W5	7/3/2006 16:00	126	277	-	-	146	46	-	-	0.01	0.04	0.014	15.7	1.1	0.23	0.00004	0.036	0.0008	0.062	0.1	0.0002	0.002	38.4	0.00004	0.001	0.002	0.0014	0.035	0.00004	1.44	0.01	9.27	0.002	0.002	3	0.002	0.0004	0.001	6	0.0003	5.76	0.01	0.165	0.01	0.001	0.0015	0.01	0.01	0.001
W5	5/23/2011 0:00	74	169	-	-	120	47	-	-	0.009	0.09	0.013	7.8	1.2	0.16	0.00002	0.03	0.0007	0.045	0.05	0.0001	0.001	22	0.00002	0.0005	0.001	0.0026	0.445	0.00002	1.08	0.005	6.27	0.04	0.001	4.7	0.0005	0.00005	0.0001	4	0.0003	4.07	0.005	0.176	0.005	0.00005	0.0006	0.005	0.005	0.0005
W5	5/30/2011 0:00	61	140	-	-	92	90	-	-	0.005	0.04	0.011	9.4	0.7	0.1	0.00002	0.021	0.0005	0.036	0.05	0.0001	0.001	17.9	0.00001	0.0005	0.001	0.0018	0.048	0.00002	0.8	0.005	5.17	0.015	0.001	2.47	0.001	0.0002	0.0005	3	0.0001	3.33	0.005	0.113	0.005	0.00005	0.0008	0.005	0.005	0.0005
W5	6/7/2011 0:00

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | Dissolved Elements | | | | | | | |

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | | | Dissolved Elements | | | | | | | |

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | Dissolved Elements | | | | | | | |

Attachment 3: Sitewide Database

Station	Date / Time	General Parameters								Anions & Nitrogen Species						Dissolved Elements																																				
		Alk-T	Cond-L	ORP	pH-F	TDS	TSS	Temp-F	O-DO-%	$N\text{-}NO_2$	$N\text{-}NO_3$	$N\text{-}NH_3$	SO_4-D	Chlord	Fluord	Ag-D	Al-D	As-D	Ba-D	B-D	Be-D	Bi-D	Ca-D	Cd-D	Co-D	Cr-D	Cu-D	Fe-D	Hg-D	K-D	Li-D	Mg-D	Mn-D	Mo-D	Na-D	Ni-D	Pb-D	Sb-D	S-D	Se-D	Si-D	Sn-D	Sr-D	Ti-D	Tl-D	U-D	V-D	Zn-D	Zr-D
		mg/L	µS/cm	mV		mg/L	mg/L	°C	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
W50	10/19/2010 0:00	140	644			410	1			0.081	14	0.4	91	25	0.44	0.00002	0.048	0.0004	0.099	0.05	0.0001	0.001	67.8	0.00001	0.0005	0.001	0.0047	0.005	0.00002	5.97	0.005	19.2	0.104	0.015	28	0.001	0.0002	0.0005	34	0.0042	4.52	0.005	1.32	0.005	0.00005	0.0013	0.005	0.005	0.0005
W50	11/7/2010 0:00	180	601		7.98	370	1	2.97		0.06	10.8	0.008	86	7.3	0.53	0.00002	0.008	0.0003	0.101	0.05	0.0001	0.001	69.7	0.00001	0.0005	0.001	0.0043	0.005	0.00002	4.15	0.005	20.2	0.068	0.008	21.3	0.001	0.0002	0.0005	30	0.0026	5.92	0.005	0.742	0.005	0.00005	0.003	0.005	0.005	0.0005
W50	11/11/2010 0:00																																																	
W50	11/11/2010 2:00	180	604		7.99	400	1	3		0.007	10.8	0.067	86	7.7	0.45	0.00002	0.008	0.0004	0.104	0.05	0.0001	0.001	71.6	0.00001	0.0005	0.001	0.0045	0.005	0.00002	4.68	0.005	22	0.077	0.007	23.2	0.001	0.0002	0.0005	33	0.0026	6.13	0.005	0.728	0.005	0.00005	0.0028	0.005	0.005	0.0005
W50	11/12/2010 0:00											0.03																																						
W50	5/2/2011 0:00	37	96			92	2			0.005	0.07		5	2.3	0.15	0.00002	0.066	0.0004	0.03	0.05	0.0001	0.001	13.1	0.00003	0.0005	0.001	0.0281	0.094	0.00002	3.47	0.005	4.6	0.127	0.002	1.69	0.003	0.0002	0.0005	3	0.0002	3.1	0.005	0.091	0.005	0.00005	0.0001	0.005	0.009	0.0005
W50	5/7/2011 0:00	24	55			54	27			0.005	0.02	0.006	0.5	1.1	0.06	0.00002	0.063	0.0003	0.02	0.05	0.0001	0.001	7.55	0.00002	0.0005	0.001	0.0042	0.186	0.00002	1.07	0.005	2.34	0.03	0.001	1.37	0.001	0.0002	0.0005	3	0.0001	2.22	0.005	0.061	0.005	0.00005	0.0001	0.005	0.005	0.0005
W50	10/18/2011 0:00	190	494		7.02	290	4	3.8	20.2	0.005	1.92	0.018	50	5.5		0.00002	0.011	0.0003	0.08	0.05	0.0001	0.001	56.8	0.00001	0.0005	0.001	0.0051	0.02	0.00002	3.41	0.005	17.3	0.002	0.008	19.1	0.001	0.0002	0.0005	20	0.0006	5.75	0.005	0.731	0.005	0.00005	0.0022	0.005	0.005	0.0005
W50	11/13/2011 0:00	183	479		7.83	284	5.3	2.5	91.1	0.005	3.1	0.0091		5.7		0.00002	0.0062	0.00039	0.0756	0.05	0.0001	0.001	49.9	0.00001	0.0005	0.001	0.00638	0.005	0.00002	3.94	0.005	17.1	0.0151	0.0067	18.1	0.001	0.0002	0.0005	18.6	0.00102	4.31	0.005	0.562	0.005	0.00005	0.00231	0.005	0.005	0.0005
W50	4/13/2012 18:48	376	924		7.86	548	57.3	0	85.2	0.0217	4.86	0.1238	46.3	8.92	0.789	0.00004	0.0116	0.0005	0.1422	0.15	0.0011	0.001	114.4	0.000028	0.0008	0.0022	0.01501	0.0481	0.00002	7.29	0.01	34.9	0.1413	0.0115	32.5	0.002	0.0007	0.001	16	0.00173	4.92	0.0055	0.577	0.015	0.00025	0.00544	0.006	0.0142	0.0005
W50	4/14/2012 11:10	418	1000		7.62	615	5.9	2	92.2	0.0152	5.52	0.0189	48.7	9.91	0.892	0.00004	0.0195	0.0009	0.1622	0.15	0.0011	0.001	129.8	0.000029	0.0008	0.002	0.01287	0.0465	0.00002	7.44	0.01	39	0.211	0.0126	36.8	0.002	0.0007	0.001	17.9	0.0018	5.41	0.0055	0.615	0.015	0.00025	0.00592	0.006	0.01	0.0005
W50	4/15/2012 9:50	424	1009		8.01	633	6.7	2.4	84.5	0.0134	5.65	0.022	46.7	9.96	0.864	0.00004	0.0099	0.00088	0.1619	0.15	0.0011	0.001	131.1	0.000027	0.0008	0.002	0.01103	0.035	0.00002	7.54	0.01	39.1	0.0941	0.0129	36.8	0.002	0.0007	0.001	17.9	0.00178	5.32	0.0055	0.63	0.015	0.00025	0.00618	0.006	0.01	0.0005
W50	4/16/2012 11:00	422	1012			647	5			0.0112	5.54	0.0233	48.2	9.97	0.873	0.00004	0.0104	0.00089	0.1638	0.15	0.0011	0.001	134.1	0.000027	0.0008	0.002	0.0113	0.035	0.00002	7.46	0.01	39.5	0.089	0.012	37.1	0.002	0.0007	0.001	18.1	0.00184	5.38	0.0055	0.629	0.015	0.00025	0.00595	0.006	0.01	0.0005
W50	4/17/2012 11:00				7.79			2.4	85.2																																									
W50	4/18/2012 10:30	401	1020		7.88	651	34.6	2.3	92.3	0.018	9.65	0.0566	57.5	10.85	0.734	0.00004	0.0131	0.0009	0.1756	0.15	0.0011	0.001	126.6	0.000038	0.0008	0.002	0.0504	0.0741	0.00002	7.36	0.01	41.2	0.0887	0.0112	37.3	0.0021	0.0007	0.001	20.8	0.00399	5.78	0.0055	0.663	0.015	0.00025	0.00388	0.006	0.01	0.0005
W50	4/19/2012 13:50	396	1020		7.77	639	11.1	2.5	87.3	0.0176	9.86	0.0449	59.1	10.82	0.729	0.00004	0.0143	0.00088	0.175	0.15	0.0011	0.001	127.9	0.000041	0.0008	0.002	0.0497	0.0807	0.00002	7.3	0.01	41.3	0.0872	0.0113	37.2	0.002	0.0007	0.001	20.7	0.00378	5.89	0.0055	0.657	0.015	0.00025	0.00375	0.006	0.01	0.0005
W50	4/20/2012 16:05	398	1006		7.79	647	13	2.4	8.39	0.016	9.43	0.0386	55.7	10.32	0.745	0.00004	0.0155	0.00087	0.1784	0.15	0.0011	0.001	129.1	0.000042	0.0008	0.002	0.0504	0.0846	0.00002	7.55	0.01	40.8	0.086	0.0109	36.2	0.0021	0.0007	0.001	19.5	0.00371	5.93	0.0055	0.666	0.015	0.00025	0.0038	0.006	0.0116	0.0005
W50	4/21/2012 16:30	395	1016		7.78	644	8.7	2.4	90.8	0.0165	9.26	0.0361	52.5	10.49	0.765	0.00004	0.0123	0.0009	0.1754	0.15	0.0011	0.001	127.9	0.000043	0.0008	0.002	0.0499	0.076	0.00002	7.32	0.01	40.6	0.082	0.0112	36	0.0021	0.0007	0.001	20.4	0.00385	5.96	0.0055	0.653	0.015	0.00025	0.0037	0.006	0.01	0.0005
W50	4/22/2012 15:30	393	1013		7.65	657	9.7	2.5	92.5	0.0169	9.29	0.0489	51.6	10.18	0.754	0.00004	0.0123	0.00091	0.1765	0.15	0.0011	0.001	126.8	0.000049	0.0008	0.002	0.0499	0.076	0.00002	7.32	0.01	40.5	0.0818	0.0116	36.1	0.002	0.0007	0.001	19.8	0.00377	5.95	0.0055	0.653	0.015	0.00025	0.00392	0.006	0.01	0.0005
W50	4/23/2012 14:46	396	1015		7.62	665	12.9	2.5	99.2	0.016	9.31	0.0467	51.7	10.08	0.744	0.00004	0.012	0.0009	0.1781	0.15	0.0011	0.001	121.9	0.000032	0.0008	0.002	0.0481	0.0759	0.00002	7.26	0.01	39.4	0.081	0.0118	35	0.002	0.0007	0.001	19.8	0.00349	5.45	0.0055	0.648	0.015	0.00025	0.00418	0.006	0.01	0.0005
W50	4/24/2012 0:00	396	1016		7.58	649	14	2.1	98.3	0.0171	9.35	0.0352	49.4	10.31	0.744	0.00007	0.0158	0.0014	0.1733	0.15	0.0051	0.001	124.2	0.000075	0.001	0.0015	0.0496	0.0733	0.00021	3.64	0.055	40.1	0.0797	0.011	35.6	0.006	0.0012	0.001	19.3	0.0038	5.56	0.005	0.635	0.055	0.00025	0.00376	0.035	0.01	0.0005
W50	4/25/2012 0:00	186	512		7.58	316	3.8	2.4	90.9	0.0086	4.51	0.018	50.8	5.2	0.37	0.00002	0.019	0.00038	0.0864	0.05	0.0001	0.001	59.5	0.000019	0.0005	0.001	0.0256	0.0449	0.00001	3.54	0.005	19.6	0.0402	0.0056	17.3	0.0014	0.0002	0.0005	18.1	0.00175	5.49	0.005	0.657	0.005	0.00005	0.00197	0.005	0.005	0.0005
W50	4/25/2012 12:02	201	494			331	4.2			0.0101	4.54	0.0195		4.85	0.38	0.00002	0.0078	0.0005	0.093	0.1	0.001		65.5	0.000017	0.0003	0.001	0.0262	0.038	0.00001	4	0.005	20.8	0.0415	0.0055	18.8	0.0011	0.0005	0.0005		0.0017		0.0005		0.01	0.0002	0.00201	0.001	0.005	
W50	4/26/2012 0:00	184	510	187.2	7.57	310	4.4	2.4	88.6	0.0093	4.51	0.021	52.6	5.3	0.38	0.00002	0.0104	0.00038	0.0868	0.05	0.0001	0.001	57.4	0.000022	0.0005	0.001	0.0254	0.0477	0.00001	3.59	0.005	19.2	0.0435	0.0055	17.5	0.0011	0.0002	0.0005	18.3	0.00174	5.49	0.005	0.643	0.005	0.00005	0.00191	0.005	0.005	0.0005
W50	4/26/2012 11:10	202	491			303	6.2			0.0071	4.51	0.118		4.83	0.379	0.00002	0.0103	0.0005	0.091	0.1	0.001		65.8	0.000017	0.0003	0.001	0.0256	0.034	0.00001	3.9	0.005	20.5	0.043	0.0055	18.2	0.0011	0.0005	0.0005		0.0017		0.0005		0.01	0.0002	0.00197	0.001	0.005	
W50	4/27/2012 0:00	183	510	143.7	7.77	322	3.9	2.4	86.5	0.0097	4.52	0.018	50.9	5.5	0.37	0.00002	0.0076	0.00043	0.0854	0.05	0.0001	0.001	62.2	0.000025	0.0005	0.001	0.0245	0.0442	0.00001	3.68	0.005	19.9	0.0422	0.0054	18.1	0.001	0.0002	0.0005	19.6	0.00168	5.97	0.005	0.633	0.005	0.00005	0.00182	0.005	0.005	0.0005
W50	4/27/2012 15:40	194	490			324	6.7			0.0071	4.41	0.0176		4.8	0.378	0.00002	0.0074	0.0005	0.092	0.1	0.001		65.1	0.000019	0.0003	0.001	0.026	0.039	0.00001	4	0.005	21.1	0.0424	0.0055	19	0.0011	0.0005	0.0005		0.0018		0.0005		0.01	0.0002	0.00193	0.001	0.005	
W50	4/28/2012 0:00	185	511	156.3	7.6	324	4.2	2.3	87.3	0.0091	4.55	0.021	50.5	5.3	0.37	0.00002	0.0215	0.00041	0.0865	0.05	0.0001	0.001	62.9	0.000027	0.0005	0.001	0.0271	0.0784	0.00001	3.71	0.005	20.1	0.0449	0.0054	18.2	0.0011	0.0002	0.0005	20.2	0.00176	5.96	0.005	0.638	0.005	0.00005	0.00182	0.005	0.005	0.0005
W50	4/28/2012 8:50	198	490			329	4.7			0.0076	4.4	0.0247		4.78	0.375	0.00002	0.0071	0.0005	0.092	0.1	0.001		64.9	0.000018	0.0003	0.001	0.0259	0.037	0.00001	4	0.005	21.1	0.0424	0.0056	19.1	0.0011	0.0005	0.0005		0.0017		0.0005		0.01	0.0002	0.00196	0.001	0.005	
W50	4/29/2012 0:00	184	511	133.2	7.47	308	4.1	2.3	89.2	0.0103	4.37	0.016	50	5.3	0.37	0.00002	0.0064	0.0004	0.0848	0.05	0.0001	0.001	61.8	0.000022	0.0005	0.001	0.0245	0.0432	0.00001	3.68	0.005	19.8	0.0448	0.0056	17.9	0.001	0.0002	0.0005	19.5	0.00185	5.89	0.005	0.635	0.005	0.00005	0.00182	0.005	0.005	0.0005
W50	4/29/2012 9:00	195	489			325	6			0.0068	4.4	0.0943		4.8	0.376	0.00002	0.0066	0.0005	0.091	0.1	0.001		65.6	0.000019	0.0003	0.001	0.0257	0.039	0.00001	4	0.005	21.1	0.0453	0.0052	19	0.001	0.0005	0.0005		0.0017		0.0005		0.01	0.0002	0.00181	0.001	0.005	
W50	4/30/2012 0:00	195	512	88.7	7.48	314	3.9	2.4	81.8	0.0099	4.47	0.018	50.7	5.2	0.37	0.00002	0.0061	0.00038	0.0852	0.05	0.0001	0.001	60.7	0.000019	0.0005	0.001	0.0245	0.0447	0.00001	3.65	0.005	19.7	0.0488	0.0054	17.9	0.001	0.0002	0.0005	19.4	0.00161	5.78	0.005	0.633	0.005	0.00005	0.00181	0.005	0.005	0.0005
W50	4/30/2012 10:50	192	491			330	4			0.0066	4.35	0.642		4.95	0.376	0.00002	0.0063	0.0005	0.088	0.1	0.001		63.9	0.000018	0.0003	0.001	0.0252	0.039	0.00001	3.7	0.005	20.3	0.0486	0.0051	17.8	0.001	0.0005	0.0005		0.0018		0.0005		0.01	0.0002	0.0018	0.001	0.005	
W50	5/1/2012 14:30	191	507	79.6	7.73	322	3.6	2.6	82.1	0.0085	4.37	0.016	51.9	5.1	0.37	0.00002	0.0066	0.00045	0.0874	0.05	0.0001	0.001	60.7	0.000016	0.0005	0.001	0.026	0.0493	0.00001	3.68	0.005	19.9	0.0545	0.0057	17.7	0.001	0.0002	0.0005	18.7	0.00173	5.75	0.005	0.643	0.005	0.00005	0.00185	0.005	0.005	0.0005
W50	5/2/2012 15:45	190	497	94.5	7.65	322	4.1	2.4	84	0.0087	4.47	0.013	51.4	5.6	0.37	0.00002	0.0099	0.00044	0.0868	0.05	0.0001	0.001	59.1	0.000021	0.0005	0.001	0.026	0.0572	0.00001	3.67	0.005	19.8	0.0579	0.0056	17.6	0.001	0.0002	0.0005	18.1	0.0016	5.67	0.005	0.637	0.005	0.00005	0.00182	0.005	0.005	0.0005
W50	5/3/2012 10:30	190	502	87	7.59	316	3.8	2.5	82.6	0.0112	4.21	0.019	50.4	5.4	0.37	0.00002	0.0063	0.00043	0.0856	0.05	0.0001	0.001	60.6	0.000022	0.0005	0.001	0.0257	0.0504	0.00001	3.61	0.005	19.4	0.0547	0.0055	17.5	0.001	0.0002	0.0005	18.6	0.00161	5.82	0.005	0.631	0.005	0.00005	0.00181	0.005	0.005	0.0005
W50	5/4/2012 14:30	104	388	95.1	7.25	264	6.6	3.5	87.2	0.0084	2.97	0.021	40.7	4.3	0.27	0.00002	0.0239	0.00038	0.0691	0.05	0.0001	0.001	45.7	0.000033	0.0005	0.001	0.027	0.0851	0.00001	2.93	0.005	14.5	0.0703	0.0039	12.7	0.001	0.0002	0.0005	13.3	0.00123	4.44	0.005	0.474	0.005	0.00005	0.00131	0.005	0.005	0.0005
W50	5/5/2012 9:30	104	388	95.2	7.52	230	6.3	3.1	70.8	0.0083	2.96	0.017	40.1	4.2	0.27	0.00002	0.0165	0.00037	0.0688	0.05	0.0001	0.001	44.9	0.000021	0.0005	0.001	0.0253	0.0812	0.00001	2.91	0.005	14.7	0.0742	0.004	12.8	0.001	0.0002	0.0005	13.4	0.00115	4.17	0.005	0.472	0.005	0.00005	0.00131	0.005	0.005	0.0005
W50	5/6/2012 14:00	153	411	84.4	7.55	246	10.6	3.1	70.2	0.0101	3.21	0.022	43.6	4.6	0.31	0.00002	0.0136	0.00038	0.0718	0.05	0.0001	0.001	49.6	0.000019	0.0005	0.001	0.0254	0.0768	0.00001	3.09	0.005	14.8	0.0683	0.0043	13	0.001	0.0002	0.0005	15.3	0.00129	5.07	0.005	0.497	0.005	0.00005	0.00141	0.005	0.005	0.0005
W50	5/7/2012 0:00	195	477	26	7.7	286	3.7	4.3	46.9	0.005	1.6	0.0062	44.2	5	0.4	0.00002	0.0056	0.00036	0.0782	0.05	0.0001	0.001	61.1	0.000012	0.0005	0.001	0.0071	0.0174	0.00001	3.63	0.005	18.2	0.0227	0.0063	17.6	0.0011	0.0002	0.0005	17	0.00063	5.67	0.005	0.607	0.005	0.00005	0.00262	0.005	0.005	0.0005
W50	5/9/2012 14:00	163	433	132	7.3	286	6.1	3.2	94.6	0.0099	3.16	0.027	46.3	4.4	0.32	0.00002	0.0209	0.00037	0.0795	0.05	0.0001	0.001	52.6	0.000024	0.0005	0.001	0.0281	0.105	0.00001	3.38	0.005	16.9	0.1	0.0046	14.7	0.001	0.0002	0.0005	15.3	0.00143	4.89	0.005	0.548	0.005	0.00005	0.00161	0.005	0.005	0.0005
W50	5/10/2012 17:00	151	399	80.6	7.83	258	6.8	3.6	95	0.0091	2.91	0.03	42	3.9	0.29	0.00002	0.016	0.00039	0.0745	0.05	0.0001	0.001	48.8	0.000024	0.0005	0.001	0.0256	0.12	0.00001	3.07	0.005	15.2	0.119	0.0044	13.3	0.001	0.0002	0.0005	14.2	0.00126	4.54	0.005	0.513	0.005	0.00005	0.00155	0.005	0.005	0.0005
W50	4/22/2013 11:45	193	478	397.4	8.64	286	13.7	1.9		0.005	2.42	0.032	47.6	5.2	0.31	0.00002	0.0077	0.00033	0.0761	0.05	0.0001	0.001	59.8	0.00001	0.0005	0.001	0.0167	0.029	0.00001	3.1	0.005	18.7	0.0126	0.0044	14.8	0.001	0.0002	0.0005	15.7	0.00087	4.57	0.005	0.594	0.005	0.00005	0.00178	0.005	0.005	0.0005
W50	4/23/2013 8:10			-418.2	8.07			1.8																																								
W50	4/25/2013 6:40			15.2	7.8			1.6	114																																							
W50	4/26/2013 6:40	196	484			280	3.7			0.0077	3.15	0.035	46.5	5.8	0.32	0.00002	0.0052	0.00029	0.0775	0.05	0.0001	0.001	56.3	0.00001	0.0005	0.001	0.0176	0.0265	0.00001	3.02	0.005	19	0.0041	0.0038	14.8	0.001	0.0002	0.0005	16.4	0.0008	4.49	0.005	0.578	0.005	0.00005	0.00159	0.005	0.005	0.0005
W50	4/30/2013 5:50	176	447	-14.1	7.79	280	3	1.2	105.2	0.0149	2.71	0.023	38.2	5.1	0.29	0.00002	0.0033	0.0003	0.0729	0.05	0.0001	0.001	52	0.00001	0.0005	0.001	0.0158	0.023	0.00001	2.9	0.005	17.3	0.0049	0.0037	15.4	0.001	0.0002	0.0005	14.9	0.00093	4.15	0.005	0.549	0.005	0.00005	0.00153	0.005	0.005	0.0005
W50	5/3/2013 13:45	173	437			252	2.9			0.0115	2.59	0.043				0.00002	0.0042	0.00032	0.0715	0.05	0.0001	0.001	49.2	0.00001	0.0005	0.001	0.0142	0.0213	0.00001	2.84	0.005	16.5	0.0111	0.0039	15.1	0.001	0.0002	0.0005	13.3	0.00064	3.85	0.005	0.536	0.005	0.00005	0.00158	0.005	0.005	0.0005
W50	5/5/2013 15:00	169	423	36.7	7.59	252	6.4	1.6	106.5	0.0084	2.61	0.048	39.5	5.7	0.26	0.00002	0.0047	0.0003	0.0701	0.05	0.0001	0.001	49.8	0.00001	0.0005	0.001	0.0149	0.0308	0.00001	2.76	0.005	16.2	0.0206	0.0037	15.1	0.001	0.0002	0.0005	13.2	0.00062	3.86	0.005	0.524	0.005	0.00005	0.00154	0.005	0.005	0.0005
W50	5/7/2013 16:30	165	441	45.4	8.8	278	8.8	1.5	91.9	0.0187	12.2	0.044	40.8	11	0.29	0.00002	0.0062	0.00035	0.0746	0.05	0.0001	0.001	51.7	0.00001	0.0005	0.001	0.0195	0.0869	0.00001	3.09	0.005	16.7	0.0999	0.0038	14.4	0.001	0.0002	0.0005	13.3	0.0007	4.06	0.005	0.537	0.005	0.00005	0.00149	0.005	0.005	0.0005
W50	5/16/2013 14:50	46.2	116	67.7	8.1	116	3.5	4.2	85.8	0.0646	0.953	0.079	0.82	1.9	0.12	0.00002	0.0496	0.00027	0.0361	0.05	0.0001	0.001	17.3	0.00001	0.0005	0.001	0.0223	0.131	0.00001	1.44	0.005	5.03	0.026	0.0014	3.54	0.0012	0.0002	0.0005	3	0.00026	2.61	0.005	0.147	0.005	0.00005	0.0004	0.005	0.005	0.0005
W50	5/23/2013 0:00	46.8	133	5.5	8.25	118	27.8	3.7	92.7	0.0371	0.906	0.043	0.5	4.9	0.12	0.00002	0.12	0.00029	0.0371	0.05	0.0001	0.001	15.5	0.000014	0.0005	0.001	0.0322	0.205	0.00001	2.12	0.005	4.53	0.0309	0.0017	5.69	0.0015	0.0002	0.0005	4.1	0.00027	2.36	0.005	0.241	0.0052	0.00005	0.00024	0.005	0.005	0.0005
W50	5/24/2013 7:30	48.7	142	-11.9	7.97	132	19.4	3.6	96	0.0415	1.2	0.056	3.22	4.9	0.13																																				
W50	5/25/2013 7:25			10.6	7.91			4.7	88.5																																							
W50	5/26/2013 7:15			37.5	7.54			5.4	86.9																																							
W50	5/27/2013 6:50				8			8																																							
W50	5/28/2013 8:25	63.8	205	41.5	7.81	156	8.5	7.1	74.9	0.048	2.13	0.082	21.6	6.1	0.2	0.00002	0.0363	0.00027

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | | Dissolved Elements | | | | | | | |

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | | Dissolved Elements | | | | | | | |

Attachment 3: Sitewide Database

Station	Date / Time	General Parameters								Anions & Nitrogen Species						Dissolved Elements																														
		Alk-T	Cond-L	ORP	pH-F	TDS	TSS	Temp-F	O-DO-%	$N\text{-}NO_3$	$N\text{-}NO_3$	$N\text{-}NH_3$	SO_4-D	Chlord	Fluord	Ag-D	Al-D	As-D	Ba-D	B-D	Be-D	Bi-D	Ca-D	Cd-D	Co-D	Cr-D	Cu-D	Fe-D	Hg-D	K-D	Li-D	Mg-D	Mn-D	Mo-D	Na-D	Ni-D	Pb-D	Sb-D	S-D	Se-D	Si-D	Sn-D	Sr-D	Ti-D	Tl-D	U-D	V-D	Zn-D	Zr-D
		mg/L	µS/cm	mV		mg/L	mg/L	°C	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
W62	1/4/2019 0:00	435	1280	-	-	864	5	-	-	0.0123	8.69	0.0114	260	28.9	-	0.00001	0.0022	0.00041	0.104	0.023	0.00002	0.00005	187	0.0000192	0.00011	0.00023	0.058	0.033	0.000005	6.33	0.0034	50.9	0.0269	0.00822	31.5	0.00114	0.00005	0.0001	93.2	0.00344	7.7	0.0001	1.95	0.0003	0.00001	0.00528	0.00051	0.0279	0.0003
W62	1/4/2019 11:10	432	1320	231.3	7.22	864	4.8	4.6	92.5	0.017	8.41	0.0101	264	28.8	-	0.00001	0.0022	0.00044	0.108	0.024	0.00002	0.00005	186	0.0000208	0.00013	0.0002	0.0576	0.032	0.000005	6.05	0.0036	50.9	0.0276	0.00834	32.1	0.00114	0.00005	0.0001	98.5	0.00364	8.05	0.0001	1.98	0.0003	0.00001	0.00548	0.00054	0.0334	0.0003
W62	2/2/2019 0:00	425	1250	-	-	840	3	-	-	0.005	8.11	0.0077	257	30.1	-	0.00001	0.0021	0.00045	0.111	0.024	0.00002	0.00005	179	0.0000232	0.00011	0.0002	0.0533	0.024	0.000005	5.74	0.0028	46.4	0.032	0.00784	31	0.00101	0.00005	0.0001	82.3	0.00321	7.52	0.0001	1.9	0.0003	0.00001	0.0055	0.00057	0.0425	0.0003
W62	2/2/2019 10:45	437	1260	244	6.7	851	7.7	2.1	85.6	0.005	8.09	0.0115	256	30	-	0.00001	0.0023	0.00056	0.113	0.025	0.00002	0.00005	183	0.00022	0.00011	0.0002	0.0537	0.027	0.000005	5.96	0.003	47.4	0.0321	0.00791	30.7	0.00102	0.00005	0.0001	81.9	0.00326	7.57	0.0001	1.91	0.0003	0.00001	0.00559	0.00059	0.0434	0.0003
W62	3/3/2019 0:00	414	1220	-	-	815	3	-	-	0.005	7.11	0.0115	237	31	-	0.00001	0.0028	0.00045	0.103	0.024	0.00002	0.00005	183	0.0000285	0.0001	0.00031	0.057	0.027	0.000005	5.71	0.0029	48.9	0.0268	0.00716	30.7	0.00117	0.00005	0.0001	79	0.00269	7.62	0.0001	1.85	0.0003	0.00001	0.00569	0.00061	0.0586	0.0003
W62	3/3/2019 10:45	413	1210	152.3	7.28	811	3.3	4.1	119.2	0.005	7.1	0.0108	238	30.7	-	0.00001	0.0022	0.00047	0.101	0.025	0.00002	0.00005	176	0.0000272	0.00011	0.00019	0.0567	0.023	0.000005	5.72	0.0029	49.7	0.026	0.00715	31.4	0.00122	0.00005	0.0001	78.6	0.00254	7.75	0.0001	1.89	0.0003	0.00001	0.00562	0.00065	0.0569	0.0003
W62	4/9/2019 10:40	344	1130	141.8	8.01	763	3	2	109	0.0257	11.1	0.0116	248	31.4	-	0.00001	0.0022	0.00041	0.0997	0.026	0.00002	0.00005	152	0.0000261	0.00013	0.00022	0.0442	0.021	0.000005	5.99	0.0038	42.7	0.0369	0.0109	27.4	0.00091	0.00005	0.0001	78.1	0.00493	6.1	0.0001	1.88	0.0003	0.00001	0.00533	0.00062	0.0408	0.0003
W62	5/7/2019 17:05	385	1150	218.1	7.93	771	7.9	5	81.7	0.0062	8.98	0.0107	225	29.4	-	0.00001	0.0178	0.00055	0.0922	0.025	0.00002	0.00005	164	0.0000281	0.00013	0.00019	0.0501	0.042	0.000005	5.98	0.0032	47.1	0.0415	0.00744	28.9	0.00113	0.00005	0.0001	82.5	0.00365	7.59	0.0001	1.7	0.0015	0.00001	0.00523	0.00083	0.0309	0.0003
W62	6/6/2019 15:00	315	1050	175.6	7.57	699	4.6	0.8	86	0.0109	8.26	0.0102	209	27.8	-	0.00001	0.004	0.0006	0.091	0.025	0.00002	0.00005	155	0.0000167	0.00011	0.00017	0.0562	0.03	0.000005	6.09	0.0031	45.7	0.0317	0.00797	29	0.00115	0.00005	0.00012	74.8	0.00319	7.8	0.0001	1.777	0.00038	0.00001	0.0054	0.00079	0.0112	0.0003
W62	7/4/2019 10:45	331	983	127.8	7.96	641	8.6	9.3	76.5	0.005	6.32	0.0099	177	23.1	-	0.00001	0.0024	0.00055	0.0811	0.022	0.00002	0.00005	140	0.0000193	0.0001	0.00018	0.05	0.031	0.000005	5.44	0.0027	41.3	0.0374	0.00629	27.5	0.00116	0.00005	0.0001	62.1	0.00243	7.17	0.0001	1.56	0.0003	0.00001	0.00481	0.00069	0.0119	0.0003
W62	8/10/2019 10:00	303	987	168.8	7.93	760	11.2	6.4	84.4	0.014	7.12	0.0113	206	23.4	0.38	0.00001	0.0033	0.00054	0.0965	0.025	0.00002	0.00005	144	0.0000177	0.00012	0.00025	0.0407	0.029	0.000005	5.19	0.0032	41.4	0.0343	0.00809	29.3	0.00112	0.00005	0.00011	73.1	0.00371	6.85	0.0001	1.65	0.0006	0.00001	0.00443	0.00077	0.0069	0.0003
W62	9/1/2019 11:15	387	1110	170.7	7.78	759	3	4.9	87.7	0.0066	8.43	0.0129	212	25.5	-	0.00001	0.0039	0.0005	0.1	0.024	0.00002	0.00005	165	0.0000174	0.00013	0.00025	0.0462	0.074	0.000005	6.13	0.0031	46.4	0.036	0.00792	34	0.00123	0.00005	0.0001	74.7	0.0034	7.54	0.0001	1.96	0.0003	0.00001	0.00484	0.0007	0.0062	0.0003
W62	10/13/2019 14:35	380	1280	172.7	7.36	974	5.5	3.9	85.7	0.0066	10.7	0.0089	352	27.6	-	0.00001	0.0025	0.00054	0.133	0.04	0.00002	0.00005	210	0.0000479	0.00012	0.00023	0.0552	0.028	0.000005	7.06	0.0039	60.8	0.0152	0.00953	40.6	0.00114	0.00005	0.0001	122	0.00519	7.24	0.0001	2.48	0.0003	0.00001	0.00559	0.00072	0.054	0.0003
W62	11/10/2019 9:00	416	1260	179.7	7.94	867	10	3.2	82.6	0.0062	11	0.0142	251	27.6	-	0.00001	0.0021	0.00055	0.116	0.029	0.00002	0.00005	190	0.0000312	0.0001	0.00021	0.0546	0.031	0.000005	7.04	0.0034	54.9	0.0158	0.0088	37.7	0.00116	0.00005	0.0001	84.9	0.00407	8.32	0.0001	2.29	0.0003	0.00001	0.00549	0.00071	0.0945	0.0003
W62	12/23/2019 13:55	422	1270	164.6	8.09	926	19.2	-	105.3	0.01	10.7	0.011	286	30.1	0.49	0.00001	0.0038	0.00052	0.114	0.032	0.00002	0.00005	209	0.0000224	0.00012	0.00023	0.051	0.029	0.000005	6.83	0.0036	55.5	0.0197	0.00918	37.3	0.00121	0.00005	0.0001	96.2	0.00423	7.74	0.0001	2.36	0.0003	0.00001	0.00627	0.00073	0.0132	0.0003
W62	1/20/2020 16:10	914	2630	169.2	7.38	1877	15.2	-0.1	32.2	0.01	20.1	0.0191	540	58.7	-	0.00002	0.0078	0.0012	0.209	0.058	0.00004	0.0001	407	0.0000473	0.00023	0.00055	0.0984	0.054	0.00001	12.79	0.0062	103.9	0.0229	0.01673	73	0.00211	0.0001	0.0002	184.2	0.00984	16.1	0.0002	4.54	0.00061	0.00002	0.01139	0.00143	0.145	0.00047
W62	2/21/2020 10:15	416	1300	199.6	7.95	-	8.1	2	77.7	0.01	9.78	0.0074	261	30.1	-	0.00001	0.0022	0.00059	0.094	0.031	0.00002	0.00005	223	0.0000165	0.00011	0.00024	0.0532	0.026	0.000005	6.83	0.0034	60.8	0.0118	0.00851	36.5	0.00113	0.00005	0.0001	89.3	0.00372	8.18	0.0001	2.46	0.00033	0.00001	0.00601	0.00075	0.316	0.00024
W62	3/9/2020 9:20	461	1310	138	7.31	902	3	2.8	76.8	0.005	9.44	0.0096	250	29.5	0.344	0.00001	0.0029	0.00061	0.0989	0.027	0.00002	0.00005	173	0.0000244	0.001	0.00024	0.0529	0.03	0.000005	6.22	0.0031	54.2	0.00828	0.00744	32.5	0.00112	0.00005	0.0001	81.3	0.00382	8.39	0.0001	1.97	0.0003	0.00001	0.00564	0.00074	0.465	0.00023
W62	4/13/2020 8:05	468	1330	137.7	7.49	958	9.4	2.9	69.6	0.0138	10.1	0.0134	268	31.1	-	0.00001	0.0031	0.0006	0.111	0.026	0.00002	0.00005	196	0.000115	0.00013	0.00024	0.0614	0.03	0.000005	6.46	0.003	55.6	0.0229	0.00736	36.2	0.00134	0.00005	0.00013	95.7	0.00372	8.25	0.0001	2.12	0.0003	0.00001	0.00578	0.00073	0.482	0.00024
W62	5/25/2020 11:05	281	1230	170.2	7.25	885	19.4	2.7	70.4	0.0351	24.8	0.0256	303	20.4	-	0.00001	0.0025	0.00046	0.0978	0.039	0.00003	0.00005	176	0.0000849	0.00011	0.00017	0.0386	0.024	0.000005	7.37	0.0042	49.2	0.0251	0.0143	33.1	0.0009	0.00005	0.00014	110	0.0107	6.16	0.0001	2.15	0.00032	0.00001	0.00624	0.00057	0.0202	0.0002
W62	6/18/2020 11:20	299	1170	196.2	7.63	826	3.5	12.3	85.1	0.0169	19.1	0.0094	272	20.1	-	0.00001	0.002	0.00044	0.0888	0.045	0.00002	0.00005	157	0.0000518	0.0001	0.00014	0.035	0.018	0.000005	5.8	0.0034	43.9	0.0153	0.0106	30.2	0.00072	0.00005	0.0001	92.5	0.00798	6.52	0.0001	1.78	0.0003	0.00001	0.00498	0.00052	0.0105	0.0002
W62	8/1/2020 15:40	278	1190	140.2	7.68	802	3	12.7	78.4	0.005	15.7	0.0105	279	43.2	-	0.00001	0.0026	0.00046	0.089	0.039	0.00002	0.00005	154	0.000034	0.0001	0.00021	0.042	0.024	0.000005	5.93	0.0065	39.4	0.0128	0.0113	27.4	0.00058	0.00005	0.0001	90.3	0.007	5.94	0.0001	1.89	0.0003	0.00001	0.0045	0.00054	0.0129	0.0002
W62	9/4/2020 11:00	298	1160	21.5	7.87	814	39.2	2.5	93.1	0.012	16.2	0.0144	259	32.7	-	0.000013	0.0186	0.00039	092	0.034	0.00002	0.00005	171	0.0000693	0.0001	0.00022	058	0.06	0.000005	6.46	0.0041	44.3	0.0444	0.0135	30.3	0.00103	0.00005	0.00011	94.8	0.00714	6.89	0.00012	1.88	0.00242	0.00001	0.00464	0.00053	057	0.0002
W62	10/15/2020 17:25	356	1250	239.4	7.53	917	20.4	1.7	96.5	0.0174	18.4	0.0107	280	30.2	-	0.00001	0.0029	0.00043	101	03	0.00002	0.00005	184	0.0000614	0.0001	0.00026	0.0724	0.036	0.000005	6.93	0.0039	49.4	0.0442	0.0103	36.2	0.00119	0.00005	0.0001	95.3	0.0072	7.91	0.0001	2.37	0.0003	0.00001	0.00475	0.0005	0.0334	0.00022
W62	11/10/2020 11:35	338	1250	184.8	7.71	902	3	1.3	72.2	0.005	18.9	0.0063	272	29.2	-	0.00001	0.0028	0.00047	0.0912	029	0.00002	0.00005	202	0.0000285	0.00012	0.00021	0.0514	0.046	0.000005	6.74	0.0038	50.7	0.0229	0.0105	34.5	0.0011	0.00005	0.0001	104	0.00735	7.54	0.0001	2.16	0.0003	0.00001	0.00538	0.00058	0.0524	0.00023
W62	12/8/2020 14:05	406	1210	-	-	955	3	-	-	0.005	19.2	0.0083	278	30.5	-	0.00001	0.0024	0.00044	0.0992	03	0.00002	0.00005	194	0.000038	0.00011	0.00026	0.0558	0.039	0.000005	7.63	0.0037	56.7	0.0146	0.00906	37.6	0.00127	0.00005	0.0001	103	0.00606	7.97	0.0001	2.24	0.0006	0.00001	0.00541	0.00057	0.0357	0.00022
W7	6/7/1994 0:00	-	121	-	-	97	79	-	-	0.005	0.063	0.007	-	1	0.17	0.0001	0.055	0.0002	0.044	0.1	0.005	0.1	16.6	0.0002	0.001	0.001	0.003	0.281	-	0.6	-	5.71	0.058	0.001	3.01	0.002	0.001	0.0001	-	0.0005	4.32	-	-	0.166	-	-	0.00025	0.03	0.005	-
W7	7/8/1994 0:00	-	133	-	-	93	13	-	-	0.004	0.048	0.009	-	1.2	0.16	0.0001	0.057	0.0002	0.044	0.1	0.005	0.1	17.5	0.0002	0.001	0.001	0.002	0.237	-	0.59	-	5.7	0.012	0.001	3.04	0.003	0.001	0.0001	-	0.0005	5.16	-	0.179	-	-	0.00014	0.03	0.005	-
W7	8/10/1994 0:00	-	199	-	-	128	5	-	-	0.002	0.06	0.005	-	1.1	0.35	0.0001	0.021	0.0003	0.058	0.1	0.005	0.1	26.4	0.0002	0.001	0.001	0.001	0.126	-	0.83	-	8.46	0.044	0.001	5.23	0.001	0.001	0.0001	-	0.0005	5.5	-	0.283	-	-	0.00031	0.03	0.005	-
W7	5/27/2005 0:00	36.7	152	-	-	116	30.5	-	-	0.0018	0.0824	0.02	0.5	0.5	-	0.00002	0.0236	0.0005	0.045	0.1	0.01	-	19.5	-	0.0003	0.001	0.0018	0.136	0.00002	2	0.005	6.77	0.0193	0.001	3.9	0.0016	0.0005	0.0005	-	-	-	0.0005	-	0.01	0.0002	0.00036	0.03	0.005	-
W7	6/30/2005 0:00	117	233	-	-	153	14	-	-	0.0017	0.172	0.02	10.2	0.92	-	0.00001	0.0086	0.00042	0.0609	0.01	0.0005	0.0005	30	-	0.0001	0.0005	0.00119	0.07	-	2	0.005	10.2	0.0415	0.00124	6.9	0.00093	0.00005	0.0001	-	-	5.72	0.0001	0.284	0.01	0.0001	0.00759	0.001	0.0064	-
W7	7/29/2005 0:00	323	323	-	-	197	17	-	-	0.001	0.169	0.02	-	0.5	-	0.00001	0.0096	0.00035	0.061	0.1	0.005	0.0005	41.3	-	0.0005	0.0005	0.0045	0.105	-	2	0.005	15.6	0.0244	0.00127	8.8	0.00095	0.00005	0.0001	-	-	5.47	0.0001	0.277	0.01	0.0001	0.00994	0.001	0.002	-
W7	8/30/2005 0:00	113	211	-	-	148	3	-	-	0.001	0.0226	0.02	6.02	0.5	-	0.00002	0.0156	0.00051	062	0.1	001	-	27.8	0.000017	0.0003	001	0.0014	0.292	0.00002	2	0.005	9.7	0.0315	001	5.9	0.0015	0.0005	0.0005	-	-	-	0.0005	-	0.01	0.0002	0.00055	0.03	0.005	-
W7	9/28/2005 0:00	95.9	190	-	-	142	361	-	-	0.001	0.0586	0.02	5.62	0.5	-	0.00002	0.0186	0.00054	055	0.1	001	-	27.4	0.000017	0.0003	001	0.0016	0.32	0.00002	2	0.005	9.32	0.0414	001	5.3	0.0018	0.0005	0.0005	-	-	-	0.0005	-	0.01	0.0002	0.00038	0.03	0.005	-
W7	10/15/2005 0:00	-	194	-	-	145	7.5	-	-	0.001	0.102	0.021	-	0.5	-	0.00001	0.0155	0.00048	0.0502	0.01	0.0005	0.0005	27.1	-	0.00011	0.0005	0.00127	0.253	-	2	0.005	9.35	0.0383	0.000925	5.5	0.00146	0.00005	0.0001	-	-	6.44	0.0001	0.23	0.01	0.0001	0.00055	0.001	0.001	-
W7	6/2/2006 11:30	49.4	98.8	-	-	104	705	-	-	0.0015	0.0449	0.062	2.98	0.5	0.155	0.00001	0.0714	0.00062	0.0341	0.01	0.0005	0.0005	14.4	-	0.00033	0.00055	0.00212	0.546	-	2	0.005	4.85	0.0882	0.000697	3.8	0.0022	0.000054	0.0001	-	-	4.19	0.0001	0.11	0.01	0.0001	0.000216	0.0017	0.001	-
W7	6/8/2006 10:40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W7	6/15/2006 0:00	95	193	-	-	114	53	-	-	-	0.18	0.027	10.5	-	-	-	0.013	0.0004	0.063	0.003	0.0001	0.0005	26.9	0.00001	0.0001	0.0005	0.001	0.09	-	0.4	0.001	8.9	0.044	0.001	5.9	0.001	0.0001	0.0002	3.5	0.0002	5.35	0.001	0.236	0.0007	0.00005	0.0007	0.0011	0.001	-
W7	6/23/2006 0:00	130	246	-	-	176	328	-	-	-	0.23	0.028	15.1	-	-	-	0.011	0.0005	0.067	002	0.0001	0.0005	31.8	0.00001	0.0001	0.0007	0.001	0.09	-	1.1	0.001	10.4	0.043	0.001	5.9	0.0013	0.0001	0.0002	4.3	0.0003	5.5	0.001	0.321	0.0006	0.00005	0.001	0.001	0.002	-
W7	6/28/2006 0:00	106	213	-	-	120	103	-	-	-	0.112	0.01	-	-	-	-	0.407	0.0008	079	002	0.0001	0.0005	22.8	0.00003	0.0009	0.0015	0.003	0.06	-	0.8	0.001	9.2	011	0.001	6.2	0.0036	0.0005	0.0002	3.4	0.0002	6.48	0.001	0.284	0.0117	0.00005	0.0009	0.0029	0.005	-
W7	7/7/2006 0:00	120	205	-	-	184	3	-	-	-	0.205	-	10.8	-	-	-	0.005	0.0006	067	005	0.0001	0.0007	26.5	0.00001	0.0001	0.0011	001	0.06	-	0.8	0.001	10.7	0.023	002	6.7	0.0015	0.0001	0.0002	4	0.0002	6.8	001	0.322	0.0007	0.00005	0.0005	0.0013	001	-
W7	7/12/2006 0:00	120	238	-	-	-	2	-	-	-	0.18	0.014	10.4	-	-	-	0.006	0.0005	064	005	0.0001	0.0007	26.9	0.00001	0.0001	0.001	001	0.06	-	0.9	0.001	10.5	0.022	001	6.6	0.0007	0.0001	0.0002	4	0.0002	5.36	001	0.322	0.0005	0.00005	0.0007	0.0018	001	-
W7	7/20/2006 0:00	122	233	-	-	-	2	-	-	-	0.19	0.012	10.5	-	-	-	0.005	0.0004	068	004	0.0001	0.0005	33	0.00001	0.0001	0.0007	002	0.11	-	1	0.001	11.7	042	001	6.7	0.0006	0.0002	0.0002	4.1	0.0002	6.36	001	0.284	0.0005	0.00005	0.001	0.0016	001	-
W7	7/26/2006 0:00	121	259	-	-	-	9	-	-	-	0.18	0.016	11.6	-	-	-	0.008	0.0004	072	002	0.0001	0.0005	33.4	0.00001	0.0001	0.0005	002	0.1	-	1	0.001	10.9	0.044	001	7	0.0021	0.0001	0.0002	4.2	0.0002	5.35	001	0.274	0.0005	0.00005	001	0.0007	001	-
W7	8/2/2006 0:00	125	256	-	-	-	4	-	-	-	0.15	0.015	10	-	-	-	0.008	0.0002	07	004	0.0001	0.0005	33.3	0.00001	0.0001	0.0005	001	0.07	-	1.1	0.001	11	033	001	7.2	0.0006	0.0001	0.0002	4	0.0002	5.87	001	0.247	0.0005	0.00005	001	0.0013	001	-
W7	8/10/2006 0:00	125	259	-	-	-	2	-	-	-	0.16	0.014	10	-	-	-	0.009	0.0005	073	005	0.0001	0.0005	32.9	0.00001	0.0001	0.0007	001	0.08	-	1	0.001	10.8	039	001	7.2	0.0006	0.0001	0.0002	4	0.0002	5.9	001	0.343	0.0006	0.00005	001	0.0015	001	-
W7	8/25/2006 0:00	131	261	-	-	180	-	-	-	-	0.12	0.027	11	-	-	-	0.012	0.0004	071	005	0.0001	0.0005	32.4	0.00001	0.0002	0.0006	001	0.08	-	0.9	0.001	11.7	037	001	6.7	0.0009	0.0001	0.0002	3.8	0.0002	6.32	001	0.344	0.0005	0.00005	0.0011	0.0017	003	-
W7	8/30/2006 0:00	129	258	-	-	200	2	-	-	-	0.11	0.012	10.5	-	-	-	0.013	0.0004	067	004	0.0001	0.0005	33.6	0.00001	0.0001	0.0008	002	0.1	-	1.2	0.002	11.7	038	001	7.7	0.0012	0.0001	0.0002	3.7	0.0002	5.84	001	0.333	0.0008	0.00005	001	0.0008	005	-
W7	9/6/2006 0:00	129	258	-	-	-	4	-	-	-	0.08	0.011	10.3	-	-	-	0.005	0.0005	068	005	0.0001	0.0005	33.5	0.00001	0.0001	0.0008	002	0.1	-	0.8	0.002	11.2	036	001	7.4	0.0009	0.0001	0.0002	3.7	0.0002	6.02	001	0.355	0.0005	0.00005	001	0.0018	002	-
W7	9/13/2006 0:00	128	254	-	-	-	5	-	-	-	0.094	0.011	10	-	-	-	0.008	0.0003	064	005	0.0001	0.0005	32.3	0.00001	0.0001	0.0009	001	0.11	-	0.9	0.002	11.4	03	001	7.4	0.0009	0.0001	0.0002	3.5	0.0002	5.56	001	0.321	0.0006	0.00005	001	0.0014	001	-
W7	9/20/2006 0:00	127	263	-	-	-	3	-	-	-	0.11	0.008	11	-	-	-	0.007	0.0005	069	005	0.0001	0.0005	33.5	0.00028	0.0001	0.0007	001	0.09	-	1	0.002	11.6	04	001	6.6	0.0005	0.0001	0.0002	3.9	0.0002	5.74	001	0.319	0.0005	0.00005	001	0.0015	001	-
W7	9/28/2006 0:00	128	266	-	-	182	-	-	-	-	0.08	0.011	11	-	-	-	0.011	0.0004	071	003	0.0001	0.0005	33.3	0.00001	0.0001	0.0008	001	0.08	-	1.1	0.001	11.1	035	001	7.4	0.0008	0.0001	0.0002	3.7	0.0002	5.97	001	0.34	0.0005	0.00005	001	0.0015	002	-
W7	10/4/2006 0:00	122	258	-	-	-	2	-	-	-	0.1	0.079	10.9	-	-	-	0.005	0.0003	068	004	0.0001	0.0005	32.6	0.00001	0.0001	0.0005	001	0.11	-	1.1	0.001	10.9	035	001	7.3	0.0007	0.0001	0.0002	3.7	0.0002	5.93	001	0.326	0.0007	0.00005	001	0.0011	001	-
W7	10/12/2006 0:00	130	266	-	-	164	4	-	-	-	0.12	0.024	11.3	-	-	-	0.007	0.0004	067	005	0.0001	0.0005	34	0.00001	0.0001	0.0005	001	0.09	-	1.1	0.001	11.4	043	001	7.4	0.0006	0.0001	0.0002	3.9	0.0003	6.08

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | | Dissolved Elements | | | | | | | |

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | | | Dissolved Elements | | | | | | | |

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | | | | | Dissolved Elements | | | | | | | | | |

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| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | | Dissolved Elements | | | | | | | |

Attachment 3: Sitewide Database

| Station | Date / Time | General Parameters | | | | | | | | Anions & Nitrogen Species | | | | | | | Dissolved Elements | | | | | | | |

Attachment 4: Description of Monitoring Stations

Attachment 4: Monitoring Station Descriptions

Monitoring Station	Description
Surface Water	
MC1	Minto Creek - Minto Canyon
MN	Minto North Pit Water
MN-0.2	Upper West Arm of McGinty Creek
MN-0.5	West Arm McGinty Creek Upstream of Confluence with East Arm
MN-1.5	Upper East Arm of McGinty Creek down from Minto North Deposit
MN-2.5	East Arm of McGinty Creek Upstream of Confluence with West Arm
MN-4.5	Main Stem of McGinty Creek near Confluence of Yukon River
W2	Minto Creek - Near Confluence with Yukon River
W5	Yukon River 100 m Downstream of Minto Creek
W50	Minto Creek - Edge of Mine Property Boundary
W6	Minto Creek - Outside Mine Property Boundary
W7	Minto Creek - Outside Mine Property Boundary
Mine Facilities	
UG1	Underground Portal 1
UG4	Underground Portal 4
W12	Main Pit
W12N	North Pit Surface Water
W12S	South Pit Surface Water
W14	Tailings Thickener Overflow
W16	Main Water Storage Pond (includes W16S and W16DF)
W3	MMER Final Discharge Point (Flume)
W45	Area 2 Pit Water
W46	Minto Creek Tributary Outside Property Boundary
W62	Drystack Tailings Facility Drainage (replaced W8A)
W8	Drystack Tailings Facility Drainage West
W8A	Drystack Tailings Facility Drainage East (Dry)
Groundwater Wells	
MW09-01-01	MW09-01 Zone 1 - Southwest of Main Pit
MW09-01-02	MW09-01 Zone 2 - Southwest of Main Pit
MW09-01-03	MW09-01 Zone 3 - Southwest of Main Pit
MW09-01-04	MW09-01 Zone 4 - Southwest of Main Pit
MW09-01-05	MW09-01 Zone 5 - Southwest of Main Pit
MW09-02-01	MW09-02 Zone 1 - Dry Stack Tailings Facility (discontinued)
MW09-02-03	MW09-02 Zone 3 - Dry Stack Tailings Facility (discontinued)
MW09-03-01	MW09-03 Zone 1 - Minto North Haul Road
MW09-03-02	MW09-03 Zone 2 - Minto North Haul Road
MW09-03-03	MW09-03 Zone 3 - Minto North Haul Road
MW09-03-04	MW09-03 Zone 4 - Minto North Haul Road
MW09-03-05	MW09-03 Zone 5 - Minto North Haul Road
MW09-04-04	MW09-04 Zone 4 - Southeast of Main Pit (discontinued)
MW12-05-01	MW12-05 Zone 1 - Downstream of Water Storage Pond along Minto Creek
MW12-05-02	MW12-05 Zone 2 - Downstream of Water Storage Pond along Minto Creek
MW12-05-03	MW12-05 Zone 3 - Downstream of Water Storage Pond along Minto Creek
MW12-05-04	MW12-05 Zone 4 - Downstream of Water Storage Pond along Minto Creek
MW12-05-05	MW12-05 Zone 5 - Downstream of Water Storage Pond along Minto Creek
MW12-05-06	MW12-05 Zone 6 - Downstream of Water Storage Pond along Minto Creek
MW12-05-07	MW12-05 Zone 7 - Downstream of Water Storage Pond along Minto Creek
MW12-06-01	MW12-06 Zone 1 - Between DSTF and Water Storage Pond
MW12-06-02	MW12-06 Zone 2 - Between DSTF and Water Storage Pond
MW12-06-03	MW12-06 Zone 3 - Between DSTF and Water Storage Pond
MW12-06-04	MW12-06 Zone 4 - Between DSTF and Water Storage Pond
MW12-06-05	MW12-06 Zone 5 - Between DSTF and Water Storage Pond
MW12-06-06	MW12-06 Zone 6 - Between DSTF and Water Storage Pond
MW12-07-01	MW12-07 Zone 1 - Main Mine Facilities East of Main Pit
MW12-07-02	MW12-07 Zone 2 - Main Mine Facilities East of Main Pit
MW12-07-03	MW12-07 Zone 3 - Main Mine Facilities East of Main Pit
MW12-07-04	MW12-07 Zone 4 - Main Mine Facilities East of Main Pit
MW17-08-01	MW17-08 Zone 1 - Background Well West of Southwest Waste Dump
MW17-08-02	MW17-08 Zone 2 - Background Well West of Southwest Waste Dump
MW17-08-03	MW17-08 Zone 3 - Background Well West of Southwest Waste Dump
MW17-08-04	MW17-08 Zone 4 - Background Well West of Southwest Waste Dump
MW17-09-01	MW17-09 Zone 1 - East of Ice Rich Overburden Dump
MW17-10-01	MW17-10 Zone 1 - Between Main Waste Dump and Main Pit
MW17-10-02	MW17-10 Zone 2 - Between Main Waste Dump and Main Pit
MW17-10-03	MW17-10 Zone 3 - Between Main Waste Dump and Main Pit
MW17-11-01	MW17-11 Zone 1 - Minto North Pit
MW17-11-02	MW17-11 Zone 2 - Minto North Pit
MW17-11-03	MW17-11 Zone 3 - Minto North Pit
MW17-11-04	MW17-11 Zone 4 - Minto North Pit
MW17-12-01	MW17-12 Zone 1 - Downstream of Water Storage Pond along Minto Creek
MW17-12-02	MW17-12 Zone 2 - Downstream of Water Storage Pond along Minto Creek
MW17-12-03	MW17-12 Zone 3 - Downstream of Water Storage Pond along Minto Creek
MW17-12-04	MW17-12 Zone 4 - Downstream of Water Storage Pond along Minto Creek
MW17-12-05	MW17-12 Zone 5 - Downstream of Water Storage Pond along Minto Creek
MW17-12-06	MW17-12 Zone 6 - Downstream of Water Storage Pond along Minto Creek
MW17-12-07	MW17-12 Zone 7 - Downstream of Water Storage Pond along Minto Creek
MW17-12-08	MW17-12 Zone 8 - Downstream of Water Storage Pond along Minto Creek

Appendix J – June 2020 AMP Exceedances and Response Letter Report

minnow
environmental inc.
A Trinity Consultants Company
204-1006 Fort Street
Victoria, British Columbia
V8V 3K4
Tel: (250) 595-1627
Fax: (250) 595-1625

July 30, 2020

Mr. Todd Swenson
Environmental Manager
Minto Mine
PO Box 11
Whitehorse Central PO
Whitehorse, Yukon
Y1A 2V3

Dear Mr. Swenson,

Re: Technical Evaluation of Exceedances of Minto Mine AMP Specific Thresholds at Minto Creek Station W2

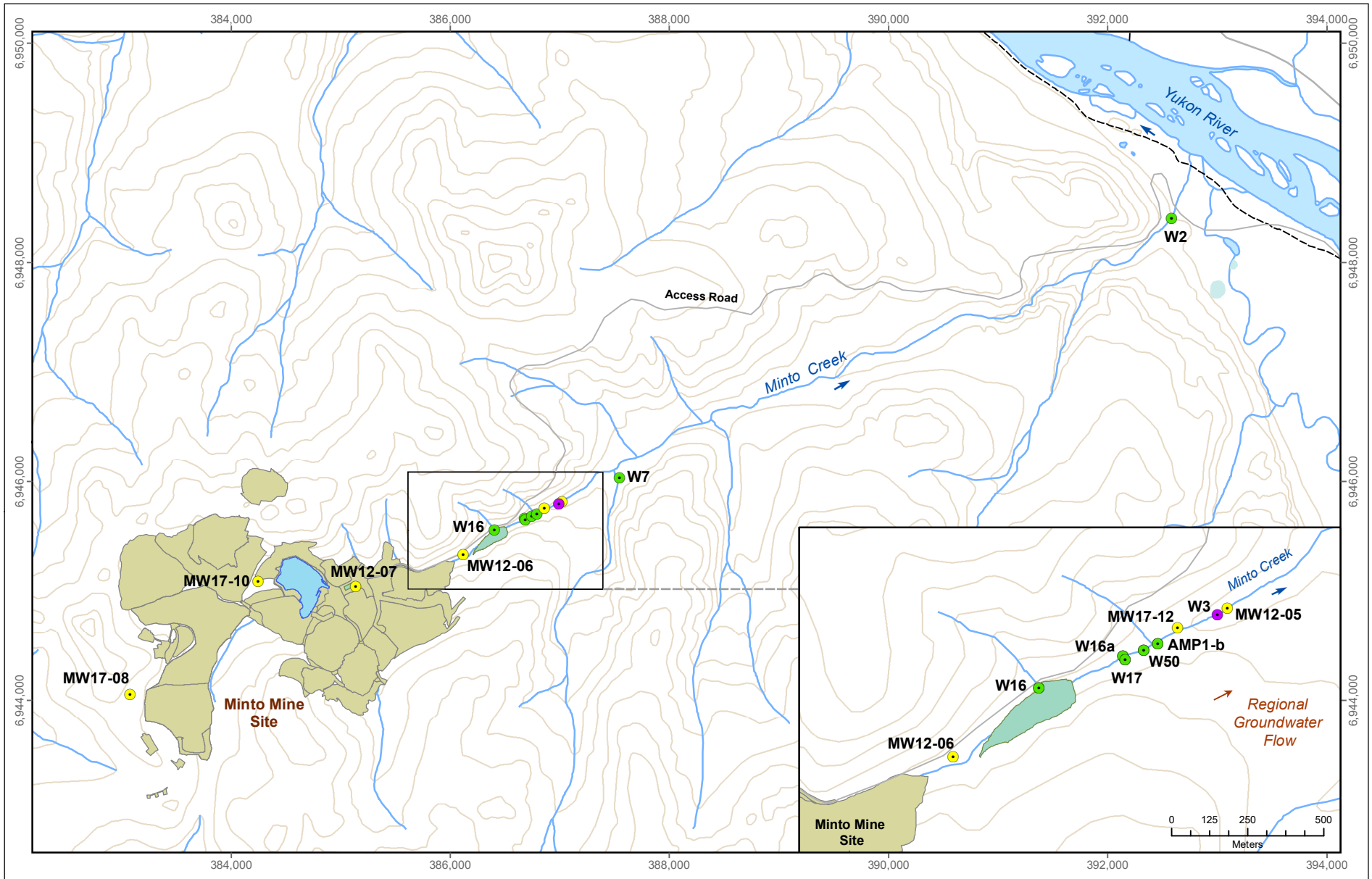
Minto Mine (Minto) retained Minnow Environmental Inc. (Minnow) as Qualified Professionals to evaluate exceedances of Adaptive Management Plan (AMP) Specific Performance Thresholds (SPTs) in lower Minto Creek (Station W2; Figure 1) in May and June 2020. The Minto Mine "Operations Adaptive Management Plan" (Minto 2017) describes the overall purpose of the AMP, presents the SPTs, and outlines the Specific Responses to exceedance of SPTs. As required under the AMP, this brief letter report provides an evaluation of whether the exceedances were mine-related, whether the exceedances are indicative of trends, and whether the exceedances were likely to have affected aquatic resources.

Background

Minto is a high-grade copper mine located within Selkirk First Nation (SFN) Category A Settlement Land Parcel R-6A approximately 240 km northwest of Whitehorse, Yukon. Mine development was initiated in 1997, commercial operations started in October 2007, and the mine entered temporary care and maintenance on October 19, 2018. Treated mine-impacted water and non-impacted water are collected in a Water Storage Pond (WSP) and periodically discharged to Minto Creek under conditions specified in Water Use Licence (WUL) QZ14-031 (August 2015). Minto Creek, in turn, flows into the Yukon River approximately 7.7 km south-east of the WSP (Figure 1).

Yukon Government Energy, Mines, and Resources (EMR) approved Minto's AMP 2017-01 under the current Quartz Mining License (QML-0001). The Yukon Water Board approved the updated AMP (AMP 2017-02) under the current Water Use Licence (QZ41-031). This assessment is relative to the AMP 2017-02 specific thresholds (Minto 2017).

The AMP for lower Minto Creek Station W2 includes the following SPTs: 1) expected case water quality predictions; 2) worst-case water quality predictions; and 3) water quality objectives (WQO). When these predictions or WQO are exceeded, they trigger Specific Responses (SRs). Each SPT is associated with SR steps, including notification, review, evaluation, and action (Table 1).



LEGEND

- Effluent Quality Monitoring Station
- Water Quality Monitoring Station
- Groundwater Quality Monitoring Station
- Regional Groundwater Flow
- Water Storage Pond
- Main Pit Lake
- Mine Footprint

0 0.5 1 2 km

N W E S

Datum: NAD 83 Map Projection: UTM Zone 8V Data Source: National Topographic Data Base (NTDB) compiled by Department of Natural Resources Canada at a scale of 1:50,000. All rights reserved.

Minto Mine Water Quality Monitoring Stations

Date July 2020
Project 197202.0050

minnow environmental inc. A Tetra Tech Company

Figure 1

Document Path: S:\Projects\197202\197202.0050 - Minto Adaptive Management Plan 2019\4 - GIS\Water Quality Map\19-50 Fig 1 Minto Water Quality Stations.mxd

Table 1: Adaptive Management Plan Specific Indicators, Performance Thresholds, and Responses for Surface Water Quality at Station W2 in Lower Minto Creek

Specific Indicators	Specific Performance Thresholds	Specific Responses
Aqueous Concentrations at Station W2 for the following parameters with water quality objectives Parameters: • NH_4-N • NO_2-N • NO_3-N • pH • Quarterly Bioassay Dissolved: • Aluminum • Arsenic • Cadmium • Chromium • Copper • Iron • Lead • Molybdenum • Nickel • Silver • Selenium • Zinc (See Table 2 for specific threshold values for W2)	**Specific Threshold 1** • Exceedance of predicted expected case maximum for dissolved concentrations at W2. (Does not apply to pH, Bioassay, Arsenic, Iron, Lead, Molybdenum, Nickel, Silver, or Zinc)	**Notification** • Minto Management • Include in scheduled Water Use Licence monthly reporting **Review** • Follow QA/QC investigative protocol: ◦ Review laboratory QA/QC report ◦ Validate original result, or re-run sample if a laboratory error is indicated **Evaluation** • Compare with W3 results. • A trend analysis will be conducted by Minto's senior level environmental personnel. **Action** • If comparison with W3 result indicates mine loadings are responsible for exceedance then: ◦ Re-sample both W2 and W3 within 24 hours of original sample result review ◦ Actions will continue until performance thresholds are no longer exceeded.
	Specific Threshold 2 • Exceedance of predicted expected case maximum for dissolved concentrations in **2 consecutive samples (scheduled or re-sample) at W2** where evaluation confirmed mine loading responsible for first exceedance (Does not apply to pH, Bioassay, Arsenic, Iron, Lead, Molybdenum, Nickel, Silver, or Zinc)	**Notification** • Minto Management • Include in scheduled Water Use Licence reporting **Review** • Follow QA/QC investigative protocol: ◦ Review laboratory QA/QC report ◦ Validate original result, or re-run sample if a laboratory error is indicated **Evaluation** • Compare with W3 results. If comparison with W3 result indicates that mine loadings are responsible for exceedance; and validation confirms original result, then: ◦ Evaluate causes for load contributions and develop investigation plan; and • A trend analysis will be conducted by Minto's senior level environmental personnel. **Action** • Implement investigation plan, including at a minimum: ◦ Re-sampling both W2 and W3 within **24 hours** of original sample result review; and ◦ Site investigation of candidate load contributions. • Review results of investigation and prepare recommendations if appropriate. • Implement recommendations • Actions will continue until performance thresholds are no longer exceeded. • If trend analysis suggests WQO exceedance within one year, then initiate actions for Specific Threshold 3
	Specific Threshold 3 • Exceedance of predicted worst case maximum for dissolved concentrations at W2 **OR** • WQO exceeded at W2 in a single	**Notification** • Minto Management, SFN, YG Inspector • Include in scheduled Water Use Licence reporting **Review** • Follow QA/QC investigative protocol: ◦ Review laboratory QA/QC report ◦ Validate original result, or re-run sample if a laboratory error is indicated **Evaluation** • Compare with W3 results. If comparison with W3 result indicates that mine loadings responsible for exceedance – and verification confirms original result – then: ◦ Evaluate causes for load contributions and develop investigation plan; and • A trend analysis will be conducted by Minto's senior level environmental personnel. **Action** • Maintain weekly monitoring at W2 and W3 • Implement investigation plan, including any reviews/revisions, and at a minimum: ◦ Re-sampling both W2 and W3 within **24 hours** of original sample result review; and ◦ Site investigation of candidate load contributions; and ◦ Site investigation of candidate load contributions; and ◦ Engage a qualified individual for the evaluation of potential effects to aquatic resources (i.e. Compare to Predicted No Effect Concentration (PNEC) and apply Biotic Ligand Model (BLM) for D-Cu, invertebrate tissue for Se, compare with calculated acute guideline for D-Cd.) This may include but not be limited to the evaluation of existing data and results from effluent toxicity, surface water toxicity, sediment chemistry, sediment toxicity, benthic invertebrate community structure and fish health testing/programs. • Review results of investigation and prepare recommendations if appropriate • Implement recommendations • Actions will continue until performance thresholds are no longer exceeded
	Specific Threshold 4 • Exceedance of predicted worst case maximum for dissolved concentrations in 2 consecutive samples (scheduled or re-sample) at W2 where evaluation confirmed mine loading responsible for first exceedance	**Notification** • Minto Management, SFN, YG Inspector • Include in scheduled Water Use Licence reporting **Review** • Compare with W3 results • Follow QA/QC investigative protocol: **Evaluation** • Compare with W3 results. If comparison with W3 result indicates mine loadings responsible for exceedance; and verification confirms original result, then: ◦ Evaluate candidate causes for load contributions & develop investigation plan (or review/revise as appropriate) ◦ Provide investigation plan to SFN/YG Inspector • Evaluate potential for mine loadings to cause adverse effects to aquatic resources (i.e. redo BLM modeling) • A trend analysis will be conducted by Minto's senior level environmental personnel. **Action** • Maintain weekly monitoring and collect samples at greater frequency as required • Develop investigation plan, including at a minimum: ◦ Re-sampling both W2 and W3 within 24 hours of original sample result review; and ◦ Site investigation of load contributions ◦ Evaluation of potential effects to aquatic resources • Review results of investigation and prepare recommendations • Implement recommendations arising from investigations. **If threshold consistently exceeded for 2 months**, then: • Develop revised forecast for near-term (12 months) water quality in Minto Creek. • Develop and implement any additional mitigation measures to reduce loading from mine site, if necessary, with appropriate regulatory approvals. • Actions will continue until performance thresholds are no longer exceeded.
	Specific Threshold 5 • Exceedance WQO or PNEC exceeded in 2 consecutive samples (scheduled or re-sample) at W2 where evaluation confirmed mine loading responsible for first exceedance	**Notification** • Minto Management, SFN, YG Inspector • Include in scheduled Water Use Licence reporting **Review** • Compare with W3 results • Follow QA/QC investigative protocol: **Evaluation** • All evaluation measures for ST4 and: ◦ Consider ongoing WQ monitoring results in development of investigation plan • Evaluate potential for mine loadings to cause adverse effects to aquatic resources (i.e. redo BLM modeling) **Action** • Maintain weekly monitoring and collect samples at greater frequency as required. • Maintain weekly monitoring and collect samples at greater frequency as required. • Develop investigation plan, including at a minimum: ◦ Re-sampling both W2 and W3 within 24 hours of original sample result review; and ◦ Site investigation of load contributions ◦ Evaluation of potential effects to aquatic resources • Review results of investigation and prepare recommendations • Implement recommendations arising from investigations. • Implement necessary reasonable & practical measures to reduce contaminant loading from mine to Minto Creek. • Suspend discharge from the mine until water quality is appropriate for discharge. • Actions will continue until performance thresholds are no longer exceeded.

Methods

The Minto Mine's source and receiving water quality monitoring program includes stations in upper and lower Minto Creek (Figure 1). Minto Mine compared the results of individual grab samples to specific thresholds of the AMP (Table 2) and identified exceedances at lower Minto Creek station, W2. During the period April (after ice off) to June 30th, 2020 Minto Mine identified exceedances of either SPTs 1, 2, or 3 for dissolved concentrations of aluminum, cadmium, copper, and molybdenum. Following the Minto Mine's review of data, and as part of the AMP response framework, Minto Mine has retained Minnow Environmental as Qualified Professionals to verify the exceedances, evaluate, and provide an action plan, if necessary.

Concentration data for aluminum, copper, cadmium, and molybdenum were reviewed to verify the SPT exceedance level. Dissolved cadmium showed an exceedance at SPT level 1, dissolved copper exceeded SPT level 2, dissolved molybdenum and dissolved aluminum exceeded SPT level 3 (see Results Section).

At SPT levels 1 and 2, data were evaluated by comparing analyte concentrations at W2 to those at station W3 (the effluent quality monitoring station; Figure 1) for the same time point. Using this comparison, data were evaluated to determine if the exceedances were mine related (as per the AMP response framework). For example, if temporal changes in water quality at station W2 were entirely due to temporal changes in water associated with mining activity, patterns in concentration data with time would be expected to mirror those changes further upstream and closer to the mine (i.e., at station W3 and W50). In addition, station W2 also receives input from groundwater and run-off, and therefore concentrations of mine-associated analytes would be expected to be diluted at station W2 when compared to station W3 and W50. Deviations from these patterns may suggest influence/contribution from other water sources such as small tributaries or groundwater, and/or that the changes in water quality at station W2 are not mine related.

In addition, water quality data from station W50 were used to help distinguish mine-related influences to Minto Creek from the influence of reference tributaries. Station W50 is located upstream of the compliance point and is not subject to the W2 water quality predictions but is subject to effluent quality standards (Water Use Licence QZ14-031). While assessment of water quality of station W50 is not within the scope of this letter report, it should be noted that water quality at station W50 did not exceed any effluent quality standards for this reporting period (April to June 2020). Water quality data from reference station W7 was also investigated to help distinguish mine-influence to water quality from background.

A trend analysis was also conducted to determine if exceedances may be expected to continue. Two approaches to the trend analysis were taken. Firstly, a non-parametric seasonal Kendall test was undertaken to evaluate for monotonic increasing or decreasing trends. This quantitative test was conducted comparing monthly mean dissolved metal (aluminum, cadmium, copper, and molybdenum) concentrations over two time periods (2011 to 2020 and 2016 to 2020; Appendix Table A.3). The second approach was an analysis of variance (ANOVA) test among the last ten years (2011 to 2020) which tested for an overall difference among years and included a month term to control for seasonal effects within year. Details of the statistical analysis for both trend analyses is provided (Appendix B).

At SPT level 3 exceedances were first evaluated as per SPTs 1 and 2. In addition, exceedances were evaluated relative to effect thresholds protective of aquatic life. The potential for additional contributing factors that may have also influenced the exceedances were investigated. For example, the potential for contribution from groundwater or small tributaries. The results of these then informed any resulting recommendations.

Table 2: Specific Thresholds for Minto Creek, Station W2

Analytes		Units	W2 Water Quality Objective	Expected Case Water Quality Predictions at W2	Worst Case Water Quality Predictions at W2
Ammonia		mg/L	0.25	0.057	0.250
Nitrite		mg/L	0.060	0.015 [a]	0.057 [a]
Nitrate		mg/L	9.1	1.1	5.1
Dissolved Aluminum		mg/L	0.10	0.057	0.077
Dissolved Arsenic		mg/L	0.0050	n/a	0.00070
Dissolved Cadmium		mg/L	$e^{(0.736(\ln(\text{hardness})-4.943)}$	0.000027	0.00004
Dissolved Chromium		mg/L	0.0010	0.00062	0.00082
Dissolved Copper	When DOC at W2 > 10 mg/L	mg/L	0.020	0.0092	0.014
	When DOC at W2 ≤ 10 mg/L	mg/L	0.013	0.0092	0.014
Dissolved Iron		mg/L	1.1	n/a	0.37
Dissolved Lead		mg/L	0.0040	n/a	0.00044
Dissolved Molybdenum		mg/L	0.073	n/a	0.0015
Dissolved Nickel		mg/L	0.11	n/a	0.0021
Dissolved Selenium		mg/L	0.0020	0.00055	0.00087
Dissolved Silver		mg/L	0.00010	n/a	0.000042
Dissolved Zinc		mg/L	0.030	n/a	0.0065

Notes: Reproduced from Table 2-3 in the Operational AMP (Minto 2017). n/a = no action will be taken on expected case predictions.
[a] Prediction reduced by 75% to account for expected nitrification in Minto Creek.

Results

Dissolved Aluminum

Concentrations of dissolved aluminum exceeded the worst-case maximum prediction for lower Minto Creek station, W2, twice; once on 28th April and once on 5th May, 2020 (Table 3). On 5th May, dissolved aluminum concentrations also exceeded the W2 water quality objective (Table 3, Figure 2), triggering SPT level 3. However, there were three lines of evidence that showed that these elevated dissolved aluminum concentrations were not mine related.

(1) A comparison of dissolved aluminum concentrations at W2 to the effluent monitoring station W3 showed that both stations showed the same concentration pattern with time and that absolute concentrations were similar (Figure 2). The pattern of changing concentrations with time suggests that water quality at these stations (W2 and W3) were controlled by the same mechanism. However, station W2 which is further downstream is also influenced by dilution from more reference tributaries, and if the elevated aluminum concentrations were mine-related, it would be expected that aluminum would be at lower concentrations in water from station W2 compared to station W3.

(2) A small tributary joins upper Minto Creek downstream of the mine site but upstream of station W3 (Figure 1). Station W50 is upstream of this confluence, and downstream of the mine site (Figure 1), therefore W50 is equally or more representative of mining influence when compared to station W3. Any observed differences in water quality between station W3 and W50 are likely due to the influence of water from the small tributary and/or from additional surface runoff from the area between W50 and W3. One sample was collected at station W50 (27th April 2020) during the period when W2 dissolved aluminum concentrations exceeded the worst-case predictions for W2. This concentration was substantially lower compared to stations W2 and W3 (Figure 2). This suggested that the dissolved aluminum concentrations were not mine related and that it was more likely that the elevated aluminum was influenced by reference water and run-off (probably associated with spring freshet) at both stations.

(3) The lack of evidence for a mine-loading cause for the elevated aluminum at station W2 was also further validated by the elevated aluminum concentrations in water from the reference station W7, although these samples were collected after the spikes in aluminum (i.e., 19th May, 2020; Figure 2). The data showed that dissolved aluminum concentrations at station W2 were equal to concentrations at the reference station (and not likely mine-influenced at that time).

The non-parametric seasonal Kendall trend analysis for dissolved aluminum showed no significant increasing or decreasing temporal trend either from 2011 or from 2016 (Table 4). A comparison of dissolved aluminum by month (April to June) among years also showed a general decrease in concentration relative to 2011, but the decrease was not significant in 2020 (Table 5; Appendix Figure A.1). Therefore, there was no evidence that aluminum concentrations were increasing, and there was no evidence that the elevated dissolved aluminum concentrations were mine-related.

The short-term acute predicted no-effect concentration for dissolved aluminum at pH ≥6.5 (typical water pH in Minto Creek is 8) is 0.1 mg/L (BCMECCS 2020). This guideline was exceeded for one sampling event only (0.105 mg/L on 5th May 2020; Appendix Table A.1) and showed a sharp decline in concentration by the subsequent sampling event (i.e., 0.03 mg/L on 12th May 2020; Appendix Table A.1). Given that the exceedance of the water quality guideline



Table 3: Concentrations of Dissolved Aluminum, Cadmium, Copper, and Molybdenum Screened Against the Specific Performance Thresholds for Lower Minto Creek Monitoring Station W2, April to June, 2020

Date	Al-D (mg/L)		Cd-D (mg/L)		Cu-D (mg/L)		Mo-D (mg/L)	
	Sample	Duplicate Sample	Sample	Duplicate Sample	Sample	Duplicate Sample	Sample	Duplicate Sample
2020-04-20	0.0178	-	0.0000198	-	0.00708	-	0.000718	-
2020-04-28	0.007	0.0846	0.0000287	-	0.013	-	0.000444	-
2020-05-05	-	-	0.0000119	-	0.0115	-	-	-
2020-05-07	0.105	-	-	-	-	-	0.000247	-
2020-05-12	-	-	0.0000101	-	0.00636	-	-	-
2020-05-14	0.03	-	-	-	-	-	0.000707	-
2020-05-19	-	-	<0.0000050	-	0.00498	-	-	-
2020-05-21	0.0184	-	-	-	-	-	0.00109	-
2020-05-25	0.0091	0.0082	0.0000062	0.0000069	0.00252	0.00246	0.00124	0.00125
2020-06-08	-	-	-	-	-	-	0.00147	0.00151
2020-06-11	0.0058	-	<0.0000050	-	0.00221	-	0.00153	-
2020-06-15	0.0052	-	<0.0000050	-	0.00182	-	0.00161	0.00169
2020-06-22	0.0058	0.0058	<0.0000050	<0.0000050	0.00204	0.00369	0.00163	0.00512

text > expected case WQ prediction
text > worst case WQ predication
text > water quality objective

Notes: - = no data available; Specific Performance Threshold values (Table 2) are outlined in the Operational AMP (Minto 2017).

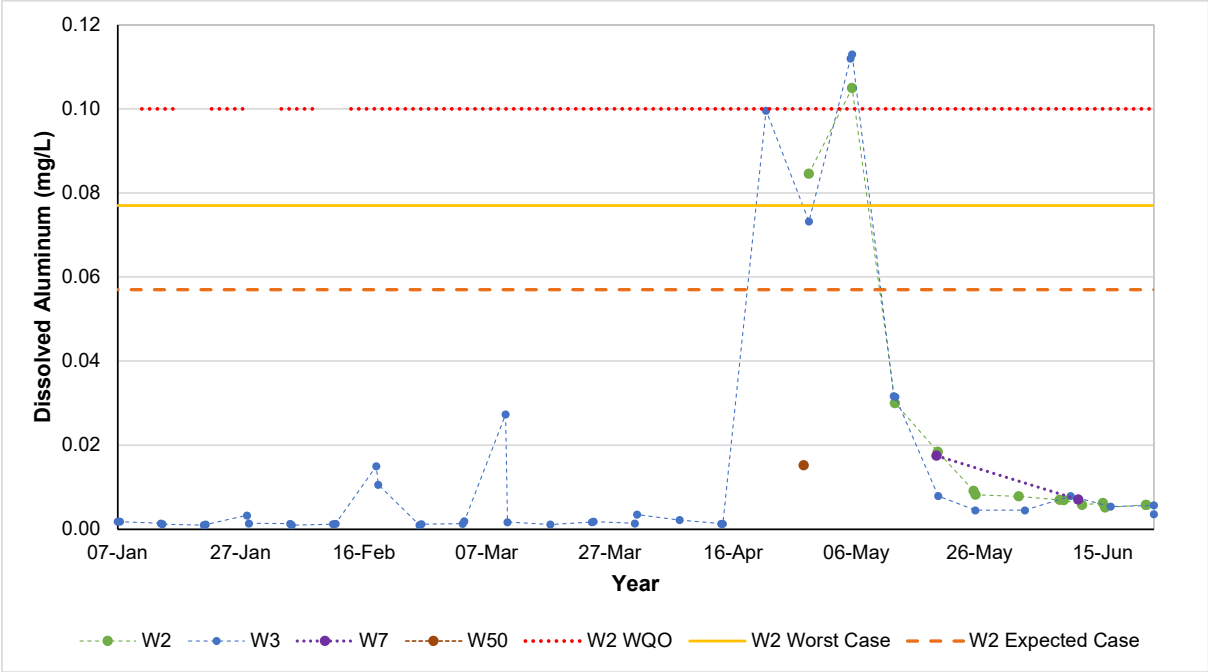


Figure 2: Dissolved Aluminum Concentrations in Lower Minto Creek Monitoring Station, W2, Compared to the W2 Water Quality Predictions and Water Quality at the Effluent Monitoring Station, W3, January to June, 2020

Table 4: Seasonal Kendall Trend Analysis For Water Quality Parameters Collected at Minto Mine, 2011 to 2020

Station	W2	
	2011 to 2020	2016 to 2020
Dissolved Aluminum (mg/L)	NS	NS
Dissolved Cadmium (mg/L)	-16	NS
Dissolved Copper (mg/L)	NS	NS
Dissolved Molybdenum (mg/L)	NS	NS

Significant decreasing temporal trend (Seasonal Kendall test for monotonic trend at α = 0.05). Value reported is the Sen's slope reported as a percentage of the median concentration or value

Significant increasing temporal trend (Seasonal Kendall test for monotonic trend at α = 0.05). Value reported is the Sen's slope reported as a percentage of the median concentration or value

"-" '= no data or insufficient data (n < 5) to test for trend. 'NS = no significant temporal trend (Seasonal Kendall test for monotonic trend at α = 0.05).

Table 5: Temporal Changes in Water Chemistry Analytes at W2, Minto Mine, April to June 2011 to 2020

Parameter	Annual Variation [a]		Q1. Is there a positive or negative change in concentrations since the base year (b) of monitoring? Magnitude of Difference (MOD)[b] and Significance (bolded) from Base Year (b)[c]										Q2. Is the 2020 annual mean greater or less than all annual historical means (2012 to 2019)?[c]									
	DF	P-Value	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Dissolved Aluminum (mg/L)	9	<0.001	b	5.2	-27.8	-41.4	-47.0	**-55.1**	-24.9	-42.1	**-73.2**	-40.7	AB	A	ABC	ABCD	BCD	CD	ABC	ABCD	D	ABCD
Dissolved Cadmium (mg/L)	9	<0.001	b	-33.9	**-59.1**	**-56.9**	**-75.4**	**-76.9**	**-55.5**	**-61.2**	**-71.8**	**-61.8**	A	AB	BC	BC	C	C	BC	BC	C	BC
Dissolved Copper (mg/L)	9	<0.001	b	-28.0	25.0	10.1	-21.2	-21.8	39.7	39.9	**-40.3**	10.6	ABC	CD	A	AB	BCD	BCD	A	A	D	AB
Dissolved Molybdenum (mg/L)	9	<0.001	b	-22.2	10.9	31.2	50.9	-1.3	-13.2	-4.0	12.7	-21.4	ABC	C	ABC	AB	A	ABC	BC	ABC	ABC	C

P-value < 0.05 (annual variation).
> 20% Decrease in concentration.
> 33% Decrease in concentration.
> 43% Decrease in concentration.
> 50% Decrease in concentration.
> 25% Increase in concentration.
> 50% Increase in concentration.
> 75% Increase in concentration.
> 100% Increase in concentration.
*Bold Significant increase or decrease from base year (b).
Significantly less than all historical years (or 2018).
Significantly greater than all historical years (or 2018).

Notes: "-" indicates no available data or analysis not conducted due to >90% of the station data being below the Laboratory Reporting Limit (LRL).

[a] The presence of annual variation was determined by a significant Year term ($\alpha = 0.05$) using an ANOVA with factors Year and Month.

[b] Magnitude of Difference (MOD) was calculated as the concentrations in each year minus the concentration in the first year divided by the concentration in the fist year × 100.

[c] Significance between each year determined using all pairwise comparisons with Tukey correction.

was for one sampling event only, the elevated aluminum concentration was not considered to be mine-related, and was likely at background concentrations, it is recommended that no further investigation regarding this exceedance event is necessary and that frequency of monitoring continues to be weekly (as per the Water Use Licence).

Dissolved Cadmium

Concentrations of dissolved cadmium showed one exceedance of the expected case maximum prediction for lower Minto Creek station W2 on 28th April, 2020 (Table 2), triggering SPT level 1. This exceedance (0.0000287 mg/L; Table 3) was very close to the expected case prediction of 0.000027 mg/L (Table 2). The pattern of varying dissolved cadmium concentrations with time generally mirrored the pattern of dissolved cadmium concentrations at the effluent monitoring station, W3 (Figure 3). The one sample collected at station W50 (upstream of the effluent discharge monitoring point) was higher than at stations W3 and W2, suggesting that this exceedance could have been mine-related. Water sampling at station W50 helps to distinguish influence of mine-related water from influence of small reference tributaries and groundwater. However, conclusions around mine influence cannot be definitively made as there was only one data point at station W50. Concentrations have declined and remained below the expected case prediction for W2 since the one exceedance above the expected case for W2.

The non-parametric seasonal Kendall trend analysis for dissolved cadmium showed a significant decreasing temporal trend from 2011 but no trend from 2016 (Table 4). A comparison of dissolved cadmium by month (April to June) among years also showed a trend of significant decreases in most years, including 2020 relative to the baseline year (2011; Table 5; Appendix Figure A.1). Therefore, there was no evidence that cadmium concentrations were increasing (cadmium concentrations appeared to be decreasing), thus no further investigative action regarding this exceedance event is considered necessary and that frequency of monitoring continues to be weekly (as per the Water Use Licence).

Dissolved Copper

Concentrations of dissolved copper showed two consecutive exceedances of the expected case maximum prediction for lower Minto Creek station W2 on 28th April (0.013 mg/L) and 5th May, 2020 (0.0115 mg/L; Table 3), triggering SPT level 2. When compared to the effluent monitoring station (W3), the concentrations of copper at station W2 showed the same varying concentration patterns with time as at station W3 (Figure 4). This suggested that the exceedances at W2 were due to the high concentrations observed at the effluent monitoring point, W3. However, the dissolved copper concentration at station W50 was lower than both stations W3 and W2, which suggested that it was not mine-related. Likely the elevated copper was associated with spring freshet and input from the small reference tributary between stations W50 and W3 (Figure 1). Concentrations of dissolved copper at both W2 and W3 have since decreased to below the predicted expected case concentration for W2 (i.e., below 0.0092 mg/L; Table 2), and dissolved copper concentrations are now within the expected case range.

The non-parametric seasonal Kendall trend analysis for dissolved copper showed no significant increasing or decreasing temporal trends either from 2011 or from 2016 (Table 4). A comparison of dissolved copper by month (April to June) among years showed no clear increase or decrease in 2020 (Table 5; Appendix Figure A.1). Therefore, there was no evidence that copper concentrations were increasing, and there was little evidence that the elevated dissolved copper concentrations were mine-related, thus no further investigative action regarding this exceedance event is considered necessary, and weekly monitoring is sufficient.

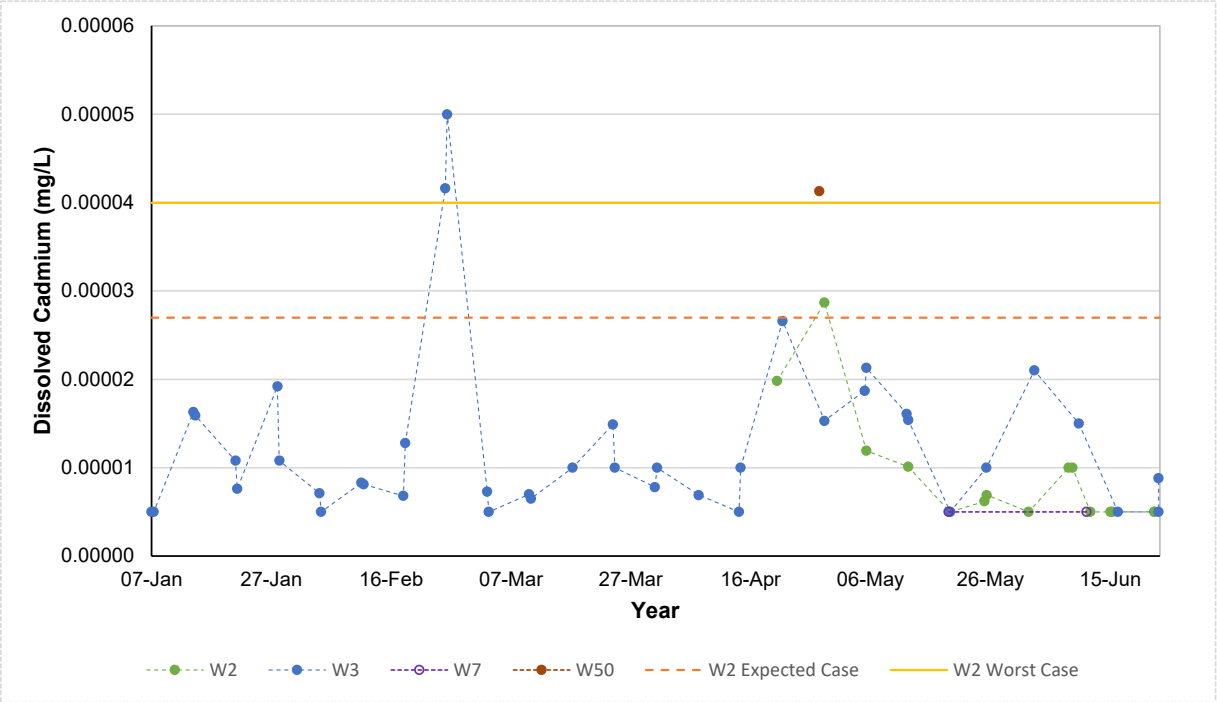


Figure 3: Dissolved cadmium concentrations in lower Minto Creek Monitoring Station, W2, compared to the W2 Water Quality Predictions and Water Quality at the Effluent Monitoring Station, W3, January to June, 2020

Note: open circles represented data that were less than the reporting limit.

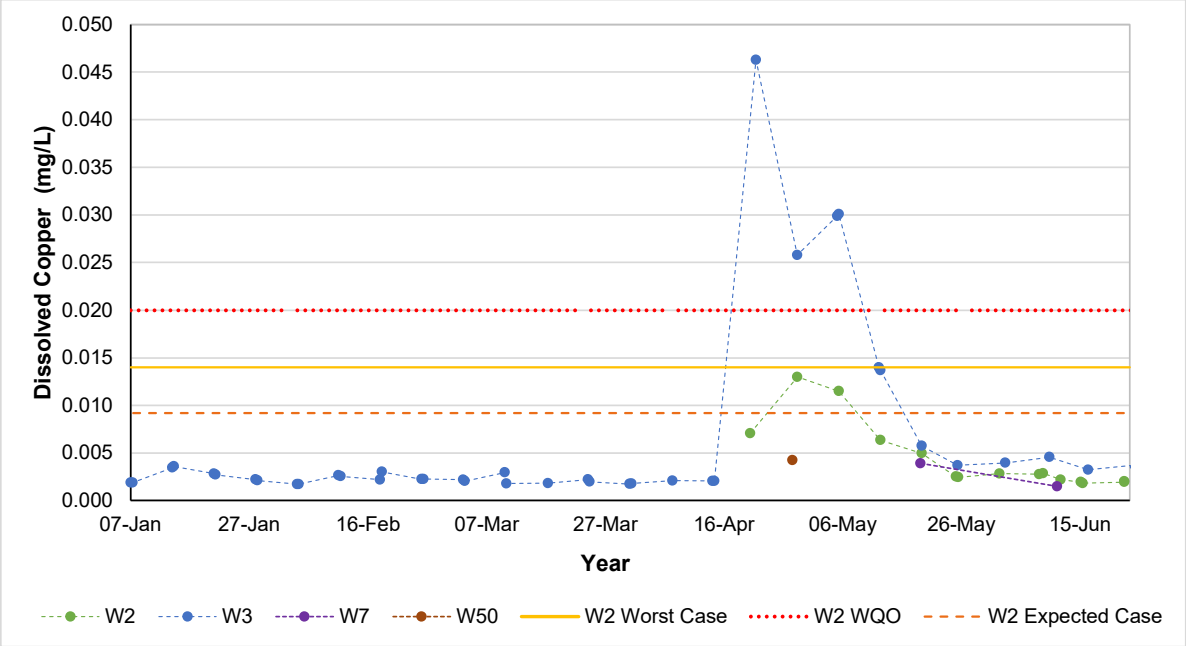


Figure 4: Dissolved copper concentrations in lower Minto Creek Monitoring Station, W2, compared to the W2 Water Quality Predictions and Water Quality at the Effluent Monitoring Station, W3, January to June, 2020

Dissolved Molybdenum

Concentrations of dissolved molybdenum exceeded the predicted worst-case maximum at lower Minto Creek station W2 on June 8th, 11th, 16th, and 23rd, 2020 (Table 3), triggering SPT level 3. When compared to the effluent monitoring station (W3), the concentrations of dissolved molybdenum at station W2 showed the same varying concentration patterns with time as at station W3 (Figure 5). This suggested that the exceedances at W2 were due to the high concentrations observed at the effluent monitoring point, W3.

Concentrations of dissolved molybdenum were higher at Station W3 (the effluent discharge monitoring point) than at Station W2 (Table 3, Figure 5), likely due to dilution from reference tributaries. However, at reference station W7 (located on a tributary of upper Minto Creek), the dissolved molybdenum concentration (at the same time as the exceedances at W2), was also higher than the predicted worst-case maximum (Appendix Table A.2, Figure 5) during one of two sampling events (for the time period April to June, 2020).

While the dissolved molybdenum concentration at station W50 (0.006 mg/L on 27th April, 2020; Appendix Table A.2) was higher than at station W2 and W3, as would be expected, it was also well below the effluent quality standard outlined in the water use licence (0.219 mg/L; Licence QZ14-031). The sampling event at station W50 was also during spring freshet, and water flow rates during spring freshet likely diluted dissolved molybdenum concentrations at both stations W2 and W3. After spring freshet, dissolved molybdenum concentrations at both stations (W2 and W3) started to increase, as well as at reference station W7. This suggested that the molybdenum concentrations that were above the predicted worst-case maximum were due to high reference molybdenum concentrations. There have been two previous investigations that have looked at additional sources of molybdenum to Minto Creek downstream of station W50:

(1) In 2016, a previous study has also investigated additional sources of dissolved molybdenum to Minto Creek. The study showed that station AMP1-b, a station where groundwater surfaces located downstream of W50 (Figure 1), had consistently higher concentrations of molybdenum than anywhere else in the Minto Creek catchment (Minto 2016). This surfacing groundwater, had high concentrations of molybdenum at the onset of the exceedance period for station W2 (i.e., 8th June, 2020; Appendix Table A.2; Figure 5), and thus may also have contributed to the above W2 worst case level predictions for dissolved Molybdenum.

(2) In 2019, a previous investigation into the influence of groundwater at station W2 associated with June 2019 exceedances showed that groundwater was naturally elevated in molybdenum and likely influences water quality at station W2 (Minnow 2020). There is no new information to suggest a different conclusion for the current exceedances.

Therefore, the elevated dissolved molybdenum observed in 2020 was also not likely mine-related, rather it is likely that the W2 station is influenced by contributions from groundwater (and/or surfacing groundwater) with naturally elevated dissolved molybdenum.

The non-parametric seasonal Kendall trend analysis for dissolved molybdenum showed no significant increasing or decreasing temporal trends either from 2011 or from 2016 (Table 4). A comparison of dissolved molybdenum by month (April to June) showed no clear increase or decrease among years, including a non-significant decrease in 2020 (relative to 2011; Table 5; Appendix Figure A.1). Therefore, there was no evidence that molybdenum concentrations were increasing, and there was some evidence that the elevated dissolved molybdenum concentrations were due to naturally elevated molybdenum concentrations in groundwater and at the reference station, W7. Thus, no further investigative action regarding this exceedance event is considered necessary, and weekly monitoring is sufficient.

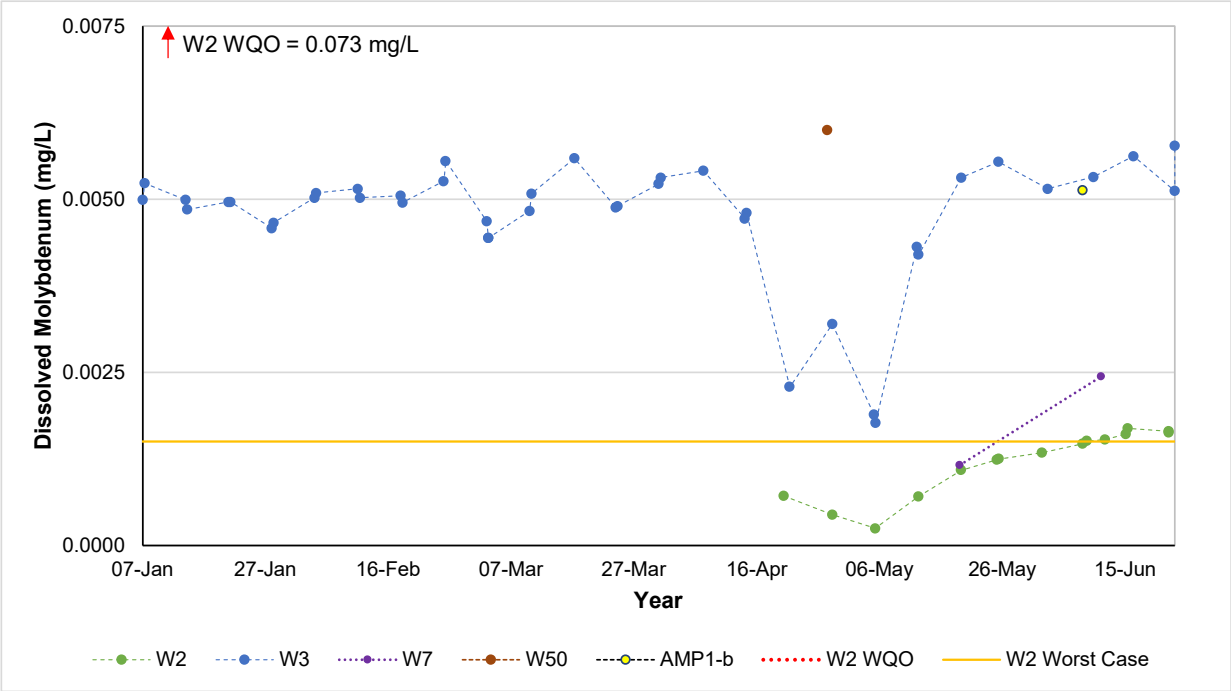


Figure 5: Dissolved molybdenum concentrations in lower Minto Creek Monitoring Station, W2, compared to the W2 Water Quality Predictions and Water Quality at the Effluent Monitoring Station, W3, January to June, 2020

The dissolved molybdenum concentrations at all monitoring stations, including W2, were well below the Minto Mine water quality objective (0.073 mg/L) and below reference conditions, so effects to aquatic life would not be expected.

Conclusions and Recommendations

For the period April to June, 2020, dissolved concentrations of cadmium showed an exceedance at SPT level 1, dissolved copper at SPT level 2, and dissolved molybdenum and dissolved aluminum exceeded at SPT level 3.

The exceedances above expected or worst-case maximum predictions for dissolved aluminum, copper, and molybdenum were not mine-related. Instead, exceedances in dissolved aluminum and copper concentrations were more likely associated with elevated concentrations in tributaries that influence water quality at stations W2 and W3. The exceedances that occurred for dissolved molybdenum were also associated with reference concentrations, and it is likely that station W2 is influenced by contributions from groundwater with naturally elevated dissolved molybdenum (Minnow 2020). Dissolved molybdenum did exceed the water criteria outlined in the AMP Level 3 trigger. However dissolved molybdenum concentrations were well below guidelines protective of aquatic life. Dissolved aluminum concentrations exceeded the guideline protective of aquatic life for one sampling event only, and this event was followed by a sharp decline to well below the guideline, however given that the aluminum exceedance was not mine-related no further action was recommended.

The exceedance observed for dissolved cadmium may have been mine-related, however the exceedance occurred over one sampling event only, and has since decreased. In addition, trend analyses showed that in general, cadmium concentrations at station W2 have been decreasing.

It is recommended that sampling continue as scheduled at stations W2 and W3 since concentrations are not expected to affect aquatic life. Increased monitoring frequency is not required at this time at stations W2 and W3.

The AMP outlines an action of resampling within 24 hours of reviewing a sample result, if an exceedance has occurred and is associated with mine loadings (Minto 2017). Given that water quality results typically take two weeks to acquire, and that sampling is conducted weekly at stations W2 and W3, sampling 24 hours after two weeks of an exceedance is impractical. It is recommended that, when an exceedance associated with mine loadings occurs, instead of sampling 24 hours after reviewing an exceedance result, that the next sample (collected one week after the original exceedance) is expedited to determine if the exceedance is continuing into a second week.

It is recommended that station W7 is monitored more frequently than the current sampling frequency (monthly), ideally at the same frequency as monitoring stations W2, W3, and W50 (i.e., weekly). Stations W7 and W50 provided insight into the contributions from background relative to any mine influence. It is also recommended that the predicted expected case and worst-case maximum concentrations for molybdenum are re-evaluated in light of the naturally high background levels of molybdenum in groundwater that influences water quality at station W2, and possibly at station W7.



Sincerely,

Minnow Environmental Inc.



Cheryl Wiramanaden, Ph.D., P.Chem.

Senior Environmental Chemist

cc: Pierre Stecko, M.Sc., R.P.Bio., EP

Senior Aquatic Scientist / Managing Principal

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APPENDIX A
SUPPORTING INFORMATION

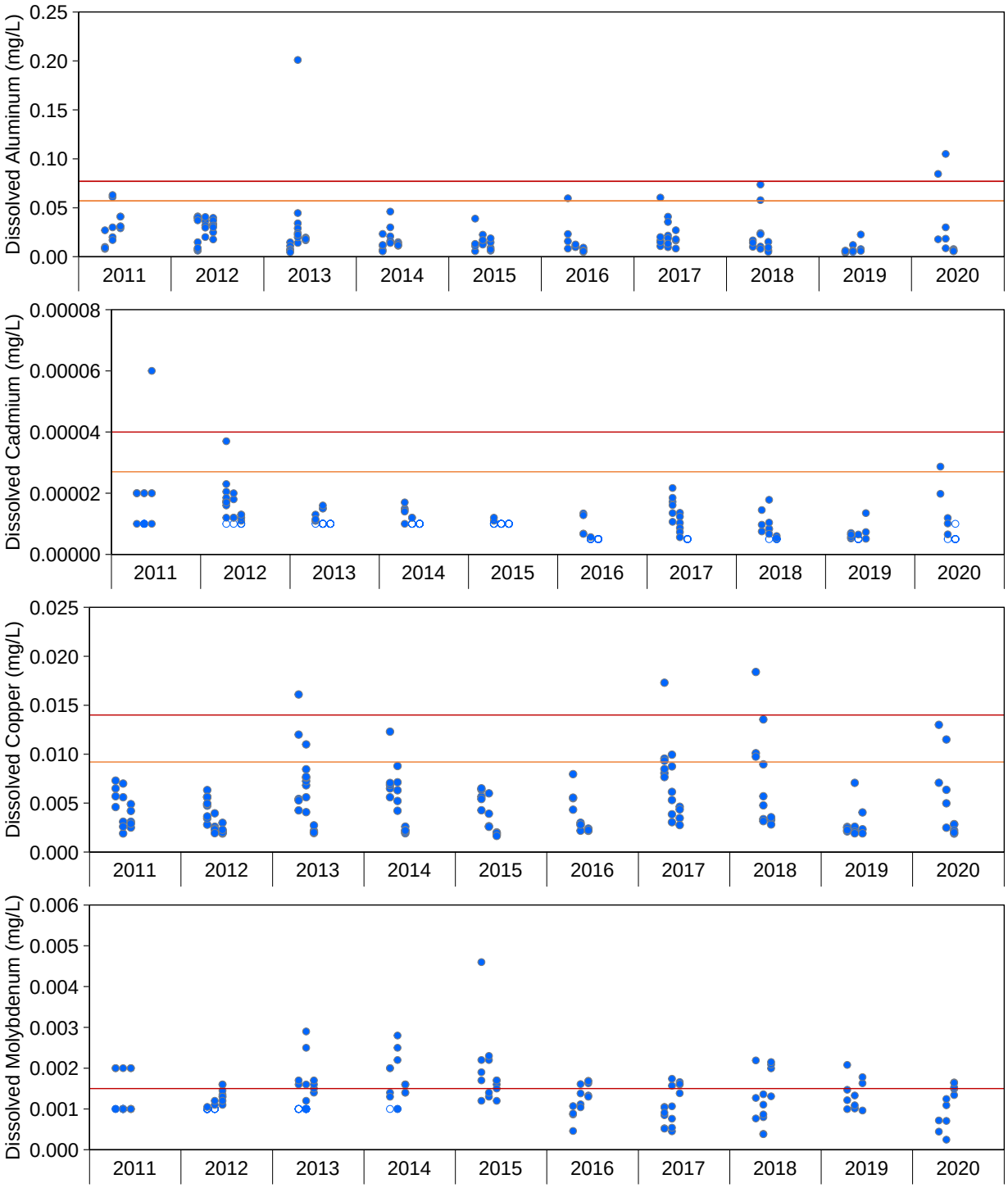


Figure A.1: Time Series Plots for Water Chemistry Concentrations from Lower Minto Creek, W2 Minto Mine, April to June 2011 to 2020

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Red lines represent expected (orange) and worst case (red) specific performance thresholds for surface water quality in Lower Minto Creek, W2.

Table A.1: Concentrations of Dissolved Aluminum, Cadmium, Copper, and Molybdenum at Lower Minto Creek Monitoring Station (W2) Compared to Effluent Monitoring Station (W3), April to June, 2020

Analyte	Lower Minto Creek Monitoring Station (W2)			Effluent Monitoring Station (W3)		
	Date	Sample	Duplicate Sample	Date	Sample	Duplicate Sample
Al-D (mg/L)	2020-04-20	0.0178	-	2020-04-21	0.0996	-
	2020-04-28	0.007	0.0846	2020-04-28	0.0732	-
	2020-05-07	0.105	-	2020-05-05	0.112	0.113
	2020-05-14	0.03	-	2020-05-12	0.0317	0.0315
	2020-05-21	0.0184	-	2020-05-19	0.0079	-
	2020-05-25	0.0091	0.0082	2020-05-25	0.0045	-
	2020-06-11	0.0058	-	2020-06-11	-	-
	2020-06-15	0.0052	-	2020-06-16	0.0054	-
	2020-06-22	0.0058	0.0058	2020-06-23	0.0057	0.0036
Cd-D (mg/L)	2020-04-20	0.0000198	-	2020-04-21	0.0000266	-
	2020-04-28	0.0000287	-	2020-04-28	0.0000153	-
	2020-05-05	0.0000119	-	2020-05-05	0.0000187	0.0000213
	2020-05-12	0.0000101	-	2020-05-12	0.0000161	0.0000154
	2020-05-19	<0.0000050	-	2020-05-19	0.000005	-
	2020-05-25	0.0000062	0.0000069	2020-05-25	<0.0000100	-
	2020-06-11	<0.0000050	-	2020-06-09	<0.0000150	-
	2020-06-15	<0.0000050	-	2020-06-16	<0.0000050	-
	2020-06-22	<0.0000050	<0.0000050	2020-06-23	<0.000005	0.0000088
Cu-D (mg/L)	2020-04-20	0.00708	-	2020-04-21	0.0463	-
	2020-04-28	0.013	-	2020-04-28	0.0258	-
	2020-05-05	0.0115	-	2020-05-05	0.0299	0.0301
	2020-05-12	0.00636	-	2020-05-12	0.014	0.0137
	2020-05-19	0.00498	-	2020-05-19	0.00576	-
	2020-05-25	0.00252	0.00246	2020-05-25	0.00372	-
	2020-06-11	0.00221	-	2020-06-11	-	-
	2020-06-15	0.00182	-	2020-06-16	0.00105	-
	2020-06-22	0.00204	0.00369	2020-06-23	0.00369	0.00328
Mo-D (mg/L)	2020-04-20	0.000718	-	2020-04-21	0.00229	-
	2020-04-28	0.000444	-	2020-04-28	0.0032	-
	2020-05-07	0.000247	-	2020-05-05	0.00189	-
	2020-05-14	0.000707	-	2020-05-12	0.00431	-
	2020-05-21	0.00109	-	2020-05-19	0.00531	-
	2020-05-25	0.00124	0.00125	2020-05-25	0.00554	-
	2020-06-08	0.00147	0.00151	2020-06-08	0.00532	-
	2020-06-11	0.00153	-	2020-06-11	-	-
	2020-06-15	0.00161	0.00169	2020-06-16	0.00562	-
	2020-06-22	0.00163	0.00512	2020-06-23	0.00512	0.00577

text > expected case WQ prediction
text > worst case WQ predication
text > water quality objective

Notes: - = no data available; Specific Performance Thresholds (Table 1) are outlined in the Operational AMP (Minto 2017).

Table A.2: Concentrations of Dissolved Aluminum, Cadmium, Copper, and Molybdenum for Minto Mine Monitoring Stations W7, W50, and AMP1-b April to June, 2020

Station Description	Date	Al-D (mg/L)	Cd-D (mg/L)	Cu-D (mg/L)	Mo-D (mg/L)
W7 Tributary to Minto Creek	19-May-20	0.0175	<0.0000050	0.00391	0.00116
	11-Jun-20	0.0071	<0.0000050	0.0015	0.00244
W50 Upper Minto Creek	27-Apr-20	0.0152	0.0000413	0.00426	0.00600
AMP1-b Source of Side Channel, downstream of W50	08-Jun-20	0.0022	<0.0000100	0.00442	0.00513

Table A.3: Monthly Mean Water Quality Data for W2, Minto Mine, April to June 2011 to 2020

Parameter	Year	Monthly Mean		
		April	May	June
Dissolved Aluminum (mg/L)	2011	0.0135	0.0382	0.0346
	2012	0.0243	0.0318	0.0309
	2013	0.00886	0.0487	0.0183
	2014	0.0118	0.0254	0.0127
	2015	0.0162	0.0166	0.0112
	2016	0.0268	0.0109	0.00678
	2017	0.0230	0.0233	0.0175
	2018	0.0137	0.0328	0.00906
	2019	0.00534	0.00719	0.0121
	2020	0.0512	0.0405	0.00641
Dissolved Cadmium (mg/L)	2011	0.0000175	0.0000140	0.0000480
	2012	0.0000189	0.0000144	0.0000114
	2013	0.0000113	0.0000120	<0.00001
	2014	0.0000141	0.0000108	<0.00001
	2015	0.0000106	<0.00001	<0.00001
	2016	0.00000993	0.00000516	<0.000005
	2017	0.0000163	0.00000963	<0.000005
	2018	0.0000106	0.00000944	0.00000533
	2019	0.00000609	0.00000538	0.00000863
	2020	0.0000243	0.00000839	<0.000005
Dissolved Copper (mg/L)	2011	0.00603	0.00404	0.00352
	2012	0.00477	0.00263	0.00218
	2013	0.00861	0.00731	0.00221
	2014	0.00766	0.00633	0.00220
	2015	0.00565	0.00379	0.00184
	2016	0.00584	0.00270	0.00227
	2017	0.0101	0.00618	0.00380
	2018	0.0128	0.00658	0.00327
	2019	0.00235	0.00342	0.00276
	2020	0.0100	0.00633	0.00236
Dissolved Molybdenum (mg/L)	2011	0.00150	0.00120	0.00140
	2012	0.00101	0.00106	0.00136
	2013	0.00126	0.00153	0.00155
	2014	0.00154	0.00190	0.00152
	2015	0.00232	0.00180	0.00154
	2016	0.000821	0.00129	0.00153
	2017	0.000815	0.00102	0.00157
	2018	0.00141	0.000816	0.00189
	2019	0.00144	0.00112	0.00146
	2020	0.000581	0.000822	0.00153

APPENDIX B
STATISTICAL METHODS

APPENDIX B STATISITICAL METHODS

Method 1: Seasonal Kendall Test for Increasing or Decreasing Trends

Quantitative tests for temporal trends in monthly mean concentrations at station W2 were conducted over two time periods (2011 to 2020 and 2016 to 2020) using the non-parametric seasonal Kendall test described by Hirsch et al. (1982). First monthly mean concentrations were estimated using the Kaplan-Meier method. The method involves transforming the left censored (i.e., < value) dataset to a right censored (i.e., > value) dataset, and then using the K-M estimator (used to estimate the mean survival time in survival analysis) to estimate the mean. The calculation was conducted using the survfit() function in the survival package (Therneau 2017) in R (R Core Team, 2019) and involved calculating the area under the K-M survival curve. The K-M method is non-parametric and can accommodate multiple LRLs. The method of estimating the mean is equivalent to using the distribution of detectable values below the LRL to represent values that are < LRL. For example, the mean of the data set {1, 2, <4, 5} is estimated as the mean of 1, 2, [½×1 + ½×2], and 5 which is 2.375. The value <4 is replaced by the distribution of values below 4 (i.e., 1 and 2 with equal weight of ½). Similarly, the mean of the data set {1, 1.6, 2, 2.1, <4, 5} is estimated as the mean of 1, 1.6, 2, 2.1, [¼×1 + ¼×1.6 + ¼×2 + ¼×2.1], and 5 which is 2.229. Again, the value <4 is replaced by the distribution of values below 4 (i.e., 1, 1.6, 2, and 2.1 with equal weight of ¼). If there is only one LRL and no detected values below the LRL, then the K-M estimate of the mean is equivalent to replacing the value below the LRL with the LRL (i.e., the best estimate for the values < LRL is the LRL).

The seasonal Kendall test assesses temporal trends separately for each season (or month in this case) and combines the results for each season into an overall test for trend. The test is non-parametric and assesses whether there is a monotonic increasing or monotonic decreasing trend over time. The test is conducted by calculating the test statistic S_i which is equal to the sum of the number of increases and decreases from a time period t to all time periods after t for each observation in season i. The overall test statistic S is computed as the sum of S_i for all seasons. The significance of the observed S is determined by comparing it to a critical value of S (at the significance level $\alpha = 0.05$) determined from the exact sampling distribution of S (calculated by determining all possible permutations and combinations of S based on the increases and decreases from the number of pairwise comparisons made; Hirsch et al. 1982). If more than 45 pairwise comparisons are made (equivalent to the number of

pairwise comparisons for n = 10 in a single season), then the normal approximation is used to calculate a p-value and to assess significance (Hirsch et al. 1982). The standard normal deviate Z is calculated as:

$$Z = \begin{cases} \frac{S-1}{\sqrt{\sigma_S}} if\ S > 0 \\ 0 \quad if\ S = 0 \\ \frac{S+1}{\sqrt{\sigma_S}} if\ S < 0 \end{cases}$$

where $\sigma_S = \sum_{i=1}^{k} \frac{n_i(n_i-1)(2n_i+5)-\sum_{T_i} t_i(t_i-1)(2t_i+5)}{18}$ and n_i is the number of samples in month i, t_i is the number of tied values for each tied value T_i, and k is the number of seasons (Hirsch et al. 1982).

An estimate of the trend slope over time is estimated by computing the median of all slopes between data pairs within the same month (Helsel and Hirsch 2002). The slope is reported as a change in concentration per year and as a percentage change in concentration per year. The intercept of a line through the time series is estimated as the median intercept of all lines through each point with the estimated slope (Pohlert 2016). The trend analysis was only conducted with a minimum number of 5 pairwise comparisons, the minimum number required for all consecutive increases or decrease to be significant at α = 0.05. The tests were conducted using scripts written in R software (R Core Team 2019).

Method 2: ANOVA comparison among years (10 years)

Temporal changes in water concentrations were also evaluated for station W2 from 2011 to 2020 using an Analysis of Variance (ANOVA). Only data collected from April to June were included in the analysis given that these were the only months consistently sampled across all years. Because of the presence of LRLs for many parameters, a censored regression ANOVA model with factors *Year* and *Month* and assuming a log-normal distribution of the response variable was fit with maximum likelihood estimation for each station. The significance of each term in the model was assessed using likelihood-ratio tests to determine if there is a significant change in log-likelihood with the addition of the term in the model. This tests for an overall difference among years and including the *month* term in the model controlled for seasonal effects within a year. If the year term was significant (α = 0.05) then post-hoc contrasts were conducted to test for all pairwise differences among years with an α = 0.05 in a Tukey's Honestly Significant Difference test (HSD) which corrects for the number of comparisons.

Magnitudes of difference (MOD) was calculated as the percent change from the concentration in the first year in the time series relative to the concentrations in the first year (2011):

$$MOD = \frac{Year_i - Year_1}{Year_1} x100\%$$

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Appendix K – MMER Effluent Monitoring and Environmental Effects Monitoring Water Quality 2020 Submissions

Minto Explorations Ltd.

Minto Mine
MDMER – EEM Annual Report
SWIM Upload

Prepared by:
Minto Explorations Ltd.
Minto Mine
February 28th, 2021

Note:

Due to external lab issues, W3 quarterly Trout LC50 had to be resampled on August 11th with W2 & W3 water quality samples. W7 water quality was collected on August 20th. Since the reference site (W7) did not thaw until May this meant we were only able to collect samples from all three stations for three of the required four EEM sampling occasions. Data below includes some sample days when only two of three stations could be sampled.

Data Summary

Station Name		W3	W3	W3	W3	W3	W3
Smpl Date		5/19/2020 5:40	7/8/2020 11:30	8/4/2020 6:10	8/11/2020 6:45	9/1/2020 6:55	10/6/2020 6:05
Lab Report No	Units	WR2000225	WR2000482	WR2000607	WR2000667	WR2000798	WR2001038
Hard-D	mg/L	290	286	252	265	323	268
Alk-T	mg/L	263	249	246	241	238	224
N-NH3	mg/L	0.0126	0.0073	0.0115	0.0102	0.0076	0.0098
N-NO3	mg/L	0.107	0.0610	0.0771	0.0743	0.0601	0.0620
Chlord	mg/L	5.28	5.23	4.97	4.90	4.56	4.66
C-DOC	mg/L	10.2	8.45	8.58	8.92	9.63	11.1
TSS	mg/L	4.2	13.8	<3.0	<3.0	<3.0	<3.0
pH-F	pH units	7.82	7.76	6.74	7.74	7.79	7.81
Temp-F	C	0.2	3.2	2.5	2.3	2.2	1.7
O-DO	mg/L	11.92	11.57	11.43	12.06	11.35	11.55
Cond-F	µS/cm	293.3	331.7	313.1	309.6	299.9	290.3
Al-D	mg/L	0.0079	0.0076	0.0034	0.0100	0.0047	0.0049
As-T	mg/L	0.00030	0.00028	0.00029	0.00039	0.00029	0.00024
Ca-T	mg/L	58.4	58.2	58.4	63.2	58.0	53.6
Cd-T	mg/L	<0.0000050	0.0000094	0.0000247	<0.0000050	<0.0000050	0.0000093
Co-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cr-T	mg/L	0.00019	0.00017	0.00028	0.00017	0.00019	0.00035
Cu-T	mg/L	0.00567	0.00357	0.00685	0.00354	0.00367	0.00441
Fe-T	mg/L	0.088	0.028	0.100	0.030	0.036	0.035
Hg-T	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Mg-T	mg/L	29.2	31.4	29.7	28.2	28.2	25.4
Mn-T	mg/L	0.0820	0.0497	0.0733	0.0713	0.0550	0.0504
Mo-D	mg/L	0.00531	0.00524	0.00506	0.00497	0.00544	0.00502
Na-T	mg/L	17.3	18.3	18.1	17.9	17.8	15.0
Ni-T	mg/L	0.00154	0.00118	0.00144	0.00131	0.00144	0.00150
P-T	mg/L	<0.050	<0.050	0.186	<0.050	<0.050	<0.050
Pb-T	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
S-T	mg/L	17.5	19.0	19.3	20.0	18.9	19.4
Se-T	mg/L	0.000280	0.000228	0.000253	0.000238	0.000267	0.000258
Tl-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
U-T	mg/L	0.00312	0.00265	0.00237	0.00249	0.00234	0.00207
Zn-T	mg/L	<0.0030	<0.0030	0.0037	<0.0030	<0.0030	<0.0030

Station Name		W7	W7	W7	W7	W7
Smpl Date		5/19/2020 6:00	7/8/2020 10:55	8/20/2020 17:45	9/1/2020 7:20	10/5/2020 15:45
Lab Report No	Units	WR2000225	WR2000482	WR2000752	WR2000798	WR2001038
Hard-D	mg/L	89.6	132	122	148	126
Alk-T	mg/L	86.1	132	122	123	121
N-NH3	mg/L	0.0066	0.0091	0.0109	0.0126	0.0161
N-NO3	mg/L	<0.0050	0.0833	0.0461	0.0490	0.0471
Chlord	mg/L	0.36	0.28	0.20	0.22	0.34
C-DOC	mg/L	19.5	10.0	14.3	13.4	12.0
TSS	mg/L	<3.0	19.6	20.3	4.2	9.4
pH-F	pH units	7.93	7.64	7.5	7.87	7.83
Temp-F	C	0	2.5	4.1	3.5	2.2
O-DO	mg/L	14.04	11.67	11.85	11.99	12.62
Cond-F	µS/cm	90.2	150.4	143	142.4	139.1
Al-D	mg/L	0.0175	0.0058	0.0186	0.0122	0.0103
As-T	mg/L	0.00039	0.00052	0.00054	0.00048	0.00044
Ca-T	mg/L	20.0	34.1	29.2	29.0	30.0
Cd-T	mg/L	<0.0000050	<0.0000050	0.0000054	<0.0000050	<0.0000050
Co-T	mg/L	<0.00010	0.00024	0.00023	0.00014	0.00014
Cr-T	mg/L	0.00040	0.00074	0.00085	0.00059	0.00068
Cu-T	mg/L	0.00378	0.00160	0.00204	0.00188	0.00154
Fe-T	mg/L	0.080	0.438	0.431	0.249	0.279
Hg-T	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Mg-T	mg/L	8.46	12.2	11.2	11.0	10.4
Mn-T	mg/L	0.0110	0.0301	0.0239	0.0208	0.0224
Mo-D	mg/L	0.00116	0.00152	0.00125	0.00131	0.00129
Na-T	mg/L	5.69	8.02	7.33	7.21	6.79
Ni-T	mg/L	0.00146	0.00138	0.00159	0.00142	0.00129
P-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050
Pb-T	mg/L	<0.000050	0.000132	0.000103	<0.000050	0.000067
S-T	mg/L	2.14	3.79	2.94	2.81	2.97
Se-T	mg/L	0.000144	0.000145	0.000153	0.000160	0.000112
Tl-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
U-T	mg/L	0.000577	0.00128	0.000787	0.000708	0.000742
Zn-T	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

Station Name		W2	W2	W2	W2	W2	W2
Smpl Date		5/19/2020 5:05	7/8/2020 8:35	8/4/2020 5:20	8/11/2020 6:15	9/1/2020 6:30	10/6/2020 5:35
Lab Report No	Units	WR2000225	WR2000482	WR2000607	WR2000667	WR2000798	WR2001038
Hard-D	mg/L	122	178	150	157	176	149
Alk-T	mg/L	113	170	160	170	144	140
N-NH3	mg/L	<0.0050	<0.0050	0.0088	<0.0050	0.0214	0.0058
N-NO3	mg/L	<0.0050	0.0458	0.0262	0.0094	0.0331	<0.0050
Chlord	mg/L	1.50	1.89	1.78	1.58	1.22	1.47
C-DOC	mg/L	15.0	9.10	10.1	10.0	12.7	12.8
TSS	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	3.1
pH-F	pH units	7.99	7.91	7.17	7.87	7.96	7.94
Temp-F	C	0.5	4.6	6.6	6.7	5.2	2.7
O-DO	mg/L	11.78	10.82	10.46	11.67	11.34	13.23
Cond-F	µS/cm	130.9	220.4	218.7	220.2	186.8	174.6
Al-D	mg/L	0.0184	0.0057	0.0055	0.0066	0.0093	0.0079
As-T	mg/L	0.00052	0.00055	0.00046	0.00055	0.00061	0.00046
Ca-T	mg/L	28.6	45.3	44.1	41.4	36.8	36.6
Cd-T	mg/L	0.0000060	0.0000078	<0.0000050	<0.0000050	<0.0000050	0.0000145
Co-T	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cr-T	mg/L	0.00031	0.00028	0.00026	0.00029	0.00044	0.00028
Cu-T	mg/L	0.00396	0.00200	0.00262	0.00211	0.00253	0.00273
Fe-T	mg/L	0.115	0.174	0.042	0.056	0.169	0.123
Hg-T	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Mg-T	mg/L	11.4	14.4	14.7	14.2	13.1	11.7
Mn-T	mg/L	0.00688	0.0217	0.0128	0.0104	0.0127	0.00924
Mo-D	mg/L	0.00109	0.00186	0.00125	0.00134	0.00144	0.00133
Na-T	mg/L	7.56	10.0	10.6	10.2	8.81	7.61
Ni-T	mg/L	0.00113	0.00092	0.00101	0.00088	0.00123	0.00104
P-T	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Pb-T	mg/L	<0.000050	0.000059	<0.000050	<0.000050	<0.000050	<0.000050
S-T	mg/L	5.79	9.01	8.62	7.94	6.15	6.28
Se-T	mg/L	0.000123	0.000170	0.000137	0.000123	0.000112	0.000149
Tl-T	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
U-T	mg/L	0.000963	0.00201	0.00130	0.00154	0.00116	0.00110
Zn-T	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

Effluent Characterization

Certificates of Analysis (COA's)

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000225**	Page	: 1 of 18
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 19-May-2020 15:29
PO	: 232817 (WUL)	Date Analysis Commenced	: 20-May-2020
C-O-C number	: 202-05-19 A	Issue Date	: 04-Jun-2020 13:09
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 17		
No. of samples analysed	: 17		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Angelo Salandanan	Lab Assistant	Metals, Burnaby, British Columbia
Bruna Botti	Analyst	Inorganics - Water Quality, Burnaby, British Columbia
Dee Lee	Analsyt	Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Matthew Woods	Lab Assistant	Metals, Burnaby, British Columbia
Owen Cheng		Metals, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Inorganics - Water Quality, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Qualifiers

Qualifier	*Description*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*
DTC	*Dissolved concentration exceeds total. Results were confirmed by re-analysis.*
DTMF	*Dissolved concentration exceeds total for field-filtered metals sample. Metallic contaminants may have been introduced to dissolved sample during field filtration.*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W17	W10	W30	W16	MN-0.2
					Client sampling date / time	11-May-2020 15:50	13-May-2020 14:20	13-May-2020 15:15	13-May-2020 16:25	14-May-2020 16:05
						WR2000225-001	WR2000225-002	WR2000225-003	WR2000225-004	WR2000225-005
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		214	19.3	122	67.7	12.2
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		8.6	<1.0	1.8	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		4.3	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		223	19.3	124	67.7	12.2
conductivity	----	E100	2.0	µS/cm		497	48.3	433	239	46.4
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		264	38.0	216	125	26.7
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		252	34.2	200	118	25.8
pH	----	E108	0.10	pH units		8.46	6.87	8.30	7.88	6.93
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		337	35.9	278	193	66.3
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	<3.0	18.0	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0069	0.0206	0.0160	0.0248	0.0064
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		6.87	<0.10	1.23	3.32	0.17
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.239	<0.0050	1.52	1.63	<0.0050
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		0.241	<0.0500	1.54	1.65	<0.0500
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0017	<0.0010	0.0178	0.0272	<0.0010
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		54.3	<0.30	99.0	43.0	3.69
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		13.8	----	----	37.0	35.4
Ion Balance										
anion sum	----	EC101	0.10	meq/L		5.80	0.39	4.68	2.46	0.32
cation sum	----	EC101	0.10	meq/L		6.07	0.91	5.03	2.86	0.68
ion balance (cation-anion difference)	----	EC101	0.010	%		2.27	40.0	3.60	7.52	36.0
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.0103	0.306	0.104	0.502	0.207
antimony, total	7440-36-0	E420	0.00010	mg/L		<0.00010	<0.00010	0.00014	0.00010	<0.00010
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00041	0.00039	0.00048	0.00068	0.00042
barium, total	7440-39-3	E420	0.00010	mg/L		0.0634	0.0570	0.0515	0.0592	0.0272
beryllium, total	7440-41-7	E420	0.000020	mg/L		<0.000020	0.000034	<0.000020	0.000032	0.000036

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W17	W10	W30	W16	MN-0.2
					Client sampling date / time	11-May-2020 15:50	13-May-2020 14:20	13-May-2020 15:15	13-May-2020 16:25	14-May-2020 16:05
						WR2000225-001	WR2000225-002	WR2000225-003	WR2000225-004	WR2000225-005
						Result	Result	Result	Result	Result
Total Metals										
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, total	7440-42-8	E420	0.010	mg/L		0.018	<0.010	0.014	<0.010	<0.010
cadmium, total	7440-43-9	E420	0.0000050	mg/L		<0.0000100 DLM	0.0000160	<0.0000150 DLM	0.0000358	0.0000069
calcium, total	7440-70-2	E420	0.050	mg/L		64.1	10.2	46.5	32.3	6.86
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00012	0.00054	0.00012	0.00065	0.00056
cobalt, total	7440-48-4	E420	0.00010	mg/L		0.00012	0.00024	0.00012	0.00047	0.00022
copper, total	7440-50-8	E420	0.00050	mg/L		0.0131	0.0550	0.0308	0.109	0.00664
iron, total	7439-89-6	E420	0.010	mg/L		0.037	0.455	0.188	0.890	0.456
lead, total	7439-92-1	E420	0.000050	mg/L		0.000075	<0.000050	0.000079	0.000212	<0.000050
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0018	<0.0010	0.0029	0.0015	<0.0010
magnesium, total	7439-95-4	E420	0.100	mg/L		22.3	2.12	20.4	9.16	2.11
manganese, total	7439-96-5	E420	0.00010	mg/L		0.0373	0.0497	0.0407	0.211	0.0158
mercury, total	7439-97-6	E508	0.0000050	mg/L		<0.0000050	0.0000116	<0.0000050	0.0000066	0.0000091
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.00604	0.000139	0.0109	0.00210	0.000117
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00102	0.00185	<0.00050	0.00169	0.00174
phosphorus, total	7723-14-0	E420	0.050	mg/L		<0.050	0.058	<0.050	0.072	<0.050
potassium, total	7440-09-7	E420	0.100	mg/L		3.84	0.864	4.04	2.12	0.488
selenium, total	7782-49-2	E420	0.000050	mg/L		0.000413	0.000102	0.00631	0.000789	0.000080
silicon, total	7440-21-3	E420	0.10	mg/L		6.12	2.49	2.77	3.96	2.63
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	0.000010	0.000014	0.000022	<0.000010
sodium, total	7440-23-5	E420	0.050	mg/L		14.7	1.25	12.6	5.91	1.83
strontium, total	7440-24-6	E420	0.00020	mg/L		0.739	0.0650	0.895	0.301	0.0451
sulfur, total	7704-34-9	E420	0.50	mg/L		19.8	<0.50	34.2	14.9	1.33
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, total	7440-32-6	E420	0.00030	mg/L		0.00050	0.00214	<0.00450 DLM	0.0252	0.00295
uranium, total	7440-61-1	E420	0.000010	mg/L		0.00284	0.000027	0.00262	0.000562	0.000038
vanadium, total	7440-62-2	E420	0.00050	mg/L		<0.00050	0.00082	0.00080	0.00216	0.00066
zinc, total	7440-66-6	E420	0.0030	mg/L		<0.0030	0.0070	<0.0030	0.0072	<0.0030
zirconium, total	7440-67-7	E420	0.00020	mg/L		<0.00020	0.00062	<0.00020	0.00046	0.00051
Dissolved Metals										

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W17	W10	W30	W16	MN-0.2
					Client sampling date / time	11-May-2020 15:50	13-May-2020 14:20	13-May-2020 15:15	13-May-2020 16:25	14-May-2020 16:05
						WR2000225-001	WR2000225-002	WR2000225-003	WR2000225-004	WR2000225-005
						Result	Result	Result	Result	Result
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0030	0.265	0.0081	0.0619	0.178
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	0.00011	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00040	0.00036	0.00046	0.00052	0.00037
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0664	0.0738	0.0540	0.0548	0.0283
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	0.000033	<0.000020	<0.000020	0.000024
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.016	<0.010	0.014	<0.010	<0.010
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000077	0.0000099	<0.0000100 DLM	0.0000394	<0.0000050
calcium, dissolved	7440-70-2	E421	0.050	mg/L		67.7	11.0	49.2	33.7	6.97
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00011	0.00047	<0.00010	0.00032	0.00049
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	0.00018	<0.00010	0.00020	0.00019
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.0122	0.0793 DTC	0.0202	0.0778	0.00657
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.022	0.424	0.028	0.214	0.313
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	0.000054	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0016	<0.0010	0.0028	0.0011	<0.0010
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		23.1	2.54	22.7	9.85	2.26
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0326	0.0711 DTC	0.0275	0.183	0.0109
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	0.0000124	<0.0000050	0.0000060	0.0000078
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00617	0.000117	0.0116	0.00208	0.000102
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00094	0.00182	<0.00050	0.00159	0.00172
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		3.95	0.808	4.43	2.17	0.505
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000400	0.000085	0.00640	0.000728	0.000111
silicon, dissolved	7440-21-3	E421	0.050	mg/L		6.03	2.63	2.65	3.18	2.70
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		15.6	1.66	13.6	6.63	2.11
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.760	0.0746	0.947	0.307	0.0455
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		19.1	<0.50	34.1	14.8	1.09
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	0.00198	0.00096	0.00208	0.00164

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W17	W10	W30	W16	MN-0.2
					Client sampling date / time	11-May-2020 15:50	13-May-2020 14:20	13-May-2020 15:15	13-May-2020 16:25	14-May-2020 16:05
						WR2000225-001	WR2000225-002	WR2000225-003	WR2000225-004	WR2000225-005
						Result	Result	Result	Result	Result
Dissolved Metals										
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00241	0.000034	0.00236	0.000476	0.000030
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	0.00059	<0.00050	0.00065	0.00052
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0013	0.0058	<0.0010	0.0050	<0.0010
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	0.00064	<0.00020	0.00045	0.00061
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	DUP	MN-4.5	MN-0.5	MN-2.5	MN-1.5
					Client sampling date / time	14-May-2020	15-May-2020 11:15	15-May-2020 12:50	15-May-2020 13:20	15-May-2020 14:55
						WR2000225-006	WR2000225-007	WR2000225-008	WR2000225-009	WR2000225-010
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		11.6	48.9	52.5	40.4	20.5
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		11.6	48.9	52.5	40.4	20.5
conductivity	----	E100	2.0	µS/cm		45.2	101	112	79.4	48.6
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		26.8	59.1	64.5	48.2	31.1
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		25.6	56.7	60.6	47.1	29.7
pH	----	E108	0.10	pH units		6.92	7.72	7.77	7.63	7.15
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		68.7	105	108	88.4	74.2
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	<3.0	26.8	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0064	0.0080	0.0068	0.0104	0.0098
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.17	0.31	0.26	0.33	0.22
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		3.72	4.28	5.85	1.01	1.42
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		38.1	34.5	31.6	31.6	37.0
Ion Balance										
anion sum	----	EC101	0.10	meq/L		0.31	1.08	1.18	0.84	0.44
cation sum	----	EC101	0.10	meq/L		0.68	1.37	1.49	1.10	0.76
ion balance (cation-anion difference)	----	EC101	0.010	%		37.4	11.8	11.6	13.4	26.7
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.194	0.119	0.115	0.384	0.231
antimony, total	7440-36-0	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00035	0.00052	0.00045	0.00061	0.00042
barium, total	7440-39-3	E420	0.00010	mg/L		0.0259	0.0304	0.0311	0.0303	0.0292
beryllium, total	7440-41-7	E420	0.000020	mg/L		0.000030	0.000026	0.000025	0.000033	0.000041
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	DUP	MN-4.5	MN-0.5	MN-2.5	MN-1.5
					Client sampling date / time	14-May-2020	15-May-2020 11:15	15-May-2020 12:50	15-May-2020 13:20	15-May-2020 14:55
						WR2000225-006	WR2000225-007	WR2000225-008	WR2000225-009	WR2000225-010
						Result	Result	Result	Result	Result
Total Metals										
boron, total	7440-42-8	E420	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010
cadmium, total	7440-43-9	E420	0.0000050	mg/L		<0.0000050	0.0000079	<0.0000050	0.0000135	0.0000076
calcium, total	7440-70-2	E420	0.050	mg/L		6.76	15.5	16.7	12.6	8.04
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00053	0.00056	0.00055	0.00100	0.00077
cobalt, total	7440-48-4	E420	0.00010	mg/L		0.00021	0.00015	0.00015	0.00038	0.00034
copper, total	7440-50-8	E420	0.00050	mg/L		0.00634	0.00454	0.00366	0.00557	0.0136
iron, total	7439-89-6	E420	0.010	mg/L		0.412	0.260	0.239	0.665	0.464
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	0.000168	0.000096
lithium, total	7439-93-2	E420	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
magnesium, total	7439-95-4	E420	0.100	mg/L		2.11	4.37	4.60	3.75	2.33
manganese, total	7439-96-5	E420	0.00010	mg/L		0.0139	0.00978	0.0224	0.0479	0.0406
mercury, total	7439-97-6	E508	0.0000050	mg/L		0.0000085	0.0000066	0.0000063	0.0000079	0.0000102
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.000086	0.000471	0.000568	0.000320	0.000138
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00167	0.00192	0.00166	0.00239	0.00172
phosphorus, total	7723-14-0	E420	0.050	mg/L		<0.050	<0.050	<0.050	0.056	<0.050
potassium, total	7440-09-7	E420	0.100	mg/L		0.481	0.782	0.774	0.788	0.707
selenium, total	7782-49-2	E420	0.000050	mg/L		0.000071	0.000137	0.000185	0.000102	0.000094
silicon, total	7440-21-3	E420	0.10	mg/L		2.60	4.15	4.07	4.58	3.35
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, total	7440-23-5	E420	0.050	mg/L		1.84	3.12	3.29	2.31	1.60
strontium, total	7440-24-6	E420	0.00020	mg/L		0.0418	0.107	0.132	0.0607	0.0431
sulfur, total	7704-34-9	E420	0.50	mg/L		1.48	1.72	2.15	0.56	0.67
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, total	7440-32-6	E420	0.00030	mg/L		0.00234	0.00312	0.00285	0.0151	0.00350
uranium, total	7440-61-1	E420	0.000010	mg/L		0.000036	0.000217	0.000311	0.000076	0.000047
vanadium, total	7440-62-2	E420	0.00050	mg/L		0.00057	0.00086	0.00081	0.00167	0.00073
zinc, total	7440-66-6	E420	0.0030	mg/L		<0.0030	<0.0030	<0.0030	0.0041	<0.0030
zirconium, total	7440-67-7	E420	0.00020	mg/L		0.00048	0.00056	0.00047	0.00057	0.00062
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.177	0.0786	0.0904	0.0518	0.193

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	DUP	MN-4.5	MN-0.5	MN-2.5	MN-1.5
					Client sampling date / time	14-May-2020	15-May-2020 11:15	15-May-2020 12:50	15-May-2020 13:20	15-May-2020 14:55
						WR2000225-006	WR2000225-007	WR2000225-008	WR2000225-009	WR2000225-010
						Result	Result	Result	Result	Result
Dissolved Metals										
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00038	0.00050	0.00042	0.00043	0.00039
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0280	0.0326	0.0334	0.0258	0.0303
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		0.000023	<0.000020	<0.000020	<0.000020	0.000030
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000050	0.0000055	0.0000077	0.0000062	0.0000068
calcium, dissolved	7440-70-2	E421	0.050	mg/L		7.08	16.0	17.6	12.7	8.44
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00050	0.00050	0.00040	0.00054	0.00070
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00018	0.00014	0.00013	0.00016	0.00031
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00646	0.00512	0.00452	0.00598	0.0160
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.308	0.211	0.225	0.168	0.334
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		2.22	4.63	4.99	4.00	2.43
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0106	0.00420	0.0210	0.0248	0.0372
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		0.0000091	0.0000080	0.0000065	0.0000077	0.0000096
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.000090	0.000508	0.000547	0.000340	0.000134
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00166	0.00188	0.00157	0.00242	0.00167
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		0.499	0.845	0.869	0.824	0.730
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000096	0.000194	0.000207	0.000148	0.000094
silicon, dissolved	7440-21-3	E421	0.050	mg/L		2.72	4.19	4.05	4.11	3.45
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		2.06	3.34	3.68	2.36	1.72
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.0419	0.108	0.135	0.0591	0.0427
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		1.00	1.43	1.95	<0.50	<0.50
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		0.00159	0.00204	0.00529 DTMF	0.00132	0.00167
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000030	0.000191	0.000263	0.000049	0.000038

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	DUP	MN-4.5	MN-0.5	MN-2.5	MN-1.5
					Client sampling date / time	14-May-2020	15-May-2020 11:15	15-May-2020 12:50	15-May-2020 13:20	15-May-2020 14:55
						WR2000225-006	WR2000225-007	WR2000225-008	WR2000225-009	WR2000225-010
						Result	Result	Result	Result	Result
Dissolved Metals										
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00051	0.00076	0.00080	0.00060	0.00060
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0014	<0.0010	0.0019	0.0036	<0.0010
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		0.00060	0.00062	0.00053	0.00056	0.00075
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MN	MC1	W17	DUP	W2
					Client sampling date / time	17-May-2020 15:00	17-May-2020 13:05	18-May-2020 10:30	18-May-2020	19-May-2020 17:05
						WR2000225-011	WR2000225-012	WR2000225-013	WR2000225-014	WR2000225-015
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		62.2	109	203	204	113
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	6.8	7.2	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	3.4	3.6	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		62.2	109	210	211	113
conductivity	----	E100	2.0	µS/cm		303	222	472	473	236
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		132	117	257	252	122
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		123	111	236	240	118
pH	----	E108	0.10	pH units		8.02	8.21	8.44	8.45	8.25
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		200	163	324	323	164
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	7.2	<3.0	<3.0	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0947	0.0062	0.0071	0.0066	<0.0050
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.60	1.38	6.16	6.12	1.50
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		6.48	<0.0050	0.259	0.255	<0.0050
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		6.53	<0.0500	0.260	0.256	<0.0500
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0420	<0.0010	<0.0010	<0.0010	<0.0010
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		63.7	13.8	52.9	52.6	15.9
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		----	20.1	13.9	14.3	15.0
Ion Balance										
anion sum	----	EC101	0.10	meq/L		3.05	2.50	5.49	5.51	2.63
cation sum	----	EC101	0.10	meq/L		3.28	2.72	5.90	5.78	2.83
ion balance (cation-anion difference)	----	EC101	0.010	%		3.63	4.21	3.60	2.39	3.66
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.0931	0.206	0.0045	0.0042	0.0395
antimony, total	7440-36-0	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00043	0.00074	0.00037	0.00034	0.00052
barium, total	7440-39-3	E420	0.00010	mg/L		0.0203	0.0460	0.0590	0.0574	0.0413
beryllium, total	7440-41-7	E420	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MN	MC1	W17	DUP	W2
					Client sampling date / time	17-May-2020 15:00	17-May-2020 13:05	18-May-2020 10:30	18-May-2020	19-May-2020 17:05
						WR2000225-011	WR2000225-012	WR2000225-013	WR2000225-014	WR2000225-015
						Result	Result	Result	Result	Result
Total Metals										
boron, total	7440-42-8	E420	0.010	mg/L		0.028	<0.010	0.017	0.016	<0.010
cadmium, total	7440-43-9	E420	0.0000050	mg/L		0.0000323	0.0000091	<0.0000050	<0.0000050	0.0000060
calcium, total	7440-70-2	E420	0.050	mg/L		39.2	27.5	62.3	62.2	28.6
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		<0.00010	0.00066	0.00016	0.00013	0.00031
cobalt, total	7440-48-4	E420	0.00010	mg/L		<0.00010	0.00022	<0.00010	<0.00010	<0.00010
copper, total	7440-50-8	E420	0.00050	mg/L		0.0229	0.00501	0.0107	0.0109	0.00396
iron, total	7439-89-6	E420	0.010	mg/L		0.104	0.403	<0.010	<0.010	0.115
lead, total	7439-92-1	E420	0.000050	mg/L		0.000065	0.000095	<0.000050	<0.000050	<0.000050
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0030	0.0012	0.0017	0.0017	0.0012
magnesium, total	7439-95-4	E420	0.100	mg/L		6.09	10.2	19.6	20.5	11.4
manganese, total	7439-96-5	E420	0.00010	mg/L		0.0123	0.0440	0.0189	0.0178	0.00688
mercury, total	7439-97-6	E508	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.0110	0.00102	0.00574	0.00570	0.00102
nickel, total	7440-02-0	E420	0.00050	mg/L		<0.00050	0.00174	0.00086	0.00085	0.00113
phosphorus, total	7723-14-0	E420	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, total	7440-09-7	E420	0.100	mg/L		2.56	1.11	3.39	3.40	1.20
selenium, total	7782-49-2	E420	0.000050	mg/L		0.00973	0.000184	0.000379	0.000406	0.000123
silicon, total	7440-21-3	E420	0.10	mg/L		1.94	5.34	6.17	6.10	4.93
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, total	7440-23-5	E420	0.050	mg/L		11.4	7.05	13.4	13.8	7.56
strontium, total	7440-24-6	E420	0.00020	mg/L		1.12	0.260	0.686	0.699	0.273
sulfur, total	7704-34-9	E420	0.50	mg/L		22.0	4.78	18.3	18.5	5.79
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, total	7440-32-6	E420	0.00030	mg/L		0.00391	0.00957	<0.00030	<0.00030	0.00141
uranium, total	7440-61-1	E420	0.000010	mg/L		0.000694	0.000882	0.00252	0.00253	0.000963
vanadium, total	7440-62-2	E420	0.00050	mg/L		0.00062	0.00136	<0.00050	<0.00050	0.00078
zinc, total	7440-66-6	E420	0.0030	mg/L		0.0031	<0.0030	<0.0030	<0.0030	<0.0030
zirconium, total	7440-67-7	E420	0.00020	mg/L		<0.00020	0.00032	<0.00020	<0.00020	0.00021
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0075	0.0161	0.0024	0.0036	0.0184

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MN	MC1	W17	DUP	W2
					Client sampling date / time	17-May-2020 15:00	17-May-2020 13:05	18-May-2020 10:30	18-May-2020	19-May-2020 17:05
						WR2000225-011	WR2000225-012	WR2000225-013	WR2000225-014	WR2000225-015
						Result	Result	Result	Result	Result
Dissolved Metals										
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00041	0.00060	0.00036	0.00034	0.00049
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0215	0.0448	0.0626	0.0616	0.0450
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.028	<0.010	0.017	0.017	<0.010
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000303	0.0000070	<0.0000050	<0.0000050	<0.0000050
calcium, dissolved	7440-70-2	E421	0.050	mg/L		41.6	28.3	65.9	65.3	29.5
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	0.00034	0.00010	0.00011	0.00026
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	0.00012	<0.00010	<0.00010	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.0106	0.00451	0.0115	0.0112	0.00498
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.013	0.097	<0.010	<0.010	0.086
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	0.000060
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0028	0.0010	0.0016	0.0016	0.0011
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		6.78	11.2	22.5	21.6	11.7
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.00591	0.0295	0.0166	0.0161	0.00185
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.0116	0.00111	0.00612	0.00628	0.00109
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	0.00148	0.00086	0.00083	0.00114
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		2.85	1.19	3.81	3.70	1.28
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.00992	0.000212	0.000444	0.000508	0.000119
silicon, dissolved	7440-21-3	E421	0.050	mg/L		1.87	5.10	6.00	6.02	4.86
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		13.0	7.80	15.2	14.8	8.33
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		1.14	0.275	0.730	0.714	0.295
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		21.4	4.67	17.7	18.1	5.42
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		0.00039	0.00070	<0.00030	<0.00030	0.00125
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000601	0.000790	0.00229	0.00228	0.000876

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MN	MC1	W17	DUP	W2
					Client sampling date / time	17-May-2020 15:00	17-May-2020 13:05	18-May-2020 10:30	18-May-2020	19-May-2020 17:05
						WR2000225-011	WR2000225-012	WR2000225-013	WR2000225-014	WR2000225-015
						Result	Result	Result	Result	Result
Dissolved Metals										
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	0.00085	<0.00050	<0.00050	0.00071
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	0.0013
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	0.00031	<0.00020	<0.00020	0.00023
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W3	W7	----	----	----
					Client sampling date / time	19-May-2020 17:40	19-May-2020 18:00	----	----	----
						WR2000225-016	WR2000225-017	--------	--------	--------
						Result	Result	----	----	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		251	86.1	----	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		11.6	<1.0	----	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		5.8	<1.0	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		263	86.1	----	----	----
conductivity	----	E100	2.0	µS/cm		524	167	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		290	89.6	----	----	----
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		266	84.7	----	----	----
pH	----	E108	0.10	pH units		8.47	8.07	----	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		360	128	----	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		4.2	<3.0	----	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0126	0.0066	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		5.28	0.36	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.107	<0.0050	----	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		0.107	<0.0500	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	<0.0010	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		50.9	5.95	----	----	----
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		10.2	19.5	----	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		6.47	1.85	----	----	----
cation sum	----	EC101	0.10	meq/L		6.74	2.09	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		2.04	6.09	----	----	----
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.0500	0.0231	----	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L		<0.00010	<0.00010	----	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00030	0.00039	----	----	----
barium, total	7440-39-3	E420	0.00010	mg/L		0.0575	0.0394	----	----	----
beryllium, total	7440-41-7	E420	0.000020	mg/L		<0.000020	<0.000020	----	----	----
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	----	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W3	W7	----	----	----
					Client sampling date / time	19-May-2020 17:40	19-May-2020 18:00	----	----	----
						WR2000225-016	WR2000225-017	--------	--------	--------
						Result	Result	----	----	----
Total Metals										
boron, total	7440-42-8	E420	0.010	mg/L		0.020	<0.010	----	----	----
cadmium, total	7440-43-9	E420	0.0000050	mg/L		<0.0000050	<0.0000050	----	----	----
calcium, total	7440-70-2	E420	0.050	mg/L		58.4	20.0	----	----	----
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00019	0.00040	----	----	----
cobalt, total	7440-48-4	E420	0.00010	mg/L		<0.00010	<0.00010	----	----	----
copper, total	7440-50-8	E420	0.00050	mg/L		0.00567	0.00378	----	----	----
iron, total	7439-89-6	E420	0.010	mg/L		0.088	0.080	----	----	----
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	<0.000050	----	----	----
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0032	<0.0010	----	----	----
magnesium, total	7439-95-4	E420	0.100	mg/L		29.2	8.46	----	----	----
manganese, total	7439-96-5	E420	0.00010	mg/L		0.0820	0.0110	----	----	----
mercury, total	7439-97-6	E508	0.0000050	mg/L		<0.0000050	<0.0000050	----	----	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.00505	0.00118	----	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00154	0.00146	----	----	----
phosphorus, total	7723-14-0	E420	0.050	mg/L		<0.050	<0.050	----	----	----
potassium, total	7440-09-7	E420	0.100	mg/L		2.31	0.666	----	----	----
selenium, total	7782-49-2	E420	0.000050	mg/L		0.000280	0.000144	----	----	----
silicon, total	7440-21-3	E420	0.10	mg/L		6.51	5.02	----	----	----
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	----	----	----
sodium, total	7440-23-5	E420	0.050	mg/L		17.3	5.69	----	----	----
strontium, total	7440-24-6	E420	0.00020	mg/L		0.760	0.206	----	----	----
sulfur, total	7704-34-9	E420	0.50	mg/L		17.5	2.14	----	----	----
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000010	----	----	----
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	<0.00010	----	----	----
titanium, total	7440-32-6	E420	0.00030	mg/L		0.00202	0.00076	----	----	----
uranium, total	7440-61-1	E420	0.000010	mg/L		0.00312	0.000577	----	----	----
vanadium, total	7440-62-2	E420	0.00050	mg/L		0.00053	0.00086	----	----	----
zinc, total	7440-66-6	E420	0.0030	mg/L		<0.0030	<0.0030	----	----	----
zirconium, total	7440-67-7	E420	0.00020	mg/L		<0.00020	0.00033	----	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0079	0.0175	----	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W3	W7	----	----	----
					Client sampling date / time	19-May-2020 17:40	19-May-2020 18:00	----	----	----
						WR2000225-016	WR2000225-017	--------	--------	--------
						Result	Result	----	----	----
Dissolved Metals										
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00030	0.00043	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0628	0.0418	----	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.020	<0.010	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000050	<0.0000050	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		61.8	21.2	----	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00012	0.00034	----	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00576	0.00391	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.039	0.073	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0030	<0.0010	----	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		33.0	8.88	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0813	0.0102	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00531	0.00116	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00153	0.00144	----	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	----	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		2.58	0.702	----	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000268	0.000170	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		6.48	5.00	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	----	----	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		19.8	6.26	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.802	0.208	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		17.9	1.86	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	0.00054	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00280	0.000515	----	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W3	W7	----	----	----
					Client sampling date / time	19-May-2020 17:40	19-May-2020 18:00	----	----	----
						WR2000225-016	WR2000225-017	--------	--------	--------
						Result	Result	----	----	----
Dissolved Metals										
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	0.00085	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		<0.0010	<0.0010	----	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		0.00020	0.00035	----	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	----	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000482**	Page	: 1 of 14
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 14-Jul-2020 14:20
PO	: 232817	Date Analysis Commenced	: 15-Jul-2020
C-O-C number	: 2020-07-14 A	Issue Date	: 21-Jul-2020 13:40
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 14		
No. of samples analysed	: 14		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Angelo Salandanan	Lab Assistant	Metals, Burnaby, British Columbia
Bruna Botti	Analyst	Inorganics - Water Quality, Burnaby, British Columbia
Ken Chan	Supervisor - Metals Prep & Mercury	Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Kinny Wu	Laboratory Analyst	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Muneeb Alam	Analyst	Metals, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Inorganics - Water Quality, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Woochan Song	Lab Assistant	Metals, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Qualifiers

Qualifier	*Description*
DLA	*Detection Limit adjusted for required dilution.*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W2	MC1	W7	W3	W51
					Client sampling date / time	08-Jul-2020 08:35	08-Jul-2020 08:55	08-Jul-2020 10:55	08-Jul-2020 11:30	09-Jul-2020 13:20
						WR2000482-001	WR2000482-002	WR2000482-003	WR2000482-004	WR2000482-005
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		170	158	132	249	162
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		170	158	132	249	162
conductivity	----	E100	2.0	µS/cm		363	340	269	570	2860
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		178	163	132	286	1580
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		172	164	136	275	1600
pH	----	E108	0.10	pH units		8.17	8.17	8.01	8.19	7.83
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		225	210	168	346	2500
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	62.8	19.6	13.8	5.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		<0.0050	0.0117	0.0091	0.0073	5.60
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		1.89	1.39	0.28	5.23	23.0
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.0458	0.0571	0.0833	0.0610	7.37
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		<0.0500	0.0574	0.0835	0.0612	11.4
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	4.07
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		23.9	19.9	8.95	50.8	1590
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		9.10	11.2	10.0	8.45	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		3.95	3.61	2.83	6.19	37.8
cation sum	----	EC101	0.10	meq/L		4.05	3.73	3.01	6.56	37.4
ion balance (cation-anion difference)	----	EC101	0.010	%		1.25	1.63	3.08	2.90	0.532
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.0739	1.33	0.238	0.0102	0.0300
antimony, total	7440-36-0	E420	0.00010	mg/L		<0.00010	0.00015	<0.00010	<0.00010	0.00044
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00055	0.00144	0.00052	0.00028	0.00039
barium, total	7440-39-3	E420	0.00010	mg/L		0.0582	0.0830	0.0694	0.0579	0.0642
beryllium, total	7440-41-7	E420	0.000020	mg/L		<0.000020	0.000043	<0.000020	<0.000020	<0.000040 DLA
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000100 DLA

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W2	MC1	W7	W3	W51
					Client sampling date / time	08-Jul-2020 08:35	08-Jul-2020 08:55	08-Jul-2020 10:55	08-Jul-2020 11:30	09-Jul-2020 13:20
						WR2000482-001	WR2000482-002	WR2000482-003	WR2000482-004	WR2000482-005
						Result	Result	Result	Result	Result
Total Metals										
boron, total	7440-42-8	E420	0.010	mg/L		<0.010	<0.010	<0.010	0.022	0.311
cadmium, total	7440-43-9	E420	0.0000050	mg/L		0.0000078	0.0000286	<0.0000050	0.0000094	0.0000617
calcium, total	7440-70-2	E420	0.050	mg/L		45.3	38.6	34.1	58.2	532
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00028	0.00264	0.00074	0.00017	<0.00020 DLA
cobalt, total	7440-48-4	E420	0.00010	mg/L		<0.00010	0.00097	0.00024	<0.00010	0.00042
copper, total	7440-50-8	E420	0.00050	mg/L		0.00200	0.00602	0.00160	0.00357	0.00968
iron, total	7439-89-6	E420	0.010	mg/L		0.174	2.32	0.438	0.028	0.427
lead, total	7439-92-1	E420	0.000050	mg/L		0.000059	0.000596	0.000132	<0.000050	<0.000100 DLA
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0018	0.0021	0.0012	0.0027	0.0112
magnesium, total	7439-95-4	E420	0.100	mg/L		14.4	16.3	12.2	31.4	65.6
manganese, total	7439-96-5	E420	0.00010	mg/L		0.0217	0.147	0.0301	0.0497	0.730
mercury, total	7439-97-6	E508	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000100 DLM
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.00172	0.00188	0.00144	0.00510	0.0469
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00092	0.00354	0.00138	0.00118	0.00474
phosphorus, total	7723-14-0	E420	0.050	mg/L		<0.050	0.085	<0.050	<0.050	<0.100 DLA
potassium, total	7440-09-7	E420	0.100	mg/L		1.31	1.46	0.966	2.28	33.6
selenium, total	7782-49-2	E420	0.000050	mg/L		0.000170	0.000226	0.000145	0.000228	0.00448
silicon, total	7440-21-3	E420	0.10	mg/L		5.58	8.14	6.36	6.38	3.67
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000020 DLA
sodium, total	7440-23-5	E420	0.050	mg/L		10.0	10.5	8.02	18.3	106
strontium, total	7440-24-6	E420	0.00020	mg/L		0.433	0.470	0.355	0.813	6.34
sulfur, total	7704-34-9	E420	0.50	mg/L		9.01	7.44	3.79	19.0	584
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000020 DLA
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00020 DLA
titanium, total	7440-32-6	E420	0.00030	mg/L		0.00333	0.0552	0.0108	0.00042	<0.00180 DLM
uranium, total	7440-61-1	E420	0.000010	mg/L		0.00201	0.00206	0.00128	0.00265	0.00394
vanadium, total	7440-62-2	E420	0.00050	mg/L		0.00090	0.00536	0.00150	<0.00050	<0.00100 DLA
zinc, total	7440-66-6	E420	0.0030	mg/L		<0.0030	0.0055	<0.0030	<0.0030	<0.0060 DLA
zirconium, total	7440-67-7	E420	0.00020	mg/L		0.00022	0.00037	0.00020	<0.00020	<0.00040 DLA
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0057	0.0096	0.0058	0.0076	0.0052
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	0.00042

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W2	MC1	W7	W3	W51
					Client sampling date / time	08-Jul-2020 08:35	08-Jul-2020 08:55	08-Jul-2020 10:55	08-Jul-2020 11:30	09-Jul-2020 13:20
						WR2000482-001	WR2000482-002	WR2000482-003	WR2000482-004	WR2000482-005
						Result	Result	Result	Result	Result
Dissolved Metals										
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00058	0.00053	0.00038	0.00025	0.00028
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0613	0.0625	0.0661	0.0591	0.0688
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000040 DLA
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000100 DLA
boron, dissolved	7440-42-8	E421	0.010	mg/L		<0.010	<0.010	<0.010	0.022	0.324
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	0.0000084	0.0000436
calcium, dissolved	7440-70-2	E421	0.050	mg/L		45.7	41.3	32.8	64.0	531
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00018	0.00019	0.00023	0.00016	<0.00020 DLA
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	0.00038
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00179	0.00235	0.00115	0.00446	0.00181
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.036	0.079	0.041	0.025	0.088
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	0.000062	<0.000050	<0.000050	<0.000100 DLA
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0017	0.0016	0.0010	0.0030	0.0125
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		15.5	14.5	12.1	30.6	62.0
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0123	0.0157	0.0156	0.0464	0.712
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00186	0.00196	0.00152	0.00524	0.0482
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00078	0.00090	0.00088	0.00112	0.00445
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.100 DLA
potassium, dissolved	7440-09-7	E421	0.100	mg/L		1.35	1.27	0.920	2.36	34.9
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000164	0.000110	0.000130	0.000295	0.00394
silicon, dissolved	7440-21-3	E421	0.050	mg/L		5.60	5.51	5.81	6.15	3.52
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000020 DLA
sodium, dissolved	7440-23-5	E421	0.050	mg/L		10.6	10.1	7.90	18.0	103
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.484	0.407	0.371	0.764	5.91
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		8.78	7.41	3.35	19.0	584
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000020 DLA
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00020 DLA
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	0.00062	<0.00030	0.00037	<0.00060 DLA
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00217	0.00204	0.00124	0.00277	0.00407
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00064	0.00087	0.00077	<0.00050	<0.00100 DLA
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		<0.0010	0.0031	<0.0010	0.0011	0.0039

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W2	MC1	W7	W3	W51
					Client sampling date / time	08-Jul-2020 08:35	08-Jul-2020 08:55	08-Jul-2020 10:55	08-Jul-2020 11:30	09-Jul-2020 13:20
						WR2000482-001	WR2000482-002	WR2000482-003	WR2000482-004	WR2000482-005
						Result	Result	Result	Result	Result
Dissolved Metals										
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00040 DLA
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W35	W14	W2	MC1	DUP
					Client sampling date / time	09-Jul-2020 13:40	12-Jul-2020 08:50	13-Jul-2020 09:25	13-Jul-2020 09:50	13-Jul-2020
						WR2000482-006	WR2000482-007	WR2000482-008	WR2000482-009	WR2000482-010
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		163	90.1	154	162	166
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		163	90.1	154	162	166
conductivity	----	E100	2.0	µS/cm		922	3200	332	317	330
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		411	1820	160	157	160
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		401	----	156	153	154
pH	----	E108	0.10	pH units		7.98	7.99	8.13	8.14	8.15
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		612	2950	204	205	210
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		8.6	27.7	<3.0	14.0	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0093	8.94	0.0057	0.0080	0.0180
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		9.64	25.4	1.42	1.14	1.40
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		34.0	26.2	0.0294	0.0485	0.0242
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		34.0	28.3	<0.0500	<0.0500	<0.0500
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0145	2.17	<0.0010	<0.0010	<0.0010
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		166	1820	19.0	16.1	18.9
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		----	----	10.9	10.9	10.2
Ion Balance										
anion sum	----	EC101	0.10	meq/L		9.43	42.5	3.50	3.60	3.76
cation sum	----	EC101	0.10	meq/L		9.51	45.0	3.66	3.57	3.64
ion balance (cation-anion difference)	----	EC101	0.010	%		0.422	2.86	2.23	0.418	1.62
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.181	----	0.0113	0.301	0.0111
antimony, total	7440-36-0	E420	0.00010	mg/L		0.00011	----	0.00010	0.00011	<0.00010
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00035	----	0.00049	0.00076	0.00048
barium, total	7440-39-3	E420	0.00010	mg/L		0.159	----	0.0573	0.0615	0.0570
beryllium, total	7440-41-7	E420	0.000020	mg/L		<0.000020	----	<0.000020	<0.000020	<0.000020
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	----	<0.000050	<0.000050	<0.000050
boron, total	7440-42-8	E420	0.010	mg/L		0.067	----	<0.010	<0.010	<0.010

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W35	W14	W2	MC1	DUP
					Client sampling date / time	09-Jul-2020 13:40	12-Jul-2020 08:50	13-Jul-2020 09:25	13-Jul-2020 09:50	13-Jul-2020
						WR2000482-006	WR2000482-007	WR2000482-008	WR2000482-009	WR2000482-010
						Result	Result	Result	Result	Result
Total Metals										
cadmium, total	7440-43-9	E420	0.0000050	mg/L		0.0000416	----	<0.0000050	0.0000105	<0.0000050
calcium, total	7440-70-2	E420	0.050	mg/L		106	----	38.4	37.0	38.0
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00029	----	0.00025	0.00079	0.00025
cobalt, total	7440-48-4	E420	0.00010	mg/L		0.00017	----	<0.00010	0.00027	<0.00010
copper, total	7440-50-8	E420	0.00050	mg/L		0.104	----	0.00224	0.00298	0.00220
iron, total	7439-89-6	E420	0.010	mg/L		0.339	----	0.053	0.595	0.053
lead, total	7439-92-1	E420	0.000050	mg/L		0.000114	----	<0.000050	0.000145	<0.000050
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0026	----	0.0014	0.0014	0.0014
magnesium, total	7439-95-4	E420	0.100	mg/L		33.3	----	14.6	14.6	14.5
manganese, total	7439-96-5	E420	0.00010	mg/L		0.0343	----	0.00556	0.0451	0.00531
mercury, total	7439-97-6	E508	0.0000050	mg/L		<0.0000050	----	<0.0000050	<0.0000050	<0.0000050
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.00474	----	0.00170	0.00170	0.00164
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00079	----	0.00098	0.00168	0.00094
phosphorus, total	7723-14-0	E420	0.050	mg/L		<0.050	----	<0.050	<0.050	<0.050
potassium, total	7440-09-7	E420	0.100	mg/L		4.00	----	1.27	1.17	1.24
selenium, total	7782-49-2	E420	0.000050	mg/L		0.00256	----	0.000153	0.000163	0.000140
silicon, total	7440-21-3	E420	0.10	mg/L		4.48	----	5.47	6.40	5.41
silver, total	7440-22-4	E420	0.000010	mg/L		0.000016	----	<0.000010	<0.000010	<0.000010
sodium, total	7440-23-5	E420	0.050	mg/L		27.3	----	9.76	9.57	9.64
strontium, total	7440-24-6	E420	0.00020	mg/L		1.10	----	0.439	0.413	0.425
sulfur, total	7704-34-9	E420	0.50	mg/L		62.0	----	7.26	6.44	7.23
thallium, total	7440-28-0	E420	0.000010	mg/L		0.000010	----	<0.000010	<0.000010	<0.000010
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	----	<0.00010	<0.00010	0.00043
titanium, total	7440-32-6	E420	0.00030	mg/L		0.0165	----	0.00064	0.0132	0.00060
uranium, total	7440-61-1	E420	0.000010	mg/L		0.00233	----	0.00152	0.00143	0.00157
vanadium, total	7440-62-2	E420	0.00050	mg/L		0.00116	----	0.00081	0.00194	0.00076
zinc, total	7440-66-6	E420	0.0030	mg/L		0.0036	----	<0.0030	<0.0030	<0.0030
zirconium, total	7440-67-7	E420	0.00020	mg/L		<0.00020	----	<0.00020	0.00029	<0.00020
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0074	0.0507	0.0100	0.0088	0.0056
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	0.00056	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00030	0.00036	0.00045	0.00053	0.00045

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W35	W14	W2	MC1	DUP
					Client sampling date / time	09-Jul-2020 13:40	12-Jul-2020 08:50	13-Jul-2020 09:25	13-Jul-2020 09:50	13-Jul-2020
						WR2000482-006	WR2000482-007	WR2000482-008	WR2000482-009	WR2000482-010
						Result	Result	Result	Result	Result
Dissolved Metals										
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.165	0.214	0.0577	0.0557	0.0572
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000040 DLA	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000100 DLA	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.072	0.477	<0.010	<0.010	<0.010
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000270	<0.0000200 DLM	<0.0000050	<0.0000050	<0.0000050
calcium, dissolved	7440-70-2	E421	0.050	mg/L		113	625	40.8	40.1	40.9
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00018	<0.00020 DLA	0.00023	0.00025	0.00021
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	0.00027	<0.00010	<0.00010	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.0790	0.00454	0.00245	0.00244	0.00207
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.014	<0.020 DLA	0.042	0.077	0.034
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000100 DLA	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0030	0.0161	0.0016	0.0015	0.0016
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		31.3	63.6	14.2	13.8	14.0
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0242	0.563	0.00441	0.00864	0.00402
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00466	0.0756	0.00168	0.00182	0.00161
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00064	0.00695	0.00086	0.00101	0.00084
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.100 DLA	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		3.94	81.7	1.31	1.13	1.26
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.00232	0.00757	0.000143	0.000136	0.000147
silicon, dissolved	7440-21-3	E421	0.050	mg/L		4.09	2.48	5.27	5.61	5.32
silver, dissolved	7440-22-4	E421	0.000010	mg/L		0.000013	<0.000020 DLA	<0.000010	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		27.2	134	9.66	9.15	9.52
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		1.01	6.33	0.406	0.367	0.406
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		63.0	713	7.06	6.28	7.03
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		0.000010	<0.000020 DLA	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00020 DLA	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00090 DLM	0.00085	0.00045	<0.00030
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00243	0.00456	0.00152	0.00139	0.00154
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00100 DLA	0.00064	0.00081	0.00064
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0019	<0.0020 DLA	<0.0010	<0.0010	<0.0010
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00040 DLA	<0.00020	<0.00020	<0.00020

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W35	W14	W2	MC1	DUP
					Client sampling date / time	09-Jul-2020 13:40	12-Jul-2020 08:50	13-Jul-2020 09:25	13-Jul-2020 09:50	13-Jul-2020
						WR2000482-006	**WR2000482-007**	**WR2000482-008**	**WR2000482-009**	**WR2000482-010**
						Result	Result	Result	Result	Result
Dissolved Metals										
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W50	W17	W55	W3	----
					Client sampling date / time	13-Jul-2020 10:40	13-Jul-2020 10:50	13-Jul-2020 11:40	14-Jul-2020 18:50	----
						WR2000482-011	WR2000482-012	WR2000482-013	WR2000482-014	--------
						Result	Result	Result	Result	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		255	183	149	244	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		255	183	149	244	----
conductivity	----	E100	2.0	µS/cm		567	476	511	559	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		283	228	241	274	----
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		274	222	247	265	----
pH	----	E108	0.10	pH units		7.60	8.01	7.71	8.09	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		352	296	341	338	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		7.8	<3.0	4.6	<3.0	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.216	0.0063	0.0124	0.0103	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		6.52	5.48	2.09	4.99	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.0156	0.0345	0.749	0.0839	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		<0.0500	<0.0500	0.750	0.0843	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		41.6	56.4	103	48.9	----
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		14.5	14.4	27.4	9.76	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		6.15	4.99	5.24	6.04	----
cation sum	----	EC101	0.10	meq/L		6.49	5.17	5.46	6.28	----
ion balance (cation-anion difference)	----	EC101	0.010	%		2.69	1.77	2.06	1.95	----
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.0114	0.0084	0.465	0.0118	----
antimony, total	7440-36-0	E420	0.00010	mg/L		<0.00010	<0.00010	0.00015	<0.00010	----
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00041	0.00040	0.00112	0.00028	----
barium, total	7440-39-3	E420	0.00010	mg/L		0.0988	0.0561	0.0898	0.0571	----
beryllium, total	7440-41-7	E420	0.000020	mg/L		<0.000020	<0.000020	0.000024	<0.000020	----
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	----
boron, total	7440-42-8	E420	0.010	mg/L		0.016	0.017	0.028	0.021	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W50	W17	W55	W3	----
					Client sampling date / time	13-Jul-2020 10:40	13-Jul-2020 10:50	13-Jul-2020 11:40	14-Jul-2020 18:50	----
						WR2000482-011	WR2000482-012	WR2000482-013	WR2000482-014	--------
						Result	Result	Result	Result	----
Total Metals										
cadmium, total	7440-43-9	E420	0.0000050	mg/L		0.0000485	0.0000258	0.000105	0.0000331	----
calcium, total	7440-70-2	E420	0.050	mg/L		65.4	57.6	64.3	57.5	----
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00034	0.00016	0.00058	0.00016	----
cobalt, total	7440-48-4	E420	0.00010	mg/L		0.00107	<0.00010	0.00046	<0.00010	----
copper, total	7440-50-8	E420	0.00050	mg/L		0.00304	0.0116	0.0730	0.00493	----
iron, total	7439-89-6	E420	0.010	mg/L		0.078	0.011	1.07	0.035	----
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	0.00196	0.000235	<0.000050	----
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0012	0.0012	0.0029	0.0025	----
magnesium, total	7439-95-4	E420	0.100	mg/L		26.8	18.9	21.0	29.5	----
manganese, total	7439-96-5	E420	0.00010	mg/L		3.13	0.0109	0.0655	0.0483	----
mercury, total	7439-97-6	E508	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.00612	0.00747	0.00925	0.00504	----
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00925	0.00090	0.00148	0.00122	----
phosphorus, total	7723-14-0	E420	0.050	mg/L		<0.050	<0.050	0.128	<0.050	----
potassium, total	7440-09-7	E420	0.100	mg/L		2.34	3.29	3.33	2.20	----
selenium, total	7782-49-2	E420	0.000050	mg/L		0.000165	0.000468	0.00423	0.000278	----
silicon, total	7440-21-3	E420	0.10	mg/L		7.05	5.94	7.15	6.37	----
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	0.000018	<0.000010	----
sodium, total	7440-23-5	E420	0.050	mg/L		14.2	12.2	12.3	17.3	----
strontium, total	7440-24-6	E420	0.00020	mg/L		0.655	0.670	0.862	0.806	----
sulfur, total	7704-34-9	E420	0.50	mg/L		16.2	21.3	37.6	19.3	----
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	----
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	0.00012	<0.00010	<0.00010	----
titanium, total	7440-32-6	E420	0.00030	mg/L		0.00051	0.00055	0.0220	0.00065	----
uranium, total	7440-61-1	E420	0.000010	mg/L		0.00152	0.00161	0.000291	0.00252	----
vanadium, total	7440-62-2	E420	0.00050	mg/L		0.00051	0.00051	0.00192	<0.00050	----
zinc, total	7440-66-6	E420	0.0030	mg/L		<0.0030	0.0033	0.0078	0.0032	----
zirconium, total	7440-67-7	E420	0.00020	mg/L		0.00040	<0.00020	0.00027	<0.00020	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0088	0.0081	0.0162	0.0106	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	0.00012	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00042	0.00042	0.00083	0.00024	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W50	W17	W55	W3	----
					Client sampling date / time	13-Jul-2020 10:40	13-Jul-2020 10:50	13-Jul-2020 11:40	14-Jul-2020 18:50	----
						WR2000482-011	WR2000482-012	WR2000482-013	WR2000482-014	--------
						Result	Result	Result	Result	----
Dissolved Metals										
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.103	0.0575	0.0810	0.0585	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.017	0.018	0.029	0.022	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000502	0.0000196	0.0000712	0.0000168	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		69.6	60.8	63.8	62.1	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00036	0.00018	0.00033	0.00027	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00106	<0.00010	0.00012	<0.00010	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00295	0.0112	0.0288	0.00478	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.074	0.012	0.061	0.041	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0014	0.0014	0.0030	0.0028	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		26.5	18.4	19.9	28.7	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		3.21	0.00952	0.0179	0.0500	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00588	0.00707	0.00930	0.00525	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00913	0.00081	0.00125	0.00120	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	0.072	<0.050	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		2.40	3.35	3.26	2.20	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000187	0.000465	0.00399	0.000285	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		7.10	5.60	6.14	6.17	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		14.6	12.2	12.4	17.4	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.566	0.603	0.798	0.758	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		15.9	21.3	37.4	18.2	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		0.00052	0.00074	0.00055	0.00051	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00164	0.00168	0.000308	0.00266	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0017	0.0021	0.0039	0.0031	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		0.00040	<0.00020	0.00030	<0.00020	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W50	W17	W55	W3	----
					Client sampling date / time	13-Jul-2020 10:40	13-Jul-2020 10:50	13-Jul-2020 11:40	14-Jul-2020 18:50	----
						WR2000482-011	WR2000482-012	WR2000482-013	WR2000482-014	--------
						Result	Result	Result	Result	----
Dissolved Metals										
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000667**	Page	: 1 of 14
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 11-Aug-2020 15:05
PO	: 232817	Date Analysis Commenced	: 12-Aug-2020
C-O-C number	: 2020-08-11 B	Issue Date	: 21-Aug-2020 14:53
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 12		
No. of samples analysed	: 12		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Amy Liang	Analsyt	Inorganics - Water Quality, Burnaby, British Columbia
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Bruna Botti	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Monica Ko	Lab Assistant	Metals, Burnaby, British Columbia
Muneeb Alam	Analyst	Metals, Burnaby, British Columbia
Omar Beydoun	Lab Assistant	Metals, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics - Water Quality, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Qualifiers

Qualifier	*Description*
DLA	*Detection Limit adjusted for required dilution.*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*
DTMF	*Dissolved concentration exceeds total for field-filtered metals sample. Metallic contaminants may have been introduced to dissolved sample during field filtration.*
DTSE	*Dissolved Se concentration exceeds total. Positive bias on D-Se suspected due to signal enhancement from volatile selenium species. Contact ALS if an alternative test to address this interference is needed.*
HTD	*Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.*
RRV	*Reported result verified by repeat analysis.*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W35	W50	W17	W16	W10
					Client sampling date / time	09-Aug-2020 16:50	10-Aug-2020 08:30	10-Aug-2020 08:50	10-Aug-2020 09:40	10-Aug-2020 10:40
						WR2000667-001	WR2000667-002	WR2000667-003	WR2000667-004	WR2000667-005
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		169	241	186	136	160
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		169	241	186	136	160
conductivity	----	E100	2.0	µS/cm		805	558	491	422	325
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		369	265	243	208	167
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		364	258	228	195	160
pH	----	E108	0.10	pH units		7.91	7.71	8.02	8.10	7.60
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		566	345	310	280	192
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	20.1	<3.0	<3.0	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0098	0.205	0.0080	0.0176	0.0571
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		5.07	6.09	5.88	5.83	0.44
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		31.1 HTD	0.0070	0.0529	0.868	3.03
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		31.1	0.0073	0.0530	0.889	3.04
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0112	<0.0010	<0.0010	0.0212	0.0108
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		129	46.7	61.4	68.2	4.86
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		19.8	15.7	13.4	24.8	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		8.43	5.97	5.16	4.36	3.53
cation sum	----	EC101	0.10	meq/L		8.59	6.23	5.58	4.74	3.83
ion balance (cation-anion difference)	----	EC101	0.010	%		0.940	2.13	3.91	4.18	4.08
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.0148	0.0109	0.0071	0.0110	0.0394
antimony, total	7440-36-0	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00048	0.00057	0.00050	0.00058	0.00049
barium, total	7440-39-3	E420	0.00010	mg/L		0.128	0.113	0.0576	0.0647	0.200
beryllium, total	7440-41-7	E420	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W35	W50	W17	W16	W10
					Client sampling date / time	09-Aug-2020 16:50	10-Aug-2020 08:30	10-Aug-2020 08:50	10-Aug-2020 09:40	10-Aug-2020 10:40
						WR2000667-001	WR2000667-002	WR2000667-003	WR2000667-004	WR2000667-005
						Result	Result	Result	Result	Result
Total Metals										
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, total	7440-42-8	E420	0.010	mg/L		0.066	0.019	0.018	0.014	0.011
cadmium, total	7440-43-9	E420	0.0000050	mg/L		0.0000133	0.0000328	<0.0000050	0.0000103	<0.0000050
calcium, total	7440-70-2	E420	0.050	mg/L		97.9	64.8	60.6	52.4	46.7
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00027	0.00033	0.00019	0.00025	0.00030
cobalt, total	7440-48-4	E420	0.00010	mg/L		<0.00010	0.00110	<0.00010	<0.00010	0.00042
copper, total	7440-50-8	E420	0.00050	mg/L		0.0474	0.00435	0.00960	0.0466	0.0108
iron, total	7439-89-6	E420	0.010	mg/L		0.030	0.152	<0.010	0.102	1.73
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0029	0.0016	0.0016	0.0016	<0.0010
magnesium, total	7439-95-4	E420	0.100	mg/L		29.0	23.4	18.5	15.5	10.6
manganese, total	7439-96-5	E420	0.00010	mg/L		0.0337	3.72	0.0294	0.0665	0.186
mercury, total	7439-97-6	E508	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.00341	0.00701	0.00762	0.00331	0.000457
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00089	0.00914	0.00092	0.00114	0.00093
phosphorus, total	7723-14-0	E420	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, total	7440-09-7	E420	0.100	mg/L		3.22	2.65	3.67	2.73	1.38
selenium, total	7782-49-2	E420	0.000050	mg/L		0.00122	0.000152	0.000427	0.000708	0.000098
silicon, total	7440-21-3	E420	0.10	mg/L		5.59	6.93	5.81	3.34	2.37
silver, total	7440-22-4	E420	0.000010	mg/L		0.000011	<0.000010	<0.000010	<0.000010	<0.000010
sodium, total	7440-23-5	E420	0.050	mg/L		25.4	14.7	12.7	10.6	7.60
strontium, total	7440-24-6	E420	0.00020	mg/L		0.876	0.598	0.666	0.510	0.337
sulfur, total	7704-34-9	E420	0.50	mg/L		48.9	17.2	21.8	25.5	2.06
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, total	7440-32-6	E420	0.00030	mg/L		0.00068	0.00064	<0.00060 DLM	0.00046	0.00094
uranium, total	7440-61-1	E420	0.000010	mg/L		0.00170	0.00147	0.00167	0.00106	0.000132
vanadium, total	7440-62-2	E420	0.00050	mg/L		0.00079	0.00066	0.00079	0.00075	0.00075
zinc, total	7440-66-6	E420	0.0030	mg/L		<0.0030	<0.0030	<0.0030	<0.0030	0.0037
zirconium, total	7440-67-7	E420	0.00020	mg/L		0.00025	0.00038	<0.00020	0.00027	0.00030
Dissolved Metals										

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W35	W50	W17	W16	W10
					Client sampling date / time	09-Aug-2020 16:50	10-Aug-2020 08:30	10-Aug-2020 08:50	10-Aug-2020 09:40	10-Aug-2020 10:40
						WR2000667-001	WR2000667-002	WR2000667-003	WR2000667-004	WR2000667-005
						Result	Result	Result	Result	Result
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0110	0.0063	0.0021	0.0050	0.0390
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00034	0.00046	0.00038	0.00048	0.00040
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.125	0.107	0.0587	0.0618	0.224
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.065	0.017	0.017	0.013	0.010
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000226	0.0000275	<0.0000050	0.0000064	0.0000056
calcium, dissolved	7440-70-2	E421	0.050	mg/L		99.0	65.1	65.0	55.5	48.2
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00023	0.00032	0.00019	0.00020	0.00027
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	0.00101	<0.00010	<0.00010	0.00040
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.0448	0.00240	0.00946	0.0447	0.0101
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.021	0.120	<0.010	0.057	1.60
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0027	0.0014	0.0014	0.0015	<0.0010
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		29.6	25.0	19.7	16.9	11.3
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0332	4.19	0.00533	0.00337	0.198
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00334	0.00736	0.00768	0.00323	0.000437
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00090	0.00866	0.00086	0.00118	0.00098
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		3.03	2.56	3.69	2.70	1.34
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.00148	0.000276 DTSE	0.000569	0.000812	0.000152
silicon, dissolved	7440-21-3	E421	0.050	mg/L		5.66	7.03	5.72	3.20	2.46
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		26.0	15.8	14.3	11.7	8.17
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.893	0.627	0.735	0.525	0.340
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		49.2	17.3	21.4	24.7	1.98
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		0.00024 DTMF	<0.00010	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		0.00036	0.00033	<0.00030	<0.00030	0.00082

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W35	W50	W17	W16	W10
					Client sampling date / time	09-Aug-2020 16:50	10-Aug-2020 08:30	10-Aug-2020 08:50	10-Aug-2020 09:40	10-Aug-2020 10:40
						WR2000667-001	WR2000667-002	WR2000667-003	WR2000667-004	WR2000667-005
						Result	Result	Result	Result	Result
Dissolved Metals										
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00172	0.00162	0.00175	0.00114	0.000136
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		<0.0010	0.0018	<0.0010	<0.0010	0.0037
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		0.00024	0.00041	<0.00020	0.00026	0.00034
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	F-BL	W33s	MC1	UG1	W2
					Client sampling date / time	10-Aug-2020	10-Aug-2020 11:45	10-Aug-2020 14:15	10-Aug-2020 14:30	11-Aug-2020 06:15
						WR2000667-006	WR2000667-007	WR2000667-008	WR2000667-009	WR2000667-010
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	104	175	259	170
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		<1.0	104	175	259	170
conductivity	----	E100	2.0	µS/cm		<2.0	229	341	2080	340
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		<0.60	115	167	960	157
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		<0.60	114	167	1120	162
pH	----	E108	0.10	pH units		5.09	7.35	8.16	7.83	8.03
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		<1.0	142	222	1630	215
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	12.9	90.7	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		<0.0050	0.0113	0.0076	7.86	<0.0050
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		<0.10	1.41	1.34	10.6	1.58
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		<0.0050	0.0123	0.0425	13.7	0.0094
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		<0.0051	0.0128	0.0429	14.2	0.0098
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	<0.0010	<0.0010	0.503	<0.0010
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		<0.30	15.8	19.0	925	21.4
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		<0.50	----	11.2	----	10.0
Ion Balance										
anion sum	----	EC101	0.10	meq/L		<0.10	2.45	3.94	25.8	3.88
cation sum	----	EC101	0.10	meq/L		<0.10	2.56	3.82	23.8	3.58
ion balance (cation-anion difference)	----	EC101	0.010	%		<0.010	2.20	1.55	4.03	4.02
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.0095 RRV	0.0278	0.220	1.85	0.0122
antimony, total	7440-36-0	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00046	<0.00010
arsenic, total	7440-38-2	E420	0.00010	mg/L		<0.00010	0.00042	0.00083	0.00148	0.00055
barium, total	7440-39-3	E420	0.00010	mg/L		0.00022 RRV	0.0602	0.0660	0.0679	0.0630
beryllium, total	7440-41-7	E420	0.000020	mg/L		<0.000020	<0.000020	<0.000020	0.000060	<0.000020
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000100 DLA	<0.000050

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	F-BL	W33s	MC1	UG1	W2
					Client sampling date / time	10-Aug-2020	10-Aug-2020 11:45	10-Aug-2020 14:15	10-Aug-2020 14:30	11-Aug-2020 06:15
						WR2000667-006	WR2000667-007	WR2000667-008	WR2000667-009	WR2000667-010
						Result	Result	Result	Result	Result
Total Metals										
boron, total	7440-42-8	E420	0.010	mg/L		<0.010	<0.010	<0.010	0.391	0.011
cadmium, total	7440-43-9	E420	0.0000050	mg/L		0.0000108 RRV	<0.0000050	0.0000070	0.0000890	<0.0000050
calcium, total	7440-70-2	E420	0.050	mg/L		<0.050	31.9	41.7	356	41.4
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		<0.00010	0.00040	0.00065	0.00084	0.00029
cobalt, total	7440-48-4	E420	0.00010	mg/L		<0.00010	0.00014	0.00021	0.00149	<0.00010
copper, total	7440-50-8	E420	0.00050	mg/L		0.00058 RRV	0.00952	0.00243	0.111	0.00211
iron, total	7439-89-6	E420	0.010	mg/L		<0.010	0.089	0.484	2.54	0.056
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	<0.000050	0.000113	0.000817	<0.000050
lithium, total	7439-93-2	E420	0.0010	mg/L		<0.0010	<0.0010	0.0018	0.0178	0.0019
magnesium, total	7439-95-4	E420	0.100	mg/L		<0.100	8.36	15.2	56.6	14.2
manganese, total	7439-96-5	E420	0.00010	mg/L		0.00036 RRV	0.0109	0.0379	0.191	0.0104
mercury, total	7439-97-6	E508	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, total	7439-98-7	E420	0.000050	mg/L		<0.000050	0.000581	0.00178	0.0157	0.00140
nickel, total	7440-02-0	E420	0.00050	mg/L		<0.00050	0.00131	0.00136	0.00285	0.00088
phosphorus, total	7723-14-0	E420	0.050	mg/L		<0.050	<0.050	<0.050	<0.100 DLA	<0.050
potassium, total	7440-09-7	E420	0.100	mg/L		<0.100	0.182	1.34	9.95	1.54
selenium, total	7782-49-2	E420	0.000050	mg/L		<0.000050	0.000147	0.000149	0.000818	0.000123
silicon, total	7440-21-3	E420	0.10	mg/L		<0.10	5.77	6.76	10.6	5.72
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	0.000097	<0.000010
sodium, total	7440-23-5	E420	0.050	mg/L		<0.050	5.65	10.3	99.0	10.2
strontium, total	7440-24-6	E420	0.00020	mg/L		<0.00020	0.178	0.434	8.26	0.446
sulfur, total	7704-34-9	E420	0.50	mg/L		<0.50	5.96	6.88	347	7.94
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	0.000028	<0.000010
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00021	<0.00010
titanium, total	7440-32-6	E420	0.00030	mg/L		<0.00030	0.00088	0.0114	0.125	0.00050
uranium, total	7440-61-1	E420	0.000010	mg/L		<0.000010	0.000020	0.00152	0.00796	0.00154
vanadium, total	7440-62-2	E420	0.00050	mg/L		<0.00050	0.00063	0.00176	0.00634	0.00095
zinc, total	7440-66-6	E420	0.0030	mg/L		<0.0030	0.0044	<0.0030	0.0211	<0.0030
zirconium, total	7440-67-7	E420	0.00020	mg/L		<0.00020	0.00038	0.00027	<0.00040 DLA	<0.00020
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0029 RRV	0.0261	0.0071	0.0098	0.0066

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	F-BL	W33s	MC1	UG1	W2
					Client sampling date / time	10-Aug-2020	10-Aug-2020 11:45	10-Aug-2020 14:15	10-Aug-2020 14:30	11-Aug-2020 06:15
						WR2000667-006	WR2000667-007	WR2000667-008	WR2000667-009	WR2000667-010
						Result	Result	Result	Result	Result
Dissolved Metals										
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00042	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		<0.00010	0.00035	0.00065	0.00111	0.00043
barium, dissolved	7440-39-3	E421	0.00010	mg/L		<0.00010	0.0620	0.0620	0.0317	0.0620
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		<0.010	<0.010	0.011	0.363	0.011
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000100 DLM	<0.0000050
calcium, dissolved	7440-70-2	E421	0.050	mg/L		<0.050	32.1	42.1	297	39.7
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	0.00041	0.00026	<0.00010	0.00021
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	0.00017	<0.00010	0.00066	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00028 RRV	0.00902	0.00192	0.00364	0.00204
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	0.094	0.087	<0.010	0.038
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		<0.0010	<0.0010	0.0016	0.0152	0.0017
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		<0.100	8.42	15.0	53.0	14.1
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.00023 RRV	0.0143	0.00857	0.0823	0.00877
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		<0.000050	0.000539	0.00174	0.0142	0.00134
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	0.00133	0.00100	0.00227	0.00084
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		<0.100	0.173	1.23	9.10	1.41
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		<0.000050	0.000136	0.000136	0.000784	0.000132
silicon, dissolved	7440-21-3	E421	0.050	mg/L		<0.050	5.88	6.28	7.82	5.80
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		<0.050	5.66	10.3	88.4	9.15
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		<0.00020	0.177	0.458	7.49	0.412
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		<0.50	5.68	6.88	330	7.31
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	0.000012	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	0.00062	0.00045	<0.00030	0.00054
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		<0.000010	0.000024	0.00149	0.00781	0.00153

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	F-BL	W33s	MC1	UG1	W2
					Client sampling date / time	10-Aug-2020	10-Aug-2020 11:45	10-Aug-2020 14:15	10-Aug-2020 14:30	11-Aug-2020 06:15
						WR2000667-006	**WR2000667-007**	**WR2000667-008**	**WR2000667-009**	**WR2000667-010**
						Result	Result	Result	Result	Result
Dissolved Metals										
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	0.00079	<0.00050	0.00066
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0018 RRV	<0.0010	<0.0010	0.0030	<0.0010
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	0.00034	<0.00020	<0.00020	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	DUP	W3	----	----	----
					Client sampling date / time	11-Aug-2020	11-Aug-2020 06:45	----	----	----
						WR2000667-011	WR2000667-012	--------	--------	--------
						Result	Result	----	----	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		171	241	----	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		171	241	----	----	----
conductivity	----	E100	2.0	µS/cm		344	564	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		157	265	----	----	----
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		160	274	----	----	----
pH	----	E108	0.10	pH units		8.20	8.26	----	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		218	336	----	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	----	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		<0.0050	0.0102	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		1.58	4.90	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		<0.0050	0.0743	----	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		<0.0051	0.0747	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	<0.0010	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		21.9	52.8	----	----	----
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		11.5	8.92	----	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		3.92	6.06	----	----	----
cation sum	----	EC101	0.10	meq/L		3.58	6.09	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		4.53	0.247	----	----	----
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.0122	0.0081	----	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L		<0.00010	<0.00010	----	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00053	0.00039	----	----	----
barium, total	7440-39-3	E420	0.00010	mg/L		0.0639	0.0604	----	----	----
beryllium, total	7440-41-7	E420	0.000020	mg/L		<0.000020	<0.000020	----	----	----
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	----	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	DUP	W3	----	----	----
					Client sampling date / time	11-Aug-2020	11-Aug-2020 06:45	----	----	----
						WR2000667-011	WR2000667-012	--------	--------	--------
						Result	Result	----	----	----
Total Metals										
boron, total	7440-42-8	E420	0.010	mg/L		<0.010	0.022	----	----	----
cadmium, total	7440-43-9	E420	0.0000050	mg/L		<0.0000050	<0.0000050	----	----	----
calcium, total	7440-70-2	E420	0.050	mg/L		40.9	63.2	----	----	----
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00024	0.00017	----	----	----
cobalt, total	7440-48-4	E420	0.00010	mg/L		<0.00010	<0.00010	----	----	----
copper, total	7440-50-8	E420	0.00050	mg/L		0.00212	0.00354	----	----	----
iron, total	7439-89-6	E420	0.010	mg/L		0.054	0.030	----	----	----
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	<0.000050	----	----	----
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0020	0.0033	----	----	----
magnesium, total	7439-95-4	E420	0.100	mg/L		14.0	28.2	----	----	----
manganese, total	7439-96-5	E420	0.00010	mg/L		0.0100	0.0713	----	----	----
mercury, total	7439-97-6	E508	0.0000050	mg/L		<0.0000050	<0.0000050	----	----	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.00140	0.00535	----	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00082	0.00131	----	----	----
phosphorus, total	7723-14-0	E420	0.050	mg/L		<0.050	<0.050	----	----	----
potassium, total	7440-09-7	E420	0.100	mg/L		1.56	2.50	----	----	----
selenium, total	7782-49-2	E420	0.000050	mg/L		0.000169	0.000238	----	----	----
silicon, total	7440-21-3	E420	0.10	mg/L		5.84	6.66	----	----	----
silver, total	7440-22-4	E420	0.000010	mg/L		0.000026	<0.000010	----	----	----
sodium, total	7440-23-5	E420	0.050	mg/L		10.1	17.9	----	----	----
strontium, total	7440-24-6	E420	0.00020	mg/L		0.429	0.800	----	----	----
sulfur, total	7704-34-9	E420	0.50	mg/L		8.03	20.0	----	----	----
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000010	----	----	----
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	<0.00010	----	----	----
titanium, total	7440-32-6	E420	0.00030	mg/L		0.00062	0.00034	----	----	----
uranium, total	7440-61-1	E420	0.000010	mg/L		0.00153	0.00249	----	----	----
vanadium, total	7440-62-2	E420	0.00050	mg/L		0.00095	0.00071	----	----	----
zinc, total	7440-66-6	E420	0.0030	mg/L		<0.0030	<0.0030	----	----	----
zirconium, total	7440-67-7	E420	0.00020	mg/L		<0.00020	<0.00020	----	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0048	0.0100	----	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	DUP	W3	----	----	----
					Client sampling date / time	11-Aug-2020	11-Aug-2020 06:45	----	----	----
						WR2000667-011	WR2000667-012	--------	--------	--------
						Result	Result	----	----	----
Dissolved Metals										
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00041	0.00025	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0631	0.0591	----	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		<0.010	0.021	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000050	0.0000087	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		39.7	58.0	----	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00015	0.00015	----	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00206	0.00394	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.036	0.035	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0017	0.0029	----	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		14.1	29.2	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.00884	0.0660	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00130	0.00497	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00081	0.00126	----	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	----	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		1.42	2.29	----	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000132	0.000255	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		5.94	6.62	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	----	----	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		9.26	16.8	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.411	0.725	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		7.26	18.1	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		0.00031	0.00045	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00156	0.00258	----	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	DUP	W3	----	----	----
					Client sampling date / time	11-Aug-2020	11-Aug-2020 06:45	----	----	----
						WR2000667-011	WR2000667-012	--------	--------	--------
						Result	Result	----	----	----
Dissolved Metals										
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00068	<0.00050	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		<0.0010	0.0013	----	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	----	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	----	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WR2000667**	Page	: 1 of 29
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 11-Aug-2020 15:05
PO	: 232817	Issue Date	: 21-Aug-2020 14:53
C-O-C number	: 2020-08-11 B		
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 12		
No. of samples analysed	: 12		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
DUP	E298	11-Aug-2020	----	----	----		19-Aug-2020	28 days	7 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
W3	E298	11-Aug-2020	----	----	----		19-Aug-2020	28 days	7 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
F-BL	E298	10-Aug-2020	----	----	----		19-Aug-2020	28 days	8 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MC1	E298	10-Aug-2020	----	----	----		19-Aug-2020	28 days	8 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
UG1	E298	10-Aug-2020	----	----	----		19-Aug-2020	28 days	8 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
W10	E298	10-Aug-2020	----	----	----		19-Aug-2020	28 days	8 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
W16	E298	10-Aug-2020	----	----	----		19-Aug-2020	28 days	8 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
W17	E298	10-Aug-2020	----	----	----		19-Aug-2020	28 days	8 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
W2	E298	11-Aug-2020	----	----	----		19-Aug-2020	28 days	8 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
W33s	E298	10-Aug-2020	----	----	----		19-Aug-2020	28 days	8 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
W50	E298	10-Aug-2020	----	----	----		19-Aug-2020	28 days	8 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
W35	E298	09-Aug-2020	----	----	----		19-Aug-2020	28 days	9 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
W2	E235.Cl-L	11-Aug-2020	----	----	----		12-Aug-2020	28 days	1 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
DUP	E235.Cl-L	11-Aug-2020	----	----	----		14-Aug-2020	28 days	2 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
F-BL	E235.Cl-L	10-Aug-2020	----	----	----		12-Aug-2020	28 days	2 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
MC1	E235.Cl-L	10-Aug-2020	----	----	----		12-Aug-2020	28 days	2 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
UG1	E235.Cl-L	10-Aug-2020	----	----	----		12-Aug-2020	28 days	2 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
W10	E235.Cl-L	10-Aug-2020	----	----	----		12-Aug-2020	28 days	2 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
W16	E235.Cl-L	10-Aug-2020	----	----	----		12-Aug-2020	28 days	2 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
W17	E235.Cl-L	10-Aug-2020	----	----	----		12-Aug-2020	28 days	2 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
W33s	E235.Cl-L	10-Aug-2020	----	----	----		12-Aug-2020	28 days	2 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
W50	E235.Cl-L	10-Aug-2020	----	----	----		12-Aug-2020	28 days	2 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
W3	E235.Cl-L	11-Aug-2020	----	----	----		14-Aug-2020	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
W35	E235.Cl-L	09-Aug-2020	----	----	----		12-Aug-2020	28 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE										
W2	E235.NO3-L	11-Aug-2020	----	----	----		12-Aug-2020	3 days	1 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE DUP	E235.NO3-L	11-Aug-2020	----	----	----		14-Aug-2020	3 days	2 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE F-BL	E235.NO3-L	10-Aug-2020	----	----	----		12-Aug-2020	3 days	2 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MC1	E235.NO3-L	10-Aug-2020	----	----	----		12-Aug-2020	3 days	2 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE UG1	E235.NO3-L	10-Aug-2020	----	----	----		12-Aug-2020	3 days	2 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE W10	E235.NO3-L	10-Aug-2020	----	----	----		12-Aug-2020	3 days	2 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE W16	E235.NO3-L	10-Aug-2020	----	----	----		12-Aug-2020	3 days	2 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE W17	E235.NO3-L	10-Aug-2020	----	----	----		12-Aug-2020	3 days	2 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE W33s	E235.NO3-L	10-Aug-2020	----	----	----		12-Aug-2020	3 days	2 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE W50	E235.NO3-L	10-Aug-2020	----	----	----		12-Aug-2020	3 days	2 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE W3	E235.NO3-L	11-Aug-2020	----	----	----		14-Aug-2020	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE W35	E235.NO3-L	09-Aug-2020	----	----	----		12-Aug-2020	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE W2	E235.NO2-L	11-Aug-2020	----	----	----		12-Aug-2020	3 days	1 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE DUP	E235.NO2-L	11-Aug-2020	----	----	----		14-Aug-2020	3 days	2 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE F-BL	E235.NO2-L	10-Aug-2020	----	----	----		12-Aug-2020	3 days	2 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MC1	E235.NO2-L	10-Aug-2020	----	----	----		12-Aug-2020	3 days	2 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE UG1	E235.NO2-L	10-Aug-2020	----	----	----		12-Aug-2020	3 days	2 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE W10	E235.NO2-L	10-Aug-2020	----	----	----		12-Aug-2020	3 days	2 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE W16	E235.NO2-L	10-Aug-2020	----	----	----		12-Aug-2020	3 days	2 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
W17	E235.NO2-L	10-Aug-2020	----	----	----		12-Aug-2020	3 days	2 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
W33s	E235.NO2-L	10-Aug-2020	----	----	----		12-Aug-2020	3 days	2 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
W50	E235.NO2-L	10-Aug-2020	----	----	----		12-Aug-2020	3 days	2 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
W3	E235.NO2-L	11-Aug-2020	----	----	----		14-Aug-2020	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
W35	E235.NO2-L	09-Aug-2020	----	----	----		12-Aug-2020	3 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
W2	E235.SO4	11-Aug-2020	----	----	----		12-Aug-2020	28 days	1 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
DUP	E235.SO4	11-Aug-2020	----	----	----		14-Aug-2020	28 days	2 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
F-BL	E235.SO4	10-Aug-2020	----	----	----		12-Aug-2020	28 days	2 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MC1	E235.SO4	10-Aug-2020	----	----	----		12-Aug-2020	28 days	2 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
UG1	E235.SO4	10-Aug-2020	----	----	----		12-Aug-2020	28 days	2 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
W10	E235.SO4	10-Aug-2020	----	----	----		12-Aug-2020	28 days	2 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
W16	E235.SO4	10-Aug-2020	----	----	----		12-Aug-2020	28 days	2 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
W17	E235.SO4	10-Aug-2020	----	----	----		12-Aug-2020	28 days	2 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
W33s	E235.SO4	10-Aug-2020	----	----	----		12-Aug-2020	28 days	2 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
W50	E235.SO4	10-Aug-2020	----	----	----		12-Aug-2020	28 days	2 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
W3	E235.SO4	11-Aug-2020	----	----	----		14-Aug-2020	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
W35	E235.SO4	09-Aug-2020	----	----	----		12-Aug-2020	28 days	3 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
DUP	E421.Cr-L	11-Aug-2020	15-Aug-2020	180 days	3 days	✓	17-Aug-2020	176 days	1 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) F-BL	E421.Cr-L	10-Aug-2020	15-Aug-2020	180 days	4 days	✓	16-Aug-2020	175 days	1 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) W2	E421.Cr-L	11-Aug-2020	15-Aug-2020	180 days	4 days	✓	17-Aug-2020	175 days	1 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) W3	E421.Cr-L	11-Aug-2020	15-Aug-2020	180 days	4 days	✓	17-Aug-2020	175 days	1 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MC1	E421.Cr-L	10-Aug-2020	15-Aug-2020	180 days	5 days	✓	16-Aug-2020	174 days	1 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) UG1	E421.Cr-L	10-Aug-2020	15-Aug-2020	180 days	5 days	✓	17-Aug-2020	174 days	1 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) W10	E421.Cr-L	10-Aug-2020	15-Aug-2020	180 days	5 days	✓	16-Aug-2020	174 days	1 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) W16	E421.Cr-L	10-Aug-2020	15-Aug-2020	180 days	5 days	✓	16-Aug-2020	174 days	1 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) W17	E421.Cr-L	10-Aug-2020	15-Aug-2020	180 days	5 days	✓	16-Aug-2020	174 days	1 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) W33s	E421.Cr-L	10-Aug-2020	15-Aug-2020	180 days	5 days	✓	16-Aug-2020	174 days	1 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) W35	E421.Cr-L	09-Aug-2020	15-Aug-2020	180 days	5 days	✓	16-Aug-2020	174 days	1 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) W50	E421.Cr-L	10-Aug-2020	15-Aug-2020	180 days	5 days	✓	16-Aug-2020	174 days	1 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) DUP	E509	11-Aug-2020	14-Aug-2020	28 days	2 days	✓	14-Aug-2020	25 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) F-BL	E509	10-Aug-2020	14-Aug-2020	28 days	3 days	✓	14-Aug-2020	24 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MC1	E509	10-Aug-2020	14-Aug-2020	28 days	3 days	✓	14-Aug-2020	24 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) UG1	E509	10-Aug-2020	14-Aug-2020	28 days	3 days	✓	14-Aug-2020	24 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) W10	E509	10-Aug-2020	14-Aug-2020	28 days	3 days	✓	14-Aug-2020	24 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) W2	E509	11-Aug-2020	14-Aug-2020	28 days	3 days	✓	14-Aug-2020	24 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) W3	E509	11-Aug-2020	14-Aug-2020	28 days	3 days	✓	14-Aug-2020	24 days	0 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) W33s	E509	10-Aug-2020	14-Aug-2020	28 days	3 days	✓	14-Aug-2020	24 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) W16	E509	10-Aug-2020	14-Aug-2020	28 days	4 days	✓	14-Aug-2020	23 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) W17	E509	10-Aug-2020	14-Aug-2020	28 days	4 days	✓	14-Aug-2020	23 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) W35	E509	09-Aug-2020	14-Aug-2020	28 days	4 days	✓	14-Aug-2020	23 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) W50	E509	10-Aug-2020	14-Aug-2020	28 days	4 days	✓	14-Aug-2020	23 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) DUP	E421	11-Aug-2020	15-Aug-2020	180 days	3 days	✓	17-Aug-2020	176 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) F-BL	E421	10-Aug-2020	15-Aug-2020	180 days	4 days	✓	16-Aug-2020	175 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) W2	E421	11-Aug-2020	15-Aug-2020	180 days	4 days	✓	17-Aug-2020	175 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) W3	E421	11-Aug-2020	15-Aug-2020	180 days	4 days	✓	17-Aug-2020	175 days	1 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
MC1	E421	10-Aug-2020	15-Aug-2020	180 days	5 days	✓	16-Aug-2020	174 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
UG1	E421	10-Aug-2020	15-Aug-2020	180 days	5 days	✓	17-Aug-2020	174 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
W10	E421	10-Aug-2020	15-Aug-2020	180 days	5 days	✓	16-Aug-2020	174 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
W16	E421	10-Aug-2020	15-Aug-2020	180 days	5 days	✓	16-Aug-2020	174 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
W17	E421	10-Aug-2020	15-Aug-2020	180 days	5 days	✓	16-Aug-2020	174 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
W33s	E421	10-Aug-2020	15-Aug-2020	180 days	5 days	✓	16-Aug-2020	174 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
W35	E421	09-Aug-2020	15-Aug-2020	180 days	5 days	✓	16-Aug-2020	174 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
W50	E421	10-Aug-2020	15-Aug-2020	180 days	5 days	✓	16-Aug-2020	174 days	1 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid)										
DUP	E358-L	11-Aug-2020	----	----	----		13-Aug-2020	28 days	1 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) W2	E358-L	11-Aug-2020	----	----	----		13-Aug-2020	28 days	2 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) W3	E358-L	11-Aug-2020	----	----	----		13-Aug-2020	28 days	2 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) MC1	E358-L	10-Aug-2020	----	----	----		13-Aug-2020	28 days	3 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) W16	E358-L	10-Aug-2020	----	----	----		13-Aug-2020	28 days	3 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) W17	E358-L	10-Aug-2020	----	----	----		13-Aug-2020	28 days	3 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) W35	E358-L	09-Aug-2020	----	----	----		13-Aug-2020	28 days	3 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) W50	E358-L	10-Aug-2020	----	----	----		13-Aug-2020	28 days	3 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) F-BL	E358-L	10-Aug-2020	----	----	----		17-Aug-2020	28 days	7 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE W2	E290	11-Aug-2020	----	----	----		12-Aug-2020	14 days	1 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE DUP	E290	11-Aug-2020	----	----	----		13-Aug-2020	14 days	2 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE F-BL	E290	10-Aug-2020	----	----	----		12-Aug-2020	14 days	2 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MC1	E290	10-Aug-2020	----	----	----		12-Aug-2020	14 days	2 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE UG1	E290	10-Aug-2020	----	----	----		12-Aug-2020	14 days	2 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE W10	E290	10-Aug-2020	----	----	----		12-Aug-2020	14 days	2 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE W16	E290	10-Aug-2020	----	----	----		12-Aug-2020	14 days	2 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE W17	E290	10-Aug-2020	----	----	----		12-Aug-2020	14 days	2 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE W3	E290	11-Aug-2020	----	----	----		13-Aug-2020	14 days	2 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE W33s	E290	10-Aug-2020	----	----	----		12-Aug-2020	14 days	2 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE W50	E290	10-Aug-2020	----	----	----		12-Aug-2020	14 days	2 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE W35	E290	09-Aug-2020	----	----	----		12-Aug-2020	14 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE W2	E100	11-Aug-2020	----	----	----		12-Aug-2020	28 days	1 days	✓
Physical Tests : Conductivity in Water										
HDPE DUP	E100	11-Aug-2020	----	----	----		13-Aug-2020	28 days	2 days	✓
Physical Tests : Conductivity in Water										
HDPE F-BL	E100	10-Aug-2020	----	----	----		12-Aug-2020	28 days	2 days	✓
Physical Tests : Conductivity in Water										
HDPE MC1	E100	10-Aug-2020	----	----	----		12-Aug-2020	28 days	2 days	✓
Physical Tests : Conductivity in Water										
HDPE UG1	E100	10-Aug-2020	----	----	----		12-Aug-2020	28 days	2 days	✓
Physical Tests : Conductivity in Water										
HDPE W10	E100	10-Aug-2020	----	----	----		12-Aug-2020	28 days	2 days	✓
Physical Tests : Conductivity in Water										
HDPE W16	E100	10-Aug-2020	----	----	----		12-Aug-2020	28 days	2 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Conductivity in Water										
HDPE W17	E100	10-Aug-2020	----	----	----		12-Aug-2020	28 days	2 days	✓
Physical Tests : Conductivity in Water										
HDPE W3	E100	11-Aug-2020	----	----	----		13-Aug-2020	28 days	2 days	✓
Physical Tests : Conductivity in Water										
HDPE W33s	E100	10-Aug-2020	----	----	----		12-Aug-2020	28 days	2 days	✓
Physical Tests : Conductivity in Water										
HDPE W50	E100	10-Aug-2020	----	----	----		12-Aug-2020	28 days	2 days	✓
Physical Tests : Conductivity in Water										
HDPE W35	E100	09-Aug-2020	----	----	----		12-Aug-2020	28 days	3 days	✓
Physical Tests : pH by Meter										
HDPE W2	E108	11-Aug-2020	----	----	----		12-Aug-2020	0.25 hrs	37 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE DUP	E108	11-Aug-2020	----	----	----		13-Aug-2020	0.25 hrs	48 hrs	× EHTL
Physical Tests : pH by Meter										
HDPE F-BL	E108	10-Aug-2020	----	----	----		12-Aug-2020	0.25 hrs	52 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MC1	E108	10-Aug-2020	----	----	----		12-Aug-2020	0.25 hrs	53 hrs	× EHTR-FM

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : pH by Meter										
HDPE UG1	E108	10-Aug-2020	----	----	----		12-Aug-2020	0.25 hrs	53 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE W33s	E108	10-Aug-2020	----	----	----		12-Aug-2020	0.25 hrs	55 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE W10	E108	10-Aug-2020	----	----	----		12-Aug-2020	0.25 hrs	56 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE W3	E108	11-Aug-2020	----	----	----		13-Aug-2020	0.25 hrs	56 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE W16	E108	10-Aug-2020	----	----	----		12-Aug-2020	0.25 hrs	57 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE W17	E108	10-Aug-2020	----	----	----		12-Aug-2020	0.25 hrs	58 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE W50	E108	10-Aug-2020	----	----	----		12-Aug-2020	0.25 hrs	59 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE W35	E108	09-Aug-2020	----	----	----		12-Aug-2020	0.25 hrs	74 hrs	× EHTR-FM
Physical Tests : TSS by Gravimetry										
HDPE DUP	E160-H	11-Aug-2020	----	----	----		14-Aug-2020	7 days	2 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TSS by Gravimetry										
HDPE W3	E160-H	11-Aug-2020	----	----	----		14-Aug-2020	7 days	2 days	✓
Physical Tests : TSS by Gravimetry										
HDPE F-BL	E160-H	10-Aug-2020	----	----	----		14-Aug-2020	7 days	3 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MC1	E160-H	10-Aug-2020	----	----	----		14-Aug-2020	7 days	3 days	✓
Physical Tests : TSS by Gravimetry										
HDPE UG1	E160-H	10-Aug-2020	----	----	----		14-Aug-2020	7 days	3 days	✓
Physical Tests : TSS by Gravimetry										
HDPE W10	E160-H	10-Aug-2020	----	----	----		14-Aug-2020	7 days	3 days	✓
Physical Tests : TSS by Gravimetry										
HDPE W16	E160-H	10-Aug-2020	----	----	----		14-Aug-2020	7 days	3 days	✓
Physical Tests : TSS by Gravimetry										
HDPE W17	E160-H	10-Aug-2020	----	----	----		14-Aug-2020	7 days	3 days	✓
Physical Tests : TSS by Gravimetry										
HDPE W2	E160-H	11-Aug-2020	----	----	----		14-Aug-2020	7 days	3 days	✓
Physical Tests : TSS by Gravimetry										
HDPE W33s	E160-H	10-Aug-2020	----	----	----		14-Aug-2020	7 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TSS by Gravimetry										
HDPE										
W50	E160-H	10-Aug-2020	----	----	----		14-Aug-2020	7 days	3 days	✓
Physical Tests : TSS by Gravimetry										
HDPE										
W35	E160-H	09-Aug-2020	----	----	----		14-Aug-2020	7 days	4 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid)										
DUP	E420.Cr-L	11-Aug-2020	----	----	----		15-Aug-2020	180 days	4 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid)										
W2	E420.Cr-L	11-Aug-2020	----	----	----		15-Aug-2020	180 days	4 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid)										
W3	E420.Cr-L	11-Aug-2020	----	----	----		15-Aug-2020	180 days	4 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid)										
F-BL	E420.Cr-L	10-Aug-2020	----	----	----		15-Aug-2020	180 days	5 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid)										
MC1	E420.Cr-L	10-Aug-2020	----	----	----		15-Aug-2020	180 days	5 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid)										
UG1	E420.Cr-L	10-Aug-2020	----	----	----		15-Aug-2020	180 days	5 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid)										
W10	E420.Cr-L	10-Aug-2020	----	----	----		15-Aug-2020	180 days	5 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) W16	E420.Cr-L	10-Aug-2020	----	----	----		15-Aug-2020	180 days	5 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) W17	E420.Cr-L	10-Aug-2020	----	----	----		15-Aug-2020	180 days	5 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) W33s	E420.Cr-L	10-Aug-2020	----	----	----		15-Aug-2020	180 days	5 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) W35	E420.Cr-L	09-Aug-2020	----	----	----		15-Aug-2020	180 days	5 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) W50	E420.Cr-L	10-Aug-2020	----	----	----		15-Aug-2020	180 days	5 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) DUP	E508	11-Aug-2020	----	----	----		14-Aug-2020	28 days	2 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) F-BL	E508	10-Aug-2020	----	----	----		14-Aug-2020	28 days	3 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) MC1	E508	10-Aug-2020	----	----	----		14-Aug-2020	28 days	3 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) UG1	E508	10-Aug-2020	----	----	----		14-Aug-2020	28 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) W10	E508	10-Aug-2020	----	----	----		14-Aug-2020	28 days	3 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) W16	E508	10-Aug-2020	----	----	----		14-Aug-2020	28 days	3 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) W17	E508	10-Aug-2020	----	----	----		14-Aug-2020	28 days	3 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) W2	E508	11-Aug-2020	----	----	----		14-Aug-2020	28 days	3 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) W3	E508	11-Aug-2020	----	----	----		14-Aug-2020	28 days	3 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) W33s	E508	10-Aug-2020	----	----	----		14-Aug-2020	28 days	3 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) W50	E508	10-Aug-2020	----	----	----		14-Aug-2020	28 days	3 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) W35	E508	09-Aug-2020	----	----	----		14-Aug-2020	28 days	4 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) DUP	E420	11-Aug-2020	----	----	----		15-Aug-2020	180 days	4 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) W2	E420	11-Aug-2020	----	----	----		15-Aug-2020	180 days	4 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) W3	E420	11-Aug-2020	----	----	----		15-Aug-2020	180 days	4 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) F-BL	E420	10-Aug-2020	----	----	----		15-Aug-2020	180 days	5 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) MC1	E420	10-Aug-2020	----	----	----		15-Aug-2020	180 days	5 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) UG1	E420	10-Aug-2020	----	----	----		15-Aug-2020	180 days	5 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) W10	E420	10-Aug-2020	----	----	----		15-Aug-2020	180 days	5 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) W16	E420	10-Aug-2020	----	----	----		15-Aug-2020	180 days	5 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) W17	E420	10-Aug-2020	----	----	----		15-Aug-2020	180 days	5 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) W33s	E420	10-Aug-2020	----	----	----		15-Aug-2020	180 days	5 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) W35	E420	09-Aug-2020	----	----	----		15-Aug-2020	180 days	5 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) W50	E420	10-Aug-2020	----	----	----		15-Aug-2020	180 days	5 days	✓

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	71228	2	18	11.1	5.0	✓
Ammonia by Fluorescence	E298	73490	1	20	5.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	71222	2	12	16.6	5.0	✓
Conductivity in Water	E100	71226	2	12	16.6	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	72636	3	48	6.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	72064	1	16	6.2	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	72635	3	60	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	71548	2	40	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	71223	2	13	15.3	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	71224	2	16	12.5	5.0	✓
pH by Meter	E108	71227	2	24	8.3	5.0	✓
Sulfate in Water by IC	E235.SO4	71225	2	15	13.3	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	72510	1	19	5.2	5.0	✓
Total Mercury in Water by CVAAS	E508	72048	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	72509	2	20	10.0	5.0	✓
TSS by Gravimetry	E160-H	72003	1	20	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	71228	2	18	11.1	5.0	✓
Ammonia by Fluorescence	E298	73490	1	20	5.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	71222	2	12	16.6	5.0	✓
Conductivity in Water	E100	71226	2	12	16.6	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	72636	3	48	6.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	72064	1	16	6.2	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	72635	3	60	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	71548	2	40	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	71223	2	13	15.3	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	71224	2	16	12.5	5.0	✓
pH by Meter	E108	71227	2	24	8.3	5.0	✓
Sulfate in Water by IC	E235.SO4	71225	2	15	13.3	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	72510	1	19	5.2	5.0	✓
Total Mercury in Water by CVAAS	E508	72048	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	72509	1	20	5.0	5.0	✓
TSS by Gravimetry	E160-H	72003	1	20	5.0	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	71228	2	18	11.1	5.0	✓
Ammonia by Fluorescence	E298	73490	1	20	5.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	71222	2	12	16.6	5.0	✓

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Method Blanks (MB) - Continued							
Conductivity in Water	E100	71226	2	12	16.6	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	72636	3	48	6.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	72064	1	16	6.2	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	72635	3	60	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	71548	2	40	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	71223	2	13	15.3	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	71224	2	16	12.5	5.0	✓
Sulfate in Water by IC	E235.SO4	71225	2	15	13.3	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	72510	1	19	5.2	5.0	✓
Total Mercury in Water by CVAAS	E508	72048	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	72509	1	20	5.0	5.0	✓
TSS by Gravimetry	E160-H	72003	1	20	5.0	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	73490	1	20	5.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	71222	2	12	16.6	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	72636	3	48	6.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	72064	1	16	6.2	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	72635	3	60	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	71548	2	40	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	71223	2	13	15.3	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	71224	2	16	12.5	5.0	✓
Sulfate in Water by IC	E235.SO4	71225	2	15	13.3	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	72510	1	19	5.2	5.0	✓
Total Mercury in Water by CVAAS	E508	72048	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	72509	1	20	5.0	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
TSS by Gravimetry	E160-H Vancouver - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
Chloride in Water by IC (Low Level)	E235.Cl-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Vancouver - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Metals in Water by CRC ICPMS	E420 Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Vancouver - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Total Mercury in Water by CVAAS	E508 Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	“Hardness (as CaCO3), dissolved” is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. “Total Hardness” refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Hardness (Calculated) from Total Ca/Mg	EC100A Vancouver - Environmental	Water	APHA 2340B	“Hardness (as CaCO3), from total Ca/Mg” is calculated from the sum of total Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. “Total Hardness” refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations. Hardness from total Ca/Mg is normally comparable to Dissolved Hardness in non-turbid waters.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Ion Balance using Dissolved Metals	EC101 Vancouver - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
TDS in Water (Calculation)	EC103 Vancouver - Environmental	Water	APHA 1030E (mod)	Total Dissolved Solids is calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present.
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N Vancouver - Environmental	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **WR2000667**	Page	: 1 of 26
Client	: Minto Explorations Ltd.	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 11-Aug-2020 15:05
PO	: 232817	Date Analysis Commenced	: 12-Aug-2020
C-O-C number	: 2020-08-11 B	Issue Date	: 21-Aug-2020 14:53
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 12		
No. of samples analysed	: 12		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Amy Liang	Analsyt	Inorganics - Water Quality, Burnaby, British Columbia
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Bruna Botti	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Monica Ko	Lab Assistant	Metals, Burnaby, British Columbia
Muneeb Alam	Analyst	Metals, Burnaby, British Columbia
Omar Beydoun	Lab Assistant	Metals, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics - Water Quality, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 71226)											
WR2000667-001	W35	conductivity	----	E100	2.0	µS/cm	805	809	0.496%	10%	----
Physical Tests (QC Lot: 71227)											
WR2000667-001	W35	pH	----	E108	0.10	pH units	7.91	7.91	0.00%	4%	----
Physical Tests (QC Lot: 71228)											
WR2000667-001	W35	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	169	170	0.590%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	169	170	0.590%	20%	----
Physical Tests (QC Lot: 71442)											
WR2000667-011	DUP	pH	----	E108	0.10	pH units	8.20	8.20	0.00%	4%	----
Physical Tests (QC Lot: 71443)											
WR2000667-011	DUP	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	171	163	4.78%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	171	163	4.78%	20%	----
Physical Tests (QC Lot: 71444)											
WR2000667-011	DUP	conductivity	----	E100	2.0	µS/cm	344	346	0.580%	10%	----
Physical Tests (QC Lot: 72003)											
VA20B2282-002	Anonymous	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	65.5	64.9	0.920%	20%	----
Anions and Nutrients (QC Lot: 71222)											
WR2000667-001	W35	chloride	16887-00-6	E235.Cl-L	0.10	mg/L	5.07	5.05	0.352%	20%	----
Anions and Nutrients (QC Lot: 71223)											
WR2000667-001	W35	nitrate (as N)	14797-55-8	E235.NO3-L	0.0250	mg/L	31.1	30.0	3.81%	20%	----
Anions and Nutrients (QC Lot: 71224)											
WR2000667-001	W35	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	0.0112	0.0106	5.78%	20%	----
Anions and Nutrients (QC Lot: 71225)											
WR2000667-001	W35	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	129	129	0.0203%	20%	----
Anions and Nutrients (QC Lot: 72145)											

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Anions and Nutrients (QC Lot: 72145) - continued											
WR2000667-011	DUP	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 72146)											
WR2000667-011	DUP	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 72149)											
VA20B2570-004	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	40.1	40.2	0.285%	20%	----
Anions and Nutrients (QC Lot: 72152)											
WR2000667-011	DUP	chloride	16887-00-6	E235.Cl-L	0.10	mg/L	1.58	1.59	0.742%	20%	----
Anions and Nutrients (QC Lot: 73490)											
KS2001355-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 71548)											
KS2001345-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.16	1.06	0.10	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 73112)											
VA20B2409-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	10.6	10.6	0.656%	20%	----
Total Metals (QC Lot: 72048)											
WR2000654-002	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Total Metals (QC Lot: 72509)											
VA20B2404-001	Anonymous	manganese, total	7439-96-5	E420	0.00010	mg/L	0.00337	0.00333	1.35%	20%	----
VA20B2404-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0245	0.0297	0.0052	Diff <2x LOR	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00032	0.00034	0.00002	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.00823	0.00857	4.08%	20%	----
		beryllium, total	7440-41-7	E420	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0000050	mg/L	0.0000059	0.0000078	0.0000019	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.050	mg/L	3.00	3.02	0.705%	20%	----
		cobalt, total	7440-48-4	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00050	mg/L	0.0127	0.0138	8.26%	20%	----
		iron, total	7439-89-6	E420	0.010	mg/L	0.052	0.065	0.013	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000050	mg/L	0.00177	0.00204	14.0%	20%	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	0.0050	mg/L	0.313	0.325	3.96%	20%	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.000383	0.000388	0.000005	Diff <2x LOR	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E420	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Total Metals (QC Lot: 72509) - continued											
VA20B2404-001	Anonymous	potassium, total	7440-09-7	E420	0.050	mg/L	0.140	0.143	0.003	Diff <2x LOR	----
		selenium, total	7782-49-2	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		silicon, total	7440-21-3	E420	0.10	mg/L	2.76	2.84	2.58%	20%	----
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, total	7440-23-5	E420	0.050	mg/L	1.14	1.18	2.94%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.00912	0.00962	5.40%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	----
		thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	0.00018	0.00027	0.00009	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	0.00035	0.00041	0.00006	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.000014	0.000017	0.000003	Diff <2x LOR	----
		vanadium, total	7440-62-2	E420	0.00050	mg/L	0.00066	0.00060	0.00006	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	0.0123	0.0135	0.0012	Diff <2x LOR	----
		zirconium, total	7440-67-7	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
Total Metals (QC Lot: 72510)											
VA20B2404-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 72064)											
VA20B2469-009	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 72635)											
VA20B2423-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0035	0.0034	0.0001	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00115	0.00114	0.564%	20%	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.0458	0.0461	0.564%	20%	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0111	0.0109	2.27%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	0.050	0.049	0.0007	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000150	mg/L	<0.0000150	<0.0000150	0	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	170	166	2.30%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	0.00158	0.00154	2.40%	20%	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00405	0.00410	1.03%	20%	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	0.035	0.035	0.00006	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0023	0.0023	0.000007	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	19.0	19.4	1.83%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.0305	0.0299	2.08%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 72635) - continued											
VA20B2423-001	Anonymous	molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.0218	0.0219	0.374%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00198	0.00187	0.00011	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	7.92	7.68	3.10%	20%	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.000294	0.000332	0.000038	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	1.09	1.07	2.24%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	7440-23-5	E421	0.050	mg/L	71.4	70.4	1.45%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.448	0.445	0.594%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	216	217	0.304%	20%	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	0.000011	0.000011	0.00000007	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00170	0.00168	1.50%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 72636)											
VA20B2423-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 72639)											
VA20B2469-009	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0125	0.0126	0.568%	20%	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00557	0.00569	2.05%	20%	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0416	0.0423	1.63%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	0.032	0.032	0.0002	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	39.4	38.3	2.60%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	0.00038	0.00036	0.00002	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	14.7	14.4	1.55%	20%	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	0.000059	0.000058	0.0000006	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	11.4	11.3	0.930%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	1.16	1.10	4.89%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 72639) - continued											
VA20B2469-009	Anonymous	molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00148	0.00149	0.575%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00072	0.00072	0.000002	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	0.194	0.205	0.011	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	1.95	1.90	2.82%	20%	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.000217	0.000212	0.000004	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	13.1	13.2	0.822%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	7440-23-5	E421	0.050	mg/L	14.2	14.1	0.625%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.165	0.162	1.92%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	0.64	0.66	0.03	Diff <2x LOR	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	0.00490	0.00511	4.09%	20%	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.000029	0.000029	0.00000003	Diff <2x LOR	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	0.00731	0.00721	1.36%	20%	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	<0.0010	0.0012	0.0002	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	0.00061	0.00064	0.00003	Diff <2x LOR	----
Dissolved Metals (QC Lot: 72640)											
VA20B2469-009	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	0.00161	0.00161	0.0339%	20%	----
Dissolved Metals (QC Lot: 72641)											
VA20B2490-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0610	0.0613	0.474%	20%	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.0632	0.0628	0.639%	20%	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.0137	0.0138	0.700%	20%	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0871	0.0920	5.42%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	0.525	0.554	5.30%	20%	----
		cadmium, dissolved	7440-43-9	E421	0.0000200	mg/L	<0.0000200	<0.0000200	0	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	32.0	33.0	3.08%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	0.00013	0.00014	0.00001	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00035	0.00036	0.000004	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	0.000343	0.000341	0.000001	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.510	0.534	4.50%	20%	----
		magnesium, dissolved	7439-95-4	E421	0.100	mg/L	2.98	3.11	4.20%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.0807	0.0827	2.40%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 72641) - continued											
VA20B2490-001	Anonymous	molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.0650	0.0664	2.14%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	0.00051	0.00001	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.300	mg/L	<0.300	<0.300	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	77.6	79.7	2.74%	20%	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.0125	0.0123	1.86%	20%	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	3.92	4.11	4.62%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	0.000019	0.000011	0.000008	Diff <2x LOR	----
		sodium, dissolved	7440-23-5	E421	0.050	mg/L	271	282	4.04%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	1.41	1.42	0.468%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	181	187	3.62%	20%	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	0.000204	0.000202	0.881%	20%	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	0.00011	0.00012	0.000007	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.0100	mg/L	<0.0100	<0.0100	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00170	0.00170	0.0362%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	0.00081	0.00081	0.000003	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0021	0.0024	0.0003	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 72642)											
VA20B2490-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 71226)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 71228)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 71443)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 71444)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 72003)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Anions and Nutrients (QCLot: 71222)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 71223)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 71224)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 71225)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 72145)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 72146)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 72149)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 72152)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Anions and Nutrients (QCLot: 73490)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Organic / Inorganic Carbon (QCLot: 71548)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 73112)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 72048)						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----
Total Metals (QCLot: 72509)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	7440-23-5	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 72509) - continued						
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	<0.00020	----
Total Metals (QCLot: 72510)						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 72064)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 72635)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 72635) - continued						
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----
Dissolved Metals (QCLot: 72636)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 72639)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 72639) - continued						
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----
Dissolved Metals (QCLot: 72640)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 72641)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 72641) - continued						
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----
Dissolved Metals (QCLot: 72642)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 71226)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	103	90.0	110	----
Physical Tests (QCLot: 71227)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 71228)									
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	229 mg/L	91.7	75.0	125	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	100	85.0	115	----
Physical Tests (QCLot: 71442)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 71443)									
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	229 mg/L	98.6	75.0	125	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	96.6	85.0	115	----
Physical Tests (QCLot: 71444)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	106	90.0	110	----
Physical Tests (QCLot: 72003)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	95.2	85.0	115	----
Anions and Nutrients (QCLot: 71222)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 71223)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 71224)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	99.0	90.0	110	----
Anions and Nutrients (QCLot: 71225)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 72145)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 72146)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 72149)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	103	90.0	110	----
Anions and Nutrients (QCLot: 72152)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 73490)									

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Anions and Nutrients (QCLot: 73490) - continued									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.12 mg/L	102	85.0	115	----
Organic / Inorganic Carbon (QCLot: 71548)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	104	80.0	120	----
Organic / Inorganic Carbon (QCLot: 73112)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	98.5	80.0	120	----
Total Metals (QCLot: 72048)									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	93.5	80.0	120	----
Total Metals (QCLot: 72509)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	97.1	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	103	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	96.4	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	99.8	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	97.6	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	101	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	87.3	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	95.7	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	100	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	98.8	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	98.4	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	104	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	100	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	102	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	99.0	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	97.2	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	99.7	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	102	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	97.2	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	108	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	93.0	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	100	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	102	80.0	120	----
sodium, total	7440-23-5	E420	0.05	mg/L	50 mg/L	103	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	103	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	95.7	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	99.5	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 72509) - continued									
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	99.5	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	97.1	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	99.3	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	98.8	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	103	80.0	120	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.1 mg/L	100.0	80.0	120	----
Total Metals (QCLot: 72510)									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	98.6	80.0	120	----
Dissolved Metals (QCLot: 72064)									
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	97.4	80.0	120	----
Dissolved Metals (QCLot: 72635)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	96.5	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	101	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	95.8	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	99.5	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	95.3	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	95.8	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	91.1	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	98.4	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	100	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	99.6	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	99.4	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	98.9	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	93.3	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	99.3	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	96.9	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	98.3	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	100	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	109	70.0	130	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	102	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	102	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	103	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	99.5	80.0	120	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	99.8	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	101	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 72635) - continued									
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	93.9	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	96.8	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	96.0	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	94.1	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	99.4	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	99.6	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	97.6	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	95.5	80.0	120	----
Dissolved Metals (QCLot: 72636)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	99.1	80.0	120	----
Dissolved Metals (QCLot: 72639)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	106	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	92.6	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	98.5	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	96.7	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	98.1	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	114	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	93.0	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	99.9	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	99.6	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	99.8	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	97.0	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	97.2	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	103	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	102	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	98.9	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	109	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	97.1	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	99.8	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	104	70.0	130	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	104	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	104	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	106	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	97.8	80.0	120	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	114	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	102	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	85.8	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 72639) - continued									
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	113	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	95.8	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	102	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	108	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	102	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	100	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	99.5	80.0	120	----
Dissolved Metals (QCLot: 72640)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
Dissolved Metals (QCLot: 72641)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	107	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	99.5	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	98.3	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	98.5	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	99.5	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	95.7	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	102	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	99.8	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	99.1	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	98.8	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	97.8	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	94.6	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	96.1	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	104	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	99.7	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	98.3	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	98.8	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	110	70.0	130	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	99.0	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	92.7	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	95.4	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	99.8	80.0	120	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	106	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	106	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	99.6	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	97.5	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 72641) - continued									
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	98.0	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	95.9	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	96.8	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	98.8	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	99.6	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	98.5	80.0	120	----
Dissolved Metals (QCLot: 72642)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	98.7	80.0	120	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 71222)										
WR2000667-002	W50	chloride	16887-00-6	E235.Cl-L	105 mg/L	100 mg/L	105	75.0	125	----
Anions and Nutrients (QCLot: 71223)										
WR2000667-002	W50	nitrate (as N)	14797-55-8	E235.NO3-L	2.64 mg/L	2.5 mg/L	105	75.0	125	----
Anions and Nutrients (QCLot: 71224)										
WR2000667-002	W50	nitrite (as N)	14797-65-0	E235.NO2-L	0.516 mg/L	0.5 mg/L	103	75.0	125	----
Anions and Nutrients (QCLot: 71225)										
WR2000667-002	W50	sulfate (as SO4)	14808-79-8	E235.SO4	103 mg/L	100 mg/L	103	75.0	125	----
Anions and Nutrients (QCLot: 72145)										
WR2000667-011	DUP	nitrate (as N)	14797-55-8	E235.NO3-L	3.04 mg/L	2.5 mg/L	122	75.0	125	----
Anions and Nutrients (QCLot: 72146)										
VA20B2570-004	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.553 mg/L	0.5 mg/L	110	75.0	125	----
Anions and Nutrients (QCLot: 72149)										
VA20B2570-004	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	117 mg/L	100 mg/L	117	75.0	125	----
Anions and Nutrients (QCLot: 72152)										
WR2000667-011	DUP	chloride	16887-00-6	E235.Cl-L	119 mg/L	100 mg/L	119	75.0	125	----
Anions and Nutrients (QCLot: 73490)										
KS2001369-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.207 mg/L	0.2 mg/L	103	75.0	125	----
Organic / Inorganic Carbon (QCLot: 71548)										
KS2001345-002	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	4.23 mg/L	5 mg/L	84.6	70.0	130	----
Organic / Inorganic Carbon (QCLot: 73112)										
VA20B2409-002	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	ND mg/L	5 mg/L	ND	70.0	130	----
Total Metals (QCLot: 72048)										
WR2000654-003	Anonymous	mercury, total	7439-97-6	E508	0.0000963 mg/L	0.0001 mg/L	96.3	70.0	130	----
Total Metals (QCLot: 72509)										
VA20B2433-001	Anonymous	aluminum, total	7429-90-5	E420	0.195 mg/L	0.2 mg/L	97.3	70.0	130	----
		antimony, total	7440-36-0	E420	0.0208 mg/L	0.02 mg/L	104	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0203 mg/L	0.02 mg/L	101	70.0	130	----
		barium, total	7440-39-3	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 72509) - continued										
VA20B2433-001	Anonymous	beryllium, total	7440-41-7	E420	0.0418 mg/L	0.04 mg/L	105	70.0	130	----
		bismuth, total	7440-69-9	E420	0.00914 mg/L	0.01 mg/L	91.4	70.0	130	----
		boron, total	7440-42-8	E420	0.094 mg/L	0.1 mg/L	94.3	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00384 mg/L	0.004 mg/L	96.0	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0194 mg/L	0.02 mg/L	96.8	70.0	130	----
		copper, total	7440-50-8	E420	0.0186 mg/L	0.02 mg/L	92.8	70.0	130	----
		iron, total	7439-89-6	E420	1.97 mg/L	2 mg/L	98.5	70.0	130	----
		lead, total	7439-92-1	E420	0.0188 mg/L	0.02 mg/L	94.1	70.0	130	----
		lithium, total	7439-93-2	E420	0.106 mg/L	0.1 mg/L	106	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0209 mg/L	0.02 mg/L	104	70.0	130	----
		nickel, total	7440-02-0	E420	0.0392 mg/L	0.04 mg/L	98.1	70.0	130	----
		phosphorus, total	7723-14-0	E420	10.4 mg/L	10 mg/L	104	70.0	130	----
		potassium, total	7440-09-7	E420	3.93 mg/L	4 mg/L	98.3	70.0	130	----
		selenium, total	7782-49-2	E420	0.0409 mg/L	0.04 mg/L	102	70.0	130	----
		silicon, total	7440-21-3	E420	9.63 mg/L	10 mg/L	96.3	70.0	130	----
		silver, total	7440-22-4	E420	0.00402 mg/L	0.004 mg/L	100	70.0	130	----
		sodium, total	7440-23-5	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	ND mg/L	20 mg/L	ND	70.0	130	----
		thallium, total	7440-28-0	E420	0.00381 mg/L	0.004 mg/L	95.3	70.0	130	----
		tin, total	7440-31-5	E420	0.0200 mg/L	0.02 mg/L	100	70.0	130	----
		titanium, total	7440-32-6	E420	0.0429 mg/L	0.04 mg/L	107	70.0	130	----
		uranium, total	7440-61-1	E420	0.00394 mg/L	0.004 mg/L	98.6	70.0	130	----
		vanadium, total	7440-62-2	E420	0.102 mg/L	0.1 mg/L	102	70.0	130	----
		zinc, total	7440-66-6	E420	0.380 mg/L	0.4 mg/L	95.0	70.0	130	----
		zirconium, total	7440-67-7	E420	0.0430 mg/L	0.04 mg/L	108	70.0	130	----
Total Metals (QCLot: 72510)										
VA20B2433-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.0399 mg/L	0.04 mg/L	99.7	70.0	130	----
Dissolved Metals (QCLot: 72064)										
VA20B2469-010	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000925 mg/L	0.0001 mg/L	92.5	70.0	130	----
Dissolved Metals (QCLot: 72635)										
VA20B2423-002	Anonymous	aluminum, dissolved	7429-90-5	E421	0.185 mg/L	0.2 mg/L	92.3	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0196 mg/L	0.02 mg/L	97.9	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 72635) - continued										
VA20B2423-002	Anonymous	arsenic, dissolved	7440-38-2	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		barium, dissolved	7440-39-3	E421	0.0191 mg/L	0.02 mg/L	95.7	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0374 mg/L	0.04 mg/L	93.4	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00907 mg/L	0.01 mg/L	90.7	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.084 mg/L	0.1 mg/L	83.7	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00376 mg/L	0.004 mg/L	94.1	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0195 mg/L	0.02 mg/L	97.3	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0187 mg/L	0.02 mg/L	93.5	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.91 mg/L	2 mg/L	95.7	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0186 mg/L	0.02 mg/L	92.9	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0944 mg/L	0.1 mg/L	94.4	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0380 mg/L	0.04 mg/L	95.0	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	10.7 mg/L	10 mg/L	107	70.0	130	----
		potassium, dissolved	7440-09-7	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0421 mg/L	0.04 mg/L	105	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.77 mg/L	10 mg/L	97.7	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00319 mg/L	0.004 mg/L	79.8	70.0	130	----
		sodium, dissolved	7440-23-5	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	ND mg/L	20 mg/L	ND	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00371 mg/L	0.004 mg/L	92.8	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0188 mg/L	0.02 mg/L	94.2	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0387 mg/L	0.04 mg/L	96.9	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00402 mg/L	0.004 mg/L	100	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.0985 mg/L	0.1 mg/L	98.5	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.379 mg/L	0.4 mg/L	94.7	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0390 mg/L	0.04 mg/L	97.6	70.0	130	----
Dissolved Metals (QCLot: 72636)										
VA20B2423-002	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.0375 mg/L	0.04 mg/L	93.8	70.0	130	----
Dissolved Metals (QCLot: 72639)										
VA20B2469-010	Anonymous	aluminum, dissolved	7429-90-5	E421	0.212 mg/L	0.2 mg/L	106	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0208 mg/L	0.02 mg/L	104	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 72639) - continued										
VA20B2469-010	Anonymous	arsenic, dissolved	7440-38-2	E421	0.0209 mg/L	0.02 mg/L	105	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0394 mg/L	0.04 mg/L	98.6	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00902 mg/L	0.01 mg/L	90.2	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.093 mg/L	0.1 mg/L	93.3	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00407 mg/L	0.004 mg/L	102	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0196 mg/L	0.02 mg/L	98.0	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0187 mg/L	0.02 mg/L	93.5	70.0	130	----
		iron, dissolved	7439-89-6	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0193 mg/L	0.02 mg/L	96.7	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.101 mg/L	0.1 mg/L	101	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0212 mg/L	0.02 mg/L	106	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0387 mg/L	0.04 mg/L	96.8	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	11.1 mg/L	10 mg/L	111	70.0	130	----
		potassium, dissolved	7440-09-7	E421	4.74 mg/L	4 mg/L	118	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0414 mg/L	0.04 mg/L	103	70.0	130	----
		silicon, dissolved	7440-21-3	E421	ND mg/L	10 mg/L	ND	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00331 mg/L	0.004 mg/L	82.8	70.0	130	----
		sodium, dissolved	7440-23-5	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	20.8 mg/L	20 mg/L	104	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00388 mg/L	0.004 mg/L	97.1	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0205 mg/L	0.02 mg/L	102	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0404 mg/L	0.04 mg/L	101	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00414 mg/L	0.004 mg/L	103	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.103 mg/L	0.1 mg/L	103	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.414 mg/L	0.4 mg/L	103	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0462 mg/L	0.04 mg/L	115	70.0	130	----
Dissolved Metals (QCLot: 72640)										
VA20B2469-010	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.0399 mg/L	0.04 mg/L	99.8	70.0	130	----
Dissolved Metals (QCLot: 72641)										
VA20B2490-002	Anonymous	aluminum, dissolved	7429-90-5	E421	0.192 mg/L	0.2 mg/L	96.2	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0196 mg/L	0.02 mg/L	98.2	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 72641) - continued										
VA20B2490-002	Anonymous	arsenic, dissolved	7440-38-2	E421	0.0207 mg/L	0.02 mg/L	104	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0397 mg/L	0.04 mg/L	99.3	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00892 mg/L	0.01 mg/L	89.2	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.099 mg/L	0.1 mg/L	98.8	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00398 mg/L	0.004 mg/L	99.4	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0190 mg/L	0.02 mg/L	95.0	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0183 mg/L	0.02 mg/L	91.6	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.89 mg/L	2 mg/L	94.4	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0181 mg/L	0.02 mg/L	90.7	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0923 mg/L	0.1 mg/L	92.3	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0194 mg/L	0.02 mg/L	96.8	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0373 mg/L	0.04 mg/L	93.2	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	11.3 mg/L	10 mg/L	113	70.0	130	----
		potassium, dissolved	7440-09-7	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0452 mg/L	0.04 mg/L	113	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.52 mg/L	10 mg/L	95.2	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00368 mg/L	0.004 mg/L	92.1	70.0	130	----
		sodium, dissolved	7440-23-5	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	ND mg/L	20 mg/L	ND	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00353 mg/L	0.004 mg/L	88.3	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0192 mg/L	0.02 mg/L	96.2	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0388 mg/L	0.04 mg/L	96.9	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00371 mg/L	0.004 mg/L	92.7	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.0988 mg/L	0.1 mg/L	98.8	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.392 mg/L	0.4 mg/L	98.1	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0404 mg/L	0.04 mg/L	101	70.0	130	----
Dissolved Metals (QCLot: 72642)										
VA20B2490-002	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.0377 mg/L	0.04 mg/L	94.4	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number: 2020-08-11 B

Environmental Division
Whitehorse
Work Order Reference
WR2000667

Telephone : +1 867 668 6689

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Michelle Olesh

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax mintoenvironment@mintomine.com
Email 2
Email 3

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax ap@mintomine.com
Email 2

Project Information

ALS Account # / Quote #:
Job #:
PO / AFE: 232817 (WUL)
LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#
Major/Minor Code: Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only)

ALS Contact: Shane Stack **Sampler:**

Select Service Level Below - Please confirm all E&P TATs with y

Regular [R] ☑ Standard TAT if received
PRIORITY (Business Days): 4 day [P4] ☐ 3 day [P3] ☐ 2 day [P2] ☐
EMERGENCY: 1 S

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service lev

Analysis R

Indicate Filtered (F), Preserved (P) or Filtered an

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	pH / Conductivity / Alkalinity / Anions	Total Suspended Solids (TSS)	Total Dissolved Solids (TDS)	Total Metals (TM), Hardness	Dissolved Metals (DM)(filtered and preserve	Total Mercury, Hardness	Dissolved Mercury [1] (Filtered + preserved)	Total Nutrients (Ammonia)	Dissolved Organic Carbon (DOC)					Number of Containers
								P	F/P	P	F/P	P						
	W35	9-Aug-20	16:50	Water	R	R	R	R	R	R	R	R	R					7
	W50	10-Aug-20	8:30	Water	R	R	R	R	R	R	R	R	R					7
	W17	10-Aug-20	8:50	Water	R	R	R	R	R	R	R	R	R					7
	W16	10-Aug-20	9:40	Water	R	R	R	R	R	R	R	R	R					7
	W10	10-Aug-20	10:40	Water	R	R	R	R	R	R	R	R						6
	F-BL	10-Aug-20		Water	R	R	R	R	R	R	R	R						6
	W33s	10-Aug-20	11:45	Water	R	R	R	R	R	R	R	R						6
	MC1	10-Aug-20	14:15	Water	R	R	R	R	R	R	R	R	R					7
	UG1	10-Aug-20	14:30	Water	R	R	R	R	R	R	R	R						6
	W2	11-Aug-20	6:15	Water	R	R	R	R	R	R	R	R	R					7

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?
☐ YES ☑ NO
Are samples for human drinking water use?
☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
11.1	11.8				

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Ian Smith	Date: 2020-08-11	Time:	Received by:	Date: AUG 11/20	Time: 15:05	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number: 2020-08-11 B

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: mintoenvironment@mintomine.com
Email 2:
Email 3:

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐
EMERGENCY: 1 Business day [E1] ☐ | Same Day, Weekend or Statutory holiday [E0] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Michelle Olesh

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: ap@mintomine.com
Email 2:

Project Information	
ALS Account # / Quote #:	
Job #:	
PO / AFE:	232817 (WUL)
LSD:	

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only)

ALS Contact: Shane Stack **Sampler:**

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	pH / Conductivity / Alkalinity / Anions	Total Suspended Solids (TSS)	Total Disolved Solids (TDS)	Total Metals (TM), Hardness	Dissolved Metals (DM)(filtered and preserved	Total Mercury, Hardness	Dissolved Mercury [1] (Filtered + preserved)	Total Nutrients (Ammonia)	Dissolved Organic Carbon (DOC)					Number of Containers
								P	F/P	P	F/P	P	F/P					
	DUP	11-Aug-20		Water	R	R	R	R	R	R	R	R	R					7
	W3	11-Aug-20	6:45	Water	R	R	R	R	R	R	R	R	R					7

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO
Are samples for human drinking water use? ☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Ian Smith	Date: 2020-08-11	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:

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1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 2020-08-11 B

Environmental Division Whitehorse

Work Order Reference WR2000667

Telephone : +1 867 668 6689

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Michelle Olesh

Report Format / Distribution	
Select Report Format:	☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	mintoenvironment@mintomine.com
Email 2	
Email 3	

Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	ap@mintomine.com
Email 2	

Project Information	
ALS Account # / Quote #:	
Job #:	
PO / AFE:	232817 (WUL)
LSD:	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only):

ALS Contact: Shane Stack **Sampler:**

Select Service Level Below - Please confirm all E&P TATs with y

Regular [R] ☑ Standard TAT if received

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐

EMERGENCY: 1 | S

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service levi

Analysis R

Indicate Filtered (F), Preserved (P) or Filtered an

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	pH / Conductivity / Alkalinity / Anions	Total Suspended Solids (TSS)	Total Dissolved Solids (TDS)	Total Metals (TM), Hardness	Dissolved Metals (DM)(filtered and preserve	Total Mercury, Hardness	Dissolved Mercury [1] (Filtered + preserved)	Total Nutrients (Ammonia)	Dissolved Organic Carbon (DOC)					Number of Containers
								P	F/P	P	F/P	P						
	W35 ✓	9-Aug-20	16:50	Water	R	R	R	R	R	R	R	R	R					7
	W50 ✓	10-Aug-20	8:30	Water	R	R	R	R	R	R	R	R	R					7
	W17 ✓	10-Aug-20	8:50	Water	R	R	R	R	R	R	R	R	R					7
	W16 ✓	10-Aug-20	9:40	Water	R	R	R	R	R	R	R	R	R					7
	W10 ✓	10-Aug-20	10:40	Water	R	R	R	R	R	R	R	R						6
	F-BL ✓	10-Aug-20		Water	R	R	R	R	R	R	R	R						6
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	MC1 ✓	10-Aug-20	14:15	Water	R	R	R	R	R	R	R	R	R					7
	UG1 ✓	10-Aug-20	14:30	Water	R	R	R	R	R	R	R	R						6
	W2	11-Aug-20	6:15	Water	R	R	R	R	R	R	R	R	R					7

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO

Are samples for human drinking water use? ☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C	FINAL COOLER TEMPERATURES °C	
11° / 9 X 11° / 8°	10	7

SHIPMENT RELEASE (client use)		
Released by: Ian Smith	Date: 2020-08-11	Time:

INITIAL SHIPMENT RECEPTION (lab use only)		
Received by:	Date: AUG 11 20	Time: 15:05

FINAL SHIPMENT RECEPTION (lab use only)		
Received by: JC ice pack	Date: AUG 12 2020	Time: 1350

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

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1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form.**

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number: 2020-08-11 B

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Michelle Olesh

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: mintoenvironment@mintomine.com
Email 2:
Email 3:

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: ap@mintomine.com
Email 2:

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)			EMERGENCY	
	4 day [P4]	☐	1 Business day [E1]	☐
	3 day [P3]	☐	Same Day, Weekend or Statutory holiday [E0]	☐
	2 day [P2]	☐		

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #:
Job #:
PO / AFE: 232817 (WUL)
LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#:
Major/Minor Code: Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only)

ALS Contact: Shane Stack **Sampler:**

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	pH / Conductivity / Alkalinity / Anions	Total Suspended Solids (TSS)	Total Dissolved Solids (TDS)	Total Metals (TM), Hardness	Dissolved Metals (DM)(filtered and preserve	Total Mercury, Hardness	Dissolved Mercury [1] (Filtered + preserved)	Total Nutrients (Ammonia)	Dissolved Organic Carbon (DOC)	Number of Containers
								P	F/P	P	F/P	P	F/P	
	DUP	11-Aug-20		Water	R	R	R	R	R	R	R	R	R	7
	W3	11-Aug-20	6:45	Water	R	R	R	R	R	R	R	R	R	7

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?
☐ YES ☑ NO

Are samples for human drinking water use?
☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
			10	7	

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Ian Smith	Date: 2020-08-11	Time:	Received by:	Date:	Time:	Received by: Ice pad SC	Date: AUG 12 2020	Time: 1350

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

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ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000607**	Page	: 1 of 14
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 04-Aug-2020 14:50
PO	: 232817 (WUL)	Date Analysis Commenced	: 07-Aug-2020
C-O-C number	: 2020-08-04	Issue Date	: 12-Aug-2020 15:51
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 11		
No. of samples analysed	: 11		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Bruna Botti	Analyst	Inorganics - Water Quality, Burnaby, British Columbia
Cristina Alexandre	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Ken Chan	Supervisor - Metals Prep & Mercury	Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Kinny Wu	Laboratory Analyst	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Qualifiers

Qualifier	*Description*
DLA	*Detection Limit adjusted for required dilution.*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*
DTMF	*Dissolved concentration exceeds total for field-filtered metals sample. Metallic contaminants may have been introduced to dissolved sample during field filtration.*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W15	W30	W62	UG4	W2
					Client sampling date / time	01-Aug-2020 14:45	01-Aug-2020 14:15	01-Aug-2020 15:40	02-Aug-2020 13:30	04-Aug-2020 05:20
						WR2000607-001	WR2000607-002	WR2000607-003	WR2000607-004	WR2000607-005
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		166	197	278	187	160
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	7.6	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	3.8	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		166	204	278	187	160
conductivity	----	E100	2.0	µS/cm		544	702	1190	2600	340
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		251	319	548	1320	150
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		276	359	618	1440	170
pH	----	E108	0.10	pH units		8.14	8.34	8.05	7.90	8.23
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		363	450	802	2260	209
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	<3.0	158	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0199	0.0275	0.0105	12.7	0.0088
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		1.54	1.49	43.2	24.7	1.78
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		3.74	0.923	15.7	21.1	0.0262
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		3.74	0.927	15.7	21.5	0.0276
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0090	<0.0050 DLDS	0.0050	0.405	0.0013
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		110	182	279	1390	23.9
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		21.4	----	----	----	10.1
Ion Balance										
anion sum	----	EC101	0.10	meq/L		5.94	7.98	13.7	34.9	3.74
cation sum	----	EC101	0.10	meq/L		5.50	7.42	12.3	31.8	3.44
ion balance (cation-anion difference)	----	EC101	0.010	%		3.85	3.64	5.38	4.65	4.18
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.0640	0.0073	0.0357	4.23	0.0112
antimony, total	7440-36-0	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00064	<0.00010
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00042	0.00059	0.00052	0.00128	0.00046
barium, total	7440-39-3	E420	0.00010	mg/L		0.0587	0.0651	0.0942	0.0974	0.0653
beryllium, total	7440-41-7	E420	0.000020	mg/L		<0.000020	<0.000020	<0.000020	0.000108	<0.000020

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W15	W30	W62	UG4	W2
					Client sampling date / time	01-Aug-2020 14:45	01-Aug-2020 14:15	01-Aug-2020 15:40	02-Aug-2020 13:30	04-Aug-2020 05:20
						WR2000607-001	WR2000607-002	WR2000607-003	WR2000607-004	WR2000607-005
						Result	Result	Result	Result	Result
Total Metals										
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000100 DLA	<0.000050
boron, total	7440-42-8	E420	0.010	mg/L		<0.010	0.024	0.039	0.379	<0.010
cadmium, total	7440-43-9	E420	0.0000050	mg/L		0.0000104	<0.0000100 DLM	0.0000340	0.000388	<0.0000050
calcium, total	7440-70-2	E420	0.050	mg/L		75.5	82.6	172	471	44.1
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00041	0.00015	0.00030	0.00187	0.00026
cobalt, total	7440-48-4	E420	0.00010	mg/L		0.00012	<0.00010	0.00011	0.00295	<0.00010
copper, total	7440-50-8	E420	0.00050	mg/L		0.0330	0.0149	0.0489	0.856	0.00262
iron, total	7439-89-6	E420	0.010	mg/L		0.143	0.139	0.085	7.45	0.042
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	0.00436	<0.000050
lithium, total	7439-93-2	E420	0.0010	mg/L		<0.0010	0.0026	0.0050	0.0107	0.0014
magnesium, total	7439-95-4	E420	0.100	mg/L		21.3	37.0	45.6	65.0	14.7
manganese, total	7439-96-5	E420	0.00010	mg/L		0.0289	0.0153	0.0150	0.399	0.0128
mercury, total	7439-97-6	E508	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000500 DLM	<0.0000050
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.00240	0.00881	0.0116	0.0228	0.00130
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00096	<0.00050	0.00101	0.00298	0.00101
phosphorus, total	7723-14-0	E420	0.050	mg/L		<0.050	<0.050	<0.050	0.229	<0.050
potassium, total	7440-09-7	E420	0.100	mg/L		2.04	4.17	6.70	10.7	1.42
selenium, total	7782-49-2	E420	0.000050	mg/L		0.00201	0.00215	0.00704	0.00378	0.000137
silicon, total	7440-21-3	E420	0.10	mg/L		4.81	2.90	5.97	13.9	5.74
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	0.000012	0.000357	<0.000010
sodium, total	7440-23-5	E420	0.050	mg/L		11.2	24.7	31.6	117	10.6
strontium, total	7440-24-6	E420	0.00020	mg/L		0.695	1.59	2.05	7.56	0.448
sulfur, total	7704-34-9	E420	0.50	mg/L		39.1	63.4	98.3	507	8.62
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	0.000055	<0.000010
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	<0.00010	0.00011	0.00028	<0.00010
titanium, total	7440-32-6	E420	0.00030	mg/L		0.00390	0.00044	0.00172	0.296	0.00059
uranium, total	7440-61-1	E420	0.000010	mg/L		0.00121	0.00396	0.00430	0.00764	0.00130
vanadium, total	7440-62-2	E420	0.00050	mg/L		0.00078	<0.00050	0.00080	0.0153	0.00074
zinc, total	7440-66-6	E420	0.0030	mg/L		0.0068	<0.0030	0.0147	0.0565	<0.0030
zirconium, total	7440-67-7	E420	0.00020	mg/L		0.00030	<0.00020	<0.00020	<0.00040 DLA	<0.00020
Dissolved Metals										

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W15	W30	W62	UG4	W2
					Client sampling date / time	01-Aug-2020 14:45	01-Aug-2020 14:15	01-Aug-2020 15:40	02-Aug-2020 13:30	04-Aug-2020 05:20
						WR2000607-001	WR2000607-002	WR2000607-003	WR2000607-004	WR2000607-005
						Result	Result	Result	Result	Result
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0197	0.0017	0.0026	0.0117	0.0055
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	0.00010	0.00063	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00037	0.00050	0.00046	0.00067	0.00040
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0550	0.0619	0.0890	0.0262	0.0636
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000040 DLA	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000100 DLA	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		<0.010	0.023	0.039	0.404	0.012
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000052	<0.0000100 DLM	0.0000340	0.000256	<0.0000050
calcium, dissolved	7440-70-2	E421	0.050	mg/L		70.8	73.8	154	439	39.3
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00033	<0.00010	0.00021	<0.00020 DLA	0.00024
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00071	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.0265	0.0128	0.0420	0.0426	0.00282
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.077	0.111	0.024	<0.020 DLA	0.029
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000100 DLA	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		<0.0010	0.0033	0.0065	0.0134	0.0018
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		18.0	32.6	39.4	54.1	12.6
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0226	0.0131	0.0128	0.193	0.0111
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00232	0.00884	0.0113	0.0221	0.00125
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00062	<0.00050	0.00058	0.00115	0.00068
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.100 DLA	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		1.94	3.97	5.93	8.47	1.37
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.00199	0.00224	0.00700	0.00320	0.000169
silicon, dissolved	7440-21-3	E421	0.050	mg/L		4.62	2.88	5.94	6.43	5.49
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000020 DLA	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		9.67	21.7	27.4	99.5	9.38
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.639	1.58	1.89	7.16	0.423
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		35.4	56.1	90.3	448	7.42
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	0.000023	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00020 DLA	0.00012
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		0.00114	<0.00030	<0.00030	<0.00060 DLA	<0.00030

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W15	W30	W62	UG4	W2
					Client sampling date / time	01-Aug-2020 14:45	01-Aug-2020 14:15	01-Aug-2020 15:40	02-Aug-2020 13:30	04-Aug-2020 05:20
						WR2000607-001	WR2000607-002	WR2000607-003	WR2000607-004	WR2000607-005
						Result	Result	Result	Result	Result
Dissolved Metals										
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00122	0.00405	0.00450	0.00764	0.00136
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00063	<0.00050	0.00054	<0.00100 DLA	0.00066
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0011	<0.0010	0.0129	0.0183	<0.0010
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		0.00030	<0.00020	<0.00020	<0.00040 DLA	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MC1	Dup	W17	W51	W3
					Client sampling date / time	03-Aug-2020 09:00	03-Aug-2020	03-Aug-2020 15:40	02-Aug-2020 10:05	04-Aug-2020 06:10
						WR2000607-006	WR2000607-007	WR2000607-008	WR2000607-009	WR2000607-010
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		154	152	190	165	242
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		5.8	4.6	<1.0	<1.0	4.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		2.9	2.3	<1.0	<1.0	2.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		160	156	190	165	246
conductivity	----	E100	2.0	µS/cm		328	330	486	2840	547
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		151	146	213	1480	252
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		163	165	238	1580	268
pH	----	E108	0.10	pH units		8.34	8.31	8.21	8.02	8.30
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		208	202	301	2540	335
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		4.8	129	<3.0	3.0	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0126	0.0126	0.0141	6.17	0.0115
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		1.37	1.38	5.99	23.7	4.97
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.0638	0.0586	0.0233	5.88	0.0771
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		0.0645	0.0588	0.0241	10.3	0.0773
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	<0.0010	<0.0010	4.42	<0.0010
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		18.8	18.9	62.7	1640	53.2
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		11.6	11.6	12.4	----	8.58
Ion Balance										
anion sum	----	EC101	0.10	meq/L		3.63	3.56	5.28	38.8	6.16
cation sum	----	EC101	0.10	meq/L		3.47	3.35	4.87	35.2	5.84
ion balance (cation-anion difference)	----	EC101	0.010	%		2.25	3.04	4.04	4.86	2.67
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.142	0.137	0.0060	0.0504	0.0530
antimony, total	7440-36-0	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00042	<0.00010
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00073	0.00075	0.00050	0.00045	0.00029
barium, total	7440-39-3	E420	0.00010	mg/L		0.0636	0.0625	0.0620	0.0682	0.0583
beryllium, total	7440-41-7	E420	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000040 DLA	<0.000020
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000100 DLA	<0.000050

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MC1	Dup	W17	W51	W3
					Client sampling date / time	03-Aug-2020 09:00	03-Aug-2020	03-Aug-2020 15:40	02-Aug-2020 10:05	04-Aug-2020 06:10
						WR2000607-006	WR2000607-007	WR2000607-008	WR2000607-009	WR2000607-010
						Result	Result	Result	Result	Result
Total Metals										
boron, total	7440-42-8	E420	0.010	mg/L		<0.010	<0.010	0.016	0.290	0.020
cadmium, total	7440-43-9	E420	0.0000050	mg/L		0.0000086	0.0000084	<0.0000100 DLM	<0.0000600 DLM	0.0000247
calcium, total	7440-70-2	E420	0.050	mg/L		39.6	41.0	62.0	528	58.4
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00052	0.00056	0.00022	0.00030	0.00028
cobalt, total	7440-48-4	E420	0.00010	mg/L		0.00015	0.00016	<0.00010	0.00040	<0.00010
copper, total	7440-50-8	E420	0.00050	mg/L		0.00306	0.00280	0.0113	0.0128	0.00685
iron, total	7439-89-6	E420	0.010	mg/L		0.318	0.330	0.080	0.461	0.100
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	0.000057	<0.000050	<0.000100 DLA	<0.000050
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0012	0.0012	0.0011	0.0090	0.0022
magnesium, total	7439-95-4	E420	0.100	mg/L		15.6	15.2	20.2	63.6	29.7
manganese, total	7439-96-5	E420	0.00010	mg/L		0.0220	0.0247	0.0780	0.728	0.0733
mercury, total	7439-97-6	E508	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.00263	0.00168	0.00772	0.0485	0.00535
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00140	0.00135	0.00095	0.00451	0.00144
phosphorus, total	7723-14-0	E420	0.050	mg/L		<0.050	<0.050	<0.050	<0.100 DLA	0.186
potassium, total	7440-09-7	E420	0.100	mg/L		1.16	1.15	3.44	37.2	2.30
selenium, total	7782-49-2	E420	0.000050	mg/L		0.000157	0.000151	0.000432	0.00485	0.000253
silicon, total	7440-21-3	E420	0.10	mg/L		6.38	6.39	5.83	3.73	6.36
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000020 DLA	<0.000010
sodium, total	7440-23-5	E420	0.050	mg/L		10.3	10.0	13.2	109	18.1
strontium, total	7440-24-6	E420	0.00020	mg/L		0.431	0.430	0.687	6.45	0.818
sulfur, total	7704-34-9	E420	0.50	mg/L		6.71	6.58	21.9	588	19.3
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000020 DLA	<0.000010
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00020 DLA	<0.00010
titanium, total	7440-32-6	E420	0.00030	mg/L		0.00715	0.00649	0.00054	0.00297	0.00335
uranium, total	7440-61-1	E420	0.000010	mg/L		0.00140	0.00136	0.00156	0.00349	0.00237
vanadium, total	7440-62-2	E420	0.00050	mg/L		0.00142	0.00143	0.00052	<0.00100 DLA	0.00057
zinc, total	7440-66-6	E420	0.0030	mg/L		<0.0030	<0.0030	<0.0030	<0.0060 DLA	0.0037
zirconium, total	7440-67-7	E420	0.00020	mg/L		0.00021	0.00023	<0.00020	<0.00040 DLA	<0.00020
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0916	0.0074	0.0025	0.0052	0.0034

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MC1	Dup	W17	W51	W3
					Client sampling date / time	03-Aug-2020 09:00	03-Aug-2020	03-Aug-2020 15:40	02-Aug-2020 10:05	04-Aug-2020 06:10
						WR2000607-006	WR2000607-007	WR2000607-008	WR2000607-009	WR2000607-010
						Result	Result	Result	Result	Result
Dissolved Metals										
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00040	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00070	0.00059	0.00044	0.00030	0.00025
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0616	0.0569	0.0608	0.0637	0.0580
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000040 DLA	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000100 DLA	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		<0.010	<0.010	0.017	0.303	0.026
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000056	<0.0000050	<0.0000100 DLM	<0.0000300 DLM	<0.0000100 DLM
calcium, dissolved	7440-70-2	E421	0.050	mg/L		37.9	36.9	57.5	499	57.7
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00044	0.00026	0.00017	<0.00020 DLA	0.00020
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00015	<0.00010	<0.00010	0.00034	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00256	0.00244	0.00942	0.00219	0.00350
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.288	0.091	0.069	0.025	0.022
lead, dissolved	7439-92-1	E421	0.000050	mg/L		0.000075	<0.000050	<0.000050	<0.000100 DLA	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0015	0.0015	0.0014	0.0123 DTMF	0.0030
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		13.6	13.1	16.9	56.2	26.3
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0256	0.00584	0.0715	0.708	0.0500
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00170	0.00166	0.00711	0.0458	0.00506
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00107	0.00083	0.00062	0.00379	0.00100
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.100 DLA	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		1.14	1.08	3.30	33.1	2.24
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000151	0.000133	0.000519	0.00406	0.000298
silicon, dissolved	7440-21-3	E421	0.050	mg/L		6.26	5.93	5.76	3.45	6.34
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000020 DLA	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		9.32	9.01	11.9	100	16.8
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.408	0.404	0.637	6.03	0.767
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		5.89	5.70	19.6	515	16.6
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000020 DLA	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00020 DLA	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		0.00472	<0.00030	<0.00030	<0.00060 DLA	<0.00030
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00139	0.00139	0.00156	0.00360	0.00250

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MC1	Dup	W17	W51	W3
					Client sampling date / time	03-Aug-2020 09:00	03-Aug-2020	03-Aug-2020 15:40	02-Aug-2020 10:05	04-Aug-2020 06:10
						WR2000607-006	WR2000607-007	WR2000607-008	WR2000607-009	WR2000607-010
						Result	Result	Result	Result	Result
Dissolved Metals										
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00135	0.00095	<0.00050	<0.00100 DLA	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0010	<0.0010	0.0018	<0.0020 DLA	0.0024
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		0.00025	0.00021	<0.00020	<0.00040 DLA	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: W50	----	----	----	----
					Client sampling date / time: 04-Aug-2020 06:35	----	----	----	----
					WR2000607-011	--------	--------	--------	--------
					Result	----	----	----	----
Physical Tests									
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	242	----	----	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	----	----	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	----	----	----	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L	<1.0	----	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	242	----	----	----	----
conductivity	----	E100	2.0	µS/cm	534	----	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L	249	----	----	----	----
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L	270	----	----	----	----
pH	----	E108	0.10	pH units	7.76	----	----	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L	334	----	----	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L	29.9	----	----	----	----
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.218	----	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L	6.20	----	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.0105	----	----	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L	0.0111	----	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	----	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	45.2	----	----	----	----
Organic / Inorganic Carbon									
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	14.4	----	----	----	----
Ion Balance									
anion sum	----	EC101	0.10	meq/L	5.95	----	----	----	----
cation sum	----	EC101	0.10	meq/L	5.77	----	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%	1.54	----	----	----	----
Total Metals									
aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0149	----	----	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L	<0.00010	----	----	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00047	----	----	----	----
barium, total	7440-39-3	E420	0.00010	mg/L	0.106	----	----	----	----
beryllium, total	7440-41-7	E420	0.000020	mg/L	<0.000020	----	----	----	----
bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	----	----	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W50	----	----	----	----
					Client sampling date / time	04-Aug-2020 06:35	----	----	----	----
						WR2000607-011	--------	--------	--------	--------
						Result	----	----	----	----
Total Metals										
boron, total	7440-42-8	E420	0.010	mg/L		0.016	----	----	----	----
cadmium, total	7440-43-9	E420	0.0000050	mg/L		0.0000554	----	----	----	----
calcium, total	7440-70-2	E420	0.050	mg/L		65.9	----	----	----	----
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00044	----	----	----	----
cobalt, total	7440-48-4	E420	0.00010	mg/L		0.00113	----	----	----	----
copper, total	7440-50-8	E420	0.00050	mg/L		0.00416	----	----	----	----
iron, total	7439-89-6	E420	0.010	mg/L		0.086	----	----	----	----
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	----	----	----	----
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0011	----	----	----	----
magnesium, total	7439-95-4	E420	0.100	mg/L		25.5	----	----	----	----
manganese, total	7439-96-5	E420	0.00010	mg/L		3.65	----	----	----	----
mercury, total	7439-97-6	E508	0.0000050	mg/L		<0.0000050	----	----	----	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.00702	----	----	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00992	----	----	----	----
phosphorus, total	7723-14-0	E420	0.050	mg/L		<0.050	----	----	----	----
potassium, total	7440-09-7	E420	0.100	mg/L		2.46	----	----	----	----
selenium, total	7782-49-2	E420	0.000050	mg/L		0.000207	----	----	----	----
silicon, total	7440-21-3	E420	0.10	mg/L		7.09	----	----	----	----
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	----	----	----	----
sodium, total	7440-23-5	E420	0.050	mg/L		14.6	----	----	----	----
strontium, total	7440-24-6	E420	0.00020	mg/L		0.652	----	----	----	----
sulfur, total	7704-34-9	E420	0.50	mg/L		16.0	----	----	----	----
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	----	----	----	----
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	----	----	----	----
titanium, total	7440-32-6	E420	0.00030	mg/L		0.00049	----	----	----	----
uranium, total	7440-61-1	E420	0.000010	mg/L		0.00137	----	----	----	----
vanadium, total	7440-62-2	E420	0.00050	mg/L		0.00058	----	----	----	----
zinc, total	7440-66-6	E420	0.0030	mg/L		<0.0030	----	----	----	----
zirconium, total	7440-67-7	E420	0.00020	mg/L		0.00041	----	----	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0102	----	----	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W50	----	----	----	----
					Client sampling date / time	04-Aug-2020 06:35	----	----	----	----
						WR2000607-011	--------	--------	--------	--------
						Result	----	----	----	----
Dissolved Metals										
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	----	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00044	----	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0964	----	----	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	----	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	----	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.018	----	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000421	----	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		61.3	----	----	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00037	----	----	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00094	----	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00335	----	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.076	----	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	----	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0015	----	----	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		23.4	----	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		3.19	----	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	----	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00647	----	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00918	----	----	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	----	----	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		2.36	----	----	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000216	----	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		7.10	----	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	----	----	----	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		13.6	----	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.584	----	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		13.8	----	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	----	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		0.00034 DTMF	----	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		0.00044	----	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00144	----	----	----	----

Analytical Results

Sub-Matrix: **Water** (Matrix: **Water**)					Client sample ID	**W50**	----	----	----	----
					Client sampling date / time	04-Aug-2020 06:35	----	----	----	----
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*		**WR2000607-011**	--------	--------	--------	--------
						Result	----	----	----	----
Dissolved Metals										
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00062	----	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0014	----	----	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		0.00041	----	----	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	----	----	----	----
dissolved metals filtration location	----	EP421	-	-		Field	----	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000798**	Page	: 1 of 14
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: ----	Date Samples Received	: 01-Sep-2020 14:25
PO	: 232817	Date Analysis Commenced	: 04-Sep-2020
C-O-C number	: 2020-09-01 A	Issue Date	: 10-Sep-2020 14:57
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 12		
No. of samples analysed	: 12		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Angelo Salandanan	Lab Assistant	Metals, Burnaby, British Columbia
Bruna Botti	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Qualifiers

Qualifier	*Description*
DLA	*Detection Limit adjusted for required dilution.*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*
DTMF	*Dissolved concentration exceeds total for field-filtered metals sample. Metallic contaminants may have been introduced to dissolved sample during field filtration.*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W55	W12	W14	DUP	W17
					Client sampling date / time	26-Aug-2020 14:00	26-Aug-2020 14:50	26-Aug-2020 16:30	26-Aug-2020	31-Aug-2020 08:00
						WR2000798-001	WR2000798-002	WR2000798-003	WR2000798-004	WR2000798-005
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		71.2	177	90.7	171	189
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		71.2	177	90.7	171	189
conductivity	----	E100	2.0	µS/cm		185	2140	3410	2170	514
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		118	1310	1940	1310	302
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		90.5	1060	----	1080	236
pH	----	E108	0.10	pH units		7.75	8.07	8.03	8.08	8.12
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		128	1910	3250	1880	341
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	10.8	15.4	8.2	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0150	2.40	12.2	2.43	0.0336
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		2.15	21.8	29.5	22.0	6.34
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.0818	10.1	33.6	9.97	0.0354
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		0.0822	12.5	36.4	12.4	0.0362
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	2.47	2.79	2.48	<0.0010
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		16.8	1110	1950	1090	67.4
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		----	----	----	----	11.7
Ion Balance										
anion sum	----	EC101	0.10	meq/L		1.84	28.2	45.8	27.6	5.37
cation sum	----	EC101	0.10	meq/L		2.66	31.1	51.0	30.9	6.87
ion balance (cation-anion difference)	----	EC101	0.010	%		18.2	4.89	5.37	5.64	12.2
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.0758	0.183	----	0.116	0.0051
antimony, total	7440-36-0	E420	0.00010	mg/L		0.00010	0.00031	----	0.00031	<0.00010
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00046	0.00051	----	0.00046	0.00047
barium, total	7440-39-3	E420	0.00010	mg/L		0.0503	0.0671	----	0.0641	0.0610
beryllium, total	7440-41-7	E420	0.000020	mg/L		<0.000020	<0.000040 DLA	----	<0.000040 DLA	<0.000020

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W55	W12	W14	DUP	W17
					Client sampling date / time	26-Aug-2020 14:00	26-Aug-2020 14:50	26-Aug-2020 16:30	26-Aug-2020	31-Aug-2020 08:00
						WR2000798-001	WR2000798-002	WR2000798-003	WR2000798-004	WR2000798-005
						Result	Result	Result	Result	Result
Total Metals										
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000100 DLA	----	<0.000100 DLA	<0.000050
boron, total	7440-42-8	E420	0.010	mg/L		<0.010	0.203	----	0.212	0.020
cadmium, total	7440-43-9	E420	0.0000050	mg/L		0.0000111	0.000104	----	0.000122	0.0000074
calcium, total	7440-70-2	E420	0.050	mg/L		25.5	344	----	354	62.1
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00062	0.00021	----	<0.00020 DLA	0.00020
cobalt, total	7440-48-4	E420	0.00010	mg/L		<0.00010	0.00032	----	0.00026	<0.00010
copper, total	7440-50-8	E420	0.00050	mg/L		0.0632	0.0852	----	0.0799	0.0113
iron, total	7439-89-6	E420	0.010	mg/L		0.103	0.364	----	0.245	0.072
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	0.000135	----	0.000124	<0.000050
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0011	0.0093	----	0.0092	0.0014
magnesium, total	7439-95-4	E420	0.100	mg/L		6.50	48.3	----	48.0	19.6
manganese, total	7439-96-5	E420	0.00010	mg/L		0.00270	0.299	----	0.291	0.0750
mercury, total	7439-97-6	E508	0.0000050	mg/L		<0.0000050	<0.0000050	----	<0.0000050	<0.0000050
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.000910	0.0318	----	0.0316	0.00773
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00160	0.00251	----	0.00242	0.00093
phosphorus, total	7723-14-0	E420	0.050	mg/L		<0.050	<0.100 DLA	----	<0.100 DLA	<0.050
potassium, total	7440-09-7	E420	0.100	mg/L		1.32	18.6	----	18.4	3.49
selenium, total	7782-49-2	E420	0.000050	mg/L		0.000235	0.00538	----	0.00561	0.000480
silicon, total	7440-21-3	E420	0.10	mg/L		5.96	4.74	----	4.70	6.04
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000020 DLA	----	<0.000020 DLA	<0.000010
sodium, total	7440-23-5	E420	0.050	mg/L		4.26	70.8	----	71.1	13.2
strontium, total	7440-24-6	E420	0.00020	mg/L		0.200	5.12	----	5.00	0.671
sulfur, total	7704-34-9	E420	0.50	mg/L		5.55	391	----	396	23.5
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000020 DLA	----	<0.000020 DLA	<0.000010
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	<0.00020 DLA	----	<0.00020 DLA	0.00016
titanium, total	7440-32-6	E420	0.00030	mg/L		0.00168	0.0102	----	0.00547	<0.00030
uranium, total	7440-61-1	E420	0.000010	mg/L		0.000205	0.00498	----	0.00516	0.00164
vanadium, total	7440-62-2	E420	0.00050	mg/L		0.00080	0.00128	----	0.00104	<0.00050
zinc, total	7440-66-6	E420	0.0030	mg/L		<0.0030	<0.0060 DLA	----	<0.0060 DLA	<0.0030
zirconium, total	7440-67-7	E420	0.00020	mg/L		0.00053	<0.00040 DLA	----	<0.00040 DLA	<0.00020
Dissolved Metals										

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W55	W12	W14	DUP	W17
					Client sampling date / time	26-Aug-2020 14:00	26-Aug-2020 14:50	26-Aug-2020 16:30	26-Aug-2020	31-Aug-2020 08:00
						WR2000798-001	WR2000798-002	WR2000798-003	WR2000798-004	WR2000798-005
						Result	Result	Result	Result	Result
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0773	0.0036	0.0535	0.0045	0.0060
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		0.00011	0.00032	0.00044	0.00030	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00042	0.00024	0.00026	<0.00020 DLA	0.00039
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0558	0.0658	0.200	0.0666	0.0681
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		0.000025	<0.000040 DLA	<0.000040 DLA	<0.000040 DLA	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000100 DLA	<0.000100 DLA	<0.000100 DLA	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		<0.010	0.213	0.665	0.215	0.018
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000161	0.0000937	<0.0000250 DLM	0.000114	0.0000083
calcium, dissolved	7440-70-2	E421	0.050	mg/L		33.8	427	672	422	80.1
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00057	<0.00020 DLA	<0.00020 DLA	<0.00020 DLA	0.00016
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00020 DLA	<0.00020 DLA	0.00020	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.0657	0.0518	0.00198	0.0520	0.0115
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.088	<0.020 DLA	<0.020 DLA	<0.020 DLA	0.058
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000100 DLA	<0.000100 DLA	<0.000100 DLA	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0012	0.0088	0.0104	0.0088	0.0014
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		8.16	60.4	64.4	61.5	24.8
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.00276	0.278	0.345	0.287	0.0722
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000500 DLM	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.000949	0.0343	0.0766	0.0337	0.00838
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00162	0.00243	0.00337	0.00243	0.00092
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.100 DLA	<0.100 DLA	<0.100 DLA	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		1.42	21.6	97.4	22.4	3.76
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000292	0.00544	0.00648	0.00562	0.000482
silicon, dissolved	7440-21-3	E421	0.050	mg/L		5.95	4.69	2.22	4.51	5.87
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000020 DLA	<0.000020 DLA	<0.000020 DLA	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		5.76 DTMF	93.3	202	93.3	16.5
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.238	5.65	7.13	5.65	0.829
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		5.08	408	703	394	21.8
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000020 DLA	<0.000020 DLA	<0.000020 DLA	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		0.00014	<0.00020 DLA	0.00027	<0.00020 DLA	0.00013
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		0.00225	<0.00060 DLA	<0.00060 DLA	<0.00060 DLA	0.00054

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W55	W12	W14	DUP	W17
					Client sampling date / time	26-Aug-2020 14:00	26-Aug-2020 14:50	26-Aug-2020 16:30	26-Aug-2020	31-Aug-2020 08:00
						WR2000798-001	WR2000798-002	WR2000798-003	WR2000798-004	WR2000798-005
						Result	Result	Result	Result	Result
Dissolved Metals										
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000184	0.00433	0.00348	0.00430	0.00152
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00074	<0.00100 DLA	<0.00100 DLA	<0.00100 DLA	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0019	0.0029	<0.0020 DLA	0.0032	0.0022
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		0.00060	<0.00040 DLA	<0.00040 DLA	<0.00040 DLA	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MC1	MN	W50	W2	W3
					Client sampling date / time	31-Aug-2020 10:50	31-Aug-2020 14:10	01-Sep-2020 15:50	01-Sep-2020 06:30	01-Sep-2020 06:55
						WR2000798-006	WR2000798-007	WR2000798-008	WR2000798-009	WR2000798-010
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		137	82.5	244	144	238
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		137	82.5	244	144	238
conductivity	----	E100	2.0	µS/cm		295	443	546	306	546
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		181	200	313	176	323
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		140	166	252	146	261
pH	----	E108	0.10	pH units		8.19	8.13	7.68	8.17	8.17
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		204	294	362	208	354
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		19.0	<3.0	<3.0	<3.0	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0246	0.0257	0.221	0.0214	0.0076
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		1.10	1.03	5.91	1.22	4.56
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.0131	11.0	0.0233	0.0331	0.0601
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		0.0134	11.0	0.0240	0.0333	0.0601
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	0.0221	<0.0010	<0.0010	<0.0010
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		15.2	87.3	44.1	17.0	48.5
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		13.7	----	14.7	12.7	9.63
Ion Balance										
anion sum	----	EC101	0.10	meq/L		3.09	4.28	5.96	3.27	5.91
cation sum	----	EC101	0.10	meq/L		4.13	5.07	7.29	4.04	7.49
ion balance (cation-anion difference)	----	EC101	0.010	%		14.4	8.45	10.0	10.5	11.8
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.370	0.0874	0.0467	0.0576	0.0119
antimony, total	7440-36-0	E420	0.00010	mg/L		<0.00010	0.00013	<0.00010	<0.00010	<0.00010
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00084	0.00052	0.00053	0.00061	0.00029
barium, total	7440-39-3	E420	0.00010	mg/L		0.0624	0.0268	0.110	0.0567	0.0575
beryllium, total	7440-41-7	E420	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MC1	MN	W50	W2	W3
					Client sampling date / time	31-Aug-2020 10:50	31-Aug-2020 14:10	01-Sep-2020 15:50	01-Sep-2020 06:30	01-Sep-2020 06:55
						WR2000798-006	WR2000798-007	WR2000798-008	WR2000798-009	WR2000798-010
						Result	Result	Result	Result	Result
Total Metals										
boron, total	7440-42-8	E420	0.010	mg/L		<0.010	0.052	0.019	<0.010	0.024
cadmium, total	7440-43-9	E420	0.0000050	mg/L		0.0000098	0.0000364	0.0000441	<0.0000050	<0.0000050
calcium, total	7440-70-2	E420	0.050	mg/L		34.9	53.4	60.7	36.8	58.0
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00102	<0.00010	0.00041	0.00044	0.00019
cobalt, total	7440-48-4	E420	0.00010	mg/L		0.00029	<0.00010	0.00124	<0.00010	<0.00010
copper, total	7440-50-8	E420	0.00050	mg/L		0.00329	0.0202	0.00611	0.00253	0.00367
iron, total	7439-89-6	E420	0.010	mg/L		0.696	0.107	0.332	0.169	0.036
lead, total	7439-92-1	E420	0.000050	mg/L		0.000150	0.000051	<0.000050	<0.000050	<0.000050
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0015	0.0043	0.0015	0.0015	0.0030
magnesium, total	7439-95-4	E420	0.100	mg/L		12.9	8.05	24.5	13.1	28.2
manganese, total	7439-96-5	E420	0.00010	mg/L		0.0448	0.00667	3.74	0.0127	0.0550
mercury, total	7439-97-6	E508	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.00140	0.0206	0.00695	0.00132	0.00524
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00195	<0.00050	0.00940	0.00123	0.00144
phosphorus, total	7723-14-0	E420	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, total	7440-09-7	E420	0.100	mg/L		0.993	3.98	2.40	1.10	2.30
selenium, total	7782-49-2	E420	0.000050	mg/L		0.000151	0.0146	0.000192	0.000112	0.000267
silicon, total	7440-21-3	E420	0.10	mg/L		7.40	2.89	7.61	6.53	6.75
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, total	7440-23-5	E420	0.050	mg/L		8.21	17.9	14.4	8.81	17.8
strontium, total	7440-24-6	E420	0.00020	mg/L		0.361	1.45	0.598	0.380	0.775
sulfur, total	7704-34-9	E420	0.50	mg/L		5.58	30.4	15.8	6.15	18.9
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	0.00024	<0.00010	<0.00010	<0.00010
titanium, total	7440-32-6	E420	0.00030	mg/L		0.0161	0.00441	0.00244	0.00238	0.00047
uranium, total	7440-61-1	E420	0.000010	mg/L		0.00106	0.000952	0.00141	0.00116	0.00234
vanadium, total	7440-62-2	E420	0.00050	mg/L		0.00198	0.00088	0.00067	0.00097	<0.00050
zinc, total	7440-66-6	E420	0.0030	mg/L		<0.0030	<0.0030	0.0065	<0.0030	<0.0030
zirconium, total	7440-67-7	E420	0.00020	mg/L		0.00033	<0.00020	0.00045	0.00022	<0.00020
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0109	0.0138	0.0120	0.0093	0.0047

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MC1	MN	W50	W2	W3
					Client sampling date / time	31-Aug-2020 10:50	31-Aug-2020 14:10	01-Sep-2020 15:50	01-Sep-2020 06:30	01-Sep-2020 06:55
						WR2000798-006	WR2000798-007	WR2000798-008	WR2000798-009	WR2000798-010
						Result	Result	Result	Result	Result
Dissolved Metals										
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	0.00013	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00054	0.00040	0.00047	0.00052	0.00021
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0594	0.0275	0.112	0.0610	0.0612
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		<0.010	0.047	0.017	<0.010	0.022
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000050	0.0000369	0.0000279	<0.0000050	<0.0000050
calcium, dissolved	7440-70-2	E421	0.050	mg/L		45.8	63.8	75.3	44.2	70.4
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00040	<0.00010	0.00033	0.00032	0.00017
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	0.00129	<0.00010	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00256	0.00976	0.00251	0.00247	0.00363
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.109	0.012	0.222	0.068	0.020
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0013	0.0042	0.0014	0.0015	0.0029
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		16.2	9.91	30.3	16.0	35.8
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0112	0.00304	4.30	0.00658	0.0507
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00146	0.0218	0.00724	0.00144	0.00544
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00137	<0.00050	0.00904	0.00114	0.00142
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		1.03	4.21	2.52	1.18	2.43
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000096	0.0140	0.000195	0.000130	0.000280
silicon, dissolved	7440-21-3	E421	0.050	mg/L		6.34	2.65	7.26	6.43	6.45
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		11.0	22.2	18.2	11.2	22.4
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.431	1.71	0.698	0.444	0.879
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		4.68	28.8	14.9	5.66	16.9
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		0.00059	0.00034	0.00088	0.00045	<0.00030
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000958	0.000854	0.00125	0.00107	0.00212

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MC1	MN	W50	W2	W3
					Client sampling date / time	31-Aug-2020 10:50	31-Aug-2020 14:10	01-Sep-2020 15:50	01-Sep-2020 06:30	01-Sep-2020 06:55
						WR2000798-006	WR2000798-007	WR2000798-008	WR2000798-009	WR2000798-010
						Result	Result	Result	Result	Result
Dissolved Metals										
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00088	0.00056	0.00050	0.00073	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		0.00027	<0.00020	0.00043	0.00024	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W7	DUP	----	----	----
					Client sampling date / time	01-Sep-2020 07:20	31-Aug-2020	----	----	----
						WR2000798-011	WR2000798-012	--------	--------	--------
						Result	Result	----	----	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		123	141	----	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		123	141	----	----	----
conductivity	----	E100	2.0	µS/cm		246	292	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		148	174	----	----	----
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		118	140	----	----	----
pH	----	E108	0.10	pH units		8.07	8.18	----	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		173	202	----	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		4.2	236	----	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0126	0.0072	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.22	1.07	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.0490	0.0146	----	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		0.0490	0.0150	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	<0.0010	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		7.09	14.4	----	----	----
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		13.4	13.9	----	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		2.62	3.15	----	----	----
cation sum	----	EC101	0.10	meq/L		3.38	3.97	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		12.7	11.5	----	----	----
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.107	0.406	----	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L		<0.00010	0.00011	----	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00048	0.00081	----	----	----
barium, total	7440-39-3	E420	0.00010	mg/L		0.0627	0.0644	----	----	----
beryllium, total	7440-41-7	E420	0.000020	mg/L		<0.000020	<0.000020	----	----	----
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	----	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W7	DUP	----	----	----
					Client sampling date / time	01-Sep-2020 07:20	31-Aug-2020	----	----	----
						WR2000798-011	WR2000798-012	--------	--------	--------
						Result	Result	----	----	----
Total Metals										
boron, total	7440-42-8	E420	0.010	mg/L		<0.010	<0.010	----	----	----
cadmium, total	7440-43-9	E420	0.0000050	mg/L		<0.0000050	0.0000131	----	----	----
calcium, total	7440-70-2	E420	0.050	mg/L		29.0	34.6	----	----	----
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00059	0.00111	----	----	----
cobalt, total	7440-48-4	E420	0.00010	mg/L		0.00014	0.00032	----	----	----
copper, total	7440-50-8	E420	0.00050	mg/L		0.00188	0.00370	----	----	----
iron, total	7439-89-6	E420	0.010	mg/L		0.249	0.745	----	----	----
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	0.000163	----	----	----
lithium, total	7439-93-2	E420	0.0010	mg/L		<0.0010	0.0015	----	----	----
magnesium, total	7439-95-4	E420	0.100	mg/L		11.0	12.9	----	----	----
manganese, total	7439-96-5	E420	0.00010	mg/L		0.0208	0.0471	----	----	----
mercury, total	7439-97-6	E508	0.0000050	mg/L		<0.0000050	<0.0000050	----	----	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.00128	0.00146	----	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00142	0.00200	----	----	----
phosphorus, total	7723-14-0	E420	0.050	mg/L		<0.050	<0.050	----	----	----
potassium, total	7440-09-7	E420	0.100	mg/L		0.791	1.02	----	----	----
selenium, total	7782-49-2	E420	0.000050	mg/L		0.000160	0.000155	----	----	----
silicon, total	7440-21-3	E420	0.10	mg/L		6.75	7.46	----	----	----
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	----	----	----
sodium, total	7440-23-5	E420	0.050	mg/L		7.21	8.42	----	----	----
strontium, total	7440-24-6	E420	0.00020	mg/L		0.318	0.360	----	----	----
sulfur, total	7704-34-9	E420	0.50	mg/L		2.81	5.84	----	----	----
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000010	----	----	----
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	<0.00010	----	----	----
titanium, total	7440-32-6	E420	0.00030	mg/L		0.00409	0.0186	----	----	----
uranium, total	7440-61-1	E420	0.000010	mg/L		0.000708	0.00105	----	----	----
vanadium, total	7440-62-2	E420	0.00050	mg/L		0.00106	0.00207	----	----	----
zinc, total	7440-66-6	E420	0.0030	mg/L		<0.0030	0.0052	----	----	----
zirconium, total	7440-67-7	E420	0.00020	mg/L		0.00026	0.00042	----	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0122	0.0131	----	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W7	DUP	----	----	----
					Client sampling date / time	01-Sep-2020 07:20	31-Aug-2020	----	----	----
						WR2000798-011	WR2000798-012	--------	--------	--------
						Result	Result	----	----	----
Dissolved Metals										
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00042	0.00055	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0657	0.0595	----	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		<0.010	<0.010	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000050	<0.0000050	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		37.0	43.4	----	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00036	0.00032	----	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00183	0.00280	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.086	0.111	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		<0.0010	0.0013	----	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		13.5	15.9	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0152	0.0114	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00131	0.00150	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00124	0.00124	----	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	----	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		0.820	1.01	----	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000164	0.000132	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		6.42	6.40	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	----	----	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		9.09	10.5	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.371	0.423	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		2.30	5.10	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		0.00051	0.00081	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000648	0.000936	----	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W7	DUP	----	----	----
					Client sampling date / time	01-Sep-2020 07:20	31-Aug-2020	----	----	----
						WR2000798-011	WR2000798-012	--------	--------	--------
						Result	Result	----	----	----
Dissolved Metals										
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00074	0.00091	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		<0.0010	<0.0010	----	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		0.00025	0.00027	----	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	----	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WR2000798**	Page	: 1 of 29
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: ----	Date Samples Received	: 01-Sep-2020 14:25
PO	: 232817	Issue Date	: 10-Sep-2020 14:57
C-O-C number	: 2020-09-01 A		
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 12		
No. of samples analysed	: 12		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Matrix Spike outliers occur.
- Laboratory Control Sample (LCS) outliers occur - please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **Water**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Laboratory Control Sample (LCS) Recoveries								
Dissolved Metals	QC-MRG2-8207700 2	----	sodium, dissolved	7440-23-5	E421	129 % MES	80.0-120%	Recovery greater than upper control limit

Result Qualifiers

Qualifier	Description
MES	*Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).*

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
DUP	E298	26-Aug-2020	----	----	----		09-Sep-2020	28 days	13 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
W12	E298	26-Aug-2020	----	----	----		09-Sep-2020	28 days	13 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
W14	E298	26-Aug-2020	----	----	----		09-Sep-2020	28 days	13 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
W55	E298	26-Aug-2020	----	----	----		09-Sep-2020	28 days	13 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
W50	E298	01-Sep-2020	----	----	----		09-Sep-2020	28 days	7 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
DUP	E298	31-Aug-2020	----	----	----		09-Sep-2020	28 days	8 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MN	E298	31-Aug-2020	----	----	----		09-Sep-2020	28 days	8 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
W2	E298	01-Sep-2020	----	----	----		09-Sep-2020	28 days	8 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
W3	E298	01-Sep-2020	----	----	----		09-Sep-2020	28 days	8 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
W7	E298	01-Sep-2020	----	----	----		09-Sep-2020	28 days	8 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MC1	E298	31-Aug-2020	----	----	----		09-Sep-2020	28 days	9 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
W17	E298	31-Aug-2020	----	----	----		09-Sep-2020	28 days	9 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
W50	E235.Cl-L	01-Sep-2020	----	----	----		04-Sep-2020	28 days	2 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
DUP	E235.Cl-L	31-Aug-2020	----	----	----		04-Sep-2020	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
MN	E235.Cl-L	31-Aug-2020	----	----	----		04-Sep-2020	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
W2	E235.Cl-L	01-Sep-2020	----	----	----		04-Sep-2020	28 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE W3	E235.Cl-L	01-Sep-2020	----	----	----		04-Sep-2020	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE W7	E235.Cl-L	01-Sep-2020	----	----	----		04-Sep-2020	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MC1	E235.Cl-L	31-Aug-2020	----	----	----		04-Sep-2020	28 days	4 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE W17	E235.Cl-L	31-Aug-2020	----	----	----		04-Sep-2020	28 days	4 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE DUP	E235.Cl-L	26-Aug-2020	----	----	----		04-Sep-2020	28 days	8 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE W12	E235.Cl-L	26-Aug-2020	----	----	----		04-Sep-2020	28 days	8 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE W14	E235.Cl-L	26-Aug-2020	----	----	----		04-Sep-2020	28 days	8 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE W55	E235.Cl-L	26-Aug-2020	----	----	----		04-Sep-2020	28 days	8 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE W50	E235.NO3-L	01-Sep-2020	----	----	----		04-Sep-2020	3 days	2 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE DUP	E235.NO3-L	31-Aug-2020	----	----	----		04-Sep-2020	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MN	E235.NO3-L	31-Aug-2020	----	----	----		04-Sep-2020	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE W2	E235.NO3-L	01-Sep-2020	----	----	----		04-Sep-2020	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE W3	E235.NO3-L	01-Sep-2020	----	----	----		04-Sep-2020	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE W7	E235.NO3-L	01-Sep-2020	----	----	----		04-Sep-2020	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MC1	E235.NO3-L	31-Aug-2020	----	----	----		04-Sep-2020	3 days	4 days	× EHT
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE W17	E235.NO3-L	31-Aug-2020	----	----	----		04-Sep-2020	3 days	4 days	× EHT
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE DUP	E235.NO3-L	26-Aug-2020	----	----	----		04-Sep-2020	3 days	8 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE W12	E235.NO3-L	26-Aug-2020	----	----	----		04-Sep-2020	3 days	8 days	× EHTR

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE W14	E235.NO3-L	26-Aug-2020	----	----	----		04-Sep-2020	3 days	8 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE W55	E235.NO3-L	26-Aug-2020	----	----	----		04-Sep-2020	3 days	8 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE W50	E235.NO2-L	01-Sep-2020	----	----	----		04-Sep-2020	3 days	2 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE DUP	E235.NO2-L	31-Aug-2020	----	----	----		04-Sep-2020	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MN	E235.NO2-L	31-Aug-2020	----	----	----		04-Sep-2020	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE W2	E235.NO2-L	01-Sep-2020	----	----	----		04-Sep-2020	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE W3	E235.NO2-L	01-Sep-2020	----	----	----		04-Sep-2020	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE W7	E235.NO2-L	01-Sep-2020	----	----	----		04-Sep-2020	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MC1	E235.NO2-L	31-Aug-2020	----	----	----		04-Sep-2020	3 days	4 days	× EHT

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE W17	E235.NO2-L	31-Aug-2020	----	----	----		04-Sep-2020	3 days	4 days	× EHT
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE DUP	E235.NO2-L	26-Aug-2020	----	----	----		04-Sep-2020	3 days	8 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE W12	E235.NO2-L	26-Aug-2020	----	----	----		04-Sep-2020	3 days	8 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE W14	E235.NO2-L	26-Aug-2020	----	----	----		04-Sep-2020	3 days	8 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE W55	E235.NO2-L	26-Aug-2020	----	----	----		04-Sep-2020	3 days	8 days	× EHTR
Anions and Nutrients : Sulfate in Water by IC										
HDPE W50	E235.SO4	01-Sep-2020	----	----	----		04-Sep-2020	28 days	2 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE DUP	E235.SO4	31-Aug-2020	----	----	----		04-Sep-2020	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MN	E235.SO4	31-Aug-2020	----	----	----		04-Sep-2020	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE W2	E235.SO4	01-Sep-2020	----	----	----		04-Sep-2020	28 days	3 days	✓

Matrix: **Water**

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Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
W3	E235.SO4	01-Sep-2020	----	----	----		04-Sep-2020	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
W7	E235.SO4	01-Sep-2020	----	----	----		04-Sep-2020	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MC1	E235.SO4	31-Aug-2020	----	----	----		04-Sep-2020	28 days	4 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
W17	E235.SO4	31-Aug-2020	----	----	----		04-Sep-2020	28 days	4 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
DUP	E235.SO4	26-Aug-2020	----	----	----		04-Sep-2020	28 days	8 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
W12	E235.SO4	26-Aug-2020	----	----	----		04-Sep-2020	28 days	8 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
W14	E235.SO4	26-Aug-2020	----	----	----		04-Sep-2020	28 days	8 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
W55	E235.SO4	26-Aug-2020	----	----	----		04-Sep-2020	28 days	8 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
W2	E421.Cr-L	01-Sep-2020	05-Sep-2020	180 days	3 days	✓	07-Sep-2020	176 days	2 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) W3	E421.Cr-L	01-Sep-2020	05-Sep-2020	180 days	3 days	✓	07-Sep-2020	176 days	2 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) W50	E421.Cr-L	01-Sep-2020	05-Sep-2020	180 days	3 days	✓	07-Sep-2020	176 days	2 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) W7	E421.Cr-L	01-Sep-2020	05-Sep-2020	180 days	3 days	✓	07-Sep-2020	176 days	2 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) DUP	E421.Cr-L	31-Aug-2020	05-Sep-2020	180 days	4 days	✓	07-Sep-2020	175 days	2 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MC1	E421.Cr-L	31-Aug-2020	05-Sep-2020	180 days	4 days	✓	07-Sep-2020	175 days	2 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MN	E421.Cr-L	31-Aug-2020	05-Sep-2020	180 days	4 days	✓	07-Sep-2020	175 days	2 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) W17	E421.Cr-L	31-Aug-2020	05-Sep-2020	180 days	4 days	✓	07-Sep-2020	175 days	2 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) DUP	E421.Cr-L	26-Aug-2020	05-Sep-2020	180 days	9 days	✓	07-Sep-2020	170 days	2 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) W12	E421.Cr-L	26-Aug-2020	05-Sep-2020	180 days	9 days	✓	07-Sep-2020	170 days	2 days	✓

Matrix: **Water**

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Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) W14	E421.Cr-L	26-Aug-2020	05-Sep-2020	180 days	9 days	✓	07-Sep-2020	170 days	2 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) W55	E421.Cr-L	26-Aug-2020	05-Sep-2020	180 days	9 days	✓	07-Sep-2020	170 days	2 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) W50	E509	01-Sep-2020	04-Sep-2020	28 days	2 days	✓	04-Sep-2020	25 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) DUP	E509	31-Aug-2020	04-Sep-2020	28 days	3 days	✓	04-Sep-2020	24 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MN	E509	31-Aug-2020	04-Sep-2020	28 days	3 days	✓	04-Sep-2020	24 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) W2	E509	01-Sep-2020	04-Sep-2020	28 days	3 days	✓	04-Sep-2020	24 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) W3	E509	01-Sep-2020	04-Sep-2020	28 days	3 days	✓	04-Sep-2020	24 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) W7	E509	01-Sep-2020	04-Sep-2020	28 days	3 days	✓	04-Sep-2020	24 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MC1	E509	31-Aug-2020	04-Sep-2020	28 days	4 days	✓	04-Sep-2020	23 days	0 days	✓

Matrix: **Water**

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Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) W17	E509	31-Aug-2020	04-Sep-2020	28 days	4 days	✓	04-Sep-2020	23 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) DUP	E509	26-Aug-2020	04-Sep-2020	28 days	8 days	✓	04-Sep-2020	19 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) W12	E509	26-Aug-2020	04-Sep-2020	28 days	8 days	✓	04-Sep-2020	19 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) W55	E509	26-Aug-2020	04-Sep-2020	28 days	8 days	✓	04-Sep-2020	19 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) W14	E509	26-Aug-2020	05-Sep-2020	28 days	9 days	✓	05-Sep-2020	18 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) W2	E421	01-Sep-2020	05-Sep-2020	180 days	3 days	✓	07-Sep-2020	176 days	2 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) W3	E421	01-Sep-2020	05-Sep-2020	180 days	3 days	✓	07-Sep-2020	176 days	2 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) W50	E421	01-Sep-2020	05-Sep-2020	180 days	3 days	✓	07-Sep-2020	176 days	2 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) W7	E421	01-Sep-2020	05-Sep-2020	180 days	3 days	✓	07-Sep-2020	176 days	2 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) DUP	E421	31-Aug-2020	05-Sep-2020	180 days	4 days	✓	07-Sep-2020	175 days	2 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MC1	E421	31-Aug-2020	05-Sep-2020	180 days	4 days	✓	07-Sep-2020	175 days	2 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MN	E421	31-Aug-2020	05-Sep-2020	180 days	4 days	✓	07-Sep-2020	175 days	2 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) W17	E421	31-Aug-2020	05-Sep-2020	180 days	4 days	✓	07-Sep-2020	175 days	2 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) DUP	E421	26-Aug-2020	05-Sep-2020	180 days	9 days	✓	07-Sep-2020	170 days	2 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) W12	E421	26-Aug-2020	05-Sep-2020	180 days	9 days	✓	07-Sep-2020	170 days	2 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) W14	E421	26-Aug-2020	05-Sep-2020	180 days	9 days	✓	07-Sep-2020	170 days	2 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) W55	E421	26-Aug-2020	05-Sep-2020	180 days	9 days	✓	07-Sep-2020	170 days	2 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) W50	E358-L	01-Sep-2020	----	----	----		07-Sep-2020	28 days	5 days	✓

Matrix: **Water**

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Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) DUP	E358-L	31-Aug-2020	----	----	----		07-Sep-2020	28 days	6 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) W2	E358-L	01-Sep-2020	----	----	----		07-Sep-2020	28 days	6 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) W3	E358-L	01-Sep-2020	----	----	----		07-Sep-2020	28 days	6 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) W7	E358-L	01-Sep-2020	----	----	----		07-Sep-2020	28 days	6 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) MC1	E358-L	31-Aug-2020	----	----	----		07-Sep-2020	28 days	7 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) W17	E358-L	31-Aug-2020	----	----	----		07-Sep-2020	28 days	7 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE W50	E290	01-Sep-2020	----	----	----		04-Sep-2020	14 days	2 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE DUP	E290	31-Aug-2020	----	----	----		04-Sep-2020	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE W2	E290	01-Sep-2020	----	----	----		04-Sep-2020	14 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE W3	E290	01-Sep-2020	----	----	----		04-Sep-2020	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE W7	E290	01-Sep-2020	----	----	----		04-Sep-2020	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MC1	E290	31-Aug-2020	----	----	----		04-Sep-2020	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MN	E290	31-Aug-2020	----	----	----		04-Sep-2020	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE W17	E290	31-Aug-2020	----	----	----		04-Sep-2020	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE DUP	E290	26-Aug-2020	----	----	----		04-Sep-2020	14 days	8 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE W14	E290	26-Aug-2020	----	----	----		04-Sep-2020	14 days	8 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE W12	E290	26-Aug-2020	----	----	----		04-Sep-2020	14 days	9 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE W55	E290	26-Aug-2020	----	----	----		04-Sep-2020	14 days	9 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Conductivity in Water										
HDPE W50	E100	01-Sep-2020	----	----	----		04-Sep-2020	28 days	2 days	✓
Physical Tests : Conductivity in Water										
HDPE DUP	E100	31-Aug-2020	----	----	----		04-Sep-2020	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE W2	E100	01-Sep-2020	----	----	----		04-Sep-2020	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE W3	E100	01-Sep-2020	----	----	----		04-Sep-2020	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE W7	E100	01-Sep-2020	----	----	----		04-Sep-2020	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE MC1	E100	31-Aug-2020	----	----	----		04-Sep-2020	28 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE MN	E100	31-Aug-2020	----	----	----		04-Sep-2020	28 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE W17	E100	31-Aug-2020	----	----	----		04-Sep-2020	28 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE DUP	E100	26-Aug-2020	----	----	----		04-Sep-2020	28 days	8 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Conductivity in Water										
HDPE W14	E100	26-Aug-2020	----	----	----		04-Sep-2020	28 days	8 days	✓
Physical Tests : Conductivity in Water										
HDPE W12	E100	26-Aug-2020	----	----	----		04-Sep-2020	28 days	9 days	✓
Physical Tests : Conductivity in Water										
HDPE W55	E100	26-Aug-2020	----	----	----		04-Sep-2020	28 days	9 days	✓
Physical Tests : pH by Meter										
HDPE MC1	E108	31-Aug-2020	----	----	----		04-Sep-2020	0.25 hrs	100 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE W17	E108	31-Aug-2020	----	----	----		04-Sep-2020	0.25 hrs	102 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE W14	E108	26-Aug-2020	----	----	----		04-Sep-2020	0.25 hrs	214 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE DUP	E108	26-Aug-2020	----	----	----		04-Sep-2020	0.25 hrs	215 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE W12	E108	26-Aug-2020	----	----	----		04-Sep-2020	0.25 hrs	216 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE W55	E108	26-Aug-2020	----	----	----		04-Sep-2020	0.25 hrs	216 hrs	× EHTR-FM

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : pH by Meter										
HDPE W50	E108	01-Sep-2020	----	----	----		04-Sep-2020	0.25 hrs	71 hrs	× EHTL
Physical Tests : pH by Meter										
HDPE W3	E108	01-Sep-2020	----	----	----		04-Sep-2020	0.25 hrs	79 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE W7	E108	01-Sep-2020	----	----	----		04-Sep-2020	0.25 hrs	79 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE W2	E108	01-Sep-2020	----	----	----		04-Sep-2020	0.25 hrs	80 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE DUP	E108	31-Aug-2020	----	----	----		04-Sep-2020	0.25 hrs	95 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MN	E108	31-Aug-2020	----	----	----		04-Sep-2020	0.25 hrs	96 hrs	× EHTR-FM
Physical Tests : TSS by Gravimetry										
HDPE W2	E160-H	01-Sep-2020	----	----	----		04-Sep-2020	7 days	3 days	✓
Physical Tests : TSS by Gravimetry										
HDPE W3	E160-H	01-Sep-2020	----	----	----		04-Sep-2020	7 days	3 days	✓
Physical Tests : TSS by Gravimetry										
HDPE W50	E160-H	01-Sep-2020	----	----	----		04-Sep-2020	7 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TSS by Gravimetry										
HDPE W7	E160-H	01-Sep-2020	----	----	----		04-Sep-2020	7 days	3 days	✓
Physical Tests : TSS by Gravimetry										
HDPE DUP	E160-H	31-Aug-2020	----	----	----		04-Sep-2020	7 days	4 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MC1	E160-H	31-Aug-2020	----	----	----		04-Sep-2020	7 days	4 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MN	E160-H	31-Aug-2020	----	----	----		04-Sep-2020	7 days	4 days	✓
Physical Tests : TSS by Gravimetry										
HDPE W17	E160-H	31-Aug-2020	----	----	----		04-Sep-2020	7 days	4 days	✓
Physical Tests : TSS by Gravimetry										
HDPE DUP	E160-H	26-Aug-2020	----	----	----		04-Sep-2020	7 days	9 days	× EHT
Physical Tests : TSS by Gravimetry										
HDPE W12	E160-H	26-Aug-2020	----	----	----		04-Sep-2020	7 days	9 days	× EHT
Physical Tests : TSS by Gravimetry										
HDPE W14	E160-H	26-Aug-2020	----	----	----		04-Sep-2020	7 days	9 days	× EHT
Physical Tests : TSS by Gravimetry										
HDPE W55	E160-H	26-Aug-2020	----	----	----		04-Sep-2020	7 days	9 days	× EHT

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) DUP	E420.Cr-L	26-Aug-2020	----	----	----		05-Sep-2020	180 days	10 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) W12	E420.Cr-L	26-Aug-2020	----	----	----		05-Sep-2020	180 days	10 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) W55	E420.Cr-L	26-Aug-2020	----	----	----		07-Sep-2020	180 days	12 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) W50	E420.Cr-L	01-Sep-2020	----	----	----		07-Sep-2020	180 days	5 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) DUP	E420.Cr-L	31-Aug-2020	----	----	----		07-Sep-2020	180 days	6 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) W2	E420.Cr-L	01-Sep-2020	----	----	----		07-Sep-2020	180 days	6 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) W3	E420.Cr-L	01-Sep-2020	----	----	----		07-Sep-2020	180 days	6 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) W7	E420.Cr-L	01-Sep-2020	----	----	----		07-Sep-2020	180 days	6 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) MC1	E420.Cr-L	31-Aug-2020	----	----	----		07-Sep-2020	180 days	7 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) MN	E420.Cr-L	31-Aug-2020	----	----	----		07-Sep-2020	180 days	7 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) W17	E420.Cr-L	31-Aug-2020	----	----	----		07-Sep-2020	180 days	7 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) W50	E508	01-Sep-2020	----	----	----		04-Sep-2020	28 days	2 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) DUP	E508	31-Aug-2020	----	----	----		04-Sep-2020	28 days	3 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) MN	E508	31-Aug-2020	----	----	----		04-Sep-2020	28 days	3 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) W2	E508	01-Sep-2020	----	----	----		04-Sep-2020	28 days	3 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) W3	E508	01-Sep-2020	----	----	----		04-Sep-2020	28 days	3 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) W7	E508	01-Sep-2020	----	----	----		04-Sep-2020	28 days	3 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) MC1	E508	31-Aug-2020	----	----	----		04-Sep-2020	28 days	4 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) W17	E508	31-Aug-2020	----	----	----		04-Sep-2020	28 days	4 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) DUP	E508	26-Aug-2020	----	----	----		04-Sep-2020	28 days	8 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) W12	E508	26-Aug-2020	----	----	----		04-Sep-2020	28 days	8 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) W55	E508	26-Aug-2020	----	----	----		04-Sep-2020	28 days	8 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) DUP	E420	26-Aug-2020	----	----	----		05-Sep-2020	180 days	10 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) W12	E420	26-Aug-2020	----	----	----		05-Sep-2020	180 days	10 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) W55	E420	26-Aug-2020	----	----	----		07-Sep-2020	180 days	12 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) W50	E420	01-Sep-2020	----	----	----		07-Sep-2020	180 days	5 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) DUP	E420	31-Aug-2020	----	----	----		07-Sep-2020	180 days	6 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) W2	E420	01-Sep-2020	----	----	----		07-Sep-2020	180 days	6 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) W3	E420	01-Sep-2020	----	----	----		07-Sep-2020	180 days	6 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) W7	E420	01-Sep-2020	----	----	----		07-Sep-2020	180 days	6 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) MC1	E420	31-Aug-2020	----	----	----		07-Sep-2020	180 days	7 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) MN	E420	31-Aug-2020	----	----	----		07-Sep-2020	180 days	7 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) W17	E420	31-Aug-2020	----	----	----		07-Sep-2020	180 days	7 days	✓

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	81618	1	12	8.3	5.0	✓
Ammonia by Fluorescence	E298	82572	1	19	5.2	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	81612	1	12	8.3	5.0	✓
Conductivity in Water	E100	81617	1	12	8.3	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	82077	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	81738	3	27	11.1	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	82078	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	82570	1	14	7.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	81613	1	12	8.3	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	81614	1	12	8.3	5.0	✓
pH by Meter	E108	81616	1	12	8.3	5.0	✓
Sulfate in Water by IC	E235.SO4	81615	1	12	8.3	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	81710	2	25	8.0	5.0	✓
Total Mercury in Water by CVAAS	E508	81703	1	15	6.6	5.0	✓
Total Metals in Water by CRC ICPMS	E420	81711	2	37	5.4	5.0	✓
TSS by Gravimetry	E160-H	81988	2	40	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	81618	1	12	8.3	5.0	✓
Ammonia by Fluorescence	E298	82572	1	19	5.2	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	81612	1	12	8.3	5.0	✓
Conductivity in Water	E100	81617	1	12	8.3	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	82077	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	81738	3	27	11.1	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	82078	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	82570	1	14	7.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	81613	1	12	8.3	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	81614	1	12	8.3	5.0	✓
pH by Meter	E108	81616	1	12	8.3	5.0	✓
Sulfate in Water by IC	E235.SO4	81615	1	12	8.3	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	81710	2	25	8.0	5.0	✓
Total Mercury in Water by CVAAS	E508	81703	1	15	6.6	5.0	✓
Total Metals in Water by CRC ICPMS	E420	81711	2	37	5.4	5.0	✓
TSS by Gravimetry	E160-H	81988	2	40	5.0	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	81618	1	12	8.3	5.0	✓
Ammonia by Fluorescence	E298	82572	1	19	5.2	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	81612	1	12	8.3	5.0	✓

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Method Blanks (MB) - Continued							
Conductivity in Water	E100	81617	1	12	8.3	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	82077	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	81738	3	27	11.1	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	82078	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	82570	1	14	7.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	81613	1	12	8.3	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	81614	1	12	8.3	5.0	✓
Sulfate in Water by IC	E235.SO4	81615	1	12	8.3	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	81710	2	25	8.0	5.0	✓
Total Mercury in Water by CVAAS	E508	81703	1	15	6.6	5.0	✓
Total Metals in Water by CRC ICPMS	E420	81711	2	37	5.4	5.0	✓
TSS by Gravimetry	E160-H	81988	2	40	5.0	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	82572	1	19	5.2	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	81612	1	12	8.3	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	82077	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	81738	3	27	11.1	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	82078	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	82570	1	14	7.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	81613	1	12	8.3	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	81614	1	12	8.3	5.0	✓
Sulfate in Water by IC	E235.SO4	81615	1	12	8.3	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	81710	2	25	8.0	5.0	✓
Total Mercury in Water by CVAAS	E508	81703	1	15	6.6	5.0	✓
Total Metals in Water by CRC ICPMS	E420	81711	2	37	5.4	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
TSS by Gravimetry	E160-H Vancouver - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
Chloride in Water by IC (Low Level)	E235.Cl-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Vancouver - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Metals in Water by CRC ICPMS	E420 Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Vancouver - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Total Mercury in Water by CVAAS	E508 Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	“Hardness (as CaCO3), dissolved” is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. “Total Hardness” refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Hardness (Calculated) from Total Ca/Mg	EC100A Vancouver - Environmental	Water	APHA 2340B	“Hardness (as CaCO3), from total Ca/Mg” is calculated from the sum of total Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. “Total Hardness” refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations. Hardness from total Ca/Mg is normally comparable to Dissolved Hardness in non-turbid waters.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Ion Balance using Dissolved Metals	EC101 Vancouver - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
TDS in Water (Calculation)	EC103 Vancouver - Environmental	Water	APHA 1030E (mod)	Total Dissolved Solids is calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present.
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N Vancouver - Environmental	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **WR2000798**	Page	: 1 of 20
Client	: Minto Explorations Ltd.	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: ----	Date Samples Received	: 01-Sep-2020 14:25
PO	: 232817	Date Analysis Commenced	: 04-Sep-2020
C-O-C number	: 2020-09-01 A	Issue Date	: 10-Sep-2020 14:57
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 12		
No. of samples analysed	: 12		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Angelo Salandanan	Lab Assistant	Metals, Burnaby, British Columbia
Bruna Botti	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 81616)											
WR2000798-003	W14	pH	----	E108	0.10	pH units	8.03	8.02	0.125%	4%	----
Physical Tests (QC Lot: 81617)											
WR2000798-003	W14	conductivity	----	E100	2.0	µS/cm	3410	3440	0.876%	10%	----
Physical Tests (QC Lot: 81618)											
WR2000798-003	W14	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	90.7	89.0	1.89%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	90.7	89.0	1.89%	20%	----
Physical Tests (QC Lot: 81988)											
VA20B4456-003	Anonymous	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	19.6	20.8	1.2	Diff <2x LOR	----
Physical Tests (QC Lot: 81989)											
WR2000798-012	DUP	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	236	235	0.594%	20%	----
Anions and Nutrients (QC Lot: 81612)											
WR2000798-001	W55	chloride	16887-00-6	E235.Cl-L	0.10	mg/L	2.15	2.14	0.521%	20%	----
Anions and Nutrients (QC Lot: 81613)											
WR2000798-001	W55	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.0818	0.0822	0.546%	20%	----
Anions and Nutrients (QC Lot: 81614)											
WR2000798-001	W55	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 81615)											
WR2000798-001	W55	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	16.8	16.8	0.261%	20%	----
Anions and Nutrients (QC Lot: 82572)											
WR2000797-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0410	0.0394	0.0016	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 82570)											
WR2000797-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	0.78	0.69	0.09	Diff <2x LOR	----
Total Metals (QC Lot: 81703)											
WR2000797-007	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Total Metals (QC Lot: 81710)											
VA20B4264-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
Total Metals (QC Lot: 81711)											
VA20B4264-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0052	0.0047	0.0005	Diff <2x LOR	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Laboratory Duplicate (DUP) Report						
					LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Total Metals (QC Lot: 81711) - continued											
VA20B4264-001	Anonymous	antimony, total	7440-36-0	E420	0.00010	mg/L	0.00012	0.00011	0.000005	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00037	0.00040	0.00003	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.160	0.152	4.96%	20%	----
		beryllium, total	7440-41-7	E420	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.010	mg/L	0.019	0.019	0.0003	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.050	mg/L	42.5	42.1	0.934%	20%	----
		cobalt, total	7440-48-4	E420	0.00010	mg/L	0.00012	0.00010	0.00001	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00050	mg/L	0.00176	0.00175	0.000006	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.010	mg/L	0.025	0.024	0.0006	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0094	0.0093	0.00002	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	0.100	mg/L	33.5	32.2	4.03%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.00134	0.00129	3.41%	20%	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00114	0.00113	0.906%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.00068	0.00067	0.00001	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E420	0.050	mg/L	0.063	0.068	0.005	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.050	mg/L	1.80	1.79	0.372%	20%	----
		selenium, total	7782-49-2	E420	0.0500	mg/L	0.446 µg/L	0.000452	0.000006	Diff <2x LOR	----
		silicon, total	7440-21-3	E420	0.10	mg/L	3.84	3.75	2.22%	20%	----
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, total	7440-23-5	E420	0.050	mg/L	9.78	9.05	7.68%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.204	0.206	0.930%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	15.0	14.5	2.87%	20%	----
		thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.0100	mg/L	<0.0100	<0.0100	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.00102	0.00103	1.82%	20%	----
		vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	0.0135	0.0132	0.0003	Diff <2x LOR	----
		zirconium, total	7440-67-7	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
Total Metals (QC Lot: 81993)											
VA20B4249-002	Anonymous	aluminum, total	7429-90-5	E420	3.00	mg/L	81.9 µg/L	0.0790	3.63%	20%	----
		antimony, total	7440-36-0	E420	0.100	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.100	mg/L	0.26 µg/L	0.00026	0.000001	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Total Metals (QC Lot: 81993) - continued											
VA20B4249-002	Anonymous	barium, total	7440-39-3	E420	0.100	mg/L	15.8 µg/L	0.0160	1.17%	20%	----
		beryllium, total	7440-41-7	E420	0.100	mg/L	<0.100 µg/L	<0.000100	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.0500	mg/L	<0.050 µg/L	<0.000050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	10.0	mg/L	<10 µg/L	<0.010	0	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.00500	mg/L	0.0089 µg/L	0.0000126	0.0000038	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	50.0	mg/L	4900 µg/L	5.03	2.57%	20%	----
		cobalt, total	7440-48-4	E420	0.100	mg/L	0.21 µg/L	0.00019	0.00002	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.500	mg/L	1.38 µg/L	0.00141	0.00004	Diff <2x LOR	----
		iron, total	7439-89-6	E420	10.0	mg/L	376 µg/L	0.376	0.0192%	20%	----
		lead, total	7439-92-1	E420	0.0500	mg/L	0.098 µg/L	0.000100	0.000002	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	1.00	mg/L	<1.0 µg/L	<0.0010	0	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	5.00	mg/L	1800 µg/L	1.79	0.946%	20%	----
		manganese, total	7439-96-5	E420	0.100	mg/L	32.9 µg/L	0.0326	0.769%	20%	----
		molybdenum, total	7439-98-7	E420	0.0500	mg/L	0.223 µg/L	0.000230	0.000007	Diff <2x LOR	----
		nickel, total	7440-02-0	E420	0.500	mg/L	0.61 µg/L	0.00060	0.000009	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E420	50.0	mg/L	<50 µg/L	<0.050	0	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	50.0	mg/L	1660 µg/L	1.65	0.388%	20%	----
		selenium, total	7782-49-2	E420	0.0500	mg/L	<0.050 µg/L	0.000074	0.000024	Diff <2x LOR	----
		silicon, total	7440-21-3	E420	100	mg/L	16800 µg/L	16.7	0.916%	20%	----
		silver, total	7440-22-4	E420	0.0100	mg/L	<0.010 µg/L	<0.000010	0	Diff <2x LOR	----
		sodium, total	7440-23-5	E420	50.0	mg/L	5210 µg/L	5.16	0.969%	20%	----
		strontium, total	7440-24-6	E420	0.200	mg/L	55.6 µg/L	0.0548	1.39%	20%	----
		sulfur, total	7704-34-9	E420	500	mg/L	1050 µg/L	1.18	0.13	Diff <2x LOR	----
		thallium, total	7440-28-0	E420	0.0100	mg/L	<0.010 µg/L	<0.000010	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.100	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.300	mg/L	2.02 µg/L	0.00192	0.00009	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.0100	mg/L	<0.010 µg/L	<0.000010	0	Diff <2x LOR	----
		vanadium, total	7440-62-2	E420	0.500	mg/L	2.56 µg/L	0.00250	0.00007	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	3.00	mg/L	<3.0 µg/L	<0.0030	0	Diff <2x LOR	----
		zirconium, total	7440-67-7	E420	0.200	mg/L	0.23 µg/L	0.00022	0.000006	Diff <2x LOR	----
Total Metals (QC Lot: 81994)											
VA20B4249-002	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.100	mg/L	0.35 µg/L	0.00036	0.000006	Diff <2x LOR	----
Dissolved Metals (QC Lot: 81738)											
VA20B4303-007	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 81739)											

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 81739) - continued											
WR2000798-009	W2	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 82077)											
VA20B4303-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	0.00018	0.00014	0.00003	Diff <2x LOR	----
Dissolved Metals (QC Lot: 82078)											
VA20B4303-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0023	0.0023	0.00006	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00019	0.00016	0.00003	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0124	0.0125	0.523%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	0.0000125	0.0000124	0.0000001	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	42.4	43.7	3.09%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00049	0.00047	0.00002	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0040	0.0039	0.00007	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	7.96	8.10	1.76%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00049	0.00050	0.000003	Diff <2x LOR	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00447	0.00448	0.183%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	1.84	1.89	2.77%	20%	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.000556	0.000528	5.30%	20%	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	7.81	7.87	0.703%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	7440-23-5	E421	0.050	mg/L	6.82	6.79	0.385%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.209	0.215	2.85%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	5.47	5.22	4.67%	20%	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	0.00011	0.00010	0.000004	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00632	0.00651	2.99%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	0.00100	0.00094	0.00006	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0010	0.0011	0.00007	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 82078) - continued											
VA20B4303-001	Anonymous	zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 82131)											
VA20B4383-006	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 81617)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 81618)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 81988)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Physical Tests (QCLot: 81989)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Anions and Nutrients (QCLot: 81612)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 81613)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 81614)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 81615)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 82572)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Organic / Inorganic Carbon (QCLot: 82570)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 81703)						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----
Total Metals (QCLot: 81710)						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
Total Metals (QCLot: 81711)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 81711) - continued						
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	7440-23-5	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	<0.00020	----
Total Metals (QCLot: 81993)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 81993) - continued						
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	7440-23-5	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	<0.00020	----
Total Metals (QCLot: 81994)						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 81738)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 81739)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 82077)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 82078)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 82078) - continued						
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----
Dissolved Metals (QCLot: 82131)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 81616)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 81617)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	107	90.0	110	----
Physical Tests (QCLot: 81618)									
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	229 mg/L	80.6	75.0	125	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	96.4	85.0	115	----
Physical Tests (QCLot: 81988)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	86.7	85.0	115	----
Physical Tests (QCLot: 81989)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	87.0	85.0	115	----
Anions and Nutrients (QCLot: 81612)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	107	90.0	110	----
Anions and Nutrients (QCLot: 81613)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	108	90.0	110	----
Anions and Nutrients (QCLot: 81614)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	106	90.0	110	----
Anions and Nutrients (QCLot: 81615)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	110	90.0	110	----
Anions and Nutrients (QCLot: 82572)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.12 mg/L	105	85.0	115	----
Organic / Inorganic Carbon (QCLot: 82570)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	98.9	80.0	120	----
Total Metals (QCLot: 81703)									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	86.5	80.0	120	----
Total Metals (QCLot: 81710)									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	94.1	80.0	120	----
Total Metals (QCLot: 81711)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	99.7	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	98.5	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	93.5	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	93.9	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 81711) - continued									
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	93.4	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	103	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	91.9	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	96.8	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	94.5	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	93.3	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	92.6	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	96.1	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	100	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	94.8	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	93.7	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	93.8	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	95.2	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	95.2	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	96.3	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	94.4	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	92.0	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	102	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	97.6	80.0	120	----
sodium, total	7440-23-5	E420	0.05	mg/L	50 mg/L	94.3	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	103	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	108	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	102	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	97.4	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	93.2	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	108	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	94.8	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	93.2	80.0	120	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.1 mg/L	95.4	80.0	120	----
Total Metals (QCLot: 81993)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	104	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	104	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	99.1	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	105	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	101	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	106	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	104	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 81993) - continued									
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	100	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	106	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	101	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	103	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	106	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	105	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	102	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	103	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	99.8	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	104	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	103	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	103	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	96.3	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	105	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	101	80.0	120	----
sodium, total	7440-23-5	E420	0.05	mg/L	50 mg/L	102	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	107	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	92.0	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	106	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	98.4	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	97.3	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	101	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	102	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	101	80.0	120	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.1 mg/L	98.6	80.0	120	----
Total Metals (QCLot: 81994)									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	105	80.0	120	----
Dissolved Metals (QCLot: 81738)									
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	95.2	80.0	120	----
Dissolved Metals (QCLot: 81739)									
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	96.2	80.0	120	----
Dissolved Metals (QCLot: 82077)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	98.4	80.0	120	----
Dissolved Metals (QCLot: 82078)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	105	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report: Spike Concentration	Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High	Qualifier
Dissolved Metals (QCLot: 82078) - continued									
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	108	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	99.1	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	103	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	98.7	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	108	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	98.1	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	99.3	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	100	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	99.8	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	101	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	81.5	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	101	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	95.0	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	102	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	99.8	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	103	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	100	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	104	70.0	130	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	101	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	95.4	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	104	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	102	80.0	120	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	# 129	80.0	120	MES
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	99.6	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	98.6	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	106	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	101	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	98.8	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	90.2	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	102	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	109	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	97.8	80.0	120	----
Dissolved Metals (QCLot: 82131)									
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	87.3	80.0	120	----

Qualifiers

Qualifier	Description
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 81612)										
WR2000798-002	W12	chloride	16887-00-6	E235.Cl-L	2100 mg/L	2000 mg/L	105	75.0	125	----
Anions and Nutrients (QCLot: 81613)										
WR2000798-002	W12	nitrate (as N)	14797-55-8	E235.NO3-L	52.2 mg/L	50 mg/L	104	75.0	125	----
Anions and Nutrients (QCLot: 81614)										
WR2000798-002	W12	nitrite (as N)	14797-65-0	E235.NO2-L	10.4 mg/L	10 mg/L	104	75.0	125	----
Anions and Nutrients (QCLot: 81615)										
WR2000798-002	W12	sulfate (as SO4)	14808-79-8	E235.SO4	2060 mg/L	2000 mg/L	103	75.0	125	----
Anions and Nutrients (QCLot: 82572)										
WR2000797-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.200 mg/L	0.2 mg/L	100	75.0	125	----
Organic / Inorganic Carbon (QCLot: 82570)										
WR2000797-002	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	4.94 mg/L	5 mg/L	98.9	70.0	130	----
Total Metals (QCLot: 81703)										
WR2000798-001	W55	mercury, total	7439-97-6	E508	0.0000860 mg/L	0.0001 mg/L	86.0	70.0	130	----
Total Metals (QCLot: 81710)										
VA20B4265-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.0376 mg/L	0.04 mg/L	94.0	70.0	130	----
Total Metals (QCLot: 81711)										
VA20B4265-001	Anonymous	aluminum, total	7429-90-5	E420	0.189 mg/L	0.2 mg/L	94.4	70.0	130	----
		antimony, total	7440-36-0	E420	0.0199 mg/L	0.02 mg/L	99.5	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0189 mg/L	0.02 mg/L	94.3	70.0	130	----
		barium, total	7440-39-3	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0369 mg/L	0.04 mg/L	92.3	70.0	130	----
		bismuth, total	7440-69-9	E420	0.00934 mg/L	0.01 mg/L	93.4	70.0	130	----
		boron, total	7440-42-8	E420	0.087 mg/L	0.1 mg/L	87.3	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00376 mg/L	0.004 mg/L	94.0	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0180 mg/L	0.02 mg/L	90.0	70.0	130	----
		copper, total	7440-50-8	E420	0.0176 mg/L	0.02 mg/L	88.2	70.0	130	----
		iron, total	7439-89-6	E420	1.82 mg/L	2 mg/L	91.0	70.0	130	----
		lead, total	7439-92-1	E420	0.0182 mg/L	0.02 mg/L	91.1	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 81711) - continued										
VA20B4265-001	Anonymous	lithium, total	7439-93-2	E420	0.0892 mg/L	0.1 mg/L	89.2	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	0.0184 mg/L	0.02 mg/L	91.9	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0194 mg/L	0.02 mg/L	97.1	70.0	130	----
		nickel, total	7440-02-0	E420	0.0361 mg/L	0.04 mg/L	90.2	70.0	130	----
		phosphorus, total	7723-14-0	E420	9.80 mg/L	10 mg/L	98.0	70.0	130	----
		potassium, total	7440-09-7	E420	3.55 mg/L	4 mg/L	88.8	70.0	130	----
		selenium, total	7782-49-2	E420	0.0394 mg/L	0.04 mg/L	98.4	70.0	130	----
		silicon, total	7440-21-3	E420	9.71 mg/L	10 mg/L	97.1	70.0	130	----
		silver, total	7440-22-4	E420	0.00394 mg/L	0.004 mg/L	98.4	70.0	130	----
		sodium, total	7440-23-5	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	ND mg/L	20 mg/L	ND	70.0	130	----
		thallium, total	7440-28-0	E420	0.00371 mg/L	0.004 mg/L	92.7	70.0	130	----
		tin, total	7440-31-5	E420	0.0197 mg/L	0.02 mg/L	98.5	70.0	130	----
		titanium, total	7440-32-6	E420	0.0378 mg/L	0.04 mg/L	94.6	70.0	130	----
		uranium, total	7440-61-1	E420	0.00381 mg/L	0.004 mg/L	95.4	70.0	130	----
		vanadium, total	7440-62-2	E420	0.0958 mg/L	0.1 mg/L	95.8	70.0	130	----
		zinc, total	7440-66-6	E420	0.370 mg/L	0.4 mg/L	92.6	70.0	130	----
		zirconium, total	7440-67-7	E420	0.0414 mg/L	0.04 mg/L	103	70.0	130	----
Total Metals (QCLot: 81993)										
VA20B4249-003	Anonymous	aluminum, total	7429-90-5	E420	0.193 mg/L	0.2 mg/L	96.7	70.0	130	----
		antimony, total	7440-36-0	E420	0.0189 mg/L	0.02 mg/L	94.3	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0189 mg/L	0.02 mg/L	94.6	70.0	130	----
		barium, total	7440-39-3	E420	0.0197 mg/L	0.02 mg/L	98.4	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0396 mg/L	0.04 mg/L	99.0	70.0	130	----
		bismuth, total	7440-69-9	E420	0.00949 mg/L	0.01 mg/L	94.9	70.0	130	----
		boron, total	7440-42-8	E420	0.102 mg/L	0.1 mg/L	102	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00388 mg/L	0.004 mg/L	97.0	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0193 mg/L	0.02 mg/L	96.7	70.0	130	----
		copper, total	7440-50-8	E420	0.0191 mg/L	0.02 mg/L	95.6	70.0	130	----
		iron, total	7439-89-6	E420	1.93 mg/L	2 mg/L	96.7	70.0	130	----
		lead, total	7439-92-1	E420	0.0193 mg/L	0.02 mg/L	96.4	70.0	130	----
		lithium, total	7439-93-2	E420	0.0998 mg/L	0.1 mg/L	99.8	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 81993) - continued										
VA20B4249-003	Anonymous	manganese, total	7439-96-5	E420	0.0194 mg/L	0.02 mg/L	97.2	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0192 mg/L	0.02 mg/L	95.9	70.0	130	----
		nickel, total	7440-02-0	E420	0.0396 mg/L	0.04 mg/L	99.0	70.0	130	----
		phosphorus, total	7723-14-0	E420	9.38 mg/L	10 mg/L	93.8	70.0	130	----
		potassium, total	7440-09-7	E420	3.77 mg/L	4 mg/L	94.4	70.0	130	----
		selenium, total	7782-49-2	E420	0.0386 mg/L	0.04 mg/L	96.6	70.0	130	----
		silicon, total	7440-21-3	E420	ND mg/L	10 mg/L	ND	70.0	130	----
		silver, total	7440-22-4	E420	0.00379 mg/L	0.004 mg/L	94.8	70.0	130	----
		sodium, total	7440-23-5	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	20.0 mg/L	20 mg/L	99.9	70.0	130	----
		thallium, total	7440-28-0	E420	0.00373 mg/L	0.004 mg/L	93.3	70.0	130	----
		tin, total	7440-31-5	E420	0.0186 mg/L	0.02 mg/L	93.0	70.0	130	----
		titanium, total	7440-32-6	E420	0.0386 mg/L	0.04 mg/L	96.6	70.0	130	----
		uranium, total	7440-61-1	E420	0.00393 mg/L	0.004 mg/L	98.3	70.0	130	----
		vanadium, total	7440-62-2	E420	0.0985 mg/L	0.1 mg/L	98.5	70.0	130	----
		zinc, total	7440-66-6	E420	0.387 mg/L	0.4 mg/L	96.8	70.0	130	----
		zirconium, total	7440-67-7	E420	0.0398 mg/L	0.04 mg/L	99.5	70.0	130	----
Total Metals (QCLot: 81994)										
VA20B4249-003	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.0403 mg/L	0.04 mg/L	101	70.0	130	----
Dissolved Metals (QCLot: 81738)										
VA20B4303-008	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000930 mg/L	0.0001 mg/L	93.0	70.0	130	----
Dissolved Metals (QCLot: 81739)										
WR2000798-010	W3	mercury, dissolved	7439-97-6	E509	0.0000991 mg/L	0.0001 mg/L	99.1	70.0	130	----
Dissolved Metals (QCLot: 82077)										
VA20B4303-002	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.0386 mg/L	0.04 mg/L	96.6	70.0	130	----
Dissolved Metals (QCLot: 82078)										
VA20B4303-002	Anonymous	aluminum, dissolved	7429-90-5	E421	0.201 mg/L	0.2 mg/L	101	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0202 mg/L	0.02 mg/L	101	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0198 mg/L	0.02 mg/L	98.8	70.0	130	----
		barium, dissolved	7440-39-3	E421	0.0188 mg/L	0.02 mg/L	94.0	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0399 mg/L	0.04 mg/L	99.8	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00878 mg/L	0.01 mg/L	87.8	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.095 mg/L	0.1 mg/L	94.9	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00392 mg/L	0.004 mg/L	98.1	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 82078) - continued										
VA20B4303-002	Anonymous	calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0196 mg/L	0.02 mg/L	97.9	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0197 mg/L	0.02 mg/L	98.4	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.92 mg/L	2 mg/L	96.2	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0196 mg/L	0.02 mg/L	98.0	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.113 mg/L	0.1 mg/L	113	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	0.0196 mg/L	0.02 mg/L	98.2	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0204 mg/L	0.02 mg/L	102	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0390 mg/L	0.04 mg/L	97.4	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	10.4 mg/L	10 mg/L	104	70.0	130	----
		potassium, dissolved	7440-09-7	E421	3.72 mg/L	4 mg/L	93.1	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0399 mg/L	0.04 mg/L	99.7	70.0	130	----
		silicon, dissolved	7440-21-3	E421	8.32 mg/L	10 mg/L	83.2	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00406 mg/L	0.004 mg/L	101	70.0	130	----
		sodium, dissolved	7440-23-5	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	20.0 mg/L	20 mg/L	100	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00377 mg/L	0.004 mg/L	94.4	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0196 mg/L	0.02 mg/L	98.1	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0402 mg/L	0.04 mg/L	101	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00353 mg/L	0.004 mg/L	88.2	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.101 mg/L	0.1 mg/L	101	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.430 mg/L	0.4 mg/L	108	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0487 mg/L	0.04 mg/L	122	70.0	130	----
Dissolved Metals (QCLot: 82131)										
VA20B4383-007	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000874 mg/L	0.0001 mg/L	87.4	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 2020-09-01 A

Environmental Division Whitehorse
Work Order Reference
WR2000798

Telephone : +1 867 668 6689

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Michelle Olesh

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax mintoenvironment@mintomine.com
Email 2
Email 3

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax ap@mintomine.com
Email 2

Project Information

ALS Account # / Quote #:
Job #:
PO / AFE: 232817 (WUL)
LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#
Major/Minor Code: Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only)

ALS Contact: Shane Stack **Sampler:**

Select Service Level Below - Please confirm all E&P TATs

Regular [R] ☑ Standard TAT if rec

PRIORITY (Business Days): 4 day [P4] ☐ 3 day [P3] ☐ 2 day [P2] ☐ EMERGENCY

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the serv

Analys

Indicate Filtered (F), Preserved (P) or Filte

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	pH / Conductivity / Alkalinity / Anions	Total Suspended Solids (TSS)	Total Dissolved Solids (TDS)	Total Metals (TM), Hardness	Dissolved Metals (DM)(filtered and preserve	Total Mercury, Hardness	Dissolved Mercury [1] (Filtered + preserved)	Total Nutrients (Ammonia)	Dissolved Organic Carbon (DOC)					Number of Containers
								P	F/P	P	F/P							
	W55	26-Aug-20	14:00	Water	R	R	R	R	R	R	R	R						6
	W12	26-Aug-20	14:50	Water	R	R	R	R	R	R	R	R						6
	W14	26-Aug-20	16:30	Water	R	R	R		R		R	R						4
	DUP	26-Aug-20		Water	R	R	R	R	R	R	R	R						6
	W17	31-Aug-20	8:00	Water	R	R	R	R	R	R	R	R	R					7
	MC1	31-Aug-20	10:50	Water	R	R	R	R	R	R	R	R	R					7
	MN	31-Aug-20	14:10	Water	R	R	R	R	R	R	R	R						6
	W50	1-Sep-20	15:50	Water	R	R	R	R	R	R	R	R	R					7
	W2	1-Sep-20	6:30	Water	R	R	R	R	R	R	R	R	R					7
	W3	1-Sep-20	6:55	Water	R	R	R	R	R	R	R	R	R					7

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?
☐ YES ☑ NO
Are samples for human drinking water use?
☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
6°	5°				

SHIPMENT RELEASE (client use)		
Released by: Ian Smith	Date: 2020-09-01	Time:

INITIAL SHIPMENT RECEPTION (lab use only)		
Received by:	Date: AUG SEPT 1/20	Time: 14:25

FINAL SHIPMENT RECEPTION (lab use only)		
Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 2020-09-01 A

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Michelle Olesh

Project Information

ALS Account # / Quote #:	
Job #:	
PO / AFE:	232817 (WUL)
LSD:	

ALS Lab Work Order # (lab use only)

Report Format / Distribution

Select Report Format:	☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	mintoenvironment@mintomine.com
Email 2	
Email 3	

Invoice Distribution

Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	ap@mintomine.com
Email 2	

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Contact: Shane Stack **Sampler:**

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)		EMERGENCY	
	4 day [P4] ☐		1 Business day [E1] ☐
	3 day [P3] ☐		Same Day, Weekend or Statutory holiday [E0] ☐
	2 day [P2] ☐		

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	pH / Conductivity / Alkalinity / Anions	Total Suspended Solids (TSS)	Total Disolved Solids (TDS)	Total Metals (TM), Hardness	Dissolved Metals (DM)(filtered and preserve	Total Mercury, Hardness	Dissolved Mercury [1] (Filtered + preserved)	Total Nutrients (Ammonia)	Dissolved Organic Carbon (DOC)	Number of Containers
					P			P	F/P	P	F/P	P	F/P	
	W7	1-Sep-20	7:20	Water	R	R	R	R	R	R	R	R	R	7
	DUP	31-Aug-20		Water	R	R	R	R	R	R	R	R	R	7

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO

Are samples for human drinking water use? ☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐	SIF Observations	Yes ☐	No ☐	
Ice Packs	☐	Ice Cubes ☐	Custody seal intact	Yes ☐	No ☐
Cooling Initiated	☐				

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Ian Smith	Date: 2020-09-01	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2001038**	Page	: 1 of 10
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 06-Oct-2020 13:45
PO	: 232817	Date Analysis Commenced	: 08-Oct-2020
C-O-C number	: 2020-10-06 A	Issue Date	: 21-Oct-2020 18:47
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 9		
No. of samples analysed	: 9		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Bruna Botti	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Clarie Tejano		Metals, Burnaby, British Columbia
Dan Gebert	Laboratory Analyst	Metals, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Gloria Chan	Lab Analyst	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Omar Beydoun	Lab Assistant	Metals, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics - Water Quality, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Qualifiers

Qualifier	*Description*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W15	W35	W50	W17	W16
					Client sampling date / time	05-Oct-2020 07:25	05-Oct-2020 07:45	05-Oct-2020 08:20	05-Oct-2020 08:35	05-Oct-2020 09:00
						WR2001038-001	WR2001038-002	WR2001038-003	WR2001038-004	WR2001038-005
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		202	117	242	188	169
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		202	117	242	188	169
conductivity	----	E100	2.0	µS/cm		803	412	530	499	495
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		441	202	269	251	264
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		392	187	249	231	235
pH	----	E108	0.10	pH units		8.10	7.85	7.61	7.96	7.91
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		579	286	349	330	339
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	12.0	<3.0	<3.0	3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0066	0.0151	0.244	0.0451	0.0497
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		2.16	2.60	6.15	6.06	6.67
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		11.6	10.2	0.0128	0.193	1.37
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		11.6	10.2	0.0140	0.193	1.38
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0050 DLDS	0.0072	0.0012	<0.0010	0.0098
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		203	49.2	48.7	75.8	87.0
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		14.5	20.4	15.7	14.9	18.3
Ion Balance										
anion sum	----	EC101	0.10	meq/L		9.16	4.16	6.03	5.52	5.48
cation sum	----	EC101	0.10	meq/L		9.54	4.56	6.26	5.71	5.91
ion balance (cation-anion difference)	----	EC101	0.010	%		2.03	4.59	1.87	1.69	3.78
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.0174	0.189	0.0121	0.0031	0.0310
antimony, total	7440-36-0	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00031	0.00032	0.00058	0.00036	0.00041
barium, total	7440-39-3	E420	0.00010	mg/L		0.0724	0.0684	0.114	0.0557	0.0714
beryllium, total	7440-41-7	E420	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W15	W35	W50	W17	W16
					Client sampling date / time	05-Oct-2020 07:25	05-Oct-2020 07:45	05-Oct-2020 08:20	05-Oct-2020 08:35	05-Oct-2020 09:00
						WR2001038-001	WR2001038-002	WR2001038-003	WR2001038-004	WR2001038-005
						Result	Result	Result	Result	Result
Total Metals										
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, total	7440-42-8	E420	0.010	mg/L		<0.010	0.021	0.018	0.017	0.013
cadmium, total	7440-43-9	E420	0.0000050	mg/L		0.0000607	0.0000984	0.0000596	<0.0000050	0.0000136
calcium, total	7440-70-2	E420	0.050	mg/L		110	49.4	61.0	62.7	63.8
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00020	0.00041	0.00040	0.00031	0.00023
cobalt, total	7440-48-4	E420	0.00010	mg/L		<0.00010	0.00015	0.00152	<0.00010	0.00014
copper, total	7440-50-8	E420	0.00050	mg/L		0.00970	0.0572	0.00240	0.00833	0.0334
iron, total	7439-89-6	E420	0.010	mg/L		0.072	0.284	0.335	<0.010	0.128
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	0.000082	<0.000050	<0.000050	<0.000050
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0010	0.0013	0.0015	0.0014	0.0014
magnesium, total	7439-95-4	E420	0.100	mg/L		28.5	15.4	23.5	18.1	18.4
manganese, total	7439-96-5	E420	0.00010	mg/L		0.0162	0.0285	3.56	0.00828	0.308
mercury, total	7439-97-6	E508	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.00262	0.00154	0.00702	0.00624	0.00303
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00066	0.00113	0.00934	0.00088	0.00102
phosphorus, total	7723-14-0	E420	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, total	7440-09-7	E420	0.100	mg/L		2.89	1.43	2.35	3.30	2.63
selenium, total	7782-49-2	E420	0.000050	mg/L		0.00683	0.000488	0.000158	0.000533	0.00117
silicon, total	7440-21-3	E420	0.10	mg/L		5.33	6.24	7.63	5.94	4.58
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	0.000013	<0.000010	<0.000010	<0.000010
sodium, total	17341-25-2	E420	0.050	mg/L		12.6	9.59	13.4	11.9	11.3
strontium, total	7440-24-6	E420	0.00020	mg/L		0.950	0.453	0.576	0.688	0.618
sulfur, total	7704-34-9	E420	0.50	mg/L		73.7	18.5	17.7	27.9	33.4
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, total	7440-32-6	E420	0.00030	mg/L		0.00076	0.0153	0.00056	<0.00030	0.00195
uranium, total	7440-61-1	E420	0.000010	mg/L		0.00225	0.000462	0.00148	0.00170	0.00122
vanadium, total	7440-62-2	E420	0.00050	mg/L		<0.00050	0.00095	0.00062	<0.00050	<0.00050
zinc, total	7440-66-6	E420	0.0030	mg/L		<0.0030	0.0032	<0.0030	<0.0030	0.0032
zirconium, total	7440-67-7	E420	0.00020	mg/L		<0.00020	0.00029	0.00039	<0.00020	0.00026
Dissolved Metals										

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W15	W35	W50	W17	W16
					Client sampling date / time	05-Oct-2020 07:25	05-Oct-2020 07:45	05-Oct-2020 08:20	05-Oct-2020 08:35	05-Oct-2020 09:00
						WR2001038-001	WR2001038-002	WR2001038-003	WR2001038-004	WR2001038-005
						Result	Result	Result	Result	Result
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0112	0.0188	0.0106	0.0030	0.0030
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00034	0.00029	0.00061	0.00038	0.00041
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0839	0.0686	0.122	0.0626	0.0748
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		<0.010	0.020	0.016	0.016	0.012
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000121	0.0000789	0.0000470	<0.0000050	0.0000081
calcium, dissolved	7440-70-2	E421	0.050	mg/L		123	54.0	66.8	67.1	71.9
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00018	0.00042	0.00051	0.00030	0.00033
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	0.00164	<0.00010	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.0101	0.0387	0.00213	0.00895	0.0325
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.051	0.034	0.314	<0.010	0.041
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0011	0.0012	0.0015	0.0015	0.0015
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		32.3	16.4	24.7	20.2	20.5
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0170	0.0238	3.98	0.00661	0.0606
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00254	0.00158	0.00683	0.00640	0.00306
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00078	0.00118	0.00970	0.00088	0.00102
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		3.32	1.52	2.57	3.70	2.96
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.00607	0.000437	0.000157	0.000468	0.000892
silicon, dissolved	7440-21-3	E421	0.050	mg/L		4.87	5.55	7.00	5.46	4.14
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	17341-25-2	E421	0.050	mg/L		14.6	10.8	15.1	13.9	12.7
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		1.01	0.498	0.607	0.722	0.645
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		65.8	16.8	15.8	24.8	29.0
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		0.00034	0.00083	0.00048	<0.00030	<0.00030

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W15	W35	W50	W17	W16
					Client sampling date / time	05-Oct-2020 07:25	05-Oct-2020 07:45	05-Oct-2020 08:20	05-Oct-2020 08:35	05-Oct-2020 09:00
						WR2001038-001	WR2001038-002	WR2001038-003	WR2001038-004	WR2001038-005
						Result	Result	Result	Result	Result
Dissolved Metals										
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00214	0.000447	0.00136	0.00158	0.00112
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	0.00064	<0.00050	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		<0.0010	0.0015	<0.0010	<0.0010	<0.0010
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	0.00029	0.00041	<0.00020	0.00021
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W7	DUP	W2	W3	----
					Client sampling date / time	05-Oct-2020 15:45	05-Oct-2020	06-Oct-2020 05:35	06-Oct-2020 06:05	----
						WR2001038-006	WR2001038-007	WR2001038-008	WR2001038-009	--------
						Result	Result	Result	Result	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		121	168	140	224	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		121	168	140	224	----
conductivity	----	E100	2.0	µS/cm		237	501	294	510	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		126	260	149	268	----
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		118	241	140	239	----
pH	----	E108	0.10	pH units		8.03	7.92	8.07	8.03	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		162	337	194	328	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		9.4	4.0	3.1	<3.0	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0161	0.0483	0.0058	0.0098	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.34	6.51	1.47	4.66	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.0471	1.37	<0.0050	0.0620	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		0.0472	1.38	<0.0051	0.0620	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	0.0099	<0.0010	<0.0010	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		8.33	87.2	18.1	50.9	----
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		12.0	18.4	12.8	11.1	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		2.61	5.46	3.20	5.68	----
cation sum	----	EC101	0.10	meq/L		2.89	5.82	3.40	6.18	----
ion balance (cation-anion difference)	----	EC101	0.010	%		5.09	3.19	3.03	4.22	----
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.136	0.0331	0.0406	0.0104	----
antimony, total	7440-36-0	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	----
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00044	0.00043	0.00046	0.00024	----
barium, total	7440-39-3	E420	0.00010	mg/L		0.0597	0.0718	0.0501	0.0543	----
beryllium, total	7440-41-7	E420	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	----
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W7	DUP	W2	W3	----
					Client sampling date / time	05-Oct-2020 15:45	05-Oct-2020	06-Oct-2020 05:35	06-Oct-2020 06:05	----
						WR2001038-006	WR2001038-007	WR2001038-008	WR2001038-009	--------
						Result	Result	Result	Result	----
Total Metals										
boron, total	7440-42-8	E420	0.010	mg/L		<0.010	0.012	<0.010	0.021	----
cadmium, total	7440-43-9	E420	0.0000050	mg/L		<0.0000050	0.0000152	0.0000145	0.0000093	----
calcium, total	7440-70-2	E420	0.050	mg/L		30.0	65.2	36.6	53.6	----
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00068	0.00023	0.00028	0.00035	----
cobalt, total	7440-48-4	E420	0.00010	mg/L		0.00014	0.00014	<0.00010	<0.00010	----
copper, total	7440-50-8	E420	0.00050	mg/L		0.00154	0.0338	0.00273	0.00441	----
iron, total	7439-89-6	E420	0.010	mg/L		0.279	0.134	0.123	0.035	----
lead, total	7439-92-1	E420	0.000050	mg/L		0.000067	<0.000050	<0.000050	<0.000050	----
lithium, total	7439-93-2	E420	0.0010	mg/L		<0.0010	0.0014	0.0015	0.0025	----
magnesium, total	7439-95-4	E420	0.100	mg/L		10.4	18.9	11.7	25.4	----
manganese, total	7439-96-5	E420	0.00010	mg/L		0.0224	0.314	0.00924	0.0504	----
mercury, total	7439-97-6	E508	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.00128	0.00311	0.00130	0.00495	----
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00129	0.00107	0.00104	0.00150	----
phosphorus, total	7723-14-0	E420	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	----
potassium, total	7440-09-7	E420	0.100	mg/L		0.779	2.66	1.20	2.20	----
selenium, total	7782-49-2	E420	0.000050	mg/L		0.000112	0.00102	0.000149	0.000258	----
silicon, total	7440-21-3	E420	0.10	mg/L		6.68	4.62	6.33	6.60	----
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	----
sodium, total	17341-25-2	E420	0.050	mg/L		6.79	11.1	7.61	15.0	----
strontium, total	7440-24-6	E420	0.00020	mg/L		0.302	0.610	0.351	0.710	----
sulfur, total	7704-34-9	E420	0.50	mg/L		2.97	31.8	6.28	19.4	----
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	----
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	----
titanium, total	7440-32-6	E420	0.00030	mg/L		0.00624	0.00185	0.00162	0.00061	----
uranium, total	7440-61-1	E420	0.000010	mg/L		0.000742	0.00120	0.00110	0.00207	----
vanadium, total	7440-62-2	E420	0.00050	mg/L		0.00103	<0.00050	0.00065	<0.00050	----
zinc, total	7440-66-6	E420	0.0030	mg/L		<0.0030	0.0044	<0.0030	<0.0030	----
zirconium, total	7440-67-7	E420	0.00020	mg/L		0.00024	0.00029	<0.00020	<0.00020	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0103	0.0029	0.0079	0.0049	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W7	DUP	W2	W3	----
					Client sampling date / time	05-Oct-2020 15:45	05-Oct-2020	06-Oct-2020 05:35	06-Oct-2020 06:05	----
						WR2001038-006	WR2001038-007	WR2001038-008	WR2001038-009	--------
						Result	Result	Result	Result	----
Dissolved Metals										
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00044	0.00043	0.00058	0.00030	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0651	0.0738	0.0568	0.0607	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		<0.010	0.012	<0.010	0.020	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000050	0.0000089	0.0000129	0.0000054	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		31.0	71.0	37.8	61.5	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00048	0.00016	0.00027	0.00020	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00154	0.0323	0.00235	0.00457	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.075	0.040	0.066	0.025	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		<0.0010	0.0015	0.0015	0.0028	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		11.7	20.0	13.2	27.7	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0148	0.0594	0.00475	0.0537	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00129	0.00305	0.00133	0.00502	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00110	0.00108	0.00112	0.00163	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		0.872	2.96	1.38	2.51	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000127	0.000971	0.000096	0.000198	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		6.04	4.11	6.07	6.24	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L		8.01	12.6	8.89	17.5	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.323	0.647	0.378	0.748	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		2.57	28.9	6.13	17.3	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		0.00044	<0.00030	0.00041	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000660	0.00113	0.00104	0.00200	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W7	DUP	W2	W3	----
					Client sampling date / time	05-Oct-2020 15:45	05-Oct-2020	06-Oct-2020 05:35	06-Oct-2020 06:05	----
						WR2001038-006	**WR2001038-007**	**WR2001038-008**	**WR2001038-009**	--------
						Result	Result	Result	Result	----
Dissolved Metals										
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00068	<0.00050	0.00063	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		0.00021	0.00021	<0.00020	<0.00020	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WR2001038**	Page	: 1 of 24
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 06-Oct-2020 13:45
PO	: 232817	Issue Date	: 21-Oct-2020 18:47
C-O-C number	: 2020-10-06 A		
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 9		
No. of samples analysed	: 9		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
DUP	E298	05-Oct-2020	----	----	----		15-Oct-2020	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
W15	E298	05-Oct-2020	----	----	----		15-Oct-2020	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
W16	E298	05-Oct-2020	----	----	----		15-Oct-2020	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
W17	E298	05-Oct-2020	----	----	----		15-Oct-2020	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
W35	E298	05-Oct-2020	----	----	----		15-Oct-2020	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
W50	E298	05-Oct-2020	----	----	----		15-Oct-2020	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
W7	E298	05-Oct-2020	----	----	----		15-Oct-2020	28 days	10 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) W2	E298	06-Oct-2020	----	----	----		15-Oct-2020	28 days	9 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) W3	E298	06-Oct-2020	----	----	----		15-Oct-2020	28 days	9 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE DUP	E235.Cl-L	05-Oct-2020	----	----	----		08-Oct-2020	28 days	2 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE W2	E235.Cl-L	06-Oct-2020	----	----	----		08-Oct-2020	28 days	2 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE W3	E235.Cl-L	06-Oct-2020	----	----	----		08-Oct-2020	28 days	2 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE W7	E235.Cl-L	05-Oct-2020	----	----	----		08-Oct-2020	28 days	2 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE W15	E235.Cl-L	05-Oct-2020	----	----	----		08-Oct-2020	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE W16	E235.Cl-L	05-Oct-2020	----	----	----		08-Oct-2020	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE W17	E235.Cl-L	05-Oct-2020	----	----	----		08-Oct-2020	28 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE W35	E235.Cl-L	05-Oct-2020	----	----	----		08-Oct-2020	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE W50	E235.Cl-L	05-Oct-2020	----	----	----		08-Oct-2020	28 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE DUP	E235.NO3-L	05-Oct-2020	----	----	----		08-Oct-2020	3 days	2 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE W2	E235.NO3-L	06-Oct-2020	----	----	----		08-Oct-2020	3 days	2 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE W3	E235.NO3-L	06-Oct-2020	----	----	----		08-Oct-2020	3 days	2 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE W7	E235.NO3-L	05-Oct-2020	----	----	----		08-Oct-2020	3 days	2 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE W15	E235.NO3-L	05-Oct-2020	----	----	----		08-Oct-2020	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE W16	E235.NO3-L	05-Oct-2020	----	----	----		08-Oct-2020	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE W17	E235.NO3-L	05-Oct-2020	----	----	----		08-Oct-2020	3 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE W35	E235.NO3-L	05-Oct-2020	----	----	----		08-Oct-2020	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE W50	E235.NO3-L	05-Oct-2020	----	----	----		08-Oct-2020	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE DUP	E235.NO2-L	05-Oct-2020	----	----	----		08-Oct-2020	3 days	2 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE W2	E235.NO2-L	06-Oct-2020	----	----	----		08-Oct-2020	3 days	2 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE W3	E235.NO2-L	06-Oct-2020	----	----	----		08-Oct-2020	3 days	2 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE W7	E235.NO2-L	05-Oct-2020	----	----	----		08-Oct-2020	3 days	2 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE W15	E235.NO2-L	05-Oct-2020	----	----	----		08-Oct-2020	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE W16	E235.NO2-L	05-Oct-2020	----	----	----		08-Oct-2020	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE W17	E235.NO2-L	05-Oct-2020	----	----	----		08-Oct-2020	3 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
W35	E235.NO2-L	05-Oct-2020	----	----	----		08-Oct-2020	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
W50	E235.NO2-L	05-Oct-2020	----	----	----		08-Oct-2020	3 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
DUP	E235.SO4	05-Oct-2020	----	----	----		08-Oct-2020	28 days	2 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
W2	E235.SO4	06-Oct-2020	----	----	----		08-Oct-2020	28 days	2 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
W3	E235.SO4	06-Oct-2020	----	----	----		08-Oct-2020	28 days	2 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
W7	E235.SO4	05-Oct-2020	----	----	----		08-Oct-2020	28 days	2 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
W15	E235.SO4	05-Oct-2020	----	----	----		08-Oct-2020	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
W16	E235.SO4	05-Oct-2020	----	----	----		08-Oct-2020	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
W17	E235.SO4	05-Oct-2020	----	----	----		08-Oct-2020	28 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
W35	E235.SO4	05-Oct-2020	----	----	----		08-Oct-2020	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
W50	E235.SO4	05-Oct-2020	----	----	----		08-Oct-2020	28 days	3 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
DUP	E421.Cr-L	05-Oct-2020	15-Oct-2020	180 days	10 days	✓	19-Oct-2020	169 days	3 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
W15	E421.Cr-L	05-Oct-2020	15-Oct-2020	180 days	10 days	✓	19-Oct-2020	169 days	3 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
W16	E421.Cr-L	05-Oct-2020	15-Oct-2020	180 days	10 days	✓	19-Oct-2020	169 days	3 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
W17	E421.Cr-L	05-Oct-2020	15-Oct-2020	180 days	10 days	✓	19-Oct-2020	169 days	3 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
W35	E421.Cr-L	05-Oct-2020	15-Oct-2020	180 days	10 days	✓	19-Oct-2020	169 days	3 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
W50	E421.Cr-L	05-Oct-2020	15-Oct-2020	180 days	10 days	✓	19-Oct-2020	169 days	3 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
W7	E421.Cr-L	05-Oct-2020	15-Oct-2020	180 days	10 days	✓	19-Oct-2020	169 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) W2	E421.Cr-L	06-Oct-2020	15-Oct-2020	180 days	9 days	✓	19-Oct-2020	170 days	3 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) W3	E421.Cr-L	06-Oct-2020	15-Oct-2020	180 days	9 days	✓	19-Oct-2020	170 days	3 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) W15	E509	05-Oct-2020	09-Oct-2020	28 days	4 days	✓	09-Oct-2020	23 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) W35	E509	05-Oct-2020	09-Oct-2020	28 days	4 days	✓	09-Oct-2020	23 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) W50	E509	05-Oct-2020	09-Oct-2020	28 days	4 days	✓	09-Oct-2020	23 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) DUP	E509	05-Oct-2020	13-Oct-2020	28 days	7 days	✓	13-Oct-2020	20 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) W2	E509	06-Oct-2020	13-Oct-2020	28 days	7 days	✓	13-Oct-2020	20 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) W3	E509	06-Oct-2020	13-Oct-2020	28 days	7 days	✓	13-Oct-2020	20 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) W7	E509	05-Oct-2020	13-Oct-2020	28 days	7 days	✓	13-Oct-2020	20 days	0 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) W16	E509	05-Oct-2020	13-Oct-2020	28 days	8 days	✓	13-Oct-2020	19 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) W17	E509	05-Oct-2020	13-Oct-2020	28 days	8 days	✓	13-Oct-2020	19 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) DUP	E421	05-Oct-2020	15-Oct-2020	180 days	10 days	✓	19-Oct-2020	169 days	3 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) W15	E421	05-Oct-2020	15-Oct-2020	180 days	10 days	✓	19-Oct-2020	169 days	3 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) W16	E421	05-Oct-2020	15-Oct-2020	180 days	10 days	✓	19-Oct-2020	169 days	3 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) W17	E421	05-Oct-2020	15-Oct-2020	180 days	10 days	✓	19-Oct-2020	169 days	3 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) W35	E421	05-Oct-2020	15-Oct-2020	180 days	10 days	✓	19-Oct-2020	169 days	3 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) W50	E421	05-Oct-2020	15-Oct-2020	180 days	10 days	✓	19-Oct-2020	169 days	3 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) W7	E421	05-Oct-2020	15-Oct-2020	180 days	10 days	✓	19-Oct-2020	169 days	3 days	✓

Matrix: **Water**

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Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) W2	E421	06-Oct-2020	15-Oct-2020	180 days	9 days	✓	19-Oct-2020	170 days	3 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) W3	E421	06-Oct-2020	15-Oct-2020	180 days	9 days	✓	19-Oct-2020	170 days	3 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) W15	E358-L	05-Oct-2020	----	----	----		15-Oct-2020	28 days	10 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) W16	E358-L	05-Oct-2020	----	----	----		15-Oct-2020	28 days	10 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) W17	E358-L	05-Oct-2020	----	----	----		15-Oct-2020	28 days	10 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) W35	E358-L	05-Oct-2020	----	----	----		15-Oct-2020	28 days	10 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) W50	E358-L	05-Oct-2020	----	----	----		15-Oct-2020	28 days	10 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) DUP	E358-L	05-Oct-2020	----	----	----		15-Oct-2020	28 days	9 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) W2	E358-L	06-Oct-2020	----	----	----		15-Oct-2020	28 days	9 days	✓

Matrix: **Water**

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Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid)										
W3	E358-L	06-Oct-2020	----	----	----		15-Oct-2020	28 days	9 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid)										
W7	E358-L	05-Oct-2020	----	----	----		15-Oct-2020	28 days	9 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
DUP	E290	05-Oct-2020	----	----	----		08-Oct-2020	14 days	2 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
W2	E290	06-Oct-2020	----	----	----		08-Oct-2020	14 days	2 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
W3	E290	06-Oct-2020	----	----	----		08-Oct-2020	14 days	2 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
W7	E290	05-Oct-2020	----	----	----		08-Oct-2020	14 days	2 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
W15	E290	05-Oct-2020	----	----	----		08-Oct-2020	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
W16	E290	05-Oct-2020	----	----	----		08-Oct-2020	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
W17	E290	05-Oct-2020	----	----	----		08-Oct-2020	14 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE W35	E290	05-Oct-2020	----	----	----		08-Oct-2020	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE W50	E290	05-Oct-2020	----	----	----		08-Oct-2020	14 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE DUP	E100	05-Oct-2020	----	----	----		08-Oct-2020	28 days	2 days	✓
Physical Tests : Conductivity in Water										
HDPE W2	E100	06-Oct-2020	----	----	----		08-Oct-2020	28 days	2 days	✓
Physical Tests : Conductivity in Water										
HDPE W3	E100	06-Oct-2020	----	----	----		08-Oct-2020	28 days	2 days	✓
Physical Tests : Conductivity in Water										
HDPE W7	E100	05-Oct-2020	----	----	----		08-Oct-2020	28 days	2 days	✓
Physical Tests : Conductivity in Water										
HDPE W15	E100	05-Oct-2020	----	----	----		08-Oct-2020	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE W16	E100	05-Oct-2020	----	----	----		08-Oct-2020	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE W17	E100	05-Oct-2020	----	----	----		08-Oct-2020	28 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Conductivity in Water										
HDPE W35	E100	05-Oct-2020	----	----	----		08-Oct-2020	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE W50	E100	05-Oct-2020	----	----	----		08-Oct-2020	28 days	3 days	✓
Physical Tests : pH by Meter										
HDPE W3	E108	06-Oct-2020	----	----	----		08-Oct-2020	0.25 hrs	55 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE W2	E108	06-Oct-2020	----	----	----		08-Oct-2020	0.25 hrs	56 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE DUP	E108	05-Oct-2020	----	----	----		08-Oct-2020	0.25 hrs	70 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE W7	E108	05-Oct-2020	----	----	----		08-Oct-2020	0.25 hrs	70 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE W16	E108	05-Oct-2020	----	----	----		08-Oct-2020	0.25 hrs	76 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE W17	E108	05-Oct-2020	----	----	----		08-Oct-2020	0.25 hrs	77 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE W50	E108	05-Oct-2020	----	----	----		08-Oct-2020	0.25 hrs	77 hrs	× EHTR-FM

Matrix: **Water**

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Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : pH by Meter										
HDPE W15	E108	05-Oct-2020	----	----	----		08-Oct-2020	0.25 hrs	78 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE W35	E108	05-Oct-2020	----	----	----		08-Oct-2020	0.25 hrs	78 hrs	× EHTR-FM
Physical Tests : TSS by Gravimetry										
HDPE W16	E160-H	05-Oct-2020	----	----	----		09-Oct-2020	7 days	3 days	✓
Physical Tests : TSS by Gravimetry										
HDPE DUP	E160-H	05-Oct-2020	----	----	----		09-Oct-2020	7 days	4 days	✓
Physical Tests : TSS by Gravimetry										
HDPE W15	E160-H	05-Oct-2020	----	----	----		09-Oct-2020	7 days	4 days	✓
Physical Tests : TSS by Gravimetry										
HDPE W17	E160-H	05-Oct-2020	----	----	----		09-Oct-2020	7 days	4 days	✓
Physical Tests : TSS by Gravimetry										
HDPE W2	E160-H	06-Oct-2020	----	----	----		10-Oct-2020	7 days	4 days	✓
Physical Tests : TSS by Gravimetry										
HDPE W3	E160-H	06-Oct-2020	----	----	----		10-Oct-2020	7 days	4 days	✓
Physical Tests : TSS by Gravimetry										
HDPE W35	E160-H	05-Oct-2020	----	----	----		09-Oct-2020	7 days	4 days	✓

Matrix: **Water**

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Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TSS by Gravimetry										
HDPE W50	E160-H	05-Oct-2020	----	----	----		09-Oct-2020	7 days	4 days	✓
Physical Tests : TSS by Gravimetry										
HDPE W7	E160-H	05-Oct-2020	----	----	----		09-Oct-2020	7 days	4 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) W2	E420.Cr-L	06-Oct-2020	----	----	----		17-Oct-2020	180 days	10 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) W3	E420.Cr-L	06-Oct-2020	----	----	----		17-Oct-2020	180 days	10 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) DUP	E420.Cr-L	05-Oct-2020	----	----	----		17-Oct-2020	180 days	11 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) W15	E420.Cr-L	05-Oct-2020	----	----	----		17-Oct-2020	180 days	11 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) W16	E420.Cr-L	05-Oct-2020	----	----	----		17-Oct-2020	180 days	11 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) W17	E420.Cr-L	05-Oct-2020	----	----	----		17-Oct-2020	180 days	11 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) W35	E420.Cr-L	05-Oct-2020	----	----	----		17-Oct-2020	180 days	11 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) W50	E420.Cr-L	05-Oct-2020	----	----	----		17-Oct-2020	180 days	11 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) W7	E420.Cr-L	05-Oct-2020	----	----	----		17-Oct-2020	180 days	11 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) DUP	E508	05-Oct-2020	----	----	----		13-Oct-2020	28 days	7 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) W2	E508	06-Oct-2020	----	----	----		13-Oct-2020	28 days	7 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) W3	E508	06-Oct-2020	----	----	----		13-Oct-2020	28 days	7 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) W7	E508	05-Oct-2020	----	----	----		13-Oct-2020	28 days	7 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) W15	E508	05-Oct-2020	----	----	----		13-Oct-2020	28 days	8 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) W16	E508	05-Oct-2020	----	----	----		13-Oct-2020	28 days	8 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) W17	E508	05-Oct-2020	----	----	----		13-Oct-2020	28 days	8 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) W35	E508	05-Oct-2020	----	----	----		13-Oct-2020	28 days	8 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) W50	E508	05-Oct-2020	----	----	----		13-Oct-2020	28 days	8 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) W2	E420	06-Oct-2020	----	----	----		17-Oct-2020	180 days	10 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) W3	E420	06-Oct-2020	----	----	----		17-Oct-2020	180 days	10 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) DUP	E420	05-Oct-2020	----	----	----		17-Oct-2020	180 days	11 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) W15	E420	05-Oct-2020	----	----	----		17-Oct-2020	180 days	11 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) W16	E420	05-Oct-2020	----	----	----		17-Oct-2020	180 days	11 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) W17	E420	05-Oct-2020	----	----	----		17-Oct-2020	180 days	11 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) W35	E420	05-Oct-2020	----	----	----		17-Oct-2020	180 days	11 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) W50	E420	05-Oct-2020	----	----	----		17-Oct-2020	180 days	11 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) W7	E420	05-Oct-2020	----	----	----		17-Oct-2020	180 days	11 days	✓

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	99316	1	17	5.8	5.0	✓
Ammonia by Fluorescence	E298	103061	1	9	11.1	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	99314	1	9	11.1	5.0	✓
Conductivity in Water	E100	99317	1	17	5.8	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	103319	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	100381	2	25	8.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	103318	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	103060	1	9	11.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	99311	1	20	5.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	99312	1	17	5.8	5.0	✓
pH by Meter	E108	99315	1	17	5.8	5.0	✓
Sulfate in Water by IC	E235.SO4	99313	1	17	5.8	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	101809	1	18	5.5	5.0	✓
Total Mercury in Water by CVAAS	E508	101625	1	16	6.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	101808	1	20	5.0	5.0	✓
TSS by Gravimetry	E160-H	100180	3	60	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	99316	1	17	5.8	5.0	✓
Ammonia by Fluorescence	E298	103061	1	9	11.1	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	99314	1	9	11.1	5.0	✓
Conductivity in Water	E100	99317	1	17	5.8	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	103319	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	100381	2	25	8.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	103318	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	103060	1	9	11.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	99311	1	20	5.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	99312	1	17	5.8	5.0	✓
pH by Meter	E108	99315	1	17	5.8	5.0	✓
Sulfate in Water by IC	E235.SO4	99313	1	17	5.8	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	101809	1	18	5.5	5.0	✓
Total Mercury in Water by CVAAS	E508	101625	1	16	6.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	101808	1	20	5.0	5.0	✓
TSS by Gravimetry	E160-H	100180	3	60	5.0	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	99316	1	17	5.8	5.0	✓
Ammonia by Fluorescence	E298	103061	1	9	11.1	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	99314	1	9	11.1	5.0	✓

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Method Blanks (MB) - Continued							
Conductivity in Water	E100	99317	1	17	5.8	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	103319	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	100381	2	25	8.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	103318	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	103060	1	9	11.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	99311	1	20	5.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	99312	1	17	5.8	5.0	✓
Sulfate in Water by IC	E235.SO4	99313	1	17	5.8	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	101809	1	18	5.5	5.0	✓
Total Mercury in Water by CVAAS	E508	101625	1	16	6.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	101808	1	20	5.0	5.0	✓
TSS by Gravimetry	E160-H	100180	3	60	5.0	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	103061	1	9	11.1	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	99314	1	9	11.1	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	103319	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	100381	2	25	8.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	103318	2	20	10.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	103060	1	9	11.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	99311	1	20	5.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	99312	1	17	5.8	5.0	✓
Sulfate in Water by IC	E235.SO4	99313	1	17	5.8	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	101809	1	18	5.5	5.0	✓
Total Mercury in Water by CVAAS	E508	101625	1	16	6.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	101808	1	20	5.0	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
TSS by Gravimetry	E160-H Vancouver - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
Chloride in Water by IC (Low Level)	E235.Cl-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Vancouver - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Metals in Water by CRC ICPMS	E420 Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Vancouver - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Total Mercury in Water by CVAAS	E508 Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	“Hardness (as CaCO3), dissolved” is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. “Total Hardness” refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Hardness (Calculated) from Total Ca/Mg	EC100A Vancouver - Environmental	Water	APHA 2340B	“Hardness (as CaCO3), from total Ca/Mg” is calculated from the sum of total Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. “Total Hardness” refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations. Hardness from total Ca/Mg is normally comparable to Dissolved Hardness in non-turbid waters.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Ion Balance using Dissolved Metals	EC101 Vancouver - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
TDS in Water (Calculation)	EC103 Vancouver - Environmental	Water	APHA 1030E (mod)	Total Dissolved Solids is calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present.
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N Vancouver - Environmental	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **WR2001038**	Page	: 1 of 16
Client	: Minto Explorations Ltd.	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 06-Oct-2020 13:45
PO	: 232817	Date Analysis Commenced	: 08-Oct-2020
C-O-C number	: 2020-10-06 A	Issue Date	: 21-Oct-2020 18:47
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 9		
No. of samples analysed	: 9		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Bruna Botti	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Clarie Tejano		Metals, Burnaby, British Columbia
Dan Gebert	Laboratory Analyst	Metals, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Gloria Chan	Lab Analyst	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Omar Beydoun	Lab Assistant	Metals, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics - Water Quality, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 100180)											
VA20B7644-001	Anonymous	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	151	129	15.6%	20%	----
Physical Tests (QC Lot: 100694)											
VA20B7640-002	Anonymous	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	4.2	<3.0	1.2	Diff <2x LOR	----
Physical Tests (QC Lot: 100907)											
VA20B7339-002	Anonymous	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	97.5	115	16.7%	20%	----
Physical Tests (QC Lot: 99315)											
VA20B7514-003	Anonymous	pH	----	E108	0.10	pH units	7.63	7.64	0.131%	4%	----
Physical Tests (QC Lot: 99316)											
VA20B7514-003	Anonymous	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	26.4	26.5	0.378%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	26.4	26.5	0.378%	20%	----
Physical Tests (QC Lot: 99317)											
VA20B7514-003	Anonymous	conductivity	----	E100	2.0	µS/cm	75.5	75.0	0.664%	10%	----
Anions and Nutrients (QC Lot: 103061)											
WR2001038-001	W15	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0066	0.0066	0.00001	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 99311)											
VA20B7514-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.0457	0.0421	0.0036	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 99312)											
VA20B7514-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 99313)											
VA20B7514-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	19.6	19.6	0.420%	20%	----
Anions and Nutrients (QC Lot: 99314)											
WR2001038-001	W15	chloride	16887-00-6	E235.Cl-L	0.50	mg/L	2.16	2.18	0.03	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 103060)											
WR2001038-001	W15	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	14.5	14.6	1.21%	20%	----
Total Metals (QC Lot: 101625)											
WR2001037-009	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	0.0000053	<0.0000050	0.0000003	Diff <2x LOR	----
Total Metals (QC Lot: 101808)											
VA20B7407-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0708	0.0694	2.10%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Total Metals (QC Lot: 101808) - continued											
VA20B7407-001	Anonymous	antimony, total	7440-36-0	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00012	0.00014	0.00001	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.0234	0.0241	2.84%	20%	----
		beryllium, total	7440-41-7	E420	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0000050	mg/L	0.0000235	0.0000206	0.0000029	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.050	mg/L	16.3	16.8	3.42%	20%	----
		cobalt, total	7440-48-4	E420	0.00010	mg/L	0.00012	0.00012	0.0000006	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00050	mg/L	0.00074	0.00073	0.000010	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.010	mg/L	0.084	0.084	0.0005	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	0.100	mg/L	2.01	2.04	1.54%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.227	0.216	5.16%	20%	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.000106	0.000090	0.000016	Diff <2x LOR	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.00078	0.00077	0.000009	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E420	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.100	mg/L	0.207	0.205	0.002	Diff <2x LOR	----
		selenium, total	7782-49-2	E420	0.000050	mg/L	0.000114	0.000121	0.000007	Diff <2x LOR	----
		silicon, total	7440-21-3	E420	0.10	mg/L	5.09	5.07	0.320%	20%	----
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, total	17341-25-2	E420	0.050	mg/L	1.78	1.74	2.09%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.0706	0.0723	2.37%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	2.71	2.92	0.21	Diff <2x LOR	----
		thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	0.00121	0.00113	0.00008	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	----
		zirconium, total	7440-67-7	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
Total Metals (QC Lot: 101809)											
VA20B7407-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00019	0.00018	0.000007	Diff <2x LOR	----
Dissolved Metals (QC Lot: 100381)											
WR2001037-014	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 101717)											
VA20B7582-002	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 103318)											
WR2001038-001	W15	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0112	0.0117	4.12%	20%	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00034	0.00034	0.000003	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0839	0.0849	1.22%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	0.0000121	0.0000124	0.0000003	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	123	121	1.59%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.0101	0.0104	3.76%	20%	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	0.051	0.050	0.0009	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0011	0.0011	0.00004	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.100	mg/L	32.3	32.6	1.09%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.0170	0.0172	0.891%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00254	0.00256	0.859%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00078	0.00074	0.00004	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.100	mg/L	3.32	3.38	1.53%	20%	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.00607	0.00604	0.488%	20%	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	4.87	4.90	0.710%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E421	0.050	mg/L	14.6	15.3	4.58%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	1.01	1.02	1.53%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	65.8	66.4	0.895%	20%	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	0.00034	0.00053	0.00019	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00214	0.00212	0.787%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 103319)											
WR2001038-001	W15	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	0.00018	0.00022	0.00004	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 100180)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Physical Tests (QCLot: 100694)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Physical Tests (QCLot: 100907)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Physical Tests (QCLot: 99316)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 99317)						
conductivity	----	E100	1	µS/cm	<1.0	----
Anions and Nutrients (QCLot: 103061)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 99311)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 99312)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 99313)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 99314)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Organic / Inorganic Carbon (QCLot: 103060)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 101625)						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----
Total Metals (QCLot: 101808)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 101808) - continued						
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	17341-25-2	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	<0.00020	----
Total Metals (QCLot: 101809)						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 100381)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 101717)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 103318)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 103318) - continued						
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----
Dissolved Metals (QCLot: 103319)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 100180)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	99.3	85.0	115	----
Physical Tests (QCLot: 100694)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	91.4	85.0	115	----
Physical Tests (QCLot: 100907)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	109	85.0	115	----
Physical Tests (QCLot: 99315)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 99316)									
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	229 mg/L	94.4	75.0	125	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	100	85.0	115	----
Physical Tests (QCLot: 99317)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	100	90.0	110	----
Anions and Nutrients (QCLot: 103061)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.12 mg/L	95.0	85.0	115	----
Anions and Nutrients (QCLot: 99311)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	104	90.0	110	----
Anions and Nutrients (QCLot: 99312)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	103	90.0	110	----
Anions and Nutrients (QCLot: 99313)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	106	90.0	110	----
Anions and Nutrients (QCLot: 99314)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	104	90.0	110	----
Organic / Inorganic Carbon (QCLot: 103060)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	98.2	80.0	120	----
Total Metals (QCLot: 101625)									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	101	80.0	120	----
Total Metals (QCLot: 101808)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	105	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	113	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	102	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	104	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 101808) - continued									
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	100	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	105	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	100	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	108	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	101	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	102	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	104	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	107	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	97.5	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	99.4	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	119	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	106	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	103	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	110	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	105	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	112	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	107	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	106	80.0	120	----
sodium, total	17341-25-2	E420	0.05	mg/L	50 mg/L	100.0	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	109	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	92.3	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	107	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	105	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	102	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	101	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	105	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	112	80.0	120	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.1 mg/L	104	80.0	120	----
Total Metals (QCLot: 101809)									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
Dissolved Metals (QCLot: 100381)									
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	99.0	80.0	120	----
Dissolved Metals (QCLot: 101717)									
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	99.8	80.0	120	----
Dissolved Metals (QCLot: 103318)									

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 103318) - continued									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	108	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	107	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	105	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	108	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	96.7	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	99.8	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	96.5	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	107	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	104	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	103	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	107	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	95.6	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	99.4	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	101	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	98.3	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	112	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	109	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	105	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	104	70.0	130	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	106	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	104	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	99.6	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	108	80.0	120	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	103	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	112	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	91.7	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	100	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	104	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	101	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	98.6	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	108	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	104	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	103	80.0	120	----
Dissolved Metals (QCLot: 103319)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	105	80.0	120	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 103061)										
WR2001038-002	W35	ammonia, total (as N)	7664-41-7	E298	0.208 mg/L	0.2 mg/L	104	75.0	125	----
Anions and Nutrients (QCLot: 99311)										
VA20B7514-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.51 mg/L	2.5 mg/L	100	75.0	125	----
Anions and Nutrients (QCLot: 99312)										
VA20B7514-002	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.497 mg/L	0.5 mg/L	99.3	75.0	125	----
Anions and Nutrients (QCLot: 99313)										
VA20B7514-002	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	100 mg/L	100 mg/L	100	75.0	125	----
Anions and Nutrients (QCLot: 99314)										
WR2001038-002	W35	chloride	16887-00-6	E235.Cl-L	105 mg/L	100 mg/L	105	75.0	125	----
Organic / Inorganic Carbon (QCLot: 103060)										
WR2001038-002	W35	carbon, dissolved organic [DOC]	----	E358-L	ND mg/L	5 mg/L	ND	70.0	130	----
Total Metals (QCLot: 101625)										
WR2001037-010	Anonymous	mercury, total	7439-97-6	E508	0.0000996 mg/L	0.0001 mg/L	99.6	70.0	130	----
Total Metals (QCLot: 101808)										
VA20B7407-002	Anonymous	aluminum, total	7429-90-5	E420	0.142 mg/L	0.2 mg/L	70.9	70.0	130	----
		antimony, total	7440-36-0	E420	0.0218 mg/L	0.02 mg/L	109	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0193 mg/L	0.02 mg/L	96.6	70.0	130	----
		barium, total	7440-39-3	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0415 mg/L	0.04 mg/L	104	70.0	130	----
		bismuth, total	7440-69-9	E420	0.0104 mg/L	0.01 mg/L	104	70.0	130	----
		boron, total	7440-42-8	E420	0.101 mg/L	0.1 mg/L	101	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00409 mg/L	0.004 mg/L	102	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0193 mg/L	0.02 mg/L	96.6	70.0	130	----
		copper, total	7440-50-8	E420	0.0191 mg/L	0.02 mg/L	95.5	70.0	130	----
		iron, total	7439-89-6	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		lead, total	7439-92-1	E420	0.0202 mg/L	0.02 mg/L	101	70.0	130	----
		lithium, total	7439-93-2	E420	0.102 mg/L	0.1 mg/L	102	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 101808) - continued										
VA20B7407-002	Anonymous	manganese, total	7439-96-5	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0211 mg/L	0.02 mg/L	106	70.0	130	----
		nickel, total	7440-02-0	E420	0.0389 mg/L	0.04 mg/L	97.2	70.0	130	----
		phosphorus, total	7723-14-0	E420	10.2 mg/L	10 mg/L	102	70.0	130	----
		potassium, total	7440-09-7	E420	4.10 mg/L	4 mg/L	102	70.0	130	----
		selenium, total	7782-49-2	E420	0.0440 mg/L	0.04 mg/L	110	70.0	130	----
		silicon, total	7440-21-3	E420	9.34 mg/L	10 mg/L	93.4	70.0	130	----
		silver, total	7440-22-4	E420	0.00408 mg/L	0.004 mg/L	102	70.0	130	----
		sodium, total	17341-25-2	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	21.6 mg/L	20 mg/L	108	70.0	130	----
		thallium, total	7440-28-0	E420	0.00407 mg/L	0.004 mg/L	102	70.0	130	----
		tin, total	7440-31-5	E420	0.0203 mg/L	0.02 mg/L	101	70.0	130	----
		titanium, total	7440-32-6	E420	0.0369 mg/L	0.04 mg/L	92.3	70.0	130	----
		uranium, total	7440-61-1	E420	0.00405 mg/L	0.004 mg/L	101	70.0	130	----
		vanadium, total	7440-62-2	E420	0.103 mg/L	0.1 mg/L	103	70.0	130	----
		zinc, total	7440-66-6	E420	0.406 mg/L	0.4 mg/L	102	70.0	130	----
		zirconium, total	7440-67-7	E420	0.0419 mg/L	0.04 mg/L	105	70.0	130	----
Total Metals (QCLot: 101809)										
VA20B7407-002	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.0392 mg/L	0.04 mg/L	97.9	70.0	130	----
Dissolved Metals (QCLot: 100381)										
WR2001037-015	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000980 mg/L	0.0001 mg/L	98.0	70.0	130	----
Dissolved Metals (QCLot: 101717)										
WR2001038-004	W17	mercury, dissolved	7439-97-6	E509	0.0000938 mg/L	0.0001 mg/L	93.8	70.0	130	----
Dissolved Metals (QCLot: 103318)										
WR2001038-002	W35	antimony, dissolved	7440-36-0	E421	0.0209 mg/L	0.02 mg/L	104	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0244 mg/L	0.02 mg/L	122	70.0	130	----
WR2001038-002	W35	aluminum, dissolved	7429-90-5	E421	0.217 mg/L	0.2 mg/L	108	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0411 mg/L	0.04 mg/L	103	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00904 mg/L	0.01 mg/L	90.4	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.093 mg/L	0.1 mg/L	93.2	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00430 mg/L	0.004 mg/L	107	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0208 mg/L	0.02 mg/L	104	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 103318) - continued										
WR2001038-002	W35	copper, dissolved	7440-50-8	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		iron, dissolved	7439-89-6	E421	2.00 mg/L	2 mg/L	100	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0190 mg/L	0.02 mg/L	94.9	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.111 mg/L	0.1 mg/L	111	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0217 mg/L	0.02 mg/L	109	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0418 mg/L	0.04 mg/L	104	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	10.3 mg/L	10 mg/L	103	70.0	130	----
		potassium, dissolved	7440-09-7	E421	4.23 mg/L	4 mg/L	106	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0428 mg/L	0.04 mg/L	107	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.68 mg/L	10 mg/L	96.8	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00425 mg/L	0.004 mg/L	106	70.0	130	----
		sodium, dissolved	17341-25-2	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	21.3 mg/L	20 mg/L	106	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00381 mg/L	0.004 mg/L	95.3	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0208 mg/L	0.02 mg/L	104	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0422 mg/L	0.04 mg/L	106	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00375 mg/L	0.004 mg/L	93.8	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.109 mg/L	0.1 mg/L	109	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.408 mg/L	0.4 mg/L	102	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0442 mg/L	0.04 mg/L	111	70.0	130	----
Dissolved Metals (QCLot: 103319)										
WR2001038-002	W35	chromium, dissolved	7440-47-3	E421.Cr-L	0.0422 mg/L	0.04 mg/L	106	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number: 2020-10-06 A

Page 1 of 1

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Michelle Olesh

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax mintoenvironment@mintomine.com
Email 2
Email 3

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax ap@mintomine.com
Email 2

Project Information

ALS Account # / Quote #:
Job #:
PO / AFE: 232817 (WUL)
LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#
Major/Minor Code: Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only)

ALS Contact: Shane Stack **Sampler:**

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐
EMERGENCY: 1 Business day [E1] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service le

Analysis F

Indicate Filtered (F), Preserved (P) or Filtered a

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	pH / Conductivity / Alkalinity / Anions	Total Suspended Solids (TSS)	Total Disolved Solids (TDS)	Total Metals (TM), Hardness	Dissolved Metals (DM),(filtered and preserve	Total Mercury, Hardness	Dissolved Mercury [1] (Filtered + preserved)	Total Nutrients (Ammonia)	Dissolved Organic Carbon					Number c
								P	F/P	P	F/P	P						
	W15	5-Oct-20	7:25	Water	R	R	R	R	R	R	R	R	R					7
	W35	5-Oct-20	7:45	Water	R	R	R	R	R	R	R	R	R					7
	W50	5-Oct-20	8:20	Water	R	R	R	R	R	R	R	R	R					7
	W17	5-Oct-20	8:35	Water	R	R	R	R	R	R	R	R	R					7
	W16	5-Oct-20	9:00	Water	R	R	R	R	R	R	R	R	R					7
	W7	5-Oct-20	15:45	Water	R	R	R	R	R	R	R	R	R					7
	DUP	5-Oct-20		Water	R	R	R	R	R	R	R	R	R					7
	W2	6-Oct-20	5:35	Water	R	R	R	R	R	R	R	R	R					7
	W3	6-Oct-20	6.05	Water	R	R	R	R	R	R	R	R	R					7

Environmental Division
Whitehouse
Work Order Reference
WR2001038

Telephone : +1 867 668 6689

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?
☐ YES ☑ NO

Are samples for human drinking water use?
☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C								FINAL COOLER TEMPERATURES °C		
1	3	2	2	2	2	2	2			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Ian Smith	Date: 2020-10-06	Time:	Received by:	Date: oct 6/20	Time: 13:45	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000752**	Page	: 1 of 18
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: 232817 (WUL)	Date Samples Received	: 25-Aug-2020 14:26
PO	: ----	Date Analysis Commenced	: 26-Aug-2020
C-O-C number	: 2020-08-25 A, 1 OF 2 AND 2 OF	Issue Date	: 01-Sep-2020 21:09
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 17		
No. of samples analysed	: 17		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Angelo Salandanan	Lab Assistant	Metals, Burnaby, British Columbia
Bruna Botti	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Cindy Tang	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Clarie Tejano		Metals, Burnaby, British Columbia
Cristina Alexandre	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Dan Gebert	Laboratory Analyst	Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Muneeb Alam	Analyst	Metals, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Qualifiers

Qualifier	*Description*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*
DTC	*Dissolved concentration exceeds total. Results were confirmed by re-analysis.*
DTMF	*Dissolved concentration exceeds total for field-filtered metals sample. Metallic contaminants may have been introduced to dissolved sample during field filtration.*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	C4 WATER	W46 WATER	W6 WATER	W7 WATER	MN-4.5 WATER
					Client sampling date / time	20-Aug-2020 15:45	20-Aug-2020 16:25	20-Aug-2020 17:00	20-Aug-2020 17:45	21-Aug-2020 14:05
						WR2000752-001	WR2000752-002	WR2000752-003	WR2000752-004	WR2000752-005
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		94.2	141	92.4	122	71.5
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		94.2	141	92.4	122	71.5
conductivity	----	E100	2.0	µS/cm		190	284	179	237	150
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		100	148	95.0	122	83.5
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		93.3	138	90.6	119	73.6
pH	----	E108	0.10	pH units		7.89	8.02	7.91	8.03	7.90
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		138	189	131	162	118
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	19.9	4.9	20.3	7.4
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0100	0.0143	0.0119	0.0109	0.0110
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.22	1.12	1.33	0.20	0.30
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		<0.0050	0.0348	<0.0050	0.0461	0.0059
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		<0.0051	0.0352	<0.0051	0.0461	0.0063
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		6.79	13.7	1.30	6.75	6.16
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		17.4	13.7	18.1	14.3	20.1
Ion Balance										
anion sum	----	EC101	0.10	meq/L		2.03	3.14	1.91	2.59	1.56
cation sum	----	EC101	0.10	meq/L		2.27	3.37	2.10	2.78	1.88
ion balance (cation-anion difference)	----	EC101	0.010	%		5.58	3.53	4.74	3.54	9.30
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.0310	0.116	0.0927	0.259	0.123
antimony, total	7440-36-0	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00058	0.00052	0.00052	0.00054	0.00044
barium, total	7440-39-3	E420	0.00010	mg/L		0.0486	0.0622	0.0454	0.0631	0.0405
beryllium, total	7440-41-7	E420	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	C4 WATER	W46 WATER	W6 WATER	W7 WATER	MN-4.5 WATER
					Client sampling date / time	20-Aug-2020 15:45	20-Aug-2020 16:25	20-Aug-2020 17:00	20-Aug-2020 17:45	21-Aug-2020 14:05
						WR2000752-001	WR2000752-002	WR2000752-003	WR2000752-004	WR2000752-005
						Result	Result	Result	Result	Result
Total Metals										
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, total	7440-42-8	E420	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010
cadmium, total	7440-43-9	E420	0.0000050	mg/L		<0.0000050	0.0000056	<0.0000050	0.0000054	0.0000060
calcium, total	7440-70-2	E420	0.050	mg/L		24.8	34.0	25.4	29.2	20.7
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00058	0.00050	0.00044	0.00085	0.00062
cobalt, total	7440-48-4	E420	0.00010	mg/L		0.00013	0.00014	<0.00010	0.00023	0.00014
copper, total	7440-50-8	E420	0.00050	mg/L		0.00199	0.00260	0.00174	0.00204	0.00275
iron, total	7439-89-6	E420	0.010	mg/L		0.242	0.229	0.134	0.431	0.221
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	0.000057	<0.000050	0.000103	0.000061
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0010	0.0012	<0.0010	0.0011	<0.0010
magnesium, total	7439-95-4	E420	0.100	mg/L		7.65	12.8	6.61	11.2	5.31
manganese, total	7439-96-5	E420	0.00010	mg/L		0.0239	0.0259	0.0106	0.0239	0.00936
mercury, total	7439-97-6	E508	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.000694	0.00169	0.000413	0.00127	0.000689
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00163	0.00130	0.00161	0.00159	0.00144
phosphorus, total	7723-14-0	E420	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, total	7440-09-7	E420	0.100	mg/L		0.607	0.943	0.256	0.776	0.488
selenium, total	7782-49-2	E420	0.000050	mg/L		0.000084	0.000147	0.000102	0.000153	0.000181
silicon, total	7440-21-3	E420	0.10	mg/L		6.62	6.23	6.51	6.54	5.96
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, total	7440-23-5	E420	0.050	mg/L		5.31	9.04	4.46	7.33	4.42
strontium, total	7440-24-6	E420	0.00020	mg/L		0.190	0.390	0.123	0.309	0.144
sulfur, total	7704-34-9	E420	0.50	mg/L		2.49	5.12	0.58	2.94	2.18
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, total	7440-32-6	E420	0.00030	mg/L		0.00117	0.00504	0.00303	0.0100	0.00554
uranium, total	7440-61-1	E420	0.000010	mg/L		0.000226	0.000949	0.000144	0.000787	0.000204
vanadium, total	7440-62-2	E420	0.00050	mg/L		0.00061	0.00122	0.00084	0.00153	0.00113
zinc, total	7440-66-6	E420	0.0030	mg/L		<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
zirconium, total	7440-67-7	E420	0.00020	mg/L		0.00042	0.00022	0.00024	0.00030	0.00041
Dissolved Metals										

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	C4 WATER	W46 WATER	W6 WATER	W7 WATER	MN-4.5 WATER
					Client sampling date / time	20-Aug-2020 15:45	20-Aug-2020 16:25	20-Aug-2020 17:00	20-Aug-2020 17:45	21-Aug-2020 14:05
						WR2000752-001	WR2000752-002	WR2000752-003	WR2000752-004	WR2000752-005
						Result	Result	Result	Result	Result
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0165	0.0069	0.0095	0.0186	0.0242
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00052	0.00046	0.00047	0.00037	0.00039
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0478	0.0611	0.0414	0.0599	0.0381
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	0.0000102	<0.0000050
calcium, dissolved	7440-70-2	E421	0.050	mg/L		25.9	35.6	26.3	30.3	23.0
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00053	0.00026	0.00025	0.00034	0.00040
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00011	<0.00010	<0.00010	<0.00010	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00231	0.00221	0.00150	0.00373 DTC	0.00246
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.179	0.071	0.061	0.092	0.070
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		<0.0010	0.0010	<0.0010	<0.0010	<0.0010
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		8.65	14.3	7.13	11.2	6.32
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0188	0.0170	0.00757	0.0119	0.00113
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.000661	0.00165	0.000376	0.00125	0.000614
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00152	0.00102	0.00142	0.00120	0.00116
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		0.640	0.968	0.258	0.717	0.511
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000098	0.000172	0.000096	0.000158	0.000181
silicon, dissolved	7440-21-3	E421	0.050	mg/L		6.17	5.76	6.10	6.53	5.42
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		5.46	8.85	4.36	7.40	4.34
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.177	0.359	0.116	0.330	0.136
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		2.51	5.04	0.76	2.62	2.19
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		0.00062 DTMF	<0.00010	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		0.00072	0.00032	0.00049	0.00119	0.00071

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	C4 WATER	W46 WATER	W6 WATER	W7 WATER	MN-4.5 WATER
					Client sampling date / time	20-Aug-2020 15:45	20-Aug-2020 16:25	20-Aug-2020 17:00	20-Aug-2020 17:45	21-Aug-2020 14:05
						WR2000752-001	WR2000752-002	WR2000752-003	WR2000752-004	WR2000752-005
						Result	Result	Result	Result	Result
Dissolved Metals										
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000246	0.000998	0.000148	0.000707	0.000208
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	0.00078	0.00055	0.00070	0.00060
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		<0.0010	<0.0010	<0.0010	0.0034	<0.0010
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		0.00043	0.00021	0.00024	0.00026	0.00040
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MN-0.5 WATER	MN-2.5 WATER	MN-1.5 WATER	MN-0.2 WATER	DUP WATER
					Client sampling date / time	21-Aug-2020 15:00	21-Aug-2020 15:40	21-Aug-2020 16:55	21-Aug-2020 17:45	20-Aug-2020
						WR2000752-006	WR2000752-007	WR2000752-008	WR2000752-009	WR2000752-010
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		62.4	73.6	31.8	25.0	92.0
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		62.4	73.6	31.8	25.0	92.0
conductivity	----	E100	2.0	µS/cm		138	144	76.8	75.2	178
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		75.5	77.7	40.9	38.2	98.5
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		67.7	76.2	37.0	36.8	87.0
pH	----	E108	0.10	pH units		7.78	7.82	7.34	7.19	7.92
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		115	111	79.4	86.1	132
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		6.8	78.0	<3.0	3.6	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0160	0.0148	0.0118	0.0136	0.0112
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.19	0.40	<0.10	0.15	1.34
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.0055	<0.0050	<0.0050	<0.0050	<0.0050
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		0.0059	<0.0051	<0.0051	<0.0051	<0.0051
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		7.56	2.42	5.60	9.26	1.30
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		22.9	18.2	21.4	28.3	18.4
Ion Balance										
anion sum	----	EC101	0.10	meq/L		1.41	1.53	0.75	0.70	1.90
cation sum	----	EC101	0.10	meq/L		1.71	1.73	0.97	0.94	2.17
ion balance (cation-anion difference)	----	EC101	0.010	%		9.62	6.13	12.8	14.6	6.63
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.106	0.752	0.116	0.137	0.0680
antimony, total	7440-36-0	E420	0.00010	mg/L		<0.00010	0.00011	<0.00010	<0.00010	<0.00010
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00043	0.00068	0.00034	0.00047	0.00049
barium, total	7440-39-3	E420	0.00010	mg/L		0.0390	0.0492	0.0301	0.0354	0.0449
beryllium, total	7440-41-7	E420	0.000020	mg/L		<0.000020	0.000034	<0.000020	<0.000020	<0.000020
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MN-0.5 WATER	MN-2.5 WATER	MN-1.5 WATER	MN-0.2 WATER	DUP WATER
					Client sampling date / time	21-Aug-2020 15:00	21-Aug-2020 15:40	21-Aug-2020 16:55	21-Aug-2020 17:45	20-Aug-2020
						WR2000752-006	WR2000752-007	WR2000752-008	WR2000752-009	WR2000752-010
						Result	Result	Result	Result	Result
Total Metals										
boron, total	7440-42-8	E420	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010
cadmium, total	7440-43-9	E420	0.0000050	mg/L		0.0000059	0.0000252	0.0000067	<0.0000050	<0.0000050
calcium, total	7440-70-2	E420	0.050	mg/L		18.6	20.1	10.1	9.81	24.3
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00060	0.00175	0.00072	0.00082	0.00048
cobalt, total	7440-48-4	E420	0.00010	mg/L		0.00013	0.00064	0.00014	0.00017	0.00010
copper, total	7440-50-8	E420	0.00050	mg/L		0.00295	0.00418	0.00701	0.00321	0.00170
iron, total	7439-89-6	E420	0.010	mg/L		0.198	1.08	0.275	0.382	0.149
lead, total	7439-92-1	E420	0.000050	mg/L		0.000056	0.000370	<0.000050	<0.000050	<0.000050
lithium, total	7439-93-2	E420	0.0010	mg/L		<0.0010	0.0011	<0.0010	<0.0010	<0.0010
magnesium, total	7439-95-4	E420	0.100	mg/L		5.14	6.30	2.86	2.99	6.41
manganese, total	7439-96-5	E420	0.00010	mg/L		0.0106	0.0413	0.0101	0.0146	0.0109
mercury, total	7439-97-6	E508	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.000687	0.000470	0.000230	0.000227	0.000439
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00157	0.00274	0.00102	0.00138	0.00166
phosphorus, total	7723-14-0	E420	0.050	mg/L		<0.050	0.091	<0.050	<0.050	<0.050
potassium, total	7440-09-7	E420	0.100	mg/L		0.402	0.446	0.115	<0.100	0.258
selenium, total	7782-49-2	E420	0.000050	mg/L		0.000176	0.000124	0.000093	0.000096	0.000081
silicon, total	7440-21-3	E420	0.10	mg/L		6.07	6.90	5.89	6.37	6.46
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, total	7440-23-5	E420	0.050	mg/L		4.42	4.02	2.85	3.52	4.44
strontium, total	7440-24-6	E420	0.00020	mg/L		0.152	0.0994	0.0560	0.0629	0.127
sulfur, total	7704-34-9	E420	0.50	mg/L		2.61	1.07	2.00	3.18	0.59
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	<0.00010	0.00018	<0.00010	<0.00010
titanium, total	7440-32-6	E420	0.00030	mg/L		0.00370	0.0318	0.00205	0.00178	0.00347
uranium, total	7440-61-1	E420	0.000010	mg/L		0.000159	0.000138	0.000028	0.000027	0.000135
vanadium, total	7440-62-2	E420	0.00050	mg/L		0.00108	0.00333	0.00078	0.00084	0.00089
zinc, total	7440-66-6	E420	0.0030	mg/L		<0.0030	0.0034	0.0031	<0.0030	<0.0030
zirconium, total	7440-67-7	E420	0.00020	mg/L		0.00049	0.00039	0.00065	0.00077	0.00027
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0335	0.0162	0.105	0.123	0.0087

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MN-0.5 WATER	MN-2.5 WATER	MN-1.5 WATER	MN-0.2 WATER	DUP WATER
					Client sampling date / time	21-Aug-2020 15:00	21-Aug-2020 15:40	21-Aug-2020 16:55	21-Aug-2020 17:45	20-Aug-2020
						WR2000752-006	WR2000752-007	WR2000752-008	WR2000752-009	WR2000752-010
						Result	Result	Result	Result	Result
Dissolved Metals										
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00039	0.00035	0.00030	0.00043	0.00044
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0364	0.0340	0.0309	0.0342	0.0425
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
calcium, dissolved	7440-70-2	E421	0.050	mg/L		20.6	20.6	11.1	10.2	27.4
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00049	0.00035	0.00065	0.00071	0.00029
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	0.00014	0.00014	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00265	0.00228	0.00701	0.00295	0.00149
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.093	0.072	0.248	0.308	0.061
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		5.86	6.36	3.18	3.09	7.28
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.00162	0.0126	0.00916	0.0118	0.00745
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.000721	0.000499	0.000211	0.000150	0.000370
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00126	0.00111	0.00091	0.00118	0.00136
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		0.409	0.381	0.130	<0.100	0.258
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000147	0.000081	0.000092	0.000111	0.000121
silicon, dissolved	7440-21-3	E421	0.050	mg/L		5.72	5.47	5.73	6.00	6.24
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		4.22	3.81	2.94	3.25	4.27
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.148	0.0918	0.0530	0.0604	0.116
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		3.25	1.06	1.98	3.30	0.75
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		0.00129 DTMF	<0.00010	<0.00010	0.00045 DTMF	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		0.00108	0.00056	0.00139	0.00169	0.00034
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000157	0.000068	0.000030	0.000028	0.000147

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MN-0.5 WATER	MN-2.5 WATER	MN-1.5 WATER	MN-0.2 WATER	DUP WATER
					Client sampling date / time	21-Aug-2020 15:00	21-Aug-2020 15:40	21-Aug-2020 16:55	21-Aug-2020 17:45	20-Aug-2020
						WR2000752-006	WR2000752-007	WR2000752-008	WR2000752-009	WR2000752-010
						Result	Result	Result	Result	Result
Dissolved Metals										
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00062	<0.00050	<0.00050	<0.00050	0.00051
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		0.00052	0.00034	0.00065	0.00083	0.00025
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	DUP WATER	W4 WATER	W5 WATER	MC1 WATER	W2 WATER
					Client sampling date / time	21-Aug-2020	24-Aug-2020 14:05	24-Aug-2020 14:40	24-Aug-2020 15:15	25-Aug-2020 06:50
						WR2000752-011	WR2000752-012	WR2000752-013	WR2000752-014	WR2000752-015
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		71.6	69.0	68.9	152	136
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		71.6	69.0	68.9	152	136
conductivity	----	E100	2.0	µS/cm		152	151	153	301	281
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		81.0	79.1	79.9	157	148
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		76.2	73.4	74.6	156	141
pH	----	E108	0.10	pH units		7.86	7.91	7.88	8.18	8.11
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		118	102	101	202	189
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		5.4	31.3	21.3	101	9.6
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0075	<0.0050	0.0065	0.0091	0.0058
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.29	0.21	0.23	1.06	0.98
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		<0.0050	0.0195	0.0134	0.0186	<0.0050
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		0.0052	0.0197	0.0135	0.0189	<0.0051
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		6.12	9.98	11.1	15.0	13.9
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		20.0	7.71	6.60	14.0	14.6
Ion Balance										
anion sum	----	EC101	0.10	meq/L		1.57	1.59	1.61	3.38	3.03
cation sum	----	EC101	0.10	meq/L		1.82	1.75	1.75	3.57	3.35
ion balance (cation-anion difference)	----	EC101	0.010	%		7.37	4.79	4.17	2.73	5.02
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.134	0.584	0.420	0.960	0.386
antimony, total	7440-36-0	E420	0.00010	mg/L		<0.00010	0.00011	0.00011	0.00012	<0.00010
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00051	0.00090	0.00076	0.00121	0.00084
barium, total	7440-39-3	E420	0.00010	mg/L		0.0418	0.0509	0.0458	0.0824	0.0614
beryllium, total	7440-41-7	E420	0.000020	mg/L		<0.000020	0.000025	0.000023	0.000038	<0.000020
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	DUP WATER	W4 WATER	W5 WATER	MC1 WATER	W2 WATER
					Client sampling date / time	21-Aug-2020	24-Aug-2020 14:05	24-Aug-2020 14:40	24-Aug-2020 15:15	25-Aug-2020 06:50
						WR2000752-011	WR2000752-012	WR2000752-013	WR2000752-014	WR2000752-015
						Result	Result	Result	Result	Result
Total Metals										
boron, total	7440-42-8	E420	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010
cadmium, total	7440-43-9	E420	0.0000050	mg/L		<0.0000050	0.0000158	0.0000116	0.0000224	0.0000106
calcium, total	7440-70-2	E420	0.050	mg/L		21.2	19.6	20.8	40.8	35.1
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00067	0.00134	0.00096	0.00211	0.00115
cobalt, total	7440-48-4	E420	0.00010	mg/L		0.00014	0.00041	0.00029	0.00074	0.00030
copper, total	7440-50-8	E420	0.00050	mg/L		0.00276	0.00259	0.00217	0.00519	0.00413
iron, total	7439-89-6	E420	0.010	mg/L		0.237	0.796	0.577	1.68	0.716
lead, total	7439-92-1	E420	0.000050	mg/L		0.000066	0.000283	0.000194	0.000451	0.000165
lithium, total	7439-93-2	E420	0.0010	mg/L		<0.0010	0.0012	0.0012	0.0020	0.0017
magnesium, total	7439-95-4	E420	0.100	mg/L		5.67	5.96	5.48	13.1	12.9
manganese, total	7439-96-5	E420	0.00010	mg/L		0.0100	0.0275	0.0250	0.130	0.0552
mercury, total	7439-97-6	E508	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.000710	0.00111	0.00122	0.00159	0.00142
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00155	0.00199	0.00147	0.00308	0.00181
phosphorus, total	7723-14-0	E420	0.050	mg/L		<0.050	<0.050	<0.050	0.060	<0.050
potassium, total	7440-09-7	E420	0.100	mg/L		0.503	0.767	0.770	1.13	1.17
selenium, total	7782-49-2	E420	0.000050	mg/L		0.000152	0.000164	0.000154	0.000175	0.000186
silicon, total	7440-21-3	E420	0.10	mg/L		6.17	5.30	4.60	7.96	6.97
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, total	7440-23-5	E420	0.050	mg/L		4.68	3.26	3.09	8.84	8.54
strontium, total	7440-24-6	E420	0.00020	mg/L		0.150	0.147	0.146	0.422	0.361
sulfur, total	7704-34-9	E420	0.50	mg/L		2.28	3.35	4.22	5.49	5.39
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	<0.00010	0.00015	<0.00010	<0.00010
titanium, total	7440-32-6	E420	0.00030	mg/L		0.00515	0.0210	0.0151	0.0400	0.0166
uranium, total	7440-61-1	E420	0.000010	mg/L		0.000212	0.00101	0.000947	0.00126	0.00110
vanadium, total	7440-62-2	E420	0.00050	mg/L		0.00119	0.00258	0.00199	0.00406	0.00224
zinc, total	7440-66-6	E420	0.0030	mg/L		<0.0030	<0.0030	<0.0030	0.0048	<0.0030
zirconium, total	7440-67-7	E420	0.00020	mg/L		0.00042	0.00023	0.00020	0.00039	0.00036
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0234	0.0315	0.0269	0.0085	0.0104

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	DUP WATER	W4 WATER	W5 WATER	MC1 WATER	W2 WATER
					Client sampling date / time	21-Aug-2020	24-Aug-2020 14:05	24-Aug-2020 14:40	24-Aug-2020 15:15	25-Aug-2020 06:50
						WR2000752-011	WR2000752-012	WR2000752-013	WR2000752-014	WR2000752-015
						Result	Result	Result	Result	Result
Dissolved Metals										
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00036	0.00055	0.00055	0.00057	0.00051
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0368	0.0403	0.0404	0.0594	0.0539
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
calcium, dissolved	7440-70-2	E421	0.050	mg/L		22.6	21.4	21.4	39.1	38.1
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00040	0.00021	0.00019	0.00028	0.00032
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00231	0.00128	0.00121	0.00207	0.00240
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.072	0.066	0.060	0.104	0.074
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		<0.0010	<0.0010	<0.0010	0.0013	0.0013
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		5.98	6.24	6.43	14.5	12.8
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.00123	0.00554	0.00874	0.00880	0.00467
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.000653	0.00109	0.00117	0.00147	0.00142
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00112	0.00064	0.00054	0.00106	0.00126
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		0.492	0.693	0.747	1.08	1.07
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000140	0.000144	0.000121	0.000153	0.000111
silicon, dissolved	7440-21-3	E421	0.050	mg/L		5.70	4.20	3.81	6.20	6.50
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		4.16	3.24	2.87	8.96	8.38
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.140	0.134	0.133	0.372	0.383
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		2.35	3.26	3.69	5.68	5.09
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		0.00072	0.00085	0.00060	0.00046	0.00056
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000207	0.000978	0.000993	0.00117	0.00101

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	DUP WATER	W4 WATER	W5 WATER	MC1 WATER	W2 WATER
					Client sampling date / time	21-Aug-2020	24-Aug-2020 14:05	24-Aug-2020 14:40	24-Aug-2020 15:15	25-Aug-2020 06:50
						WR2000752-011	WR2000752-012	WR2000752-013	WR2000752-014	WR2000752-015
						Result	Result	Result	Result	Result
Dissolved Metals										
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00057	0.00070	0.00059	0.00097	0.00073
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		<0.0010	<0.0010	<0.0010	0.0013	<0.0010
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		0.00042	0.00023	<0.00020	0.00024	0.00027
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: W3 WATER	DUP WATER	----	----	----
					Client sampling date / time: 25-Aug-2020 07:25	25-Aug-2020	----	----	----
					WR2000752-016	WR2000752-017	--------	--------	--------
					Result	Result	----	----	----
Physical Tests									
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	222	224	----	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	----	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	----	----	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	222	224	----	----	----
conductivity	----	E100	2.0	µS/cm	491	488	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L	257	262	----	----	----
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L	242	235	----	----	----
pH	----	E108	0.10	pH units	8.14	8.15	----	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L	312	314	----	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L	9.2	<3.0	----	----	----
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0104	0.0072	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L	4.13	4.11	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.0460	0.0475	----	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L	0.0466	0.0478	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	44.0	44.0	----	----	----
Organic / Inorganic Carbon									
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	11.4	11.3	----	----	----
Ion Balance									
anion sum	----	EC101	0.10	meq/L	5.48	5.50	----	----	----
cation sum	----	EC101	0.10	meq/L	5.88	5.97	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%	3.52	4.10	----	----	----
Total Metals									
aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0797	0.0291	----	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L	<0.00010	<0.00010	----	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00030	0.00028	----	----	----
barium, total	7440-39-3	E420	0.00010	mg/L	0.0617	0.0576	----	----	----
beryllium, total	7440-41-7	E420	0.000020	mg/L	<0.000020	<0.000020	----	----	----
bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	----	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W3 WATER	DUP WATER	----	----	----
					Client sampling date / time	25-Aug-2020 07:25	25-Aug-2020	----	----	----
						WR2000752-016	WR2000752-017	--------	--------	--------
						Result	Result	----	----	----
Total Metals										
boron, total	7440-42-8	E420	0.010	mg/L		0.022	0.020	----	----	----
cadmium, total	7440-43-9	E420	0.0000050	mg/L		0.0000077	0.0000068	----	----	----
calcium, total	7440-70-2	E420	0.050	mg/L		55.6	53.5	----	----	----
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00028	0.00021	----	----	----
cobalt, total	7440-48-4	E420	0.00010	mg/L		0.00012	<0.00010	----	----	----
copper, total	7440-50-8	E420	0.00050	mg/L		0.00603	0.00495	----	----	----
iron, total	7439-89-6	E420	0.010	mg/L		0.145	0.066	----	----	----
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	<0.000050	----	----	----
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0027	0.0025	----	----	----
magnesium, total	7439-95-4	E420	0.100	mg/L		25.0	24.7	----	----	----
manganese, total	7439-96-5	E420	0.00010	mg/L		0.0935	0.0592	----	----	----
mercury, total	7439-97-6	E508	0.0000050	mg/L		<0.0000050	<0.0000050	----	----	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.00505	0.00477	----	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00166	0.00150	----	----	----
phosphorus, total	7723-14-0	E420	0.050	mg/L		<0.050	<0.050	----	----	----
potassium, total	7440-09-7	E420	0.100	mg/L		2.19	2.16	----	----	----
selenium, total	7782-49-2	E420	0.000050	mg/L		0.000257	0.000253	----	----	----
silicon, total	7440-21-3	E420	0.10	mg/L		6.31	6.19	----	----	----
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	----	----	----
sodium, total	7440-23-5	E420	0.050	mg/L		17.1	16.7	----	----	----
strontium, total	7440-24-6	E420	0.00020	mg/L		0.743	0.716	----	----	----
sulfur, total	7704-34-9	E420	0.50	mg/L		16.4	16.5	----	----	----
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000010	----	----	----
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	<0.00010	----	----	----
titanium, total	7440-32-6	E420	0.00030	mg/L		0.00363	0.00137	----	----	----
uranium, total	7440-61-1	E420	0.000010	mg/L		0.00209	0.00209	----	----	----
vanadium, total	7440-62-2	E420	0.00050	mg/L		0.00073	0.00054	----	----	----
zinc, total	7440-66-6	E420	0.0030	mg/L		<0.0030	<0.0030	----	----	----
zirconium, total	7440-67-7	E420	0.00020	mg/L		<0.00020	<0.00020	----	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0056	0.0046	----	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W3 WATER	DUP WATER	----	----	----
					Client sampling date / time	25-Aug-2020 07:25	25-Aug-2020	----	----	----
						WR2000752-016	WR2000752-017	--------	--------	--------
						Result	Result	----	----	----
Dissolved Metals										
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00025	0.00027	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0555	0.0553	----	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.021	0.021	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000050	<0.0000100 DLM	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		58.2	59.9	----	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00018	0.00015	----	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00429	0.00426	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.032	0.029	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0024	0.0025	----	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		27.1	27.3	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0460	0.0469	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00460	0.00475	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00130	0.00131	----	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	----	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		2.15	2.21	----	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000202	0.000236	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		5.85	5.68	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	----	----	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		15.7	15.6	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.668	0.703	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		16.1	16.1	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		0.00034	<0.00030	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00218	0.00227	----	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: W3 WATER	Client sample ID: DUP WATER	Client sample ID: ----	Client sample ID: ----	Client sample ID: ----
					Client sampling date / time: 25-Aug-2020 07:25	Client sampling date / time: 25-Aug-2020	----	----	----
					WR2000752-016	WR2000752-017	--------	--------	--------
					Result	Result	----	----	----
Dissolved Metals									
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L	<0.0010	<0.0010	----	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	<0.00020	0.00021	----	----	----
dissolved mercury filtration location	----	EP509	-	-	Field	Field	----	----	----
dissolved metals filtration location	----	EP421	-	-	Field	Field	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WR2000752**	Page	: 1 of 39
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: 232817 (WUL)	Date Samples Received	: 25-Aug-2020 14:26
PO	: ----	Issue Date	: 01-Sep-2020 21:09
C-O-C number	: 2020-08-25 A, 1 OF 2 AND 2 OF		
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 17		
No. of samples analysed	: 17		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Matrix Spike outliers occur.
- Laboratory Control Sample (LCS) outliers occur - please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **Water**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Laboratory Control Sample (LCS) Recoveries								
Dissolved Metals	QC-MRG2-7765600 2	----	bismuth, dissolved	7440-69-9	E421	121 % MES	80.0-120%	Recovery greater than upper control limit

Result Qualifiers

Qualifier	*Description*
MES	*Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).*

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
DUP - WATER	E298	21-Aug-2020	----	----	----		01-Sep-2020	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MN-0.2 - WATER	E298	21-Aug-2020	----	----	----		01-Sep-2020	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MN-0.5 - WATER	E298	21-Aug-2020	----	----	----		01-Sep-2020	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MN-1.5 - WATER	E298	21-Aug-2020	----	----	----		01-Sep-2020	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MN-2.5 - WATER	E298	21-Aug-2020	----	----	----		01-Sep-2020	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MN-4.5 - WATER	E298	21-Aug-2020	----	----	----		01-Sep-2020	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
C4 - WATER	E298	20-Aug-2020	----	----	----		01-Sep-2020	28 days	11 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
DUP - WATER	E298	20-Aug-2020	----	----	----		01-Sep-2020	28 days	11 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
W46 - WATER	E298	20-Aug-2020	----	----	----		01-Sep-2020	28 days	11 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
W6 - WATER	E298	20-Aug-2020	----	----	----		01-Sep-2020	28 days	11 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
W2 - WATER	E298	25-Aug-2020	----	----	----		27-Aug-2020	28 days	2 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
DUP - WATER	E298	25-Aug-2020	----	----	----		01-Sep-2020	28 days	6 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
W3 - WATER	E298	25-Aug-2020	----	----	----		01-Sep-2020	28 days	6 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
W7 - WATER	E298	20-Aug-2020	----	----	----		27-Aug-2020	28 days	6 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MC1 - WATER	E298	24-Aug-2020	----	----	----		01-Sep-2020	28 days	7 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
W4 - WATER	E298	24-Aug-2020	----	----	----		01-Sep-2020	28 days	7 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
W5 - WATER	E298	24-Aug-2020	----	----	----		01-Sep-2020	28 days	7 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
DUP - WATER	E235.Cl-L	25-Aug-2020	----	----	----		27-Aug-2020	28 days	1 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
MC1 - WATER	E235.Cl-L	24-Aug-2020	----	----	----		27-Aug-2020	28 days	2 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
W2 - WATER	E235.Cl-L	25-Aug-2020	----	----	----		27-Aug-2020	28 days	2 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
W3 - WATER	E235.Cl-L	25-Aug-2020	----	----	----		27-Aug-2020	28 days	2 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
W4 - WATER	E235.Cl-L	24-Aug-2020	----	----	----		27-Aug-2020	28 days	2 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
W5 - WATER	E235.Cl-L	24-Aug-2020	----	----	----		27-Aug-2020	28 days	2 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
DUP - WATER	E235.Cl-L	21-Aug-2020	----	----	----		27-Aug-2020	28 days	5 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
MN-0.2 - WATER	E235.Cl-L	21-Aug-2020	----	----	----		27-Aug-2020	28 days	5 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MN-0.5 - WATER	E235.Cl-L	21-Aug-2020	----	----	----		27-Aug-2020	28 days	5 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MN-1.5 - WATER	E235.Cl-L	21-Aug-2020	----	----	----		27-Aug-2020	28 days	5 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MN-2.5 - WATER	E235.Cl-L	21-Aug-2020	----	----	----		27-Aug-2020	28 days	5 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE MN-4.5 - WATER	E235.Cl-L	21-Aug-2020	----	----	----		27-Aug-2020	28 days	5 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE C4 - WATER	E235.Cl-L	20-Aug-2020	----	----	----		27-Aug-2020	28 days	6 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE DUP - WATER	E235.Cl-L	20-Aug-2020	----	----	----		27-Aug-2020	28 days	6 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE W46 - WATER	E235.Cl-L	20-Aug-2020	----	----	----		27-Aug-2020	28 days	6 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE W6 - WATER	E235.Cl-L	20-Aug-2020	----	----	----		27-Aug-2020	28 days	6 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE W7 - WATER	E235.Cl-L	20-Aug-2020	----	----	----		27-Aug-2020	28 days	6 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE DUP - WATER	E235.NO3-L	25-Aug-2020	----	----	----		27-Aug-2020	3 days	1 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MC1 - WATER	E235.NO3-L	24-Aug-2020	----	----	----		27-Aug-2020	3 days	2 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE W2 - WATER	E235.NO3-L	25-Aug-2020	----	----	----		27-Aug-2020	3 days	2 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE W3 - WATER	E235.NO3-L	25-Aug-2020	----	----	----		27-Aug-2020	3 days	2 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE W4 - WATER	E235.NO3-L	24-Aug-2020	----	----	----		27-Aug-2020	3 days	2 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE W5 - WATER	E235.NO3-L	24-Aug-2020	----	----	----		27-Aug-2020	3 days	2 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE DUP - WATER	E235.NO3-L	21-Aug-2020	----	----	----		27-Aug-2020	3 days	5 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MN-0.2 - WATER	E235.NO3-L	21-Aug-2020	----	----	----		27-Aug-2020	3 days	5 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MN-0.5 - WATER	E235.NO3-L	21-Aug-2020	----	----	----		27-Aug-2020	3 days	5 days	× EHTR

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MN-1.5 - WATER	E235.NO3-L	21-Aug-2020	----	----	----		27-Aug-2020	3 days	5 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MN-2.5 - WATER	E235.NO3-L	21-Aug-2020	----	----	----		27-Aug-2020	3 days	5 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MN-4.5 - WATER	E235.NO3-L	21-Aug-2020	----	----	----		27-Aug-2020	3 days	5 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE C4 - WATER	E235.NO3-L	20-Aug-2020	----	----	----		27-Aug-2020	3 days	6 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE DUP - WATER	E235.NO3-L	20-Aug-2020	----	----	----		27-Aug-2020	3 days	6 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE W46 - WATER	E235.NO3-L	20-Aug-2020	----	----	----		27-Aug-2020	3 days	6 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE W6 - WATER	E235.NO3-L	20-Aug-2020	----	----	----		27-Aug-2020	3 days	6 days	× EHTR
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE W7 - WATER	E235.NO3-L	20-Aug-2020	----	----	----		27-Aug-2020	3 days	6 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE DUP - WATER	E235.NO2-L	25-Aug-2020	----	----	----		27-Aug-2020	3 days	1 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MC1 - WATER	E235.NO2-L	24-Aug-2020	----	----	----		27-Aug-2020	3 days	2 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE W2 - WATER	E235.NO2-L	25-Aug-2020	----	----	----		27-Aug-2020	3 days	2 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE W3 - WATER	E235.NO2-L	25-Aug-2020	----	----	----		27-Aug-2020	3 days	2 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE W4 - WATER	E235.NO2-L	24-Aug-2020	----	----	----		27-Aug-2020	3 days	2 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE W5 - WATER	E235.NO2-L	24-Aug-2020	----	----	----		27-Aug-2020	3 days	2 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE DUP - WATER	E235.NO2-L	21-Aug-2020	----	----	----		27-Aug-2020	3 days	5 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MN-0.2 - WATER	E235.NO2-L	21-Aug-2020	----	----	----		27-Aug-2020	3 days	5 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MN-0.5 - WATER	E235.NO2-L	21-Aug-2020	----	----	----		27-Aug-2020	3 days	5 days	× EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MN-1.5 - WATER	E235.NO2-L	21-Aug-2020	----	----	----		27-Aug-2020	3 days	5 days	× EHTR

Matrix: **Water**

Evaluation: ✖ = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MN-2.5 - WATER	E235.NO2-L	21-Aug-2020	----	----	----		27-Aug-2020	3 days	5 days	✖ EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MN-4.5 - WATER	E235.NO2-L	21-Aug-2020	----	----	----		27-Aug-2020	3 days	5 days	✖ EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE C4 - WATER	E235.NO2-L	20-Aug-2020	----	----	----		27-Aug-2020	3 days	6 days	✖ EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE DUP - WATER	E235.NO2-L	20-Aug-2020	----	----	----		27-Aug-2020	3 days	6 days	✖ EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE W46 - WATER	E235.NO2-L	20-Aug-2020	----	----	----		27-Aug-2020	3 days	6 days	✖ EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE W6 - WATER	E235.NO2-L	20-Aug-2020	----	----	----		27-Aug-2020	3 days	6 days	✖ EHTR
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE W7 - WATER	E235.NO2-L	20-Aug-2020	----	----	----		27-Aug-2020	3 days	6 days	✖ EHTR
Anions and Nutrients : Sulfate in Water by IC										
HDPE DUP - WATER	E235.SO4	25-Aug-2020	----	----	----		27-Aug-2020	28 days	1 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MC1 - WATER	E235.SO4	24-Aug-2020	----	----	----		27-Aug-2020	28 days	2 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Sulfate in Water by IC										
HDPE W2 - WATER	E235.SO4	25-Aug-2020	----	----	----		27-Aug-2020	28 days	2 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE W3 - WATER	E235.SO4	25-Aug-2020	----	----	----		27-Aug-2020	28 days	2 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE W4 - WATER	E235.SO4	24-Aug-2020	----	----	----		27-Aug-2020	28 days	2 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE W5 - WATER	E235.SO4	24-Aug-2020	----	----	----		27-Aug-2020	28 days	2 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE DUP - WATER	E235.SO4	21-Aug-2020	----	----	----		27-Aug-2020	28 days	5 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MN-0.2 - WATER	E235.SO4	21-Aug-2020	----	----	----		27-Aug-2020	28 days	5 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MN-0.5 - WATER	E235.SO4	21-Aug-2020	----	----	----		27-Aug-2020	28 days	5 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MN-1.5 - WATER	E235.SO4	21-Aug-2020	----	----	----		27-Aug-2020	28 days	5 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MN-2.5 - WATER	E235.SO4	21-Aug-2020	----	----	----		27-Aug-2020	28 days	5 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Sulfate in Water by IC										
HDPE MN-4.5 - WATER	E235.SO4	21-Aug-2020	----	----	----		27-Aug-2020	28 days	5 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE C4 - WATER	E235.SO4	20-Aug-2020	----	----	----		27-Aug-2020	28 days	6 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE DUP - WATER	E235.SO4	20-Aug-2020	----	----	----		27-Aug-2020	28 days	6 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE W46 - WATER	E235.SO4	20-Aug-2020	----	----	----		27-Aug-2020	28 days	6 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE W6 - WATER	E235.SO4	20-Aug-2020	----	----	----		27-Aug-2020	28 days	6 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE W7 - WATER	E235.SO4	20-Aug-2020	----	----	----		27-Aug-2020	28 days	6 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) W2 - WATER	E421.Cr-L	25-Aug-2020	27-Aug-2020	180 days	1 days	✓	27-Aug-2020	178 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) DUP - WATER	E421.Cr-L	25-Aug-2020	27-Aug-2020	180 days	2 days	✓	28-Aug-2020	177 days	1 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MC1 - WATER	E421.Cr-L	24-Aug-2020	27-Aug-2020	180 days	2 days	✓	28-Aug-2020	177 days	1 days	✓

Matrix: **Water**

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Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) W3 - WATER	E421.Cr-L	25-Aug-2020	27-Aug-2020	180 days	2 days	✓	28-Aug-2020	177 days	1 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) W4 - WATER	E421.Cr-L	24-Aug-2020	27-Aug-2020	180 days	2 days	✓	28-Aug-2020	177 days	1 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) W5 - WATER	E421.Cr-L	24-Aug-2020	27-Aug-2020	180 days	2 days	✓	28-Aug-2020	177 days	1 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) DUP - WATER	E421.Cr-L	21-Aug-2020	27-Aug-2020	180 days	5 days	✓	28-Aug-2020	174 days	1 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MN-0.2 - WATER	E421.Cr-L	21-Aug-2020	27-Aug-2020	180 days	5 days	✓	28-Aug-2020	174 days	1 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MN-0.5 - WATER	E421.Cr-L	21-Aug-2020	27-Aug-2020	180 days	5 days	✓	28-Aug-2020	174 days	1 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MN-1.5 - WATER	E421.Cr-L	21-Aug-2020	27-Aug-2020	180 days	5 days	✓	28-Aug-2020	174 days	1 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MN-2.5 - WATER	E421.Cr-L	21-Aug-2020	27-Aug-2020	180 days	5 days	✓	28-Aug-2020	174 days	1 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) MN-4.5 - WATER	E421.Cr-L	21-Aug-2020	27-Aug-2020	180 days	5 days	✓	28-Aug-2020	174 days	1 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) W7 - WATER	E421.Cr-L	20-Aug-2020	27-Aug-2020	180 days	6 days	✓	27-Aug-2020	173 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) C4 - WATER	E421.Cr-L	20-Aug-2020	27-Aug-2020	180 days	6 days	✓	28-Aug-2020	173 days	1 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) DUP - WATER	E421.Cr-L	20-Aug-2020	27-Aug-2020	180 days	6 days	✓	28-Aug-2020	173 days	1 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) W46 - WATER	E421.Cr-L	20-Aug-2020	27-Aug-2020	180 days	6 days	✓	28-Aug-2020	173 days	1 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) W6 - WATER	E421.Cr-L	20-Aug-2020	27-Aug-2020	180 days	6 days	✓	28-Aug-2020	173 days	1 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) W2 - WATER	E509	25-Aug-2020	28-Aug-2020	28 days	2 days	✓	28-Aug-2020	25 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) DUP - WATER	E509	25-Aug-2020	29-Aug-2020	28 days	3 days	✓	29-Aug-2020	24 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MC1 - WATER	E509	24-Aug-2020	29-Aug-2020	28 days	4 days	✓	29-Aug-2020	23 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) W3 - WATER	E509	25-Aug-2020	29-Aug-2020	28 days	4 days	✓	29-Aug-2020	23 days	0 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) W4 - WATER	E509	24-Aug-2020	29-Aug-2020	28 days	4 days	✓	29-Aug-2020	23 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) W5 - WATER	E509	24-Aug-2020	29-Aug-2020	28 days	4 days	✓	29-Aug-2020	23 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) DUP - WATER	E509	21-Aug-2020	29-Aug-2020	28 days	7 days	✓	29-Aug-2020	20 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MN-0.2 - WATER	E509	21-Aug-2020	29-Aug-2020	28 days	7 days	✓	29-Aug-2020	20 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MN-0.5 - WATER	E509	21-Aug-2020	29-Aug-2020	28 days	7 days	✓	29-Aug-2020	20 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MN-1.5 - WATER	E509	21-Aug-2020	29-Aug-2020	28 days	7 days	✓	29-Aug-2020	20 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MN-2.5 - WATER	E509	21-Aug-2020	29-Aug-2020	28 days	7 days	✓	29-Aug-2020	20 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MN-4.5 - WATER	E509	21-Aug-2020	29-Aug-2020	28 days	7 days	✓	29-Aug-2020	20 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) W7 - WATER	E509	20-Aug-2020	28-Aug-2020	28 days	7 days	✓	28-Aug-2020	20 days	0 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) C4 - WATER	E509	20-Aug-2020	29-Aug-2020	28 days	8 days	✓	29-Aug-2020	19 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) DUP - WATER	E509	20-Aug-2020	29-Aug-2020	28 days	8 days	✓	29-Aug-2020	19 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) W46 - WATER	E509	20-Aug-2020	29-Aug-2020	28 days	8 days	✓	29-Aug-2020	19 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) W6 - WATER	E509	20-Aug-2020	29-Aug-2020	28 days	8 days	✓	29-Aug-2020	19 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) W2 - WATER	E421	25-Aug-2020	27-Aug-2020	180 days	1 days	✓	27-Aug-2020	178 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) DUP - WATER	E421	25-Aug-2020	27-Aug-2020	180 days	2 days	✓	28-Aug-2020	177 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MC1 - WATER	E421	24-Aug-2020	27-Aug-2020	180 days	2 days	✓	28-Aug-2020	177 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) W3 - WATER	E421	25-Aug-2020	27-Aug-2020	180 days	2 days	✓	28-Aug-2020	177 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) W4 - WATER	E421	24-Aug-2020	27-Aug-2020	180 days	2 days	✓	28-Aug-2020	177 days	1 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) W5 - WATER	E421	24-Aug-2020	27-Aug-2020	180 days	2 days	✓	28-Aug-2020	177 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) DUP - WATER	E421	21-Aug-2020	27-Aug-2020	180 days	5 days	✓	28-Aug-2020	174 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MN-0.2 - WATER	E421	21-Aug-2020	27-Aug-2020	180 days	5 days	✓	28-Aug-2020	174 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MN-0.5 - WATER	E421	21-Aug-2020	27-Aug-2020	180 days	5 days	✓	28-Aug-2020	174 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MN-1.5 - WATER	E421	21-Aug-2020	27-Aug-2020	180 days	5 days	✓	28-Aug-2020	174 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MN-2.5 - WATER	E421	21-Aug-2020	27-Aug-2020	180 days	5 days	✓	28-Aug-2020	174 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MN-4.5 - WATER	E421	21-Aug-2020	27-Aug-2020	180 days	5 days	✓	28-Aug-2020	174 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) W7 - WATER	E421	20-Aug-2020	27-Aug-2020	180 days	6 days	✓	27-Aug-2020	173 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) C4 - WATER	E421	20-Aug-2020	27-Aug-2020	180 days	6 days	✓	28-Aug-2020	173 days	1 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) DUP - WATER	E421	20-Aug-2020	27-Aug-2020	180 days	6 days	✓	28-Aug-2020	173 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) W46 - WATER	E421	20-Aug-2020	27-Aug-2020	180 days	6 days	✓	28-Aug-2020	173 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) W6 - WATER	E421	20-Aug-2020	27-Aug-2020	180 days	6 days	✓	28-Aug-2020	173 days	1 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) DUP - WATER	E358-L	25-Aug-2020	----	----	----		27-Aug-2020	28 days	2 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) W2 - WATER	E358-L	25-Aug-2020	----	----	----		27-Aug-2020	28 days	2 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) W3 - WATER	E358-L	25-Aug-2020	----	----	----		27-Aug-2020	28 days	2 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) MC1 - WATER	E358-L	24-Aug-2020	----	----	----		27-Aug-2020	28 days	3 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) W4 - WATER	E358-L	24-Aug-2020	----	----	----		27-Aug-2020	28 days	3 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) W5 - WATER	E358-L	24-Aug-2020	----	----	----		27-Aug-2020	28 days	3 days	✓

Matrix: **Water**

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Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) MN-0.2 - WATER	E358-L	21-Aug-2020	----	----	----		27-Aug-2020	28 days	5 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) MN-1.5 - WATER	E358-L	21-Aug-2020	----	----	----		27-Aug-2020	28 days	5 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) MN-2.5 - WATER	E358-L	21-Aug-2020	----	----	----		27-Aug-2020	28 days	5 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) C4 - WATER	E358-L	20-Aug-2020	----	----	----		27-Aug-2020	28 days	6 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) DUP - WATER	E358-L	21-Aug-2020	----	----	----		27-Aug-2020	28 days	6 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) MN-0.5 - WATER	E358-L	21-Aug-2020	----	----	----		27-Aug-2020	28 days	6 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) MN-4.5 - WATER	E358-L	21-Aug-2020	----	----	----		27-Aug-2020	28 days	6 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) W46 - WATER	E358-L	20-Aug-2020	----	----	----		27-Aug-2020	28 days	6 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) W6 - WATER	E358-L	20-Aug-2020	----	----	----		27-Aug-2020	28 days	6 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid)										
W7 - WATER	E358-L	20-Aug-2020	----	----	----		27-Aug-2020	28 days	6 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid)										
DUP - WATER	E358-L	20-Aug-2020	----	----	----		27-Aug-2020	28 days	7 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
DUP - WATER	E290	25-Aug-2020	----	----	----		26-Aug-2020	14 days	1 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
W2 - WATER	E290	25-Aug-2020	----	----	----		26-Aug-2020	14 days	1 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
W3 - WATER	E290	25-Aug-2020	----	----	----		26-Aug-2020	14 days	1 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
MC1 - WATER	E290	24-Aug-2020	----	----	----		26-Aug-2020	14 days	2 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
W4 - WATER	E290	24-Aug-2020	----	----	----		26-Aug-2020	14 days	2 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
W5 - WATER	E290	24-Aug-2020	----	----	----		26-Aug-2020	14 days	2 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
DUP - WATER	E290	21-Aug-2020	----	----	----		26-Aug-2020	14 days	5 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE MN-0.2 - WATER	E290	21-Aug-2020	----	----	----		26-Aug-2020	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MN-0.5 - WATER	E290	21-Aug-2020	----	----	----		26-Aug-2020	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MN-1.5 - WATER	E290	21-Aug-2020	----	----	----		26-Aug-2020	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MN-2.5 - WATER	E290	21-Aug-2020	----	----	----		26-Aug-2020	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MN-4.5 - WATER	E290	21-Aug-2020	----	----	----		26-Aug-2020	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE C4 - WATER	E290	20-Aug-2020	----	----	----		26-Aug-2020	14 days	6 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE DUP - WATER	E290	20-Aug-2020	----	----	----		26-Aug-2020	14 days	6 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE W46 - WATER	E290	20-Aug-2020	----	----	----		26-Aug-2020	14 days	6 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE W6 - WATER	E290	20-Aug-2020	----	----	----		26-Aug-2020	14 days	6 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE										
W7 - WATER	E290	20-Aug-2020	----	----	----		26-Aug-2020	14 days	6 days	✓
Physical Tests : Conductivity in Water										
HDPE										
DUP - WATER	E100	25-Aug-2020	----	----	----		26-Aug-2020	28 days	1 days	✓
Physical Tests : Conductivity in Water										
HDPE										
W2 - WATER	E100	25-Aug-2020	----	----	----		26-Aug-2020	28 days	1 days	✓
Physical Tests : Conductivity in Water										
HDPE										
W3 - WATER	E100	25-Aug-2020	----	----	----		26-Aug-2020	28 days	1 days	✓
Physical Tests : Conductivity in Water										
HDPE										
MC1 - WATER	E100	24-Aug-2020	----	----	----		26-Aug-2020	28 days	2 days	✓
Physical Tests : Conductivity in Water										
HDPE										
W4 - WATER	E100	24-Aug-2020	----	----	----		26-Aug-2020	28 days	2 days	✓
Physical Tests : Conductivity in Water										
HDPE										
W5 - WATER	E100	24-Aug-2020	----	----	----		26-Aug-2020	28 days	2 days	✓
Physical Tests : Conductivity in Water										
HDPE										
DUP - WATER	E100	21-Aug-2020	----	----	----		26-Aug-2020	28 days	5 days	✓
Physical Tests : Conductivity in Water										
HDPE										
MN-0.2 - WATER	E100	21-Aug-2020	----	----	----		26-Aug-2020	28 days	5 days	✓

Matrix: **Water**

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Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Conductivity in Water										
HDPE MN-0.5 - WATER	E100	21-Aug-2020	----	----	----		26-Aug-2020	28 days	5 days	✓
Physical Tests : Conductivity in Water										
HDPE MN-1.5 - WATER	E100	21-Aug-2020	----	----	----		26-Aug-2020	28 days	5 days	✓
Physical Tests : Conductivity in Water										
HDPE MN-2.5 - WATER	E100	21-Aug-2020	----	----	----		26-Aug-2020	28 days	5 days	✓
Physical Tests : Conductivity in Water										
HDPE MN-4.5 - WATER	E100	21-Aug-2020	----	----	----		26-Aug-2020	28 days	5 days	✓
Physical Tests : Conductivity in Water										
HDPE C4 - WATER	E100	20-Aug-2020	----	----	----		26-Aug-2020	28 days	6 days	✓
Physical Tests : Conductivity in Water										
HDPE DUP - WATER	E100	20-Aug-2020	----	----	----		26-Aug-2020	28 days	6 days	✓
Physical Tests : Conductivity in Water										
HDPE W46 - WATER	E100	20-Aug-2020	----	----	----		26-Aug-2020	28 days	6 days	✓
Physical Tests : Conductivity in Water										
HDPE W6 - WATER	E100	20-Aug-2020	----	----	----		26-Aug-2020	28 days	6 days	✓
Physical Tests : Conductivity in Water										
HDPE W7 - WATER	E100	20-Aug-2020	----	----	----		26-Aug-2020	28 days	6 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : pH by Meter										
HDPE MN-0.2 - WATER	E108	21-Aug-2020	----	----	----		26-Aug-2020	0.25 hrs	124 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MN-1.5 - WATER	E108	21-Aug-2020	----	----	----		26-Aug-2020	0.25 hrs	125 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MN-0.5 - WATER	E108	21-Aug-2020	----	----	----		26-Aug-2020	0.25 hrs	127 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MN-2.5 - WATER	E108	21-Aug-2020	----	----	----		26-Aug-2020	0.25 hrs	127 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE DUP - WATER	E108	21-Aug-2020	----	----	----		26-Aug-2020	0.25 hrs	128 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MN-4.5 - WATER	E108	21-Aug-2020	----	----	----		26-Aug-2020	0.25 hrs	128 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE W7 - WATER	E108	20-Aug-2020	----	----	----		26-Aug-2020	0.25 hrs	148 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE W6 - WATER	E108	20-Aug-2020	----	----	----		26-Aug-2020	0.25 hrs	149 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE C4 - WATER	E108	20-Aug-2020	----	----	----		26-Aug-2020	0.25 hrs	150 hrs	× EHTR-FM

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : pH by Meter										
HDPE W46 - WATER	E108	20-Aug-2020	----	----	----		26-Aug-2020	0.25 hrs	150 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE DUP - WATER	E108	20-Aug-2020	----	----	----		26-Aug-2020	0.25 hrs	152 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE DUP - WATER	E108	25-Aug-2020	----	----	----		26-Aug-2020	0.25 hrs	32 hrs	× EHTL
Physical Tests : pH by Meter										
HDPE W2 - WATER	E108	25-Aug-2020	----	----	----		26-Aug-2020	0.25 hrs	39 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE W3 - WATER	E108	25-Aug-2020	----	----	----		26-Aug-2020	0.25 hrs	39 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MC1 - WATER	E108	24-Aug-2020	----	----	----		26-Aug-2020	0.25 hrs	55 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE W4 - WATER	E108	24-Aug-2020	----	----	----		26-Aug-2020	0.25 hrs	56 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE W5 - WATER	E108	24-Aug-2020	----	----	----		26-Aug-2020	0.25 hrs	56 hrs	× EHTR-FM
Physical Tests : TSS by Gravimetry										
HDPE DUP - WATER	E160-H	25-Aug-2020	----	----	----		28-Aug-2020	7 days	2 days	✓

Matrix: **Water**

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Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TSS by Gravimetry										
HDPE W2 - WATER	E160-H	25-Aug-2020	----	----	----		27-Aug-2020	7 days	2 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MC1 - WATER	E160-H	24-Aug-2020	----	----	----		27-Aug-2020	7 days	3 days	✓
Physical Tests : TSS by Gravimetry										
HDPE W3 - WATER	E160-H	25-Aug-2020	----	----	----		28-Aug-2020	7 days	3 days	✓
Physical Tests : TSS by Gravimetry										
HDPE W4 - WATER	E160-H	24-Aug-2020	----	----	----		27-Aug-2020	7 days	3 days	✓
Physical Tests : TSS by Gravimetry										
HDPE W5 - WATER	E160-H	24-Aug-2020	----	----	----		27-Aug-2020	7 days	3 days	✓
Physical Tests : TSS by Gravimetry										
HDPE DUP - WATER	E160-H	21-Aug-2020	----	----	----		27-Aug-2020	7 days	5 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MN-0.2 - WATER	E160-H	21-Aug-2020	----	----	----		27-Aug-2020	7 days	5 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MN-0.5 - WATER	E160-H	21-Aug-2020	----	----	----		27-Aug-2020	7 days	5 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MN-1.5 - WATER	E160-H	21-Aug-2020	----	----	----		27-Aug-2020	7 days	5 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TSS by Gravimetry										
HDPE MN-2.5 - WATER	E160-H	21-Aug-2020	----	----	----		27-Aug-2020	7 days	5 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MN-4.5 - WATER	E160-H	21-Aug-2020	----	----	----		27-Aug-2020	7 days	5 days	✓
Physical Tests : TSS by Gravimetry										
HDPE C4 - WATER	E160-H	20-Aug-2020	----	----	----		26-Aug-2020	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE DUP - WATER	E160-H	20-Aug-2020	----	----	----		26-Aug-2020	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE W46 - WATER	E160-H	20-Aug-2020	----	----	----		26-Aug-2020	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE W6 - WATER	E160-H	20-Aug-2020	----	----	----		26-Aug-2020	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE W7 - WATER	E160-H	20-Aug-2020	----	----	----		26-Aug-2020	7 days	6 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) DUP - WATER	E420.Cr-L	25-Aug-2020	----	----	----		27-Aug-2020	180 days	2 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) W2 - WATER	E420.Cr-L	25-Aug-2020	----	----	----		27-Aug-2020	180 days	2 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) W3 - WATER	E420.Cr-L	25-Aug-2020	----	----	----		27-Aug-2020	180 days	2 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) MC1 - WATER	E420.Cr-L	24-Aug-2020	----	----	----		27-Aug-2020	180 days	3 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) W4 - WATER	E420.Cr-L	24-Aug-2020	----	----	----		27-Aug-2020	180 days	3 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) W5 - WATER	E420.Cr-L	24-Aug-2020	----	----	----		27-Aug-2020	180 days	3 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) DUP - WATER	E420.Cr-L	21-Aug-2020	----	----	----		27-Aug-2020	180 days	6 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) MN-0.2 - WATER	E420.Cr-L	21-Aug-2020	----	----	----		27-Aug-2020	180 days	6 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) MN-0.5 - WATER	E420.Cr-L	21-Aug-2020	----	----	----		27-Aug-2020	180 days	6 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) MN-1.5 - WATER	E420.Cr-L	21-Aug-2020	----	----	----		27-Aug-2020	180 days	6 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) MN-2.5 - WATER	E420.Cr-L	21-Aug-2020	----	----	----		27-Aug-2020	180 days	6 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) MN-4.5 - WATER	E420.Cr-L	21-Aug-2020	----	----	----		27-Aug-2020	180 days	6 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) W7 - WATER	E420.Cr-L	20-Aug-2020	----	----	----		27-Aug-2020	180 days	6 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) C4 - WATER	E420.Cr-L	20-Aug-2020	----	----	----		27-Aug-2020	180 days	7 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) DUP - WATER	E420.Cr-L	20-Aug-2020	----	----	----		27-Aug-2020	180 days	7 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) W46 - WATER	E420.Cr-L	20-Aug-2020	----	----	----		27-Aug-2020	180 days	7 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) W6 - WATER	E420.Cr-L	20-Aug-2020	----	----	----		27-Aug-2020	180 days	7 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) W2 - WATER	E508	25-Aug-2020	----	----	----		27-Aug-2020	28 days	2 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) DUP - WATER	E508	25-Aug-2020	----	----	----		29-Aug-2020	28 days	3 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) W3 - WATER	E508	25-Aug-2020	----	----	----		29-Aug-2020	28 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) MC1 - WATER	E508	24-Aug-2020	----	----	----		29-Aug-2020	28 days	4 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) W4 - WATER	E508	24-Aug-2020	----	----	----		29-Aug-2020	28 days	4 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) W5 - WATER	E508	24-Aug-2020	----	----	----		29-Aug-2020	28 days	4 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) DUP - WATER	E508	21-Aug-2020	----	----	----		29-Aug-2020	28 days	7 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) MN-0.2 - WATER	E508	21-Aug-2020	----	----	----		29-Aug-2020	28 days	7 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) MN-0.5 - WATER	E508	21-Aug-2020	----	----	----		29-Aug-2020	28 days	7 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) MN-1.5 - WATER	E508	21-Aug-2020	----	----	----		29-Aug-2020	28 days	7 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) MN-2.5 - WATER	E508	21-Aug-2020	----	----	----		29-Aug-2020	28 days	7 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) MN-4.5 - WATER	E508	21-Aug-2020	----	----	----		29-Aug-2020	28 days	7 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) W7 - WATER	E508	20-Aug-2020	----	----	----		27-Aug-2020	28 days	7 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) C4 - WATER	E508	20-Aug-2020	----	----	----		29-Aug-2020	28 days	8 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) DUP - WATER	E508	20-Aug-2020	----	----	----		29-Aug-2020	28 days	8 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) W46 - WATER	E508	20-Aug-2020	----	----	----		29-Aug-2020	28 days	8 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) W6 - WATER	E508	20-Aug-2020	----	----	----		29-Aug-2020	28 days	8 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) DUP - WATER	E420	25-Aug-2020	----	----	----		27-Aug-2020	180 days	2 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) W2 - WATER	E420	25-Aug-2020	----	----	----		27-Aug-2020	180 days	2 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) W3 - WATER	E420	25-Aug-2020	----	----	----		27-Aug-2020	180 days	2 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) MC1 - WATER	E420	24-Aug-2020	----	----	----		27-Aug-2020	180 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) W4 - WATER	E420	24-Aug-2020	----	----	----		27-Aug-2020	180 days	3 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) W5 - WATER	E420	24-Aug-2020	----	----	----		27-Aug-2020	180 days	3 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) DUP - WATER	E420	21-Aug-2020	----	----	----		27-Aug-2020	180 days	6 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) MN-0.2 - WATER	E420	21-Aug-2020	----	----	----		27-Aug-2020	180 days	6 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) MN-0.5 - WATER	E420	21-Aug-2020	----	----	----		27-Aug-2020	180 days	6 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) MN-1.5 - WATER	E420	21-Aug-2020	----	----	----		27-Aug-2020	180 days	6 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) MN-2.5 - WATER	E420	21-Aug-2020	----	----	----		27-Aug-2020	180 days	6 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) MN-4.5 - WATER	E420	21-Aug-2020	----	----	----		27-Aug-2020	180 days	6 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) W7 - WATER	E420	20-Aug-2020	----	----	----		27-Aug-2020	180 days	6 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) C4 - WATER	E420	20-Aug-2020	----	----	----		27-Aug-2020	180 days	7 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) DUP - WATER	E420	20-Aug-2020	----	----	----		27-Aug-2020	180 days	7 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) W46 - WATER	E420	20-Aug-2020	----	----	----		27-Aug-2020	180 days	7 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) W6 - WATER	E420	20-Aug-2020	----	----	----		27-Aug-2020	180 days	7 days	✓

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	77595	1	17	5.8	5.0	✓
Ammonia by Fluorescence	E298	77806	2	17	11.7	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	77592	1	17	5.8	5.0	✓
Conductivity in Water	E100	77593	1	17	5.8	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	77657	3	33	9.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	78314	3	51	5.8	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	77656	4	57	7.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	77810	2	17	11.7	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	77590	1	17	5.8	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	77591	1	17	5.8	5.0	✓
pH by Meter	E108	77594	1	17	5.8	5.0	✓
Sulfate in Water by IC	E235.SO4	77589	1	17	5.8	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	77622	2	17	11.7	5.0	✓
Total Mercury in Water by CVAAS	E508	78193	3	32	9.3	5.0	✓
Total Metals in Water by CRC ICPMS	E420	77621	2	23	8.7	5.0	✓
TSS by Gravimetry	E160-H	77606	4	80	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	77595	1	17	5.8	5.0	✓
Ammonia by Fluorescence	E298	77806	2	17	11.7	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	77592	1	17	5.8	5.0	✓
Conductivity in Water	E100	77593	1	17	5.8	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	77657	3	33	9.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	78314	3	51	5.8	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	77656	3	57	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	77810	2	17	11.7	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	77590	1	17	5.8	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	77591	1	17	5.8	5.0	✓
pH by Meter	E108	77594	1	17	5.8	5.0	✓
Sulfate in Water by IC	E235.SO4	77589	1	17	5.8	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	77622	2	17	11.7	5.0	✓
Total Mercury in Water by CVAAS	E508	78193	3	32	9.3	5.0	✓
Total Metals in Water by CRC ICPMS	E420	77621	2	23	8.7	5.0	✓
TSS by Gravimetry	E160-H	77606	4	80	5.0	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	77595	1	17	5.8	5.0	✓
Ammonia by Fluorescence	E298	77806	2	17	11.7	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	77592	1	17	5.8	5.0	✓

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Method Blanks (MB) - Continued							
Conductivity in Water	E100	77593	1	17	5.8	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	77657	3	33	9.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	78314	3	51	5.8	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	77656	3	57	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	77810	2	17	11.7	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	77590	1	17	5.8	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	77591	1	17	5.8	5.0	✓
Sulfate in Water by IC	E235.SO4	77589	1	17	5.8	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	77622	2	17	11.7	5.0	✓
Total Mercury in Water by CVAAS	E508	78193	3	32	9.3	5.0	✓
Total Metals in Water by CRC ICPMS	E420	77621	2	23	8.7	5.0	✓
TSS by Gravimetry	E160-H	77606	4	80	5.0	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	77806	2	17	11.7	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	77592	1	17	5.8	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	77657	3	33	9.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	78314	3	51	5.8	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	77656	3	57	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	77810	2	17	11.7	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	77590	1	17	5.8	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	77591	1	17	5.8	5.0	✓
Sulfate in Water by IC	E235.SO4	77589	1	17	5.8	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	77622	2	17	11.7	5.0	✓
Total Mercury in Water by CVAAS	E508	78193	3	32	9.3	5.0	✓
Total Metals in Water by CRC ICPMS	E420	77621	2	23	8.7	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
TSS by Gravimetry	E160-H Vancouver - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
Chloride in Water by IC (Low Level)	E235.Cl-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Vancouver - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Metals in Water by CRC ICPMS	E420 Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Vancouver - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Total Mercury in Water by CVAAS	E508 Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	“Hardness (as CaCO3), dissolved” is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. “Total Hardness” refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Hardness (Calculated) from Total Ca/Mg	EC100A Vancouver - Environmental	Water	APHA 2340B	“Hardness (as CaCO3), from total Ca/Mg” is calculated from the sum of total Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. “Total Hardness” refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations. Hardness from total Ca/Mg is normally comparable to Dissolved Hardness in non-turbid waters.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Ion Balance using Dissolved Metals	EC101 Vancouver - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
TDS in Water (Calculation)	EC103 Vancouver - Environmental	Water	APHA 1030E (mod)	Total Dissolved Solids is calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present.
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N Vancouver - Environmental	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **WR2000752**	Page	: 1 of 30
Client	: Minto Explorations Ltd.	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: 232817 (WUL)	Date Samples Received	: 25-Aug-2020 14:26
PO	: ----	Date Analysis Commenced	: 26-Aug-2020
C-O-C number	: 2020-08-25 A, 1 OF 2 AND 2 OF	Issue Date	: 01-Sep-2020 21:09
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 17		
No. of samples analysed	: 17		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Angelo Salandanan	Lab Assistant	Metals, Burnaby, British Columbia
Bruna Botti	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Cindy Tang	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Clarie Tejano		Metals, Burnaby, British Columbia
Cristina Alexandre	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Dan Gebert	Laboratory Analyst	Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Muneeb Alam	Analyst	Metals, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 77593)											
WR2000752-001	C4 WATER	conductivity	----	E100	2.0	µS/cm	190	190	0.0526%	10%	----
Physical Tests (QC Lot: 77594)											
WR2000752-001	C4 WATER	pH	----	E108	0.10	pH units	7.89	7.91	0.152%	4%	----
Physical Tests (QC Lot: 77595)											
WR2000752-001	C4 WATER	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	94.2	94.0	0.212%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	94.2	94.0	0.212%	20%	----
Physical Tests (QC Lot: 77606)											
VA20B3489-001	Anonymous	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	<3.0	<3.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 77927)											
VA20B3529-001	Anonymous	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	33.2	37.0	10.8%	20%	----
Physical Tests (QC Lot: 78310)											
VA20B3701-005	Anonymous	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	10.3	10.9	0.6	Diff <2x LOR	----
Physical Tests (QC Lot: 78499)											
VA20B3696-004	Anonymous	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	5.8	3.8	2.0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 77589)											
WR2000752-001	C4 WATER	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	6.79	6.78	0.152%	20%	----
Anions and Nutrients (QC Lot: 77590)											
WR2000752-001	C4 WATER	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 77591)											
WR2000752-001	C4 WATER	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 77592)											
WR2000752-001	C4 WATER	chloride	16887-00-6	E235.Cl-L	0.10	mg/L	0.22	0.22	0.0001	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 77806)											
WR2000752-004	W7 WATER	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0109	0.0103	0.0006	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 77998)											
WR2000752-001	C4 WATER	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0100	0.0112	0.0012	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 77810)											
WR2000752-004	W7 WATER	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	14.3	14.4	0.763%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Organic / Inorganic Carbon (QC Lot: 77997)											
WR2000752-001	C4 WATER	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	17.4	17.6	1.11%	20%	----
Total Metals (QC Lot: 77621)											
WR2000752-004	W7 WATER	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.259	0.251	3.12%	20%	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00054	0.00053	0.00001	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.0631	0.0621	1.56%	20%	----
		beryllium, total	7440-41-7	E420	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0000050	mg/L	0.0000054	<0.0000050	0.0000004	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.050	mg/L	29.2	28.8	1.65%	20%	----
		cobalt, total	7440-48-4	E420	0.00010	mg/L	0.00023	0.00022	0.000008	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00050	mg/L	0.00204	0.00209	0.00006	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.010	mg/L	0.431	0.447	3.61%	20%	----
		lead, total	7439-92-1	E420	0.000050	mg/L	0.000103	0.000100	0.000003	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0011	0.0011	0.00006	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	0.100	mg/L	11.2	10.9	2.53%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.0239	0.0241	0.956%	20%	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00127	0.00126	0.419%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.00159	0.00161	0.00002	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E420	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.100	mg/L	0.776	0.765	0.011	Diff <2x LOR	----
		selenium, total	7782-49-2	E420	0.000050	mg/L	0.000153	0.000145	0.000008	Diff <2x LOR	----
		silicon, total	7440-21-3	E420	0.10	mg/L	6.54	6.50	0.529%	20%	----
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, total	7440-23-5	E420	0.050	mg/L	7.33	7.17	2.22%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.309	0.303	1.88%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	2.94	2.75	0.19	Diff <2x LOR	----
		thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	0.0100	0.00954	5.11%	20%	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.000787	0.000801	1.73%	20%	----
		vanadium, total	7440-62-2	E420	0.00050	mg/L	0.00153	0.00151	0.00002	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	----
		zirconium, total	7440-67-7	E420	0.00020	mg/L	0.00030	0.00029	0.000007	Diff <2x LOR	----
Total Metals (QC Lot: 77622)											

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Total Metals (QC Lot: 77622) - continued											
WR2000752-004	W7 WATER	chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00085	0.00080	0.00005	Diff <2x LOR	----
Total Metals (QC Lot: 77774)											
WR2000752-001	C4 WATER	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0310	0.0348	11.6%	20%	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00058	0.00060	0.00002	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.0486	0.0501	2.90%	20%	----
		beryllium, total	7440-41-7	E420	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.050	mg/L	24.8	24.7	0.278%	20%	----
		cobalt, total	7440-48-4	E420	0.00010	mg/L	0.00013	0.00013	0.000001	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00050	mg/L	0.00199	0.00201	0.00002	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.010	mg/L	0.242	0.253	4.29%	20%	----
		lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0010	0.0011	0.00004	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	0.100	mg/L	7.65	7.50	2.09%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.0239	0.0244	2.23%	20%	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.000694	0.000696	0.322%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.00163	0.00172	0.00009	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E420	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.100	mg/L	0.607	0.621	0.013	Diff <2x LOR	----
		selenium, total	7782-49-2	E420	0.000050	mg/L	0.000084	0.000124	0.000040	Diff <2x LOR	----
		silicon, total	7440-21-3	E420	0.10	mg/L	6.62	6.70	1.19%	20%	----
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, total	7440-23-5	E420	0.050	mg/L	5.31	5.40	1.69%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.190	0.184	2.72%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	2.49	2.42	0.07	Diff <2x LOR	----
		thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	0.00117	0.00132	0.00015	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.000226	0.000229	1.45%	20%	----
		vanadium, total	7440-62-2	E420	0.00050	mg/L	0.00061	0.00068	0.00007	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	----
		zirconium, total	7440-67-7	E420	0.00020	mg/L	0.00042	0.00041	0.000008	Diff <2x LOR	----
Total Metals (QC Lot: 77775)											

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Total Metals (QC Lot: 77775) - continued											
WR2000752-001	C4 WATER	chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00058	0.00061	0.00003	Diff <2x LOR	----
Total Metals (QC Lot: 78193)											
KS2001530-001	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Total Metals (QC Lot: 78839)											
WR2000742-021	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Total Metals (QC Lot: 78840)											
WR2000752-013	W5 WATER	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 77656)											
VA20B3382-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.175	0.176	0.409%	20%	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00010	<0.00010	0.000004	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00074	0.00064	0.00010	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0121	0.0117	2.93%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	0.0000382	0.0000435	0.0000053	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	7.03	7.00	0.381%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	0.00030	0.00029	0.000008	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00192	0.00192	0.000008	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	0.374	0.380	1.53%	20%	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	1.56	1.52	2.54%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.0520	0.0498	4.16%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.000079	0.000060	0.000019	Diff <2x LOR	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00110	0.00111	0.00001	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	1.07	1.06	0.434%	20%	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.000097	0.000075	0.000022	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	4.46	4.42	1.00%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	7440-23-5	E421	0.050	mg/L	1.67	1.63	2.04%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.0498	0.0495	0.671%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 77656) - continued											
VA20B3382-001	Anonymous	tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	0.00249	0.00227	0.00022	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0051	0.0058	0.0007	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	0.00045	0.00049	0.00004	Diff <2x LOR	----
Dissolved Metals (QC Lot: 77657)											
VA20B3382-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	0.00042	0.00046	0.00004	Diff <2x LOR	----
Dissolved Metals (QC Lot: 77984)											
WR2000751-001	Anonymous	selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.000763	0.000897	16.2%	20%	----
WR2000751-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0125	0.0133	5.95%	20%	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00024	0.00024	0.000002	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00145	0.00149	2.79%	20%	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0472	0.0490	3.73%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	0.0000684	0.0000692	1.31%	20%	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	31.6	31.3	1.10%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00033	0.00033	0.000001	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	0.000074	0.000082	0.000008	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0014	0.0014	0.00001	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.100	mg/L	5.99	6.34	5.67%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00506	0.00531	4.74%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.000195	0.000209	0.000014	Diff <2x LOR	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.100	mg/L	0.119	0.117	0.002	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	2.30	2.28	1.18%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	7440-23-5	E421	0.050	mg/L	0.730	0.756	3.43%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.0924	0.0936	1.31%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	18.1	17.6	3.11%	20%	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 77984) - continued											
WR2000751-001	Anonymous	tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.000353	0.000341	3.40%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 77985)											
WR2000751-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 78008)											
VA20B3583-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00016	0.00015	0.000007	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00020	0.00018	0.00002	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0353	0.0360	2.05%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	0.069	0.070	0.002	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	<0.0000050	0.0000060	0.0000010	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	245	256	4.22%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00045	0.00048	0.00003	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0573	0.0587	2.40%	20%	----
		magnesium, dissolved	7439-95-4	E421	0.100	mg/L	175	167	4.90%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	<0.00010	0.00010	0.00000004	Diff <2x LOR	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.000528	0.000542	2.62%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00408	0.00450	0.00042	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	3.90	3.78	3.23%	20%	----
		selenium, dissolved	7782-49-2	E421	0.0500	mg/L	5.69 µg/L	0.00592	3.91%	20%	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	3.67	3.78	2.90%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	0.000011	<0.000010	0.000001	Diff <2x LOR	----
		sodium, dissolved	7440-23-5	E421	0.050	mg/L	30.9	29.9	3.23%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.988	0.985	0.367%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	326	327	0.237%	20%	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 78008) - continued											
VA20B3583-001	Anonymous	titanium, dissolved	7440-32-6	E421	0.0100	mg/L	<0.0100	<0.0100	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00908	0.00918	1.12%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 78009)											
VA20B3583-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 78314)											
VA20B3213-005	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 78899)											
KS2001529-001	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 78900)											
WR2000752-006	MN-0.5 WATER	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 77593)						
conductivity	----	E100	1	µS/cm	1.0	----
Physical Tests (QCLot: 77595)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 77606)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Physical Tests (QCLot: 77927)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Physical Tests (QCLot: 78310)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Physical Tests (QCLot: 78499)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Anions and Nutrients (QCLot: 77589)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 77590)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 77591)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 77592)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 77806)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 77998)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Organic / Inorganic Carbon (QCLot: 77810)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 77997)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 77621)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 77621) - continued						
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	7440-23-5	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	<0.00020	----
Total Metals (QCLot: 77622)						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
Total Metals (QCLot: 77774)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 77774) - continued						
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	7440-23-5	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	<0.00020	----
Total Metals (QCLot: 77775)						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
Total Metals (QCLot: 78193)						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 78839)						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----
Total Metals (QCLot: 78840)						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 77656)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 77656) - continued						
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----
Dissolved Metals (QCLot: 77657)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 77984)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 77984) - continued						
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----
Dissolved Metals (QCLot: 77985)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 78008)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 78008) - continued						
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----
Dissolved Metals (QCLot: 78009)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 78314)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 78899)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 78900)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 77593)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	101	90.0	110	----
Physical Tests (QCLot: 77594)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 77595)									
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	229 mg/L	86.9	75.0	125	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	97.7	85.0	115	----
Physical Tests (QCLot: 77606)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	104	85.0	115	----
Physical Tests (QCLot: 77927)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	90.7	85.0	115	----
Physical Tests (QCLot: 78310)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	90.4	85.0	115	----
Physical Tests (QCLot: 78499)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	90.3	85.0	115	----
Anions and Nutrients (QCLot: 77589)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 77590)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 77591)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	98.2	90.0	110	----
Anions and Nutrients (QCLot: 77592)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 77806)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.12 mg/L	105	85.0	115	----
Anions and Nutrients (QCLot: 77998)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.12 mg/L	97.4	85.0	115	----
Organic / Inorganic Carbon (QCLot: 77810)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	102	80.0	120	----
Organic / Inorganic Carbon (QCLot: 77997)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	102	80.0	120	----
Total Metals (QCLot: 77621)									

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 77621) - continued									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	104	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	98.0	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	101	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	96.0	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	101	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	103	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	100	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	99.6	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	105	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	98.7	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	100	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	101	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	102	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	102	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	103	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	102	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	98.5	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	116	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	105	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	99.5	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	104	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	102	80.0	120	----
sodium, total	7440-23-5	E420	0.05	mg/L	50 mg/L	105	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	105	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	105	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	100	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	100	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	93.9	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	103	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	103	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	99.0	80.0	120	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.1 mg/L	101	80.0	120	----
Total Metals (QCLot: 77622)									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
Total Metals (QCLot: 77774)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	103	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 77774) - continued									
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	106	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	97.6	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	114	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	98.2	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	102	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	98.8	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	104	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	102	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	100	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	98.0	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	101	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	98.1	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	98.2	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	103	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	105	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	101	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	100	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	101	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	99.8	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	94.1	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	104	80.0	120	----
sodium, total	7440-23-5	E420	0.05	mg/L	50 mg/L	105	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	111	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	92.1	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	101	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	102	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	94.2	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	97.0	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	101	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	102	80.0	120	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.1 mg/L	100	80.0	120	----
Total Metals (QCLot: 77775)									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
Total Metals (QCLot: 78193)									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	96.7	80.0	120	----
Total Metals (QCLot: 78839)									

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 78839) - continued									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	97.5	80.0	120	----
Total Metals (QCLot: 78840)									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	96.5	80.0	120	----
Dissolved Metals (QCLot: 77656)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	107	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	109	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	107	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	113	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	110	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	# 121	80.0	120	MES
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	107	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	112	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	111	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	107	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	105	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	102	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	110	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	111	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	111	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	108	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	114	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	107	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	112	70.0	130	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	109	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	114	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	119	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	110	80.0	120	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	110	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	112	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	112	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	112	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	110	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	105	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	108	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	110	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	106	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 77656) - continued									
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	108	80.0	120	----
Dissolved Metals (QCLot: 77657)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	108	80.0	120	----
Dissolved Metals (QCLot: 77984)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	96.1	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	99.1	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	93.9	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	98.9	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	89.5	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	99.0	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	94.4	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	97.4	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	98.9	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	98.5	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	93.8	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	101	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	102	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	86.5	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	99.7	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	98.4	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	102	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	97.4	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	98.1	70.0	130	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	95.7	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	102	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	102	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	104	80.0	120	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	97.8	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	104	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	101	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	99.4	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	97.8	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	91.8	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	107	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	99.7	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	105	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	99.5	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 77985)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	97.7	80.0	120	----
Dissolved Metals (QCLot: 78008)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	99.0	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	95.1	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	96.9	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	95.2	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	100	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	98.2	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	97.2	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	104	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	99.2	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	98.0	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	97.0	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	103	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	90.6	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	103	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	97.7	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	104	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	98.5	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	101	70.0	130	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	98.2	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	98.4	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	91.8	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	104	80.0	120	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	103	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	101	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	97.2	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	99.8	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	96.5	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	96.0	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	108	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	101	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	105	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	96.8	80.0	120	----
Dissolved Metals (QCLot: 78009)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	102	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 78314)									
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	101	80.0	120	----
Dissolved Metals (QCLot: 78899)									
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	96.3	80.0	120	----
Dissolved Metals (QCLot: 78900)									
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	96.5	80.0	120	----

Qualifiers

Qualifier	Description
MES	*Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).*

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 77589)										
WR2000752-002	W46 WATER	sulfate (as SO4)	14808-79-8	E235.SO4	101 mg/L	100 mg/L	101	75.0	125	----
Anions and Nutrients (QCLot: 77590)										
WR2000752-002	W46 WATER	nitrate (as N)	14797-55-8	E235.NO3-L	2.58 mg/L	2.5 mg/L	103	75.0	125	----
Anions and Nutrients (QCLot: 77591)										
WR2000752-002	W46 WATER	nitrite (as N)	14797-65-0	E235.NO2-L	0.483 mg/L	0.5 mg/L	96.7	75.0	125	----
Anions and Nutrients (QCLot: 77592)										
WR2000752-002	W46 WATER	chloride	16887-00-6	E235.Cl-L	102 mg/L	100 mg/L	102	75.0	125	----
Anions and Nutrients (QCLot: 77806)										
WR2000752-015	W2 WATER	ammonia, total (as N)	7664-41-7	E298	0.190 mg/L	0.2 mg/L	95.0	75.0	125	----
Anions and Nutrients (QCLot: 77998)										
WR2000752-002	W46 WATER	ammonia, total (as N)	7664-41-7	E298	0.206 mg/L	0.2 mg/L	103	75.0	125	----
Organic / Inorganic Carbon (QCLot: 77810)										
WR2000752-015	W2 WATER	carbon, dissolved organic [DOC]	----	E358-L	ND mg/L	5 mg/L	ND	70.0	130	----
Organic / Inorganic Carbon (QCLot: 77997)										
WR2000752-002	W46 WATER	carbon, dissolved organic [DOC]	----	E358-L	ND mg/L	5 mg/L	ND	70.0	130	----
Total Metals (QCLot: 77621)										
WR2000752-015	W2 WATER	aluminum, total	7429-90-5	E420	ND mg/L	0.2 mg/L	ND	70.0	130	----
		antimony, total	7440-36-0	E420	0.0196 mg/L	0.02 mg/L	98.1	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0194 mg/L	0.02 mg/L	97.1	70.0	130	----
		barium, total	7440-39-3	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0392 mg/L	0.04 mg/L	97.9	70.0	130	----
		bismuth, total	7440-69-9	E420	0.00955 mg/L	0.01 mg/L	95.5	70.0	130	----
		boron, total	7440-42-8	E420	0.097 mg/L	0.1 mg/L	97.1	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00393 mg/L	0.004 mg/L	98.2	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0197 mg/L	0.02 mg/L	98.7	70.0	130	----
		copper, total	7440-50-8	E420	0.0192 mg/L	0.02 mg/L	96.1	70.0	130	----
		iron, total	7439-89-6	E420	1.93 mg/L	2 mg/L	96.5	70.0	130	----
		lead, total	7439-92-1	E420	0.0188 mg/L	0.02 mg/L	94.3	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 77621) - continued										
WR2000752-015	W2 WATER	lithium, total	7439-93-2	E420	0.0951 mg/L	0.1 mg/L	95.1	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0198 mg/L	0.02 mg/L	99.2	70.0	130	----
		nickel, total	7440-02-0	E420	0.0381 mg/L	0.04 mg/L	95.3	70.0	130	----
		phosphorus, total	7723-14-0	E420	10.5 mg/L	10 mg/L	105	70.0	130	----
		potassium, total	7440-09-7	E420	3.98 mg/L	4 mg/L	99.6	70.0	130	----
		selenium, total	7782-49-2	E420	0.0401 mg/L	0.04 mg/L	100	70.0	130	----
		silicon, total	7440-21-3	E420	8.34 mg/L	10 mg/L	83.4	70.0	130	----
		silver, total	7440-22-4	E420	0.00410 mg/L	0.004 mg/L	102	70.0	130	----
		sodium, total	7440-23-5	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	19.2 mg/L	20 mg/L	96.1	70.0	130	----
		thallium, total	7440-28-0	E420	0.00379 mg/L	0.004 mg/L	94.8	70.0	130	----
		tin, total	7440-31-5	E420	0.0198 mg/L	0.02 mg/L	98.9	70.0	130	----
		titanium, total	7440-32-6	E420	0.0368 mg/L	0.04 mg/L	92.0	70.0	130	----
		uranium, total	7440-61-1	E420	0.00394 mg/L	0.004 mg/L	98.4	70.0	130	----
		vanadium, total	7440-62-2	E420	0.101 mg/L	0.1 mg/L	101	70.0	130	----
		zinc, total	7440-66-6	E420	0.386 mg/L	0.4 mg/L	96.6	70.0	130	----
		zirconium, total	7440-67-7	E420	0.0398 mg/L	0.04 mg/L	99.4	70.0	130	----
Total Metals (QCLot: 77622)										
WR2000752-015	W2 WATER	chromium, total	7440-47-3	E420.Cr-L	0.0399 mg/L	0.04 mg/L	99.8	70.0	130	----
Total Metals (QCLot: 77774)										
WR2000752-002	W46 WATER	aluminum, total	7429-90-5	E420	0.217 mg/L	0.2 mg/L	109	70.0	130	----
		antimony, total	7440-36-0	E420	0.0205 mg/L	0.02 mg/L	102	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0202 mg/L	0.02 mg/L	101	70.0	130	----
		barium, total	7440-39-3	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0393 mg/L	0.04 mg/L	98.2	70.0	130	----
		bismuth, total	7440-69-9	E420	0.00981 mg/L	0.01 mg/L	98.1	70.0	130	----
		boron, total	7440-42-8	E420	0.100 mg/L	0.1 mg/L	99.9	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00415 mg/L	0.004 mg/L	104	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0204 mg/L	0.02 mg/L	102	70.0	130	----
		copper, total	7440-50-8	E420	0.0203 mg/L	0.02 mg/L	101	70.0	130	----
		iron, total	7439-89-6	E420	2.02 mg/L	2 mg/L	101	70.0	130	----
		lead, total	7439-92-1	E420	0.0186 mg/L	0.02 mg/L	93.2	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 77774) - continued										
WR2000752-002	W46 WATER	lithium, total	7439-93-2	E420	0.0951 mg/L	0.1 mg/L	95.1	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0215 mg/L	0.02 mg/L	108	70.0	130	----
		nickel, total	7440-02-0	E420	0.0401 mg/L	0.04 mg/L	100	70.0	130	----
		phosphorus, total	7723-14-0	E420	10.1 mg/L	10 mg/L	101	70.0	130	----
		potassium, total	7440-09-7	E420	4.12 mg/L	4 mg/L	103	70.0	130	----
		selenium, total	7782-49-2	E420	0.0431 mg/L	0.04 mg/L	108	70.0	130	----
		silicon, total	7440-21-3	E420	9.72 mg/L	10 mg/L	97.2	70.0	130	----
		silver, total	7440-22-4	E420	0.00411 mg/L	0.004 mg/L	103	70.0	130	----
		sodium, total	7440-23-5	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	20.4 mg/L	20 mg/L	102	70.0	130	----
		thallium, total	7440-28-0	E420	0.00382 mg/L	0.004 mg/L	95.6	70.0	130	----
		tin, total	7440-31-5	E420	0.0203 mg/L	0.02 mg/L	102	70.0	130	----
		titanium, total	7440-32-6	E420	0.0403 mg/L	0.04 mg/L	101	70.0	130	----
		uranium, total	7440-61-1	E420	0.00381 mg/L	0.004 mg/L	95.2	70.0	130	----
		vanadium, total	7440-62-2	E420	0.104 mg/L	0.1 mg/L	104	70.0	130	----
		zinc, total	7440-66-6	E420	0.409 mg/L	0.4 mg/L	102	70.0	130	----
		zirconium, total	7440-67-7	E420	0.0410 mg/L	0.04 mg/L	102	70.0	130	----
Total Metals (QCLot: 77775)										
WR2000752-002	W46 WATER	chromium, total	7440-47-3	E420.Cr-L	0.0422 mg/L	0.04 mg/L	106	70.0	130	----
Total Metals (QCLot: 78193)										
VA20B3400-003	Anonymous	mercury, total	7439-97-6	E508	0.000477 mg/L	0.0005 mg/L	95.5	70.0	130	----
Total Metals (QCLot: 78839)										
WR2000742-022	Anonymous	mercury, total	7439-97-6	E508	0.0000965 mg/L	0.0001 mg/L	96.5	70.0	130	----
Total Metals (QCLot: 78840)										
WR2000752-014	MC1 WATER	mercury, total	7439-97-6	E508	0.0000944 mg/L	0.0001 mg/L	94.4	70.0	130	----
Dissolved Metals (QCLot: 77656)										
VA20B3382-002	Anonymous	aluminum, dissolved	7429-90-5	E421	0.207 mg/L	0.2 mg/L	103	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0212 mg/L	0.02 mg/L	106	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0203 mg/L	0.02 mg/L	102	70.0	130	----
		barium, dissolved	7440-39-3	E421	0.0206 mg/L	0.02 mg/L	103	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0427 mg/L	0.04 mg/L	107	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00992 mg/L	0.01 mg/L	99.2	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 77656) - continued										
VA20B3382-002	Anonymous	boron, dissolved	7440-42-8	E421	0.103 mg/L	0.1 mg/L	103	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00420 mg/L	0.004 mg/L	105	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0205 mg/L	0.02 mg/L	102	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0205 mg/L	0.02 mg/L	102	70.0	130	----
		iron, dissolved	7439-89-6	E421	2.06 mg/L	2 mg/L	103	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0207 mg/L	0.02 mg/L	104	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.113 mg/L	0.1 mg/L	113	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	0.982 mg/L	1 mg/L	98.2	70.0	130	----
		manganese, dissolved	7439-96-5	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0210 mg/L	0.02 mg/L	105	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0412 mg/L	0.04 mg/L	103	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	10.5 mg/L	10 mg/L	105	70.0	130	----
		potassium, dissolved	7440-09-7	E421	4.11 mg/L	4 mg/L	103	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0440 mg/L	0.04 mg/L	110	70.0	130	----
		silicon, dissolved	7440-21-3	E421	10.8 mg/L	10 mg/L	108	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00411 mg/L	0.004 mg/L	103	70.0	130	----
		sodium, dissolved	7440-23-5	E421	2.05 mg/L	2 mg/L	102	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	21.5 mg/L	20 mg/L	108	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00412 mg/L	0.004 mg/L	103	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0208 mg/L	0.02 mg/L	104	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0396 mg/L	0.04 mg/L	99.0	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00412 mg/L	0.004 mg/L	103	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.104 mg/L	0.1 mg/L	104	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.405 mg/L	0.4 mg/L	101	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0441 mg/L	0.04 mg/L	110	70.0	130	----
Dissolved Metals (QCLot: 77657)										
VA20B3382-002	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.0410 mg/L	0.04 mg/L	102	70.0	130	----
Dissolved Metals (QCLot: 77984)										
WR2000752-001	C4 WATER	aluminum, dissolved	7429-90-5	E421	0.192 mg/L	0.2 mg/L	96.0	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0211 mg/L	0.02 mg/L	106	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0194 mg/L	0.02 mg/L	96.8	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0397 mg/L	0.04 mg/L	99.4	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00959 mg/L	0.01 mg/L	95.9	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 77984) - continued										
WR2000752-001	C4 WATER	boron, dissolved	7440-42-8	E421	0.100 mg/L	0.1 mg/L	99.7	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00406 mg/L	0.004 mg/L	101	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0196 mg/L	0.02 mg/L	98.0	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0190 mg/L	0.02 mg/L	94.9	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.90 mg/L	2 mg/L	95.2	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0199 mg/L	0.02 mg/L	99.5	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0954 mg/L	0.1 mg/L	95.4	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	0.0186 mg/L	0.02 mg/L	93.2	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0201 mg/L	0.02 mg/L	100	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0388 mg/L	0.04 mg/L	97.1	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	10.5 mg/L	10 mg/L	105	70.0	130	----
		potassium, dissolved	7440-09-7	E421	3.88 mg/L	4 mg/L	97.0	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0431 mg/L	0.04 mg/L	108	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.58 mg/L	10 mg/L	95.8	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00410 mg/L	0.004 mg/L	102	70.0	130	----
		sodium, dissolved	7440-23-5	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	21.0 mg/L	20 mg/L	105	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00394 mg/L	0.004 mg/L	98.5	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0200 mg/L	0.02 mg/L	100	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0384 mg/L	0.04 mg/L	96.0	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00428 mg/L	0.004 mg/L	107	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.103 mg/L	0.1 mg/L	103	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.430 mg/L	0.4 mg/L	107	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0408 mg/L	0.04 mg/L	102	70.0	130	----
Dissolved Metals (QCLot: 77985)										
WR2000752-001	C4 WATER	chromium, dissolved	7440-47-3	E421.Cr-L	0.0390 mg/L	0.04 mg/L	97.5	70.0	130	----
Dissolved Metals (QCLot: 78008)										
VA20B3609-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.190 mg/L	0.2 mg/L	95.0	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0211 mg/L	0.02 mg/L	106	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0192 mg/L	0.02 mg/L	95.8	70.0	130	----
		barium, dissolved	7440-39-3	E421	0.0209 mg/L	0.02 mg/L	104	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0410 mg/L	0.04 mg/L	102	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.0101 mg/L	0.01 mg/L	101	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 78008) - continued										
VA20B3609-001	Anonymous	boron, dissolved	7440-42-8	E421	0.101 mg/L	0.1 mg/L	101	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00399 mg/L	0.004 mg/L	99.8	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0199 mg/L	0.02 mg/L	99.3	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0200 mg/L	0.02 mg/L	99.9	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.90 mg/L	2 mg/L	95.3	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0209 mg/L	0.02 mg/L	104	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.102 mg/L	0.1 mg/L	102	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	0.0194 mg/L	0.02 mg/L	96.9	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0207 mg/L	0.02 mg/L	103	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0396 mg/L	0.04 mg/L	98.9	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	10.4 mg/L	10 mg/L	104	70.0	130	----
		potassium, dissolved	7440-09-7	E421	3.88 mg/L	4 mg/L	96.9	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0407 mg/L	0.04 mg/L	102	70.0	130	----
		silicon, dissolved	7440-21-3	E421	8.96 mg/L	10 mg/L	89.6	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00413 mg/L	0.004 mg/L	103	70.0	130	----
		sodium, dissolved	7440-23-5	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	20.7 mg/L	20 mg/L	103	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00412 mg/L	0.004 mg/L	103	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0199 mg/L	0.02 mg/L	99.6	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0385 mg/L	0.04 mg/L	96.2	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00435 mg/L	0.004 mg/L	109	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.0997 mg/L	0.1 mg/L	99.7	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.428 mg/L	0.4 mg/L	107	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0407 mg/L	0.04 mg/L	102	70.0	130	----
Dissolved Metals (QCLot: 78009)										
VA20B3609-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.0403 mg/L	0.04 mg/L	101	70.0	130	----
Dissolved Metals (QCLot: 78314)										
VA20B3276-008	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000958 mg/L	0.0001 mg/L	95.8	70.0	130	----
Dissolved Metals (QCLot: 78899)										
KS2001529-002	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000864 mg/L	0.0001 mg/L	86.4	70.0	130	----
Dissolved Metals (QCLot: 78900)										
WR2000752-007	MN-2.5 WATER	mercury, dissolved	7439-97-6	E509	0.0000977 mg/L	0.0001 mg/L	97.7	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number: 2020-08-25 A

Page 1 of 2

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Michelle Olesh

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax mintoenvironment@mintomine.com
Email 2
Email 3

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax ap@mintomine.com
Email 2

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)		EMERGENCY	
4 day [P4]	☐	1 Business day [E1]	☐
3 day [P3]	☐	Same Day, Weekend or Statutory holiday [E0]	☐
2 day [P2]	☐		

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:		Major/Minor Code:	Routing Code:
PO / AFE:	232817 (WUL)	Requisitioner:	
LSD:		Location:	

ALS Lab Work Order # (lab use only)

ALS Contact: Shane Stack **Sampler:**

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	pH / Conductivity / Alkalinity / Anions	Total Suspended Solids (TSS)	Total Dissolved Solids (TDS)	Total Metals (TM), Hardness	Dissolved Metals (DM) (filtered and preserved)	Total Mercury, Hardness	Dissolved Mercury [1] (Filtered + preserved)	Total Nutrients (Ammonia)	Dissolved Organic Carbon (DOC)	Number of Containers
	C4	20-Aug-20	15:45	Water	R	R	R	R	R	R	R	R	R	7
	W46	20-Aug-20	16:25	Water	R	R	R	R	R	R	R	R	R	7
	W6	20-Aug-20	17:00	Water	R	R	R	R	R	R	R	R	R	7
	W7	~~20-Aug-20~~	~~17:45~~	Water	R	R	R	R	R	R	R	R	R	7
	MN-4.5	21-Aug-20	14:05	Water	R	R	R	R	R	R	R	R	R	7
	MN-0.5	21-Aug-20	15:00	Water	R	R	R	R	R	R	R	R	R	7
	MN-2.5	21-Aug-20	15:40	Water	R	R	R	R	R	R	R	R	R	7
	MN-1.5	21-Aug-20	16:55	Water	R	R	R	R	R	R	R	R	R	7
	MN-0.2	21-Aug-20	17:45	Water	R	R	R	R	R	R	R	R	R	7
	DUP	20-Aug-20		Water	R	R	R	R	R	R	R	R	R	7

Environmental Division
Whitehorse
Work Order Reference
WR2000752
Telephone : +1 867 668 6689

Drinking Water (DW) Samples[1] (client use) — Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Are samples taken from a Regulated DW System?
☐ YES ☑ NO

Are samples for human drinking water use?
☐ YES ☑ NO

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☑ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C
5.1			10 (aw on 8)

SHIPMENT RELEASE (client use)		
Released by: Chris Wall	Date: 2020-08-25	Time:

INITIAL SHIPMENT RECEPTION (lab use only)		
Received by: CC	Date: Aug 25 2020	Time: 2:26 pm

FINAL SHIPMENT RECEPTION (lab use only)		
Received by:	Date: Aug 28	Time: 9:05

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number: 2020-08-25 A

Page 1 of 2

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Michelle Olesh

Report Format / Distribution	
Select Report Format:	☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	mintoenvironment@mintomine.com
Email 2	
Email 3	
Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	ap@mintomine.com
Email 2	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:		Major/Minor Code:	Routing Code:
PO / AFE:	232817 (WUL)	Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)		ALS Contact: Shane Stack	Sampler:

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)		EMERGENCY	
4 day [P4]	☐	1 Business day [E1]	☐
3 day [P3]	☐	Same Day, Weekend or Statutory holiday [E0]	☐
2 day [P2]	☐		

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	pH / Conductivity / Alkalinity / Anions	Total Suspended Solids (TSS)	Total Dissolved Solids (TDS)	Total Metals (TM), Hardness	Dissolved Metals (DM)(filtered and preserved	Total Mercury, Hardness	Dissolved Mercury [1] (Filtered + preserved)	Total Nutrients (Ammonia)	Dissolved Organic Carbon (DOC)	Number of Containers
								P	F/P	P	F/P	P	F/P	
	DUP	21-Aug-20		Water	R	R	R	R	R	R	R	R	R	7
	W4	24-Aug-20	14:05	Water	R	R	R	R	R	R	R	R	R	7
	W5	24-Aug-20	14:40	Water	R	R	R	R	R	R	R	R	R	7
	MC1	24-Aug-20	15:15	Water	R	R	R	R	R	R	R	R	R	7
	W2	25-Aug-20	06:50	Water	R	R	R	R	R	R	R	R	R	7
	W3	25-Aug-20	07:25	Water	R	R	R	R	R	R	R	R	R	7
	DUP	25-Aug-20		Water	R	R	R	R	R	R	R	R	R	7

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?
☐ YES ☑ NO

Are samples for human drinking water use?
☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☑ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
5.2			10 (dwn 8)		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Chris Wall	Date: 2020-08-25	Time:	Received by: CC	Date: Aug 25 2020	Time: 2:26 PM	Received by:	Date: Aug 26	Time: 5:05

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

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1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

BIOASSAY COA's

Toxicity Testing for WR2000049

Collected February 18, 2020

Final Report

March 26, 2020

Submitted to: **ALS Environmental**
Burnaby, BC

8664 Commerce Court, Burnaby, BC V5A 4N7

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SIGNATURE PAGE

Report By:
Jeslin Wijaya, B.Sc
Laboratory Biologist

Reviewed By:
Armando Tang, R.P. Bio
Senior Reviewer

This report has been prepared by Nautilus Environmental Company Inc. based on data and/or samples provided by our client and the results of this study are for their sole benefit. Any reliance on the data by a third party is at the sole and exclusive risk of that party. The results presented here relate only to the sample tested.

SUMMARY

Sample Information and Test Type

Sample ID	VA2000049
Sample collection date	February 18, 2020
Sample receipt date	February 20, 2020
Sample receipt temperature	7.5°C
Test types	72-h *Pseudokirchneriella subcapitata* growth inhibition

Summary of Results

Endpoint	**% v/v**
Pseudokirchneriella subcapitata	
Growth IC25	>95.2
Growth IC50	>95.2

IC = Inhibition Concentration

1.0 INTRODUCTION

Nautilus Environmental Company Inc. conducted a sub-lethal toxicity test for ALS Environmental on a sample identified as WR2000049. The sample was collected on February 18, 2020 and delivered to the Nautilus Environmental laboratory in Burnaby, BC on February 20, 2020. The sample was transported in one 1-L container and was received at a temperature of 7.5°C. The sample was stored in the dark at 4 ± 2°C prior to testing.

This report describes the results of the toxicity test using *Pseudokirchneriella subcapitata*. Copies of raw laboratory data sheets and statistical analyses are provided in Appendix A. The chain-of-custody form is provided in Appendix B.

2.0 METHODS

Methods for the toxicity test are summarized in Table 1. Testing using *P. subcapitata* was conducted according to procedures described by Environment Canada (2007) and statistical analyses was performed using CETIS (Tidepool Scientific Software, 2013).

Table 1. Summary of test conditions: 72-h *Pseudokirchneriella subcapitata* growth inhibition test.

Test species	*Pseudokirchneriella subcapitata*, strain CPCC #37
Organism source	In-house axenic culture, obtained from Canadian Phycological Culture Center, and originally isolated from Nivelta River, Norway.
Organism age	3-to 7-day old culture in logarithmic growth phase
Test type	Static
Test duration	72 hours
Test vessel	Microplate
Test volume	220 µL
Test concentrations	Seven concentrations, plus laboratory control
Test replicates	4 per treatment; 8 for laboratory control
Number of organisms	10,000 cells/mL
Control/dilution water	Deionized water supplemented with nutrients
Test solution renewal	None
Test temperature	24 ± 2°C
Feeding	None
Light intensity	3600 to 4400 lux
Photoperiod	24 hours light
Aeration	None
Test measurements	Test area temperature measured daily; temperature and pH measured at test initiation; pH of two control wells measured at test termination
Test protocol	Environment Canada (2007), EPS 1/RM/25
Statistical software	CETIS Version 1.9.4
Test endpoint	Algal cell growth inhibition
Test acceptability criteria for controls	>16-fold increase in number of algal cells; CV ≤ 20%; no trend when analyzed using Mann-Kendall test
Reference toxicant	Zinc (added as $ZnSO_4$)

3.0 RESULTS

Results of the toxicity test are summarized in Table 2. There were no adverse effects observed on cell yield of *P. subcapitata*, resulting in IC values that were greater than the highest concentration tested. In addition, stimulatory effects were observed for *P. subcapitata* cell yield in test concentrations 3% to 95.2% (v/v).; percent stimulation for algal cell growth in these concentrations ranged from 44.3% to 259.8%.

Table 2. Results: 72-h *Pseudokirchneriella subcapitata* growth inhibition test.

Concentration (% v/v)	Cell Yield (x 10^4 cells/mL) (Mean ± SD)	Stimulation (%)
Laboratory Control	27.4 ± 2.2	--
1.5	33.5 ± 2.4	22.4
3.0	39.5 ± 3.7 *	44.3
6.0	43.2 ± 4.3 *	58.0
11.9	61.2 ± 3.1 *	123.7
23.8	83.8 ± 6.2 *	205.9
47.6	98.5 ± 10.8 *	259.8
95.2	47.0 ± 7.9 *	71.7
Test Endpoint (% v/v)		
IC25	>95.2	--
IC50	>95.2	--

SD = Standard Deviation, IC = Inhibition Concentration
* = indicates the cell yield was significantly greater than the lab control

4.0 QA/QC

The health history of the test organisms used in the exposure was acceptable and met the requirements of the Environment Canada protocol. The test met all control acceptability criteria and water quality parameters remained within ranges specified in the protocol throughout the test. Uncertainty associated with the test is best described by the standard deviation around the mean and/or the confidence intervals around the point estimates.

Results of the reference toxicant test conducted during the testing program are summarized in Table 3. Results for this test fell within the ranges for organism performance of the mean and two standard deviations, based on historical results obtained by the laboratory with this test. Thus, the sensitivity of the organisms used in this test was appropriate. The reference toxicant test was performed under the same conditions as those used for the sample.

Table 3. Reference toxicant test results.

Test Species	Endpoint	Historical Mean (2 SD Range)	CV (%)	Test Date
P. subcapitata	Growth (IC50): 31.5 µg/L Zn	30.9 (24.9 – 38.4)	11	February 21, 2020

SD = Standard Deviation, CV = Coefficient of Variation, IC = Inhibition Concentration

5.0 REFERENCES

Environment Canada. 2007. Biological test method: growth inhibition test using the freshwater alga. Environmental Protection Series, Report EPS 1/RM/25, Second Edition, March 2007. Environment Canada, Method Development and Application Section, Environmental Science and Technology Centre, Science and Technology Branch, Ottawa, ON. 53 pp.

Tidepool Scientific Software. 2013. CETIS comprehensive environmental toxicity information system, version 1.9.4.11 Tidepool Scientific Software, McKinleyville, CA. 275 pp

APPENDIX A – *Pseudokirchneriella subcapitata* Toxicity Test Data

Pseudokirchneriella subcapitata Summary Sheet

Client: ALS
Work Order No.: 200292
Start Date: Feb 21/20
Set up by: MG

Sample Information:

Sample ID: WR20000049
Sample Date: Feb 18/20
Date Received: Feb 20/20
Sample Volume: 3x1L

Test Organism Information:

Culture Date: Feb 14/20
Age of culture (Day 0): 7d

Zinc Reference Toxicant Results:

Reference Toxicant ID: SC195
Stock Solution ID: 20Zn01
Date Initiated: Feb 21/20

72-h IC50 (95% CL): 31.5 (28.0 - 34.9) ug/L Zn

72-h IC50 Reference Toxicant Mean and Range: 30.9 (24.9 - 38.4) ug/L Zn CV (%): 11

Test Results:

	Algal Growth
IC25 %(v/v) (95% CL)	>95.2
IC50 %(v/v) (95% CL)	795.2

Reviewed by: [signature]
Date reviewed: Feb. 28, 2020

72-h Algal Growth Inhibition Toxicity Test
Water Quality Measurements

Client: ALS | Setup by: MG

Sample ID: WR2000049 | Test Date/Time: Feb 21/20 @ 0730h

Work Order No.: 200292 | CER #: 4

Test Species: *Pseudokirchneriella subcapitata*

Culture Date: Feb 14/20 | Age of Culture: 7d | Culture Health: Good

Culture Count: 1 235 2 260 | Average: 247.5 | Culture Cell Density (c1): 247.5 x 10⁴ cells/mL

v1 = 220,000 cells/ml x 100 ml / (c1) 247.5x10⁴ cells/ml = 8.9 mL

Time Zero Counts: 1 24 2 23 | Average: 23.5

No. of Cells/mL: 23.5 x 10⁴ | Initial Density: # cells/mL ÷ 220 µL x 10 µL = 10682 cells/mL

Concentration %(v/v)	Water Quality		Incubator Temperature (°C)				Microplates rotated 2X per day?			
	pH	Temp (°C)								
	0 h	0 h	0 h	24 h	48 h	72 h	0 h	24 h	48 h	72 h
Control	6.9	23.0	24.0	24.0	25.0	25.0	✓	✓	✓	✓
1.5	6.9	23.0	↓	↓	↓	↓	✓	✓	✓	✓
3	7.0	23.0	↓	↓	↓	↓	✓	✓	✓	✓
6	7.2	23.0	↓	↓	↓	↓	✓	✓	✓	✓
11.9	7.3	23.0	↓	↓	↓	↓	✓	✓	✓	✓
23.8	7.7	23.0	↓	↓	↓	↓	✓	✓	✓	✓
47.6	8.0	23.0	↓	↓	↓	↓	✓	✓	✓	✓
95.2	8.2	23.0	↓	↓	↓	↓	✓	✓	✓	✓
Initials	MG	MG	MG	A	A	MG	MG	A	A	MG

Initial control pH: Well 1: 6.9 | Well 2: 6.9

Final control pH: Well 1: 7.7 | Well 2: 7.7

Light intensity (lux): 4330 | Date measured: Feb 21/20

Thermometer: 4 | Light meter: 1 | pH meter/probe: 1, 1

Sample Description: clear, colourless, odourless, no particulates

Comments:

Reviewed: [signature] | Date reviewed: Feb. 28, 2020

Pseudokirchneriella subcapitata Toxicity Test Data Sheet
72-h Algal Cell Counts

Client: ALS
Start Date/Time: Feb 21/20 @ 0730h
Work Order #: 200292
Termination Date: Feb 24/20 @ 0730h
Sample ID: WR2000049
Test set up by: MG

%(v/v)

Concentration	Rep	Count 1	Count 2	Count 3	Count 4	Comments	Initials
Control	A	28					MG
	B	30					
	C	27					
	D	25					
	E	27					
	F	28					
	G	32					
	H	30					
1.5	A	33					
	B	38					
	C	34					
	D	33					
3	A	41					
	B	36					
	C	40					
	D	45					
6	A	45					
	B	41					
	C	41					
	D	50					
11.9	A	58					
	B	64					
	C	62					
	D	65					
23.8	A	78					
	B	90					
	C	81					
	D	90					
47.6	A	98					
	B	115					
	C	95					
	D	90					
95.2	A	48					
	B	59					
	C	41					
	D	44					✓

Comments:

Reviewed by: [signature] Date Reviewed: Feb. 28, 2020

Pseudokirchneriella subcapitata Algal Counts

Client: ALS
WO#: 200292
Sample ID: WR2000049

Start Date/Time: 21-Feb-20 @ 0730h
Termination Date/Time: 24-Feb-20 @ 0730h

Initial Cell Density: 10682 cell/mL

									235000
									0.22
									0.01
Concentration %(v/v)	Rep	Count 1 (x 10^4)	Count 2 (x 10^4)	Count 3 (x 10^4)	Count 4 (x 10^4)	Mean (x 10^4)	Cell Yield (x 10^4) cell/mL		10681.82
Control	A	28				28	26.9	mean	27.3
	B	30				30	28.9	SD	2.199838
	C	27				27	25.9	CV	8.056001
	D	25				25	23.9		
	E	27				27	25.9		
	F	28				28	26.9		
	G	32				32	30.9		
	H	30				30	28.9		
1.5	A	33				33	31.9		
	B	38				38	36.9		
	C	34				34	32.9		
	D	33				33	31.9		
3	A	41				41	39.9		
	B	36				36	34.9		
	C	40				40	38.9		
	D	45				45	43.9		
6	A	45				45	43.9		
	B	41				41	39.9		
	C	41				41	39.9		
	D	50				50	48.9		
11.9	A	58				58	56.9		
	B	64				64	62.9		
	C	62				62	60.9		
	D	65				65	63.9		
23.8	A	78				78	76.9		
	B	90				90	88.9		
	C	81				81	79.9		
	D	90				90	88.9		
47.6	A	98				98	96.9		
	B	115				115	113.9		
	C	95				95	93.9		
	D	90				90	88.9		
95.2	A	48				48	46.9		
	B	59				59	57.9		
	C	41				41	39.9		
	D	44				44	42.9		

Reviewed by: _____

Date reviewed: Feb. 28 2020

CETIS Analytical Report

EC Alga Growth Inhibition Test — **Nautilus Environmental**

Analysis ID:	17-3174-0677	**Endpoint:**	Cell Yield	**CETIS Version:**	CETISv1.9.4
Analyzed:	25 Feb-20 17:40	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1
Batch ID:	10-6050-9545	**Test Type:**	Cell Growth	**Analyst:**	Mimi Tran
Start Date:	21 Feb-20 07:30	**Protocol:**	EC/EPS 1/RM/25	**Diluent:**	Deionized Water + nutrients
Ending Date:	24 Feb-20 07:30	**Species:**	Pseudokirchneriella subcapitata	**Brine:**	
Test Length:	72h	**Taxon:**	Chlorophyta	**Source:**	In-House Culture **Age:** 7d
Sample ID:	06-8068-3311	**Code:**	2892672F	**Project:**	
Sample Date:	18 Feb-20 07:45	**Material:**	Water Sample	**Source:**	ALS
Receipt Date:	20 Feb-20 15:38	**CAS (PC):**		**Station:**	WR2000049
Sample Age:	72h (7.5 °C)	**Client:**	ALS		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	1258435	200	Yes	Two-Point Interpolation

Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision(α:5%)
Extreme Value	Grubbs Extreme Value Test	3.185	2.991	0.0206	Outlier Detected
Control Trend	Mann-Kendall Trend Test	3.185		0.7305	Non-Significant Trend in Controls

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	60.01	51.08	n/a	1.666	n/a	1.958
IC10	75.58	54.19	n/a	1.323	n/a	1.845
IC15	95.14	56.67	n/a	1.051	n/a	1.765
IC20	>95.2	n/a	n/a	<1.05	n/a	n/a
IC25	>95.2	n/a	n/a	<1.05	n/a	n/a
IC40	>95.2	n/a	n/a	<1.05	n/a	n/a
IC50	>95.2	n/a	n/a	<1.05	n/a	n/a

Cell Yield Summary

			Calculated Variate						Isotonic Variate	
Conc-%	Code	Count	Mean	Min	Max	Std Dev	CV%	%Effect	Mean	%Effect
0	N	8	27.38	24	31	2.2	8.04%	0.0%	55.3	0.0%
1.5		4	33.5	32	37	2.38	7.11%	-22.37%	55.3	0.0%
3		4	39.5	35	44	3.697	9.36%	-44.29%	55.3	0.0%
6		4	43.25	40	49	4.272	9.88%	-57.99%	55.3	0.0%
11.9		4	61.25	57	64	3.096	5.05%	-123.7%	55.3	0.0%
23.8		4	83.75	77	89	6.185	7.39%	-205.9%	55.3	0.0%
47.6		4	98.5	89	114	10.85	11.01%	-259.8%	55.3	0.0%
95.2		4	47	40	58	7.874	16.75%	-71.69%	47	15.01%

Cell Yield Detail

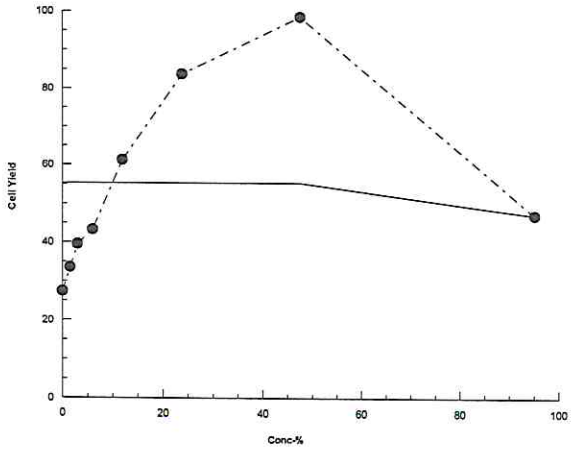
Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	N	27	29	26	24	26	27	31	29
1.5		32	37	33	32				
3		40	35	39	44				
6		44	40	40	49				
11.9		57	63	61	64				
23.8		77	89	80	89				
47.6		97	114	94	89				
95.2		47	58	40	43				

Analyst: MT QA: Feb 28/20

EC Alga Growth Inhibition Test **Nautilus Environmental**

Analysis ID:	17-3174-0677	**Endpoint:**	Cell Yield	**CETIS Version:**	CETISv1.9.4
Analyzed:	25 Feb-20 17:40	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1

Graphics



Analyst: MG QA: Feb 28/20

EC Alga Growth Inhibition Test

Nautilus Environmental

Analysis ID:	09-7436-1571	**Endpoint:**	Cell Yield	**CETIS Version:**	CETISv1.9.4
Analyzed:	25 Feb-20 17:41	**Analysis:**	Parametric-Control vs Treatments	**Status Level:**	1
Batch ID:	10-6050-9545	**Test Type:**	Cell Growth	**Analyst:**	Mimi Tran
Start Date:	21 Feb-20 07:30	**Protocol:**	EC/EPS 1/RM/25	**Diluent:**	Deionized Water + nutrients
Ending Date:	24 Feb-20 07:30	**Species:**	Pseudokirchneriella subcapitata	**Brine:**	
Test Length:	72h	**Taxon:**	Chlorophyta	**Source:**	In-House Culture **Age:** 7d
Sample ID:	06-8068-3311	**Code:**	2892672F	**Project:**	
Sample Date:	18 Feb-20 07:45	**Material:**	Water Sample	**Source:**	ALS
Receipt Date:	20 Feb-20 15:38	**CAS (PC):**		**Station:**	WR2000049
Sample Age:	72h (7.5 °C)	**Client:**	ALS		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C < T	1.5	3	2.121	66.67	30.75%

Dunnett Multiple Comparison Test

Control	vs	Conc-%	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Negative Control		1.5	1.8381	2.5262	8.418	10	CDF	0.1859	Non-Significant Effect
		3*	3.6386	2.5262	8.418	10	CDF	0.0035	Significant Effect
		6*	4.7639	2.5262	8.418	10	CDF	1.8E-04	Significant Effect
		11.9*	10.166	2.5262	8.418	10	CDF	<1.0E-37	Significant Effect
		23.8*	16.918	2.5262	8.418	10	CDF	<1.0E-37	Significant Effect
		47.6*	21.344	2.5262	8.418	10	CDF	<1.0E-37	Significant Effect
		95.2*	5.8893	2.5262	8.418	10	CDF	7.5E-06	Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Extreme Value	Grubbs Extreme Value Test	3.1846	2.9906	0.0206	Outlier Detected
Control Trend	Mann-Kendall Trend Test	3.1846		0.7305	Non-Significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	20256.1	2893.73	7	97.723	<1.0E-37	Significant Effect
Error	829.125	29.6116	28			
Total	21085.2		35			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	15.833	18.475	0.0267	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.94179	0.91658	0.0578	Normal Distribution

Cell Yield Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	N	8	27.375	25.536	29.214	27	24	31	0.77776	8.04%	0.00%
1.5		4	33.5	29.712	37.288	32.5	32	37	1.1902	7.11%	-22.37%
3		4	39.5	33.617	45.383	39.5	35	44	1.8484	9.36%	-44.29%
6		4	43.25	36.452	50.048	42	40	49	2.136	9.88%	-57.99%
11.9		4	61.25	56.324	66.176	62	57	64	1.5478	5.05%	-123.74%
23.8		4	83.75	73.909	93.591	84.5	77	89	3.0923	7.38%	-205.94%
47.6		4	98.5	81.239	115.76	95.5	89	114	5.4237	11.01%	-259.82%
95.2		4	47	34.471	59.529	45	40	58	3.937	16.75%	-71.69%

EC Alga Growth Inhibition Test

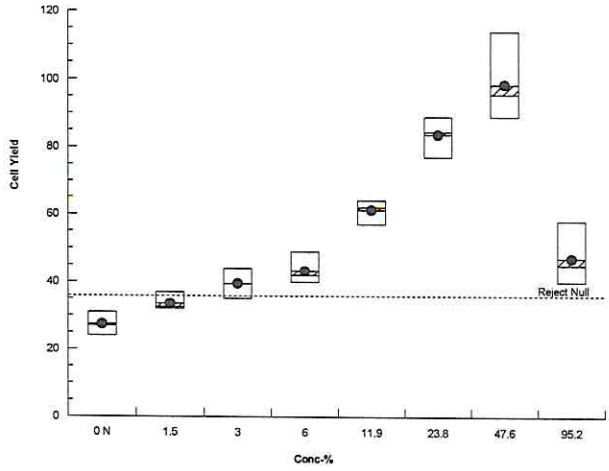
Nautilus Environmental

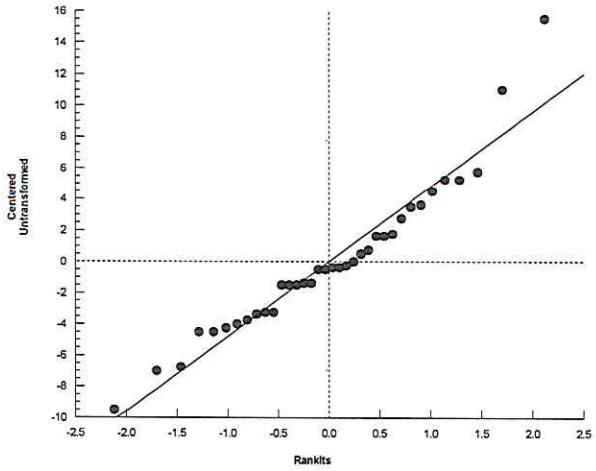
Analysis ID:	09-7436-1571	**Endpoint:**	Cell Yield	**CETIS Version:**	CETISv1.9.4
Analyzed:	25 Feb-20 17:41	**Analysis:**	Parametric-Control vs Treatments	**Status Level:**	1

Cell Yield Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	N	27	29	26	24	26	27	31	29
1.5		32	37	33	32				
3		40	35	39	44				
6		44	40	40	49				
11.9		57	63	61	64				
23.8		77	89	80	89				
47.6		97	114	94	89				
95.2		47	58	40	43				

Graphics





APPENDIX B – Chain-of-Custody Form

Chain of Custody

Whitehorse - Environmental
#12 151 Industrial Road
Whitehorse Yukon Canada Y1A 2V3

546

Destination Lab:	**Nautilus Environmental**	Due Date: 25/02/2020	Relinquished By
Address:	(Burnaby) erce Court	HT Expiry:	Date/Time
Client:	Minto Explorations Ltd.	Consignment company and Number	Received By
Work Order Number:	**WR2000049**		Date/Time
Original Receipt Date/Time	Instructions Received		Receipt Temp
18/02/2020 15:40			

ALS Lab ID	Bottle Code	Matrix	Submatrix	Container Type	Test Codes	Task Remarks
WR2000049	001-AA	Water	Water	HDPE	DAP-LC50-48	200291
WR2000049	001-AB	Water	Water	HDPE	GRN-ALG-IC50	200292
WR2000049	001-AC	Water	Water	HDPE		

Sampled on February 18
7:45am

Heather McKenzie
Account Manager:

ALSEVDataSublet@ALSGlobal.com (PDF / EXCEL/ B2B)
ALS Vancouver Phone Number: 604-253-4188

3 x 1L

7.5 °C

Feb. 20/20 @ 15:38

Clear, colourless liquid, no odour, no particulates.

END OF REPORT

Acute Toxicity Test Results

Sample WR2000031,
collected February 11, 2020

Final Report

February 26, 2020

Submitted to: **ALS Environmental**
Burnaby, BC

8664 Commerce Court, Burnaby, BC V5A 4N7

SAMPLE INFORMATION

Sample ID	Dates				Receipt temp.
	Collected	Received	Rainbow trout test initiation	*Daphnia magna* test initiation	
WR2000031	11-Feb-20 at 0900h	13-Feb-20 at 0830h	14-Feb-20 at 1145h	13-Feb-20 at 1620h	6.8 – 9.5°C

TESTS

- Rainbow trout 96-h LC50 test
- *Daphnia magna* 48-h LC50 test

RESULTS

Toxicity test results

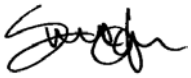
Sample ID	LC50 (% v/v)	
	Rainbow trout	*Daphnia magna*
WR2000031	>100	>100

LC = Lethal Concentration

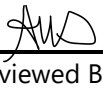
QA/QC

QA/QC summary	Rainbow trout	Daphnia magna
Reference toxicant LC50 (95% CL)	132.7 (96.9 – 182.3) µg/L Zn[1]	6.3 (5.2 – 7.7) g/L NaCl[2]
Reference toxicant historical mean (2 SD range)	87.9 (31.7 – 243.4) µg/L Zn	6.1 (4.4 – 8.5) g/L NaCl
Reference toxicant CV	54%	17%
Organism health history	Acceptable	Acceptable
Protocol deviations	None	None
Water quality range deviations	None	None
Control performance	Acceptable	Acceptable
Test performance	Valid	Valid

[1] Test date: January 30, 2020; [2] Test Date: February 11, 2020, LC = Lethal Concentration, CL = Confidence Limits, SD = Standard Deviation, CV = Coefficient of Variation



Report By:
Yvonne Lam, B.Sc.
Laboratory Biologist



Reviewed By:
Andy Diewald, B.Sc.
Senior Analyst

This report has been prepared by Nautilus Environmental Company Inc. based on data and/or samples provided by our client and the results of this study are for their sole benefit. Any reliance on the data by a third party is at the sole and exclusive risk of that party. The results presented here relate only to the samples tested.

APPENDIX A – Summary of test conditions

Table 1. Summary of test conditions: 96-h rainbow trout (*Oncorhynchus mykiss*) LC50 test.

Test species	*Oncorhynchus mykiss*
Organism source	Hatchery
Organism age	Juvenile
Test type	Static
Test duration	96 hours
Test vessel	20-L glass aquarium
Test volume	10 to 20 L (depending on size of fish)
Test solution depth	≥15 cm
Test concentrations	Five concentrations, plus laboratory control
Test replicates	1 per treatment
Number of organisms	10 per replicate
Control/dilution water	Dechlorinated Metro Vancouver municipal tapwater
Test solution renewal	None
Test temperature	15 ± 1°C
Feeding	None
Light intensity	100 to 500 lux
Photoperiod	16 hours light / 8 hours dark
Aeration	6.5 ± 1 mL/min/L
Test measurements	Temperature, dissolved oxygen and pH measured daily; salinity measured in the undiluted sample at test initiation; conductivity measured at test initiation and termination; survival checked daily
Test protocol	Environment Canada (2000), EPS 1/RM/13, with 2007 & 2016 amendments
Statistical software	CETIS Version 1.9.4
Test endpoints	Survival (96-hour LC50)
Test acceptability criterion for controls	Survival ≥90%
Reference toxicant	Zinc (added as $ZnSO_4$)

Table 2. Summary of test conditions: 48-h *Daphnia magna* LC50 test.

Test species	*Daphnia magna*
Organism source	In-house culture
Organism age	<24-hour old neonates
Test type	Static
Test duration	48 hours
Test vessel	250-mL glass beaker
Test volume	200 mL
Test solution depth	6 cm
Test concentrations	Five concentrations, plus laboratory control
Test replicates	1 per treatment
Number of organisms	10 per replicate
Control/dilution water	Moderately-hard reconstituted water + 2.5 µg/L Se
Test solution renewal	None
Test temperature	20 ± 2°C
Feeding	None
Light intensity	400 to 800 lux
Photoperiod	16 hours light / 8 hours dark
Aeration	None
Test measurements	Temperature, dissolved oxygen and pH measured daily; salinity, hardness and alkalinity measured in the undiluted sample at test initiation; conductivity measured at test initiation and termination; survival checked daily
Test protocol	Environment Canada (2000), EPS 1/RM/14, with 2016 amendments
Statistical software	CETIS Version 1.9.4
Test endpoints	Survival (48-hour LC50)
Test acceptability criterion for controls	Survival ≥90%
Reference toxicant	Sodium chloride (NaCl)

APPENDIX B – Toxicity test data

Rainbow Trout Summary Sheet

Client: ALS Environmental

Start Date/Time: 14Feb20 @ 1145h

Work Order No.: 200241

Test Species: *Oncorhynchus mykiss*

Test Validity Criteria:
≥ 90% control survival
WQ Ranges:
T (°C) = 15 ± 1; DO (mg/L) = 7.0 to 10.3; pH = 5.5 to 8.5

Sample Information:

Sample ID: WR200031
Sample Date: 11Feb20
Date Received: 13Feb20
Sample Volume: 2 × 20L
Other: —

Dilution Water:

Type: Dechlorinated Municipal Tap Water
Hardness (mg/L $CaCO_3$): 13
Alkalinity (mg/L $CaCO_3$): 12

Test Organism Information:

Batch No.: 010620
Source: Spring Valley Trout Hatchery
No. Fish/Volume (L): 10/20L
Loading Density (g/L): 0.33
Mean Length ± SD (mm): 44 ± 2 Range: 40 - 47
Mean Weight ± SD (g): 0.65 ± 0.12 Range: 0.42 - 0.80

Zinc Reference Toxicant Results:

Reference Toxicant ID: RTZn166
Stock Solution ID: 192n05
Date Initiated: 30Jan20
96-h LC50 (95% CL): 132.7 (96.9 - 182.3) µg/L Zn

Reference Toxicant Mean and Historical Range: 87.9 (31.7 - 243.4) µg/L Zn
Reference Toxicant CV (%): 54%

Test Results: The 96h LC50 is estimated to be > 100% (v/v).

Reviewed by: [signature]

Date reviewed: Feb 20/20

96-Hour Rainbow Trout Toxicity Test Data Sheet

Client/Project#: ALS Environmental
Sample I.D. WR200031
W.O. # 200241
RBT Batch #: 010620
Date Collected/Time: Feb 11/20 @ 09:00h
Date Setup/Time: Feb 14/20 @ 1145h
CER #: 3
Sample Setup By: JAD

Thermometer: Cer 3
D.O. meter/probe: 5 / DS
Cond./Salinity meter/probe: 5 / CPS
pH meter/probe: 2 / P2

Number Fish/Volume: 10 / 20L
7-d % Mortality: 0.18
Total Pre-aeration Time (mins): 30
Aeration rate adjusted to 6.5 ± 1 mL/min/L? (Y/N): Y

Undiluted Sample WQ			
Parameters	Initial WQ	Adjustment	30 min WQ
Temp °C	14.0		14.0
D.O. (mg/L)	9.9		10.0
pH	7.6		7.8
Cond. (µS/cm)	590		587
Salinity (ppt)	0.3		0.3

Concentration	# Survivors							Temperature (°C)					Dissolved Oxygen (mg/L)					pH					Conductivity (µS/cm)	
(% v/v)	1	2	4	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	96
Ctrl				10	10	10	10	14.0	14.0	14.5	15.0	14.5	9.9	10.1	9.7	9.5	9.8	7.4	7.0	7.1	7.0	7.1	32	37
6.25				10	10	10	10	14.0	14.0	14.5	15.0	14.0	9.8	10.1	9.6	9.6	9.9	7.3	7.0	7.3	7.2	7.2	70	78
12.5				10	10	10	10	14.0	14.0	14.5	15.0	14.0	9.9	10.2	9.6	9.8	10.0	7.4	7.2	7.5	7.4	7.4	109	116
25				10	10	10	10	14.0	14.0	14.5	15.0	14.0	9.9	10.1	9.5	9.6	9.9	7.5	7.5	7.9	7.8	7.8	187	195
50				10	10	10	10	14.0	14.0	14.5	15.0	14.0	9.9	10.1	9.6	9.8	9.9	7.7	8.0	8.1	8.1	8.0	301	~~342~~ 308
100				10	10	10	10	14.0	14.0	14.5	15.0	14.5	10.0	10.1	9.6	9.8	9.9	7.8	8.4	8.5	8.4	8.4	~~587~~	589
Initials				JAD	MM	MH	JAD	JAD	JAD	MM	MH	JAD	JAD	JAD	MM	MH	JAD	JAD	JAD	MM	MH	JAD	JAD	JAD

Sample Description/Comments: Clear colourless liquid. No particulates No odour.

Fish Description at 96 h: All fish appear normal. Number of Stressed Fish at 96 h: 0

Other Observations:

Reviewed by: [signature] Date Reviewed: Feb 20/20

Daphnia magna Summary Sheet

Client: ALS Environmental
Work Order No.: 200242

Start Date/Time: Feb 13/2020@1620h
Test Species: *Daphnia magna*
Set up by: MLE

Sample Information:

Sample ID: WR20000031
Sample Date: Feb 11/2020
Date Received: Feb 13/2020
Sample Volume: 2x 1L

Test Validity Criteria:

≥ 90% mean control survival and/or mobility and ≤2 daphnids exibit immobility and/or mortality in any single control replicate.

WQ Ranges:

T (°C) = 20 ± 2; DO (mg/L) = 3.6 to 9.4; pH = 6 to 8.5

Test Organism Information:

Broodstock No.: 012920C
Age of young (Day 0): <24 h
Avg No. young per brood in previous 7 d: 18
Mortality (%) in previous 7 d: 0
Days to first brood: 9

NaCl Reference Toxicant Results:

Reference Toxicant ID: DmDC46
Stock Solution ID: 20 NaCl
Date Initiated: Feb 11/2020
48-h LC50 (95% CL): 6.3 (5.2 - 7.7) g/LNaCL

Reference Toxicant Mean and Historical Range: 6.1 (4.4 - 8.5) g/L NaCL
Reference Toxicant CV (%): 17

Test Results: 48h
The LC50 is estimated to be >100% (v/v).

Reviewed by: [signature]

Date reviewed: Feb 20/20

Freshwater Acute
48 Hour Toxicity Test Data Sheet

Client: ALS ENVIRONMENTAL
Sample ID: WR2000031
Work Order No.: ~~WR-2000~~ 200242

Start Date/Time: Feb 13/2020 @ 1620
CER #: 5
No. Organisms/volume: 10/200mL
Test Organism: *D.magna*
Set up by: MHF

Thermometer: CER#5 pH meter/probe: 3 / 3 DO meter/probe: 3 / 3 Cond./Salinity meter/probe: 3 / 3

Concentration % (v/v)	Rep	Number of Live Organisms 24	48	No. Immobilized 48	Temperature (°C) 0	24	48	Dissolved oxygen (mg/L) 0	24	48	pH 0	24	48	Conductivity (µS/cm) 0	48
CTRL	A	10	10	0	20.0	20.5	19.0	8.7	8.5	8.9	7.6	7.80	7.6	350	362
	B														
	C														
	D														
6.25	A	10	10	0	20.0	20.5	19.0	8.7	8.5	8.9	7.5	7.6	7.6	364	378
	B														
	C														
	D							MHF							
12.5	A	10	10	0	20.0	20.5	19.0	~~8.5~~ 8.7	8.5	8.9	7.5	7.6	7.7	379	383
	B														
	C														
	D														
25	A	10	10	0	20.0	20.5	19.0	8.7	8.5	8.9	7.5	7.7	7.9	409	412
	B														
	C														
	D														
50	A	10	10	0	20.0	20.5	19.0	8.7	8.5	8.8	7.5	7.8	8.0	470	470
	B														
	C														
	D														
100	A	10	10	0	20.0	20.5	19.0	8.6	8.6	8.8	7.4	7.8	8.1	595	586
	B														
	C														
	D														
Technician Initials		MHF	JAD	JAD	MHF	MHF	JAD	MHF	MHF	JAD	MHF	MHF	JAD	MHF	JAD

Concentration	Hardness* (mg/L as CaCO3)	Alkalinity* (mg/L as CaCO3)
Control (MHW)	100	84
Highest conc.	278	312
Hardness adjusted	—	—

	Initial WQ	Adjustment	Adjusted WQ
Temp (°C)	20.0		
DO (mg/L)	8.6		
pH	7.4		
Cond (µS/cm)	595		
Salinity (ppt)	0.3		

Comments: _____ Mortality: Heartbeat checked under microscope not req'd.

Sample Description: clear, no colour, no odour, no particulates

Batch#: 012920C 7-d previous # young/brood: 18 Previous 7-d Mortality (%): 0 Day of 1st Brood: 9

Reviewed by: _____ Date reviewed: Feb 20/20

APPENDIX C – Chain-of-custody form

Chain of Custody
Whitehorse - Environmental
#12 151 Industrial Road
Whitehorse Yukon Canada Y1A 2V3

PREVIEW COC

Destination Lab:	**Nautilus Environmental**	Due Date: 18/02/2020	Relinquished By
Address:	(Burnaby)erce Court	HT Expiry:	Date/Time
Client:	Minto Explorations Ltd.	Consignment company and Number	Received By
Work Order Number:	**WR2000031**		Date/Time
Original Receipt Date/Time	Instructions Received		Receipt Temp
11/02/2020 14:29			

ALS Lab ID	Bottle Code	Matrix	Submatrix	Container Type	Test Codes	Task Remarks
WR2000031	001-AA	Water	Water	HDPE carboy P/F	TRT-LC50-96	
WR2000031	001-AB	Water	Water	HDPE carboy P/F		
WR2000031	001-AC	Water	Water	HDPE	DAP-LC50-48	
WR2000031	001-AD	Water	Water	HDPE		

Account Manager: Heather Mckenzie

ALSEVDataSublet@ALSGlobal.com (PDF / EXCEL/ B2B)
ALS Vancouver Phone Number: 604-253-4188

Sampling Date: February 11th at 9am

Recvd Feb 13/20
@ 0830h

no # YML

RBT LC50 - 200241 2x20L - 8.9-9.5°C
Daphnia LC50 - 200242 2x1L - 6.8-7.1°C

END OF REPORT

Acute Toxicity Test Results

Sample WR2000049,
collected February 18, 2020

Final Report

March 5, 2020

Submitted to: **ALS Environmental**
Burnaby, BC

8664 Commerce Court, Burnaby, BC V5A 4N7

SAMPLE INFORMATION

Sample ID	Dates			Receipt temperature
	Collected	Received	*Daphnia magna* test initiation	
WR2000049	18-Feb-20 at 0745h	20-Feb-20 at 1538h	20-Feb-20 at 1640h	7.5°C

TESTS

- *Daphnia magna* 48-h LC50 test

RESULTS

Toxicity test results

Sample ID	LC50 (% v/v)
WR2000049	>100

LC = Lethal Concentration

QA/QC

QA/QC summary	*Daphnia magna*
Reference toxicant LC50 (95% CL)	6.3 (5.2 – 7.7) g/L NaCl[1]
Reference toxicant historical mean (2 SD range)	6.1 (4.4 – 8.5) g/L NaCl
Reference toxicant CV	17%
Organism health history	Acceptable
Protocol deviations	None
Water quality range deviations	None
Control performance	Acceptable
Test performance	Valid

[1] Test date: February 11, 2020, LC = Lethal Concentration, SD = Standard Deviation, CL = Confidence Limits, CV = Coefficient of Variation



Report By:
Marcus Lee-Fraizer, B.Sc.
Laboratory Biologist



Reviewed By:
Edmund Canaria, R.P. Bio
Senior Analyst

This report has been prepared by Nautilus Environmental Company Inc. based on data and/or samples provided by our client and the results of this study are for their sole benefit. Any reliance on the data by a third party is at the sole and exclusive risk of that party. The results presented here relate only to the samples tested.

APPENDIX A – Summary of test conditions

Table 1. Summary of test conditions: 48-h *Daphnia magna* LC50 test.

Test species	*Daphnia magna*
Organism source	In-house culture
Organism age	<24-hour old neonates
Test type	Static
Test duration	48 hours
Test vessel	250-mL glass beaker
Test volume	200 mL
Test solution depth	6 cm
Test concentrations	Five concentrations, plus laboratory control
Test replicates	1 per treatment
Number of organisms	10 per replicate
Control/dilution water	Moderately-hard reconstituted water + 2.5 µg/L Se
Test solution renewal	None
Test temperature	20 ± 2°C
Feeding	None
Light intensity	400 to 800 lux
Photoperiod	16 hours light / 8 hours dark
Aeration	None
Test measurements	Temperature, dissolved oxygen and pH measured daily; salinity, hardness and alkalinity measured in the undiluted sample at test initiation; conductivity measured at test initiation and termination; survival checked daily
Test protocol	Environment Canada (2000), EPS 1/RM/14, with 2016 amendments
Statistical software	CETIS Version 1.9.4
Test endpoint	Survival (48-hour LC50)
Test acceptability criterion for controls	Survival ≥90%
Reference toxicant	Sodium chloride (NaCl)

APPENDIX B – Toxicity test data

Daphnia magna Summary Sheet

Client: ALS Environmental
Work Order No.: 200291

Start Date/Time: Feb 20/2020 @ 1640h
Test Species: *Daphnia magna*
Set up by: MF

Sample Information:

Sample ID: WR20000049
Sample Date: Feb 18/2020
Date Received: Feb 20/2020
Sample Volume: 3 x 1L

Test Validity Criteria:

≥ 90% mean control survival and/or mobility and ≤2 daphnids exibit immobility and/or mortality in any single control replicate.

WQ Ranges:

T (°C) = 20 ± 2; DO (mg/L) = 3.6 to 9.4; pH = 6 to 8.5

Test Organism Information:

Broodstock No.: 020520ATC
Age of young (Day 0): <24 h
Avg No. young per brood in previous 7 d: 16
Mortality (%) in previous 7 d: 0
Days to first brood: 9

NaCl Reference Toxicant Results:

Reference Toxicant ID: DmDC46
Stock Solution ID: 20 NaCl
Date Initiated: Feb 11/2020
48-h LC50 (95% CL): 6.3 (5.2-7.7) g/L NaCL

Reference Toxicant Mean and Historical Range: 6.1 (4.4-8.5) g/L NaCL
Reference Toxicant CV (%): 17

Test Results: The 48h LC50 is estimated to be >100% (v/v).

Reviewed by: [signature]

Date reviewed: Feb. 25, 2020

Freshwater Acute
48 Hour Toxicity Test Data Sheet

Client: ALS Environmental
Sample ID: WR20000049
Work Order No.: 200121

Start Date/Time: Feb 20/2020 @ 1640L
CER #: 5
No. Organisms/volume: 10/200mL
Test Organism: *D.magna*
Set up by: MMF

Thermometer: CER#5 pH meter/probe: 3 / 3 DO meter/probe: 3 / 3 Cond./Salinity meter/probe: 3 / 3

Concentration 7.1 (v/v)	Rep	Number of Live Organisms 24	Number of Live Organisms 48	No. Immobilized 48	Temperature (°C) 0	Temperature (°C) 24	Temperature (°C) 48	Dissolved oxygen (mg/L) 0	Dissolved oxygen (mg/L) 24	Dissolved oxygen (mg/L) 48	pH 0	pH 24	pH 48	Conductivity (µS/cm) 0	Conductivity (µS/cm) 48
CTRL	A	10	10	0	20.0	20.0	21.0	9.0	8.5	8.5	7.7	7.6	7.6	342	357 352
	B														
	C														
	D														
6.25	A	10	10	0	20.0	20.0	21.0	9.0	8.5	8.5	7.6	7.6	7.7	357	365
	B														
	C														
	D														
12.5	A	10	10	0	20.0	20.0	21.0	9.0	8.5	8.7	7.6	7.6	7.8	371	380
	B														
	C														
	D														
25	A	10	10	0	20.0	20.0	21.0	9.0	8.6	8.7	7.6	7.7	7.9	399	406
	B														
	C														
	D														
50	A	10	10	0	20.0	20.0	21.0	9.0	8.6	8.7	7.5	7.8	8.1	459	462
	B														
	C														
	D														
100	A	10	10	0	~~21.0~~	20.0	21.0	8.4	8.6	8.7	7.5	8.0	8.2	587	578
	B				21.0										
	C				MMF										
	D														
Technician Initials		MMF	JAD	JAD	MMF	MMF	JAD	MMF	MMF	JAD	MMF	MMF	JAD	MMF	JAD

Concentration	Hardness*	Alkalinity*
	*(mg/L as CaCo3)	
Control (MHW)	100	72
Highest conc.	350	256
Hardness adjusted		

	Initial WQ	Adjustment	Adjusted WQ
Temp (°C)	21.0		
DO (mg/L)	8.4		
pH	7.5		
Cond (µS/cm)	587		
Salinity (ppt)	0.3		

Comments: _____ Mortality: Heartbeat checked under microscope not req'd.

Sample Description: clear, colourless liquid, no odour, no particulates

Batch#: 020520AC 7-d previous # young/brood: 16 Previous 7-d Mortality (%): 0 Day of 1st Brood: 9

Reviewed by: _____ Date reviewed: Feb. 25, 2020

APPENDIX C – Chain-of-custody form

Chain of Custody

Whitehorse - Environmental
#12 151 Industrial Road
Whitehorse Yukon Canada Y1A 2V3

546

Destination Lab:	**Nautilus Environmental**	Due Date: 25/02/2020	Relinquished By
Address:	(Burnaby) [illegible]rce Court	HT Expiry:	Date/Time
Client:	Minto Explorations Ltd.	Consignment company and Number	Received By
Work Order Number:	**WR2000049**		Date/Time
Original Receipt Date/Time	Instructions Received		Receipt Temp
18/02/2020 15:40			

ALS Lab ID	Bottle Code	Matrix	Submatrix	Container Type	Test Codes	Task Remarks
WR2000049	001-AA	Water	Water	HDPE	DAP-LC50-48	200291
WR2000049	001-AB	Water	Water	HDPE	GRN-ALG-IC50	200292
WR2000049	001-AC	Water	Water	HDPE		

Sampled on February 18
7:45am

Heather McKenzie
Account Manager:

ALSEVDataSublet@ALSGlobal.com (PDF / EXCEL/ B2B)
ALS Vancouver Phone Number: 604-253-4188

3x1L

7.5°C

Feb. 20/20 @ 15:38

Clear, colourless liquid, no odour, no particulates.

END OF REPORT

Toxicity Testing on Sample WR2000227-001 W3

Collected May 19, 2020

Final Report

June 12, 2020

Submitted to: **ALS Environmental**
Burnaby, BC

8664 Commerce Court, Burnaby, BC V5A 4N7

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Table 2. Results: *Pseudokirchneriella subcapitata* growth inhibition test. 3

Table 3. Reference toxicant results. 4

List of Appendices

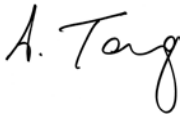
APPENDIX A – *Pseudokirchneriella subcapitata* Toxicity Test Data

APPENDIX B – Chain-of-Custody Form

SIGNATURE PAGE



Report By:
Sierra Klueppel, B.Sc
Laboratory Biologist



Reviewed By:
Armando Tang, R.P.Bio
Senior Reviewer

This report has been prepared by Nautilus Environmental Company Inc. based on data and/or samples provided by our client and the results of this study are for their sole benefit. Any reliance on the data by a third party is at the sole and exclusive risk of that party. The results presented here relate only to the samples tested.

SUMMARY

Sample Information and Test Type

Sample ID	WR2000227-001 W3
Sample collection date	May 19, 2020
Sample receipt date	May 21, 2020
Sample receipt temperature	6.9 – 7.2°C
Test types	72-h *Pseudokirchneriella subcapitata* growth inhibition

Summary of Results

Cell Yield	% v/v
Growth IC25	>95.2
Growth IC50	>95.2

IC = Inhibition Concentration

1.0 INTRODUCTION

Nautilus Environmental Company Inc. conducted a 72-h *Pseudokirchneriella subcapitata* growth inhibition toxicity test for ALS Environmental on a sample identified as WR2000227-001 W3. The sample was collected on May 19, 2020 and delivered to the Nautilus Environmental laboratory in Burnaby, BC on May 21, 2020. The sample was transported in three 1L plastic containers and was received at a temperature of 6.9-7.2°C. The sample was stored in the dark at 4 ± 2°C prior to testing.

This report describes the results of the toxicity test. Copies of raw laboratory data sheets and statistical analyses are provided in Appendix A. The chain-of-custody form is provided in Appendix B.

2.0 METHODS

Methods for the toxicity test are summarized in Table 1. Testing was conducted according to procedures described by Environment Canada (2007). Statistical analyses were performed using CETIS (Tidepool Scientific Software, 2013).

Table 1. Summary of test conditions: 72-h *Pseudokirchneriella subcapitata* growth inhibition test.

Test species	*Pseudokirchneriella subcapitata*, strain CPCC #37
Organism source	In-house axenic culture, obtained from Canadian Phycological Culture Center, and originally isolated from Nivelta River, Norway.
Organism age	3-to 7-day old culture in logarithmic growth phase
Test type	Static
Test duration	72 hours
Test vessel	Microplate
Test volume	220 µL
Test concentrations	Seven concentrations, plus laboratory control
Test replicates	4 per treatment; 8 for laboratory control
Number of organisms	10,000 cells/mL
Control/dilution water	Deionized water supplemented with nutrients
Test solution renewal	None
Test temperature	24 ± 2°C
Feeding	None
Light intensity	3600 to 4400 lux
Photoperiod	24 hours light
Aeration	None
Test measurements	Test area temperature measured daily; temperature and pH measured at test initiation; pH of two control wells measured at test termination
Test protocol	Environment Canada (2007), EPS 1/RM/25
Statistical software	CETIS Version 1.9.4
Test endpoint	Algal cell growth inhibition
Test acceptability criteria for controls	>16-fold increase in number of algal cells; CV ≤ 20%; no trend when analyzed using Mann-Kendall test
Reference toxicant	Zinc (added as $ZnSO_4$)

3.0 RESULTS

Results of the toxicity test on sample WR2000227-001 W3 are summarized in Table 2. There were no adverse effects on cell yield of *P. subcapitata*, resulting in IC25 and IC50 values of >95.2%. In addition, stimulatory effects were observed in all test concentrations; stimulation ranged from 45.4 to 214.5%.

Table 2. Results: *Pseudokirchneriella subcapitata* growth inhibition test.

Concentration (% v/v)	Cell Yield (x 10^4 cells/mL) (Mean ± SD)	Stimulation (%)
Laboratory Control	42.1 ± 3.1	--
1.5	61.2 ± 4.3*	45.4
3.0	81.5 ± 4.8*	93.5
6.0	108.5 ± 8.6*	157.6
11.9	132.5 ± 7.9*	214.5
23.8	129.2 ± 6.4*	206.8
47.6	119.5 ± 3.9*	183.7
95.2	105.2 ± 3.3*	149.9
Test Endpoint (% v/v)		
IC25	>95.2	--
IC50	>95.2	--

SD = Standard Deviation, IC = Inhibition Concentration
* = Indicates cell yield was significantly greater than the laboratory control

4.0 QA/QC

The health history of the test organisms used in the exposure was acceptable and met the requirements of the Environment Canada protocol. The test met all control acceptability criteria and water quality parameters remained within ranges specified in the protocol throughout the tests. Uncertainty associated with the test is best described by the standard deviation around the mean and/or the confidence intervals around the point estimates.

Results of the reference toxicant test conducted during the testing program are summarized in Table 3. Results for this test fell within the range for organism performance of the mean and two standard deviations, based on historical results obtained by the laboratory with this test. Thus, the sensitivity of the organisms used in the test was appropriate. The reference toxicant test was performed under the same conditions as those used for the sample.

Table 3. Reference toxicant results.

Test Species	Endpoint	Historical Mean (2 SD Range)	CV (%)	Test Date
P. subcapitata	Growth (IC50): 32.0 µg/L Zn	30.4 (24.5 – 37.8)	11	May 14, 2020

SD = Standard Deviation, CV = Coefficient of Variation, IC = Inhibition Concentration

5.0 REFERENCES

Environment Canada. 2007. Biological test method: growth inhibition test using the freshwater alga. Environmental Protection Series, Report EPS 1/RM/25. Second Edition, March 2007. Environment Canada, Method Development and Application Section, Environmental Science and Technology Centre, Science and Technology Branch, Ottawa, ON. 53 pp.

Tidepool Scientific Software. 2013. CETIS comprehensive environmental toxicity information system, version 1.9.4.11 Tidepool Scientific Software, McKinleyville, CA. 275 pp.

APPENDIX A – *Pseudokirchneriella subcapitata* Toxicity Test Data

Pseudokirchneriella subcapitata Summary Sheet

Client: ALS
Work Order No.: 20932

Start Date: May 21/20
Set up by: MD

Sample Information:

Sample ID: WR2000227-001 W3
Sample Date: May 19/20
Date Received: May 21/20
Sample Volume: 3x1L

Test Organism Information:

Culture Date: May 15/20
Age of culture (Day 0): 6d1

Zinc Reference Toxicant Results:

Reference Toxicant ID: SC199
Stock Solution ID: 20Zn01
Date Initiated: May 14/20

72-h IC50 (95% CL): 32.0 (30.0 - 34.0) ug/L Zn

72-h IC50 Reference Toxicant Mean and Range: 30.4 (24.5 - 37.8) ug/L Zn CV (%): 11

Test Results:

	Algal Growth
IC25 %(v/v) (95% CL)	>95.2
IC50 %(v/v) (95% CL)	>95.2

Reviewed by: JCh

Date reviewed: June 9/20

72-h Algal Growth Inhibition Toxicity Test
Water Quality Measurements

Client: ALS (Minto) Setup by: MG

Sample ID: WR2000227-001 W3 Test Date/Time: May 21/20 @ 1500 h

Work Order No.: 200932 CER #: 4

Test Species: *Pseudokirchneriella subcapitata*

Culture Date: MG & May 15/20 Age of Culture: 6d Culture Health: Good

Culture Count: 1 350 2 360 Average: 355 Culture Cell Density (c1): 355 x10⁴ cells/mL

v1 = 220,000 cells/ml x 100 ml / (c1) 355 x10⁴ cells/ml = 6.2 mL

Time Zero Counts: 1 21 2 23 Average: 22

No. of Cells/mL: 22 x10⁴ Initial Density: # cells/mL ÷ 220 µL x 10 µL = 10000 cells/mL

Concentration %(v/v)	Water Quality		Incubator Temperature (°C)				Microplates rotated 2X per day?			
	pH	Temp (°C)								
	0 h	0 h	0 h	24 h	48 h	72 h	0 h	24 h	48 h	72 h
Control	6.9	23.0	25.0	25.0	25.0	25.0	✓	✓	✓	✓
1.5	7.1	23.0	↓	↓	↓	↓	✓	✓	✓	✓
3	7.1	23.0					✓	✓	✓	✓
6	7.2	23.0					✓	✓	✓	✓
11.9	7.4	23.0					✓	✓	✓	✓
23.8	7.8	23.0					✓	✓	✓	✓
47.6	7.9	23.0					✓	✓	✓	✓
95.2	8.0	23.0					✓	✓	✓	✓
Initials	MG	MG	MG	MG	MW	JW	MG	MG	MW	JW

Initial control pH: Well 1: 6.9 Well 2: 6.9

Final control pH: Well 1: MG 7.1 Well 2: 7.1

Light intensity (lux): 438 Date measured: May 21/20

Thermometer: 4 Light meter: 1 pH meter/probe: 1 / 1

Sample Description: clear, light yellow, odourless, no particulates.

Comments:

Reviewed: JW Date reviewed: June 9 / 20

Pseudokirchneriella subcapitata Toxicity Test Data Sheet
72-h Algal Cell Counts

Client: ALS
Start Date/Time: May 21/20 @ 1500h
Work Order #: 200932
Termination Date: May 24/20 @ 1500h
Sample ID: WR2000227-001 W3
Test set up by: MG

%(v/v)

Concentration	Rep	Count 1	Count 2	Count 3	Count 4	Comments	Initials
Control	A	42					MG
	B	46					
	C	40					
	D	44					
	E	48					
	F	41					
	G	39					
	H	45					
1.5	A	63					
	B	59					
	C	59					
	D	68					
3	A	78					
	B	80					
	C	83					
	D	89					
6	A	115					
	B	98					
	C	108					
	D	119					
11.9	A	130					
	B	124					
	C	139					
	D	141					
23.8	A	126					
	B	125					
	C	131					
	D	139					
47.6	A	121					
	B	124					
	C	115					
	D	122					
95.2	A	108					
	B	103					
	C	110					
	D	104					↓

Comments:

Reviewed by: JM
Date Reviewed: June 9/20

Pseudokirchneriella subcapitata Algal Counts

Client: ALS
WO#: 200932
Sample ID: WR2000227-001 W3

Start Date/Time: 21-May-20 @ 1500h
Termination Date/Time: 24-May-20 @ 1500h

Initial Cell Density: 10000 cell/mL

									220000
									0.22
									0.01
Concentration %(v/v)	Rep	Count 1 (x 10^4)	Count 2 (x 10^4)	Count 3 (x 10^4)	Count 4 (x 10^4)	Mean (x 10^4)	Cell Yield (x 10^4) cell/mL		10000
Control	A	42				42	41.0	mean	42.1
	B	46				46	45.0	SD	3.136764
	C	40				40	39.0	CV	7.446323
	D	44				44	43.0		
	E	48				48	47.0		
	F	41				41	40.0		
	G	39				39	38.0		
	H	45				45	44.0		
1.5	A	63				63	62.0		
	B	59				59	58.0		
	C	59				59	58.0		
	D	68				68	67.0		
3	A	78				78	77.0		
	B	80				80	79.0		
	C	83				83	82.0		
	D	89				89	88.0		
6	A	115				115	114.0		
	B	98				98	97.0		
	C	108				108	107.0		
	D	117				117	116.0		
11.9	A	130				130	129.0		
	B	124				124	123.0		
	C	139				139	138.0		
	D	141				141	140.0		
23.8	A	126				126	125.0		
	B	125				125	124.0		
	C	131				131	130.0		
	D	139				139	138.0		
47.6	A	121				121	120.0		
	B	124				124	123.0		
	C	115				115	114.0		
	D	122				122	121.0		
95.2	A	108				108	107.0		
	B	103				103	102.0		
	C	110				110	109.0		
	D	104				104	103.0		

Reviewed by: JCM

Date reviewed: June 9/20

CETIS Analytical Report

EC Alga Growth Inhibition Test — **Nautilus Environmental**

Analysis ID:	13-4402-6394	**Endpoint:**	Cell Yield	**CETIS Version:**	CETISv1.9.4
Analyzed:	05 Jun-20 15:48	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1
Batch ID:	05-9227-2639	**Test Type:**	Cell Growth	**Analyst:**	Mimi Tran
Start Date:	21 May-20 15:00	**Protocol:**	EC/EPS 1/RM/25	**Diluent:**	Deionized Water + nutrients
Ending Date:	24 May-20 15:00	**Species:**	Pseudokirchneriella subcapitata	**Brine:**	
Test Length:	72h	**Taxon:**	Chlorophyta	**Source:**	In-House Culture **Age:** 6d
Sample ID:	09-7094-4486	**Code:**	39DF6FE6	**Project:**	
Sample Date:	19 May-20 05:40	**Material:**	Water Sample	**Source:**	ALS
Receipt Date:	21 May-20 08:50	**CAS (PC):**		**Station:**	WR2000227-001 W3
Sample Age:	57h (6.9 °C)	**Client:**	ALS		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	1240318	200	Yes	Two-Point Interpolation

Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision(α:5%)
Extreme Value	Grubbs Extreme Value Test	2.401	2.991	0.4550	No Outliers Detected
Control Trend	Mann-Kendall Trend Test	2.401		0.9049	Non-Significant Trend in Controls

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	>95.2	n/a	n/a	<1.05	n/a	n/a
IC10	>95.2	n/a	n/a	<1.05	n/a	n/a
IC15	>95.2	n/a	n/a	<1.05	n/a	n/a
IC20	>95.2	n/a	n/a	<1.05	n/a	n/a
IC25	>95.2	n/a	n/a	<1.05	n/a	n/a
IC40	>95.2	n/a	n/a	<1.05	n/a	n/a
IC50	>95.2	n/a	n/a	<1.05	n/a	n/a

Cell Yield Summary

			Calculated Variate						Isotonic Variate	
Conc-%	Code	Count	Mean	Min	Max	Std Dev	CV%	%Effect	Mean	%Effect
0	N	8	42.12	38	47	3.137	7.45%	0.0%	97.48	0.0%
1.5		4	61.25	58	67	4.272	6.98%	-45.4%	97.48	0.0%
3		4	81.5	77	88	4.796	5.88%	-93.47%	97.48	0.0%
6		4	108.5	97	116	8.583	7.91%	-157.6%	97.48	0.0%
11.9		4	132.5	123	140	7.937	5.99%	-214.5%	97.48	0.0%
23.8		4	129.2	124	138	6.397	4.95%	-206.8%	97.48	0.0%
47.6		4	119.5	114	123	3.873	3.24%	-183.7%	97.48	0.0%
95.2		4	105.2	102	109	3.304	3.14%	-149.9%	97.48	0.0%

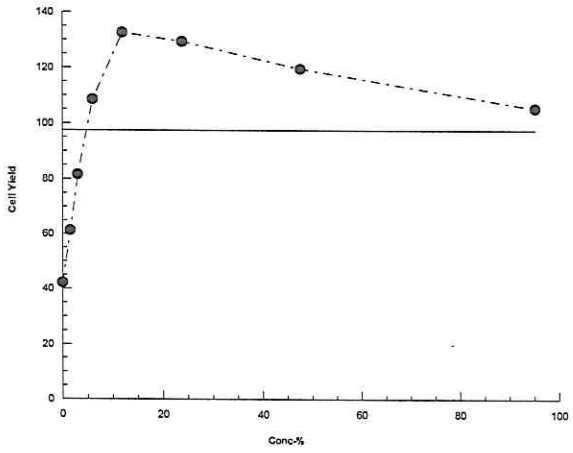
Cell Yield Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	N	41	45	39	43	47	40	38	44
1.5		62	58	58	67				
3		77	79	82	88				
6		114	97	107	116				
11.9		129	123	138	140				
23.8		125	124	130	138				
47.6		120	123	114	121				
95.2		107	102	109	103				

EC Alga Growth Inhibition Test — **Nautilus Environmental**

Analysis ID:	13-4402-6394	**Endpoint:**	Cell Yield	**CETIS Version:**	CETISv1.9.4
Analyzed:	05 Jun-20 15:48	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1

Graphics



Analyst: MD QA: June 9/20

CETIS Analytical Report

EC Alga Growth Inhibition Test — **Nautilus Environmental**

Analysis ID:	16-9741-0429	**Endpoint:**	Cell Yield	**CETIS Version:**	CETISv1.9.4
Analyzed:	05 Jun-20 15:49	**Analysis:**	Parametric-Control vs Treatments	**Status Level:**	1
Batch ID:	05-9227-2639	**Test Type:**	Cell Growth	**Analyst:**	Mimi Tran
Start Date:	21 May-20 15:00	**Protocol:**	EC/EPS 1/RM/25	**Diluent:**	Deionized Water + nutrients
Ending Date:	24 May-20 15:00	**Species:**	Pseudokirchneriella subcapitata	**Brine:**	
Test Length:	72h	**Taxon:**	Chlorophyta	**Source:**	In-House Culture **Age:** 6d
Sample ID:	09-7094-4486	**Code:**	39DF6FE6	**Project:**	
Sample Date:	19 May-20 05:40	**Material:**	Water Sample	**Source:**	ALS
Receipt Date:	21 May-20 08:50	**CAS (PC):**		**Station:**	WR2000227-001 W3
Sample Age:	57h (6.9 °C)	**Client:**	ALS		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C < T	<1.5	1.5	n/a	>66.67	19.67%

Dunnett Multiple Comparison Test

Control	vs	Control II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Negative Control		1.5*	5.831	2.526	8.285	10	CDF	8.9E-06	Significant Effect
		3*	12.01	2.526	8.285	10	CDF	<1.0E-37	Significant Effect
		6*	20.24	2.526	8.285	10	CDF	<1.0E-37	Significant Effect
		11.9*	27.56	2.526	8.285	10	CDF	<1.0E-37	Significant Effect
		23.8*	26.57	2.526	8.285	10	CDF	<1.0E-37	Significant Effect
		47.6*	23.59	2.526	8.285	10	CDF	<1.0E-37	Significant Effect
		95.2*	19.25	2.526	8.285	10	CDF	<1.0E-37	Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Extreme Value	Grubbs Extreme Value Test	2.401	2.991	0.4550	No Outliers Detected
Control Trend	Mann-Kendall Trend Test	2.401		0.9049	Non-Significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	41034.9	5862.12	7	204.4	<1.0E-37	Significant Effect
Error	803.125	28.683	28			
Total	41838		35			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	7.252	18.48	0.4031	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.974	0.9166	0.5438	Normal Distribution

Cell Yield Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	N	8	42.12	39.5	44.75	42	38	47	1.109	7.45%	0.00%
1.5		4	61.25	54.45	68.05	60	58	67	2.136	6.97%	-45.40%
3		4	81.5	73.87	89.13	80.5	77	88	2.398	5.88%	-93.47%
6		4	108.5	94.84	122.2	110.5	97	116	4.291	7.91%	-157.57%
11.9		4	132.5	119.9	145.1	133.5	123	140	3.969	5.99%	-214.54%
23.8		4	129.2	119.1	139.4	127.5	124	138	3.198	4.95%	-206.82%
47.6		4	119.5	113.3	125.7	120.5	114	123	1.936	3.24%	-183.68%
95.2		4	105.2	99.99	110.5	105	102	109	1.652	3.14%	-149.85%

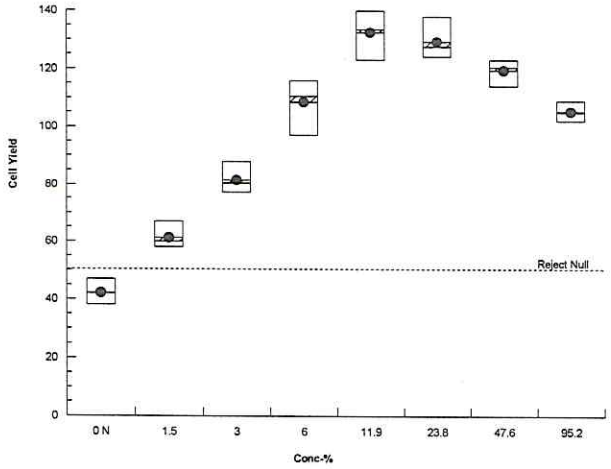
EC Alga Growth Inhibition Test — **Nautilus Environmental**

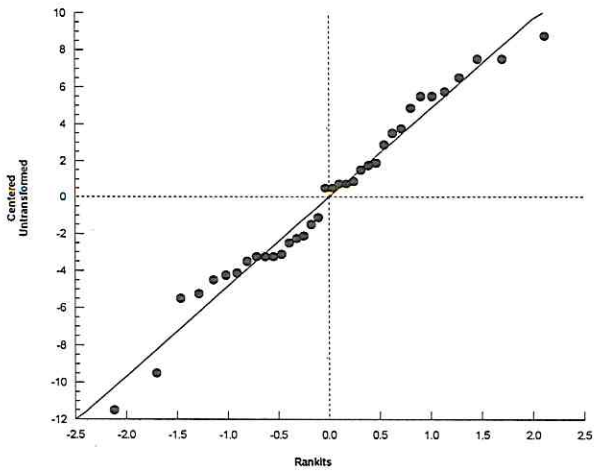
Analysis ID: 16-9741-0429 **Endpoint:** Cell Yield **CETIS Version:** CETISv1.9.4
Analyzed: 05 Jun-20 15:49 **Analysis:** Parametric-Control vs Treatments **Status Level:** 1

Cell Yield Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	N	41	45	39	43	47	40	38	44
1.5		62	58	58	67				
3		77	79	82	88				
6		114	97	107	116				
11.9		129	123	138	140				
23.8		125	124	130	138				
47.6		120	123	114	121				
95.2		107	102	109	103				

Graphics





APPENDIX B – Chain-of-Custody Form

Chain of Custody

Whitehorse - Environmental
#12 151 Industrial Road
Whitehorse YT Canada Y1A 2V3

1795

Destination Lab:	**Nautilus Environmental (Burnaby)**
Address:	8664 Commerce Court Burnaby BC Canada V5A 4N7
Client:	Minto Explorations Ltd.
Work Order Number:	**WR2000227**
Original Receipt Date/Time	Instructions Received
19/05/2020 15:27	

Relinquished By
Date/Time
Received By
Date/Time
Receipt Temp

Return as Indicated: Results: Invoice: Electronic Data:

Attention: Heather McKenzie

ALS Sample ID	Client ID	Matrix	Container Type	Test Codes	Method Description	Due Date	Sampling Date and Time	Remarks
WR2000227-001	W3	Water	HDPE carboy LC50			26-05-2020	19/05/2020 17:40 DS	
WR2000227-001	W3	Water	HDPE carboy LC50	DAP-LC50-48	Survival/LC50 Daphnia Magna (48 hours)	26-05-2020	19/05/2020 17:40 DS	
WR2000227-001	W3	Water	HDPE carboy LC50	GRN-ALG-IC50	Green Algae Growth Potential/IC50 (P. subcapitata)	26-05-2020	19/05/2020 17:40 DS	
WR2000227-001	W3	Water	HDPE carboy LC50	TRT-LC50-96	Survival/LC50 Rainbow Trout (96 hours)	26-05-2020	19/05/2020 17:40 DS	
WR2000227-001	W3	Water	HDPE carboy LC50			26-05-2020	19/05/2020 17:40 DS	

Sample disc - clear, yellow, no odour, some particulates

200931 - Rbt
200932 - Alga — LC50
200933 - DM

May 21/20 @ 8:50
TH
6.9-7.2°C

2x20L + 3x1L

END OF REPORT

Acute Toxicity Test Results

Sample WR2000227-001 W3,
collected May 19, 2020

Final Report

June 3, 2020

Submitted to: **ALS Environmental**
Burnaby, BC

8664 Commerce Court, Burnaby, BC V5A 4N7

SAMPLE INFORMATION

Sample ID	Dates				Receipt temp.
	Collected	Received	Rainbow trout test initiation	*Daphnia magna* test initiation[1]	
WR2000227-001 W3	19-May-20 at 0540h	21-May-20 at 0850h	21-May-20 at 1535h	22-May-20 at 1500h	6.9 – 7.2°C

TESTS

- Rainbow trout 96-h LC50 test
- *Daphnia magna* 48-h LC50 test

RESULTS

Toxicity test results

Sample ID	LC50 (% v/v)	
	Rainbow trout	*Daphnia magna*
WR2000227-001 W3	>100	>100

LC = Lethal Concentration

QA/QC

QA/QC summary	Rainbow trout	Daphnia magna
Reference toxicant LC50 (95% CL)	108.8 (81.3 – 145.6) µg/L Zn[1]	6.8 (5.7 – 8.1) g/L NaCl[2]
Reference toxicant historical mean (2 SD range)	97.3 (51.7 – 183.1) µg/L Zn	6.2 (4.7 – 8.3) g/L NaCl
Reference toxicant CV	32%	14%
Organism health history	Acceptable	Acceptable
Protocol deviations	None	None
Water quality range deviations	None	None
Control performance	Acceptable	Acceptable
Test performance	Valid	Valid

[1] Test date: May 14, 2020; [2] Test Date: May 27, 2020, LC = Lethal Concentration, CL = Confidence Limits, SD = Standard Deviation, CV = Coefficient of Variation

Report By:
Yvonne Lam, B.Sc.
Laboratory Biologist

Reviewed By:
Andy Diewald, B.Sc.
Senior Analyst

This report has been prepared by Nautilus Environmental Company Inc. based on data and/or samples provided by our client and the results of this study are for their sole benefit. Any reliance on the data by a third party is at the sole and exclusive risk of that party. The results presented here relate only to the samples tested.

APPENDIX A – Summary of test conditions

Table 1. Summary of test conditions: 96-h rainbow trout (*Oncorhynchus mykiss*) LC50 test.

Test species	*Oncorhynchus mykiss*
Organism source	Hatchery
Organism age	Juvenile
Test type	Static
Test duration	96 hours
Test vessel	20-L glass aquarium
Test volume	10 to 20 L (depending on size of fish)
Test solution depth	≥15 cm
Test concentrations	Five concentrations, plus laboratory control
Test replicates	1 per treatment
Number of organisms	10 per replicate
Control/dilution water	Dechlorinated Metro Vancouver municipal tapwater
Test solution renewal	None
Test temperature	15 ± 1°C
Feeding	None
Light intensity	100 to 500 lux
Photoperiod	16 hours light / 8 hours dark
Aeration	6.5 ± 1 mL/min/L
Test measurements	Temperature, dissolved oxygen and pH measured daily; salinity measured in the undiluted sample at test initiation; conductivity measured at test initiation and termination; survival checked daily
Test protocol	Environment Canada (2000), EPS 1/RM/13, with 2007 & 2016 amendments
Statistical software	CETIS Version 1.9.4
Test endpoints	Survival (96-hour LC50)
Test acceptability criterion for controls	Survival ≥90%
Reference toxicant	Zinc (added as $ZnSO_4$)

Table 2. Summary of test conditions: 48-h *Daphnia magna* LC50 test.

Test species	*Daphnia magna*
Organism source	In-house culture
Organism age	<24-hour old neonates
Test type	Static
Test duration	48 hours
Test vessel	250-mL glass beaker
Test volume	200 mL
Test solution depth	6 cm
Test concentrations	Five concentrations, plus laboratory control
Test replicates	1 per treatment
Number of organisms	10 per replicate
Control/dilution water	Moderately-hard reconstituted water + 2.5 µg/L Se
Test solution renewal	None
Test temperature	20 ± 2°C
Feeding	None
Light intensity	400 to 800 lux
Photoperiod	16 hours light / 8 hours dark
Aeration	None
Test measurements	Temperature, dissolved oxygen and pH measured daily; salinity, hardness and alkalinity measured in the undiluted sample at test initiation; conductivity measured at test initiation and termination; survival checked daily
Test protocol	Environment Canada (2000), EPS 1/RM/14, with 2016 amendments
Statistical software	CETIS Version 1.9.4
Test endpoints	Survival (48-hour LC50)
Test acceptability criterion for controls	Survival ≥90%
Reference toxicant	Sodium chloride (NaCl)

APPENDIX B – Toxicity test data

Rainbow Trout Summary Sheet

Client: ALS Environmental

Start Date/Time: May 21, 2020; 1535h

Work Order No.: 200931

Test Species: *Oncorhynchus mykiss*

Test Validity Criteria:
≥ 90% control survival
WQ Ranges:
T (°C) = 15 ± 1; DO (mg/L) = 7.0 to 10.3; pH = 5.5 to 8.5

Sample Information:

Sample ID: WR2000227-001 W3
Sample Date: May 19, 2020
Date Received: May 21, 2020
Sample Volume: 2x20L
Other: -

Dilution Water:

Type: Dechlorinated Municipal Tap Water
Hardness (mg/L $CaCO_3$): 10
Alkalinity (mg/L $CaCO_3$): 14

Test Organism Information:

Batch No.: 042920b
Source: Lynden Fish Hatcheries
No. Fish/Volume (L): 10/12L
Loading Density (g/L): 0.36
Mean Length ± SD (mm): 36 ± 2 Range: 32 – 39
Mean Weight ± SD (g): 0.47 ± 0.11 Range: 0.34 – 0.64

Zinc Reference Toxicant Results:

Reference Toxicant ID: RTZnL05R5
Stock Solution ID: 202n02
Date Initiated: May 14, 2020
96-h LC50 (95% CL): 108.8 (81.3 – 145.6) µg/L Zn

Reference Toxicant Mean and Historical Range: 97.3 (51.7 – 183.1) µg/L Zn
Reference Toxicant CV (%): 32%

Test Results: The 96 hour LC50 is estimated to be >100% (v/v).

Reviewed by: [signature] Date reviewed: June 2/20

96-Hour Rainbow Trout Toxicity Test Data Sheet

Client/Project#: ALS Environmental
Sample I.D. WR2000227-001 W3
W.O. # 200931
RBT Batch #: 0429206
Date Collected/Time: May 19/20 @ 17:40h
Date Setup/Time: May 21/20 @ 15:35h
CER #: 2
Sample Setup By:

Thermometer: Ces2
D.O. meter/probe: 5/DS
Cond./Salinity meter/probe: 5/CPS
pH meter/probe: 5/PS

Number Fish/Volume: 10/12L
7-d % Mortality: 0.95%
Total Pre-aeration Time (mins): 75
Aeration rate adjusted to 6.5 ± 1 mL/min/L? (Y/N): Y

Undiluted Sample WQ			
Parameters	Initial WQ	Adjustment	30 min WQ
Temp °C	14.5		14.5
D.O. (mg/L)	10.6		10.4
pH	7.9		8.0
Cond. (µS/cm)	521		522
Salinity (ppt)	0.3		0.3

Concentration	# Survivors							Temperature (°C)					Dissolved Oxygen (mg/L)					pH					Conductivity (µS/cm)	
(% v/v)	1	2	4	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	96
Ctrl				10	10	10	9	15.0	15.0	15.0	15.0	15.0	10.0	9.7	9.6	9.8	9.7	7.2	7.2	7.2	7.2	7.2	35	42
6.25				10	10	10	10	14.5	15.0	15.0	15.0	15.0	10.0	9.6	9.6	9.7	9.7	7.4	7.8	7.9	8.0	7.9	69	74
12.5				10	10	10	10	14.5	15.0	15.0	15.0	15.0	10.1	9.8	9.7	9.8	9.7	7.6	8.1	8.1	8.1	8.1	98	105
25				10	10	10	10	14.5	15.0	15.0	15.0	15.0	10.1	9.7	9.8	9.8	9.6	7.7	8.4	8.3	8.4	8.3	159	165
50				10	10	10	10	14.5	15.0	15.0	15.0	15.0	10.0	9.7	9.7	9.8	9.7	7.9	8.5	8.4	8.5	8.5	285	289
100				10	10	10	10	14.5	15.0	15.0	15.0	15.0	10.2	9.8	9.8	9.8	9.6	8.0	8.6	8.6	8.6	8.6	521	519
Initials					SM	JW				SM	JW				SM	JW				SM	JW			

Sample Description/Comments: Clear bright yellow odourless liquid with a few dark particulates

Fish Description at 96 h NA Remaining fish appear normal Number of Stressed Fish at 96 h 0

Other Observations:

Reviewed by: [signature] Date Reviewed: June 2/20

Daphnia magna Summary Sheet

Client: ALS Environmental
Work Order No.: 200933

Start Date/Time: May 22/2020 @ 15:00h
Test Species: *Daphnia magna*
Set up by: CCS

Sample Information:

Sample ID: WR2000227-001 W3
Sample Date: May 19/2020
Date Received: May 21/2020
Sample Volume: 3x1L

Test Validity Criteria:

≥ 90% mean control survival and/or mobility and ≤2 daphnids exibit immobility and/or mortality in any single control replicate.

WQ Ranges:

T (°C) = 20 ± 2; DO (mg/L) = 3.6 to 9.4; pH = 6 to 8.5

Test Organism Information:

Broodstock No.: 042920B
Age of young (Day 0): <24 h
Avg No. young per brood in previous 7 d: 16
Mortality (%) in previous 7 d: 0
Days to first brood: 9

NaCl Reference Toxicant Results:

Reference Toxicant ID: DmDC51
Stock Solution ID: 20NaCl
Date Initiated: May 27/2020
48-h LC50 (95% CL): 6.8 (5.7-8.1) g/LNaCL

Reference Toxicant Mean and Historical Range: 6.2 (4.7-8.3) g/L NaCL
Reference Toxicant CV (%): 14

Test Results: The 48 hr LC50 is estimated to be >100% (v/v)

Reviewed by: [signature]
Date reviewed: June 2/20

Freshwater Acute
48 Hour Toxicity Test Data Sheet

Client: ALS Environmental
Sample ID: WR2000227-001 W3
Work Order No.: 200933

Start Date/Time: May 22, 2020 @ 1500 h
CER #: 5
No. Organisms/volume: 10/200mL
Test Organism: *D.magna*
Set up by: CCS

Thermometer: CERAS pH meter/probe: 6 / 6 DO meter/probe: 6 / 6 Cond./Salinity meter/probe: 6 / 6

Concentration (% v/v)	Rep	Number of Live Organisms 24	Number of Live Organisms 48	No. Immobilized 48	Temperature (°C) 0	Temperature (°C) 24	Temperature (°C) 48	Dissolved oxygen (mg/L) 0	Dissolved oxygen (mg/L) 24	Dissolved oxygen (mg/L) 48	pH 0	pH 24	pH 48	Conductivity (µS/cm) 0	Conductivity (µS/cm) 48
Control	A	10	10	0	19.0	19.5	19.5	8.5	8.7	8.6	8.2	8.1	8.1	352	354
	B														
	C														
	D														
6.25	A	10	10	0	19.0	19.5	19.5	8.5	8.7	8.5	8.0	8.1	8.2	363	363
	B														
	C														
	D														
12.5	A	10	10	0	19.0	19.5	19.5	8.6	8.7	8.5	8.0	8.1	8.2	374	375
	B														
	C														
	D														
25	A	10	10	0	19.0	19.5	19.5	8.6	8.6	8.5	8.0	8.1	8.3	398	399
	B														
	C														
	D														
50	A	10	10	0	19.0	19.5	19.5	8.7	8.5	8.4	8.0	8.1	8.4	446	443
	B														
	C														
	D														
100	A	10	10	0	19.5	19.5	19.5	9.1	8.6	8.4	8.1 ACS	8.2	8.5	547	537
	B														
	C														
	D														
Technician Initials		MW	MW	MW	CCT	MW	MW	CCT	MW	MW	CCT	MW	MW	CCT	MW

	Hardness*	Alkalinity*
Concentration	*(mg/L as CaCo3)	
Control (MHW)	92	78
Highest conc.	252	244
Hardness adjusted	—	

	Initial WQ	Adjustment	Adjusted WQ
Temp (°C)	19.5 ACS		
DO (mg/L)	9.01		
pH	7.9		
Cond (µS/cm)	547		
Salinity (ppt)	0.3		

Comments: _____ Mortality: Heartbeat checked under microscope post 24 hrs.

Sample Description: clear, yellow, no odour, some particulates

Batch#: 042920B 7-d previous # young/brood: 16 Previous 7-d Mortality (%): 0 Day of 1st Brood: 9

Reviewed by: _____ Date reviewed: June 2/20

APPENDIX C – Chain-of-custody form

Chain of Custody

Whitehorse - Environmental
#12 151 Industrial Road
Whitehorse YT Canada Y1A 2V3

1795

Destination Lab:	**Nautilus Environmental (Burnaby)**
Address:	8664 Commerce Court Burnaby BC Canada V5A 4N7
Client:	Minto Explorations Ltd.
Work Order Number:	**WR2000227**
Original Receipt Date/Time	Instructions Received
19/05/2020 15:27	

Relinquished By
Date/Time
Received By
Date/Time
Receipt Temp

Return as Indicated: Results: Invoice: Electronic Data:

Attention: Heather McKenzie

ALS Sample ID	Client ID	Matrix	Container Type	Test Codes	Method Description	Due Date	Sampling Date and Time	Remarks
WR2000227-001	W3	Water	HDPE carboy LC50			26-05-2020	19/05/2020 17:40	
WR2000227-001	W3	Water	HDPE carboy LC50	DAP-LC50-48	Survival/LC50 Daphnia Magna (48 hours)	26-05-2020	19/05/2020 17:40	
WR2000227-001	W3	Water	HDPE carboy LC50	GRN-ALG-IC50	Green Algae Growth Potential/IC50 (P. subcapitata)	26-05-2020	19/05/2020 17:40	
WR2000227-001	W3	Water	HDPE carboy LC50	TRT-LC50-96	Survival/LC50 Rainbow Trout (96 hours)	26-05-2020	19/05/2020 17:40	
WR2000227-001	W3	Water	HDPE carboy LC50			26-05-2020	19/05/2020 17:40	

Sample disc - clear, yellow, no odour, some particulates

200931 - Rbt
200932 - Alga — LC50
200933 - Dm

May 21/20 @ 8:50
TH
6.9-7.2°C

2x20L + 3x1L

END OF REPORT

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000608**	Page	: 1 of 2
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 04-Aug-2020 14:50
PO	: ----	Date Analysis Commenced	: 21-Aug-2020
C-O-C number	: 2019-05-20 C	Issue Date	: 18-Sep-2020 10:36
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Kaitlyn Gardner	Account Manager Assistant	External Subcontracting, Burnaby, British Columbia
Kaitlyn Gardner	Account Manager Assistant	Internal Subcontracting, Fort Collins, Colorado

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
Bq/L	Becquerels per litre

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Analytical Results

Sub-Matrix: **Water** (Matrix: **Water**)					*Client sample ID*	**W3**	----	----	----	----
					Client sampling date / time	04-Aug-2020 06:10	----	----	----	----
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	**WR2000608-001**	--------	--------	--------	--------	
					Result	----	----	----	----	
Bioassays										
Daphnia magna LC50	----	DAP-LC50-48	-	-	see attached	----	----	----	----	
green algae, growth	----	GRN-ALG-IC50	-	-	see attached	----	----	----	----	
Radiological Parameters										
radium-226	13982-63-3	RA226-MMER	0.0064	Bq/L	<0.0064	----	----	----	----	

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WR2000608**	Page	: 1 of 5
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 04-Aug-2020 14:50
PO	: ----	Issue Date	: 18-Sep-2020 10:36
C-O-C number	: 2019-05-20 C		
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Bioassays : Green Algae Growth Potential/IC50 (P. subcapitata)										
HDPE P/F										
W3	GRN-ALG-IC50	04-Aug-2020	----	----	----		21-Aug-2020	----	----	
Bioassays : Survival/LC50 Daphnia Magna (48 hours)										
HDPE carboy LC50										
W3	DAP-LC50-48	04-Aug-2020	----	----	----		21-Aug-2020	5 days	17 days	× EHT
Radiological Parameters : Radium-226 by Radon Emanation										
HDPE (nitric acid)										
W3	RA226-MMER	04-Aug-2020	----	----	----		25-Aug-2020	180 days	21 days	✓

Legend & Qualifier Definitions

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

- **No Quality Control data available for this section.**

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Survival/LC50 Daphnia Magna (48 hours)	DAP-LC50-48 Nautilus Environmental (Burnaby) - 8664 Commerce Court Burnaby British Columbia Canada V5A 4N7	Water	EPS1/RM/14	See attached report.
Green Algae Growth Potential/IC50 (P. subcapitata)	GRN-ALG-IC50 Nautilus Environmental (Burnaby) - 8664 Commerce Court Burnaby British Columbia Canada V5A 4N7	Water	EPS 1/RM/25	See attached report.
Radium-226 by Radon Emanation	RA226-MMER Fort Collins - Environmental - 225 Commerce Drive Fort Collins Colorado United States 80524	Water	EPA 903.1	Radium-226 in sample was analyzed according to the current revision of SOP 783.

QUALITY CONTROL REPORT

Work Order	: **WR2000608**	Page	: 1 of 2
Client	: Minto Explorations Ltd.	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 04-Aug-2020 14:50
PO	: ----	Date Analysis Commenced	: 21-Aug-2020
C-O-C number	: 2019-05-20 C	Issue Date	: 18-Sep-2020 10:36
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Kaitlyn Gardner	Account Manager Assistant	External Subcontracting, Burnaby, British Columbia
Kaitlyn Gardner	Account Manager Assistant	Internal Subcontracting, Fort Collins, Colorado

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Wednesday, August 26, 2020

Heather McKenzie
ALS Environmental
8081 Lougheed Hwy, Suite 100
Burnaby, BC V5A 1W9

Re: ALS Workorder: 2008199
Project Name:
Project Number: WR2000608

Dear Ms. McKenzie:

One water sample was received from ALS Environmental, on 8/10/2020. The sample was scheduled for the following analysis:

Radium-226

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained from ALS Environmental.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental
Katie M. OBrien
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
AIHA	214884
Alaska (AK)	UST-086
Alaska (AK)	CO01099
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
PJ-LA (DoD ELAP/ISO 170250)	95377
Louisiana (LA)	05057
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280

2008199

Radium-226:

The sample was prepared and analyzed according to the current revision of SOP 783.

All acceptance criteria were met.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 2008199
Client Name: ALS Environmental
Client Project Name:
Client Project Number: WR2000608
Client PO Number: WR2000608

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
WR2000608-001	2008199-1		WATER	04-Aug-20	7:10

Chain of Custody

Whitehorse - Environmental
#12 151 Industrial Road
Whitehorse YT Canada Y1A
2V3

3717

2008199

Destination Lab:	**USA - Fort Collins**
Address:	225 Commerce Drive Fort Collins CO United States 80524
Client:	Minto Explorations Ltd.
Work Order Number:	**WR2000608**
Original Receipt Date/Time	Instructions Received
04/08/2020 15:50	

Relinquished By	
Date/Time	
Received By	
Date/Time	8/10/20 12:45
Receipt Temp	amb

Return as Indicated:	Results:	Invoice:	Electronic Data:
	Attention: Heather McKenzie		

ALS Sample ID	Client ID	Matrix	Container Type	Test Codes	Method Description	Due Date	Sampling Date and Time	Remarks
WR2000608-001	W3	Water	HDPE (nitric acid)	RA226-MMER	Radium-226 by Radon Emanation	24-08-2020	04/08/2020 07:10	

ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client Name/ID: ALS Burnaby Workorder No: 2008199

Project Manager: KMO Initials: TM Date: 8/10/20

1. Are airbills / shipping documents present and/or removable?	☐ Drop Off	☑ YES	☐ NO	
2. Are custody seals on **shipping** containers intact?	☑ NONE	☐ YES	☐ NO*	
3. Are custody seals on **sample** containers intact?	☑ NONE	☐ YES	☐ NO*	
4. Is there a COC (chain-of-custody) present?		☑ YES	☐ NO*	
5. Is the COC in agreement with samples received? (IDs, dates, times, # of samples, # of containers, matrix, requested analyses, etc.)		☑ YES	☐ NO*	
6. Are short-hold samples present?		☐ YES	☑ NO	
7. Are all samples within holding times for the requested analyses?		☑ YES	☐ NO*	
8. Were all sample containers received intact? (not broken or leaking)		☑ YES	☐ NO*	
9. Is there sufficient sample for the requested analyses?		☑ YES	☐ NO*	
10. Are samples in proper containers for requested analyses? (form 250, *Sample Handling Guidelines*)		☑ YES	☐ NO*	
11. Are all aqueous samples preserved correctly, if required?	☐ N/A	☐ YES	☑ NO*	
12. Were unpreserved samples pH checked, if required?	☑ N/A	☐ YES	☐ NO	
13. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, radon) free of bubbles > 6 mm in diameter?	☑ N/A	☐ YES	☐ NO	
14. Were the samples shipped on ice?		☐ YES	☑ NO	
15. Were cooler temperatures measured at 0.1 - 6.0°C? IR gun used+: ☐ #3 ☐ #5	☑ Rad Only	☐ YES	☑ NO	

Cooler #:	1	2	3	4	5
Temperature (°C):	amb	amb	amb	amb	amb
# of custody seals on cooler:	0	0	0	0	0
External mR/hr reading:	8	8	8	7	10
Background mR/hr reading:	13				

Were external mR/hr readings ≤ two times background and within DOT acceptance criteria? (If no, see Form 008) ☐ N/A ☑ YES ☐ NO

* Please provide details below for 'NO' responses in gray boxes above - for 2 thru 5 & 7 thru 12, notify PM & continue w/ login.

11.) sample read initial pH of 6: added 1.0mL HNO3 (lot# 234822) to achieve pH<2.0

All client bottle ID's vs ALS lab ID's double-checked by: TM

If applicable, was the client contacted? ☐ YES ☐ N/A Contact Name Date:

Project Manager Signature / Date: 8/11/20

Form 201r30.xls
(06/04/2020)

+IR Gun #3, VWR SN 170647571
+IR Gun #5, VWR SN 192272629

EXPRESS WORLDWIDE WPX DHL

2020-08-07 MYDHL+ 1.0 / *30-0821*

From : ALS Environmental
Paul Chandra
100 - 8081 Lougheed Highway

V5A 1W9 BURNABY BC
Canada

Origin:
YVR

To : ALS Environmental - Fort Collins
Sample Receiving
225 Commerce Drive

Contact:
Sample Receiving

3-0 amb

80524 FORT COLLINS Colorado
United States of America

US-DEN-DEN

C

Day Time

Ref: Sublets

Pce/Shpt Weight Piece
28.0/67.0 lbs 1 / 3

WAYBILL 50 2467 8772

Contents:
Environmental W ater
Samples for Research

(2L)US80524+48000001

(J) JD01 4600 0080 2871 7322

EXPRESS WORLDWIDE WPX DHL

2020-08-07 MYDHL+ 1.0 / *30-0821*

From : ALS Environmental
Paul Chandra
100 - 8081 Lougheed Highway

V5A 1W9 BURNABY BC
Canada

Origin:
YVR

To : ALS Environmental - Fort Collins
Sample Receiving
225 Commerce Drive

Contact:
Sample Receiving

80524 FORT COLLINS Colorado
United States of America

US-DEN-DEN

C

Day Time

Ref: Sublets

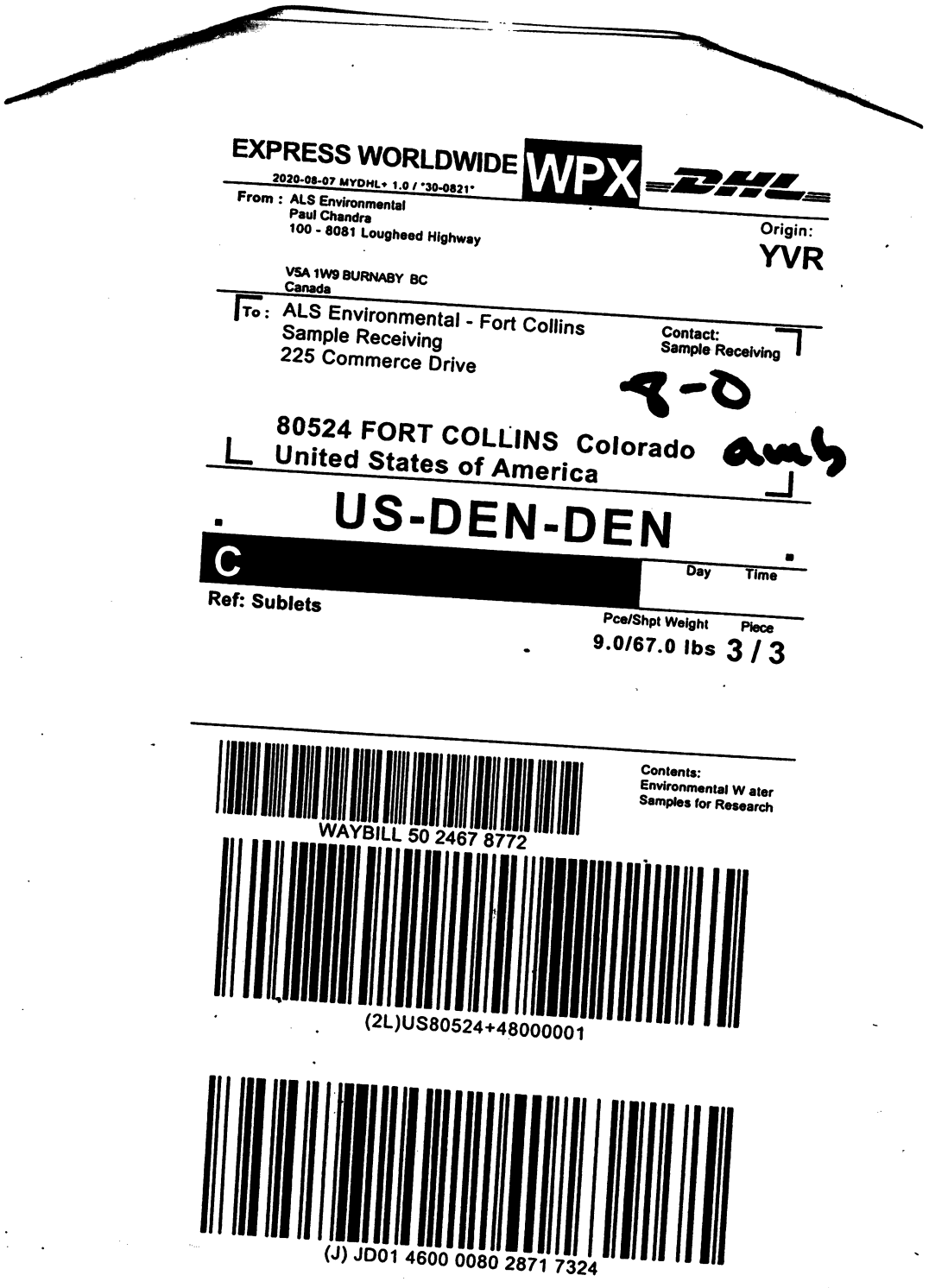
Pce/Shpt Weight Piece
30.0/67.0 lbs 2 / 3

WAYBILL 50 2467 8772

Contents:
Environmental W ater
Samples for Research

(2L)US80524+48000001

(J) JD01 4600 0080 2871 7323



EXPRESS WORLDWIDE WPX DHL

2020-08-07 MYDHL+ 1.0 / *30-0821*

From : ALS Environmental
Paul Chandra
100 - 8081 Lougheed Highway

V5A 1W9 BURNABY BC
Canada

Origin:
YVR

To : ALS Environmental - Fort Collins
Sample Receiving
225 Commerce Drive

Contact:
Sample Receiving

9-0

80524 FORT COLLINS Colorado
United States of America

amb

US-DEN-DEN

C

Day Time

Ref: Sublets

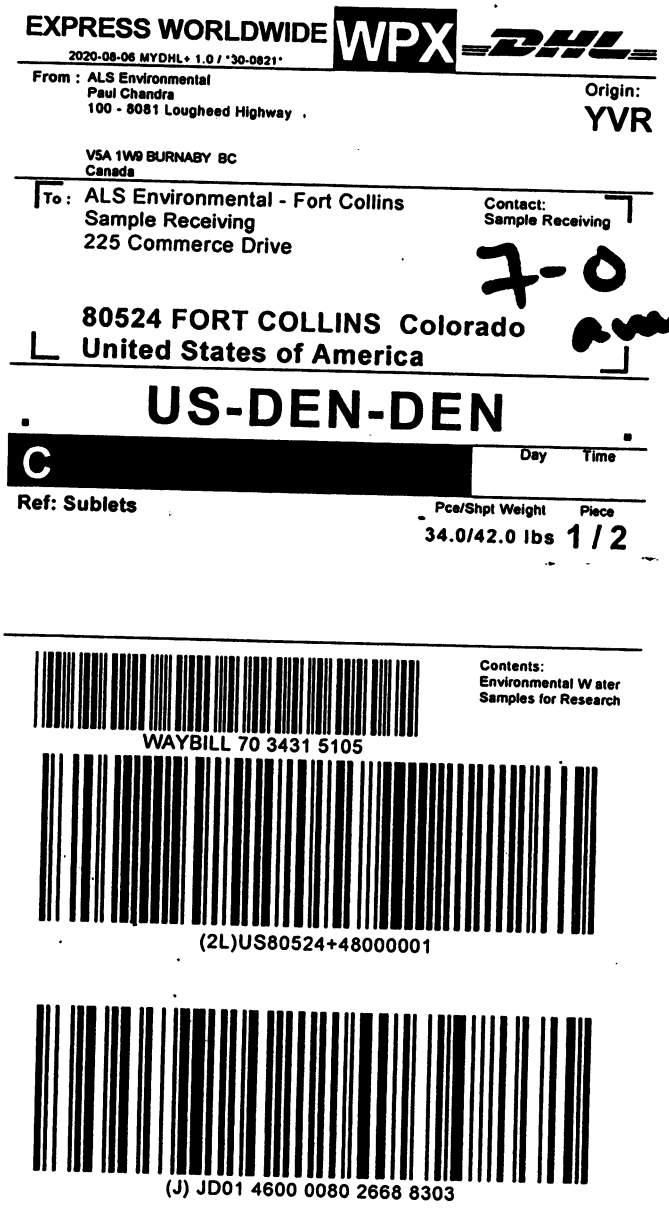
Pce/Shpt Weight Piece
9.0/67.0 lbs 3 / 3

Contents:
Environmental W ater
Samples for Research

WAYBILL 50 2467 8772

(2L)US80524+48000001

(J) JD01 4600 0080 2871 7324



EXPRESS WORLDWIDE WPX DHL

2020-08-06 MYDHL+ 1.0 / *30-0821*

From : ALS Environmental
Paul Chandra
100 - 8081 Lougheed Highway ,

V5A 1W9 BURNABY BC
Canada

Origin:
YVR

To : ALS Environmental - Fort Collins
Sample Receiving
225 Commerce Drive

Contact:
Sample Receiving

7-0
ams

80524 FORT COLLINS Colorado
United States of America

US-DEN-DEN

C

Day Time

Ref: Sublets

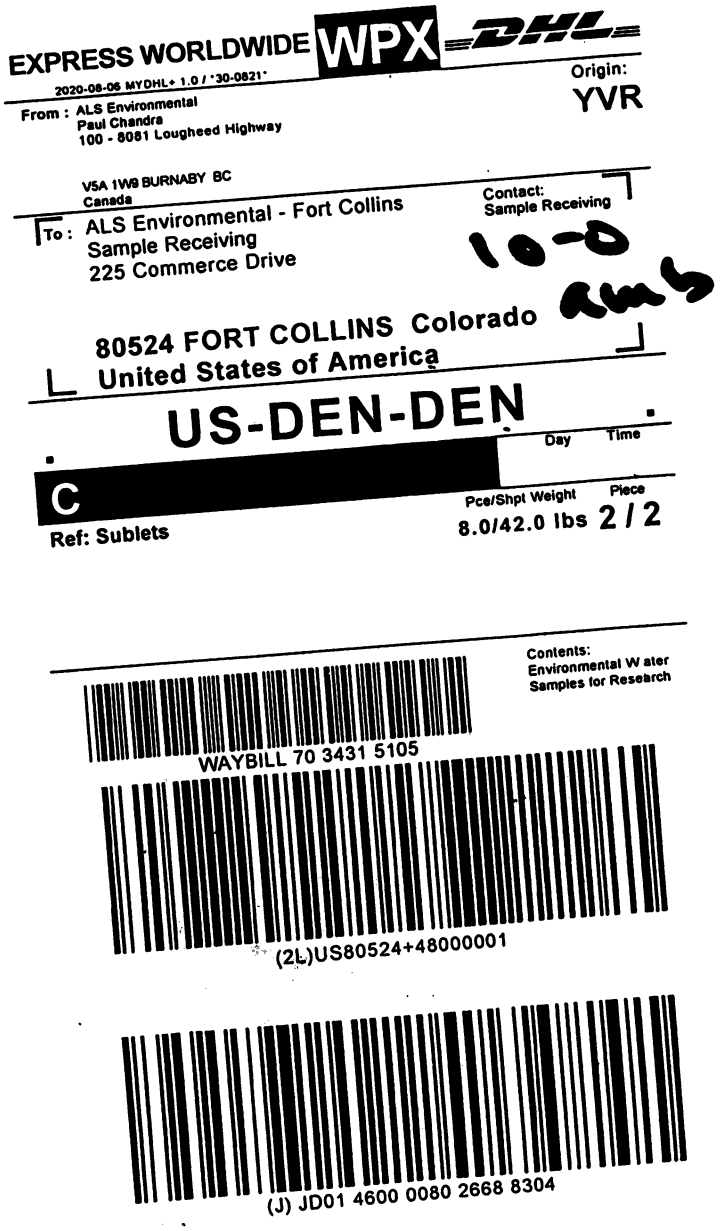
Pce/Shpt Weight Piece
34.0/42.0 lbs 1 / 2

Contents:
Environmental W ater
Samples for Research

WAYBILL 70 3431 5105

(2L)US80524+48000001

(J) JD01 4600 0080 2668 8303


EXPRESS WORLDWIDE WPX DHL

2020-08-06 MYDHL+ 1.0 / *30-0821*

Origin:
YVR

From : ALS Environmental
Paul Chandra
100 - 8081 Lougheed Highway

V5A 1W9 BURNABY BC
Canada

To : ALS Environmental - Fort Collins
Sample Receiving
225 Commerce Drive

Contact:
Sample Receiving

10-0 amb

80524 FORT COLLINS Colorado
United States of America

US-DEN-DEN

Day Time

C

Pce/Shpt Weight Piece
8.0/42.0 lbs 2 / 2

Ref: Sublets

Contents:
Environmental W ater
Samples for Research

WAYBILL 70 3431 5105

(2L)US80524+48000001

(J) JD01 4600 0080 2668 8304

Client:	ALS Environmental	**Date:**	*26-Aug-20*
Project:	WR2000608	**Work Order:**	2008199
Sample ID:	WR2000608-001	**Lab ID:**	2008199-1
Legal Location:		**Matrix:**	WATER
Collection Date:	8/4/2020 07:10	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**SOP 783**		Prep Date: **8/14/2020**		PrepBy: **TRW**
Ra-226	0.0053 (+/- 0.0046)	U	0.0064	BQ/l	NA	8/25/2020 13:47
Carr: BARIUM	*97*		*40-110*	*%REC*	DL = NA	8/25/2020 13:47

Client:	ALS Environmental	**Date:**	*26-Aug-20*
Project:	WR2000608	**Work Order:**	2008199
Sample ID:	WR2000608-001	**Lab ID:**	2008199-1
Legal Location:		**Matrix:**	WATER
Collection Date:	8/4/2020 07:10	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed

Explanation of Qualifiers

Radiochemistry:

- "Report Limit" is the MDC

U or ND - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.
# - Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.
G - Sample density differs by more than 15% of LCS density.
D - DER is greater than Control Limit

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).

U or ND - Indicates that the compound was analyzed for but not detected.

E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.

M - Duplicate injection precision was not met.

N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.

Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.

* - Duplicate analysis (relative percent difference) not within control limits.

S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

U or ND - Indicates that the compound was analyzed for but not detected.

B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.

E - Analyte concentration exceeds the upper level of the calibration range.

J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).

A - A tentatively identified compound is a suspected aldol-condensation product.

X - The analyte was diluted below an accurate quantitation level.

* - The spike recovery is equal to or outside the control criteria used.

+ - The relative percent difference (RPD) equals or exceeds the control criteria.

G - A pattern resembling gasoline was detected in this sample.

D - A pattern resembling diesel was detected in this sample.

M - A pattern resembling motor oil was detected in this sample.

C - A pattern resembling crude oil was detected in this sample.

4 - A pattern resembling JP-4 was detected in this sample.

5 - A pattern resembling JP-5 was detected in this sample.

H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.

L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.

Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
- gasoline
- JP-8
- diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

QC BATCH REPORT

Batch ID: **RE200814-1-1** Instrument ID **Alpha Scin** Method: **Radium-226 by Radon Emanation**

LCS Sample ID: **RE200814-1** Units: **BQ/l** Analysis Date: **8/25/2020 14:25**

Client ID: Run ID: **RE200814-1A** Prep Date: **8/14/2020** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.51 (+/- 0.378)	0.0142	1.719		87.9	67-120					P,Y1,M3
Carr: BARIUM	17300		17080		101	40-110					Y1

LCSD Sample ID: **RE200814-1** Units: **BQ/l** Analysis Date: **8/25/2020 14:25**

Client ID: Run ID: **RE200814-1A** Prep Date: **8/14/2020** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.62 (+/- 0.405)	0.0118	1.719		94.4	67-120		1.51	0.2	2.1	P,M3
Carr: BARIUM	17000		17090		99.6	40-110		17300			

MB Sample ID: **RE200814-1** Units: **BQ/l** Analysis Date: **8/25/2020 14:25**

Client ID: Run ID: **RE200814-1A** Prep Date: **8/14/2020** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	0.0017 (+/- 0.0038)	0.0067									Y1,U
Carr: BARIUM	17500		17090		103	40-110					Y1

The following samples were analyzed in this batch: 2008199-1

Toxicity Testing on Sample WR2000608-001 W3

Collected August 4, 2020

Final Report

September 11, 2020

Submitted to: **ALS Environmental**
Burnaby, BC

8664 Commerce Court, Burnaby, BC V5A 4N7

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SIGNATURE PAGE



Report By:
Jeslin Wijaya, B.Sc
Laboratory Biologist



Reviewed By:
Andreas Diewald, B.Sc
Senior Reviewer

This report has been prepared by Nautilus Environmental Company Inc. based on data and/or samples provided by our client and the results of this study are for their sole benefit. Any reliance on the data by a third party is at the sole and exclusive risk of that party. The results presented here relate only to the samples tested.

SUMMARY

Sample Information and Test Type

Sample ID	WR2000608-001 W3
Sample collection date	August 4, 2020
Sample receipt date	August 6, 2020
Sample receipt temperature	10.7 – 11.4°C
Test types	72-h *Pseudokirchneriella subcapitata* growth inhibition

Summary of Results

Cell Yield	% v/v
Growth IC25	>95.2
Growth IC50	>95.2

IC = Inhibition Concentration

1.0 INTRODUCTION

Nautilus Environmental Company Inc. conducted a 72-h *Pseudokirchneriella subcapitata* growth inhibition toxicity test for ALS Environmental on a sample identified as WR2000608-001 W3. The sample was collected on August 4, 2020 and delivered to the Nautilus Environmental laboratory in Burnaby, BC on August 6, 2020. The sample was transported in three 1L plastic containers and was received at a temperature of 10.7 – 11.4°C. The sample was stored in the dark at 4 ± 2°C prior to testing.

This report describes the results of the toxicity test. Copies of raw laboratory data sheets and statistical analyses are provided in Appendix A. The chain-of-custody form is provided in Appendix B.

2.0 METHODS

Methods for the toxicity test are summarized in Table 1. Testing was conducted according to procedures described by Environment Canada (2007). Statistical analyses were performed using CETIS (Tidepool Scientific Software, 2013).

Table 1. Summary of test conditions: 72-h *Pseudokirchneriella subcapitata* growth inhibition test.

Test species	*Pseudokirchneriella subcapitata*, strain CPCC #37
Organism source	In-house axenic culture, obtained from Canadian Phycological Culture Center, and originally isolated from Nivelta River, Norway.
Organism age	3-to 7-day old culture in logarithmic growth phase
Test type	Static
Test duration	72 hours
Test vessel	Microplate
Test volume	220 µL
Test concentrations	Seven concentrations, plus laboratory control
Test replicates	4 per treatment; 8 for laboratory control
Number of organisms	10,000 cells/mL
Control/dilution water	Deionized water supplemented with nutrients
Test solution renewal	None
Test temperature	24 ± 2°C
Feeding	None
Light intensity	3600 to 4400 lux
Photoperiod	24 hours light
Aeration	None
Test measurements	Test area temperature measured daily; temperature and pH measured at test initiation; pH of two control wells measured at test termination
Test protocol	Environment Canada (2007), EPS 1/RM/25
Statistical software	CETIS Version 1.9.4
Test endpoint	Algal cell growth inhibition
Test acceptability criteria for controls	>16-fold increase in number of algal cells; CV ≤ 20%; no trend when analyzed using Mann-Kendall test
Reference toxicant	Zinc (added as $ZnSO_4$)

3.0 RESULTS

Results of the toxicity test on sample WR2000608-001 W3 are summarized in Table 2. There were no adverse effects on cell yield of *P. subcapitata*, resulting in IC25 and IC50 values of >95.2%. In addition, stimulatory effects were observed in all test concentrations; stimulation ranged from 23.3 to 240.4%.

Table 2. Results: *Pseudokirchneriella subcapitata* growth inhibition test.

Concentration (% v/v)	Cell Yield (x 10^4 cells/mL) (Mean ± SD)	Stimulation (%)
Laboratory Control	48.2 ± 4.2	--
1.5	59.5 ± 2.6*	23.3
3.0	77.2 ± 6.2*	60.1
6.0	86.8 ± 5.4*	79.8
11.9	107.8 ± 4.6*	123.3
23.8	164.2 ± 5.9*	240.4
47.6	154.0 ± 6.7*	219.2
95.2	149.0 ± 8.3*	208.8
Test Endpoint (% v/v)		
IC25	>95.2	--
IC50	>95.2	--

SD = Standard Deviation, IC = Inhibition Concentration
* = Indicates cell yield was significantly greater than the laboratory control

4.0 QA/QC

The health history of the test organisms used in the exposure was acceptable and met the requirements of the Environment Canada protocol. The test met all control acceptability criteria and water quality parameters remained within ranges specified in the protocol throughout the tests. Uncertainty associated with the test is best described by the standard deviation around the mean and/or the confidence intervals around the point estimates.

Results of the reference toxicant test conducted during the testing program are summarized in Table 3. Results for this test fell within the range for organism performance of the mean and two standard deviations, based on historical results obtained by the laboratory with this test. Thus, the sensitivity of the organisms used in the test was appropriate. The reference toxicant test was performed under the same conditions as those used for the sample.

Table 3. Reference toxicant results.

Test Species	Endpoint	Historical Mean (2 SD Range)	CV (%)	Test Date
P. subcapitata	Growth (IC50): 29.7 µg/L Zn	30.4 (24.4 – 37.8)	11	August 11, 2020

SD = Standard Deviation, CV = Coefficient of Variation, IC = Inhibition Concentration

5.0 REFERENCES

Environment Canada. 2007. Biological test method: growth inhibition test using the freshwater alga. Environmental Protection Series, Report EPS 1/RM/25. Second Edition, March 2007. Environment Canada, Method Development and Application Section, Environmental Science and Technology Centre, Science and Technology Branch, Ottawa, ON. 53 pp.

Tidepool Scientific Software. 2013. CETIS comprehensive environmental toxicity information system, version 1.9.4.11 Tidepool Scientific Software, McKinleyville, CA. 275 pp.

APPENDIX A – *Pseudokirchneriella subcapitata* Toxicity Test Data

Pseudokirchneriella subcapitata Summary Sheet

Client: ALS
Work Order No.: 201493

Start Date: Aug 7/20
Set up by: MG

Sample Information:

Sample ID: WR2000 608-001 W3
Sample Date: Aug 4/20
Date Received: Aug 6/20
Sample Volume: 1 x 1L

Test Organism Information:

Culture Date: July 31/20
Age of culture (Day 0): 7d

Zinc Reference Toxicant Results:

Reference Toxicant ID: SC204
Stock Solution ID: 203101
Date Initiated: Aug 11/20

72-h IC50 (95% CL): 29.7 (24.8 - 33.1) mg/L Zn

72-h IC50 Reference Toxicant Mean and Range: 30.4 (24.4 - 37.8) mg/L Zn CV (%): 11

Test Results:

	Algal Growth
IC25 %(v/v) (95% CL)	>99.2
IC50 %(v/v) (95% CL)	>99.2

Reviewed by: JCh

Date reviewed: Aug. 31/20

72-h Algal Growth Inhibition Toxicity Test
Water Quality Measurements

Client: ALS | Setup by: MG

Sample ID: WR2000608-001W3 | Test Date/Time: Aug 7/20 0910h

Work Order No.: 201493 | CER #: 4

Test Species: *Pseudokirchneriella subcapitata*

Culture Date: July 31/20 | Age of Culture: 7d 5h | Culture Health: Good

Culture Count: 1 325 2 340 | Average: 332.5 | Culture Cell Density (c1): 332.5x10⁴ cells/mL

v1 = 220,000 cells/mL x 100 mL / (c1) 332.5x10⁴ cells/ml = 6.6 mL

Time Zero Counts: 1 22 2 23 | Average: 22.5

No. of Cells/mL: 22.5x10⁴ | Initial Density: # cells/mL ÷ 220 µL x 10 µL = 10227 cells/mL

Concentration %(v/v)	Water Quality pH 0 h	Water Quality Temp (°C) 0 h	Incubator Temperature (°C) 0 h	24 h	48 h	72 h	Microplates rotated 2X per day? 0 h	24 h	48 h	72 h
Control	7.0	23.0	25.0	25.0	25.0	25.0	✓	✓	✓	✓
1.5	7.1	23.0					✓	✓	✓	
3	7.1	23.0					✓	✓	✓	
6	7.3	23.0					✓	✓	✓	
11.9	7.7	23.0					✓	✓	✓	
23.8	7.9	23.0					✓	✓	✓	
47.6	8.0	23.0					✓	✓	✓	
95.8	8.2	23.0	↓	↓	↓	—	✓	✓	✓	—
Initials	MG	MG	MG	MF	SSK	[illegible]	MG	MF	SSK	[illegible]

Initial control pH: Well 1: 7.0 | Well 2: 7.0

Final control pH: Well 1: 7.3 | Well 2: 7.3

Light intensity (lux): 4160 | Date measured: Aug 7/20

Thermometer: 4 | Light meter: 1 | pH meter/probe: 11

Sample Description: clear, colourless, odourless, no particulates.

Comments:

Reviewed: JCM | Date reviewed: Aug. 31/20

Pseudokirchneriella subcapitata Toxicity Test Data Sheet
72-h Algal Cell Counts

Client: ALS
Start Date/Time: Aug 7/20 @ 0810h
Work Order #: 201493
Termination Date: Aug 10/20 @ 0810h
Sample ID: WR2000608-001 W3
Test set up by: MG
%(v/v)

Concentration	Rep	Count 1	Count 2	Count 3	Count 4	Comments	Initials
Control	A	51					MG
	B	42					
	C	52					
	D	54					
	E	49					
	F	44					
	G	52					
	H	50					
1.5	A	58					
	B	61					
	C	59					
	D	64					
3	A	85					
	B	78					
	C	70					
	D	80					
6	A	94					
	B	81					
	C	87					
	D	89					
11.9	A	103					
	B	114					
	C	108					
	D	110					
23.8	A	158					
	B	163					
	C	169					
	D	171					
47.6	A	164					
	B	156					
	C	149					
	D	151					
95.8	A	141					
	B	161					
	C	150					
	D	148					

Comments:

Reviewed by: JCh
Date Reviewed: Aug 31/20

Pseudokirchneriella subcapitata Algal Counts

Client: ALS
WO#: 201493
Sample ID: WR2000608-001 W3

Start Date/Time: 07-Aug-20 @ 0810h
Termination Date/Time: 10-Aug-20 @ 0810h

Initial Cell Density: 10227 cell/mL

									225000
									0.22
									0.01
Concentration %(v/v)	Rep	Count 1 (x 10^4)	Count 2 (x 10^4)	Count 3 (x 10^4)	Count 4 (x 10^4)	Mean (x 10^4)	Cell Yield (x 10^4) cell/mL		10227.27
Control	A	51				51	50.0	mean	48.2
	B	42				42	41.0	SD	4.16619
	C	52				52	51.0	CV	8.638661
	D	54				54	53.0		
	E	49				49	48.0		
	F	44				44	43.0		
	G	52				52	51.0		
	H	50				50	49.0		
1.5	A	58				58	57.0		
	B	61				61	60.0		
	C	59				59	58.0		
	D	64				64	63.0		
3	A	85				85	84.0		
	B	78				78	77.0		
	C	70				70	69.0		
	D	80				80	79.0		
6	A	94				94	93.0		
	B	81				81	80.0		
	C	87				87	86.0		
	D	89				89	88.0		
11.9	A	103				103	102.0		
	B	114				114	113.0		
	C	108				108	107.0		
	D	110				110	109.0		
23.8	A	158				158	157.0		
	B	163				163	162.0		
	C	169				169	168.0		
	D	171				171	170.0		
47.6	A	164				164	163.0		
	B	156				156	155.0		
	C	149				149	148.0		
	D	151				151	150.0		
95.2	A	141				141	140.0		
	B	161				161	160.0		
	C	150				150	149.0		
	D	148				148	147.0		

Reviewed by: _____

Date reviewed: Aug. 31/20

CETIS Analytical Report

Test Code/ID: 201493 / 02-0542-2354

EC Alga Growth Inhibition Test — **Nautilus Environmental**

Analysis ID:	08-9077-2161	**Endpoint:**	Cell Yield	**CETIS Version:**	CETISv1.9.4
Analyzed:	28 Aug-20 16:32	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1
Batch ID:	04-6297-5060	**Test Type:**	Cell Growth	**Analyst:**	Mimi Tran
Start Date:	07 Aug-20 08:10 ✓	**Protocol:**	EC/EPS 1/RM/25	**Diluent:**	Deionized Water + nutrients
Ending Date:	10 Aug-20 08:10 ✓	**Species:**	Pseudokirchneriella subcapitata	**Brine:**	
Test Length:	72h	**Taxon:**	Chlorophyta	**Source:**	In-House Culture **Age:** 7d ✓
Sample ID:	04-9667-2155	**Code:**	1D9A9D9B	**Project:**	
Sample Date:	04 Aug-20 06:10 ✓	**Material:**	Water Sample	**Source:**	ALS
Receipt Date:	06 Aug-20 16:29 ✓	**CAS (PC):**		**Station:**	WR2000608-001 W3 ✓
Sample Age:	74h (10.7 °C) ✓	**Client:**	ALS		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	1599297	200	Yes	Two-Point Interpolation

Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision(α:5%)
Extreme Value	Grubbs Extreme Value Test	2.228	2.991	0.7758	No Outliers Detected
Control Trend	Mann-Kendall Trend Test	2.228		1.0000	Non-Significant Trend in Controls

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	>95.2	n/a	n/a	<1.05	n/a	n/a
IC10	>95.2	n/a	n/a	<1.05	n/a	n/a
IC15	>95.2	n/a	n/a	<1.05	n/a	n/a
IC20	>95.2	n/a	n/a	<1.05	n/a	n/a
IC25	>95.2	n/a	n/a	<1.05	n/a	n/a
IC40	>95.2	n/a	n/a	<1.05	n/a	n/a
IC50	>95.2	n/a	n/a	<1.05	n/a	n/a

Cell Yield Summary

			Calculated Variate						Isotonic Variate	
Conc-%	Code	Count	Mean	Min	Max	Std Dev	CV%	%Effect	Mean	%Effect
0	N	8	48.25	41	53	4.166	8.64%	0.0%	105.8	0.0%
1.5		4	59.5	57	63	2.646	4.45%	-23.32%	105.8	0.0%
3		4	77.25	69	84	6.238	8.08%	-60.1%	105.8	0.0%
6		4	86.75	80	93	5.377	6.20%	-79.79%	105.8	0.0%
11.9		4	107.8	102	113	4.573	4.25%	-123.3%	105.8	0.0%
23.8		4	164.2	157	170	5.909	3.60%	-240.4%	105.8	0.0%
47.6		4	154	148	163	6.683	4.34%	-219.2%	105.8	0.0%
95.2		4	149	140	160	8.287	5.56%	-208.8%	105.8	0.0%

Cell Yield Detail

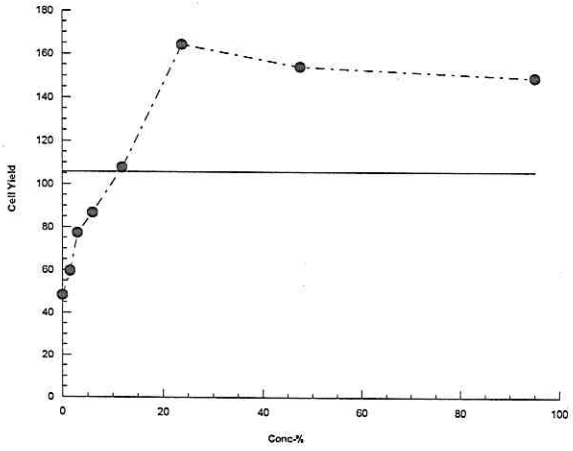
Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	N	50	41	51	53	48	43	51	49
1.5		57	60	58	63				
3		84	77	69	79				
6		93	80	86	88				
11.9		102	113	107	109				
23.8		157	162	168	170				
47.6		163	155	148	150				
95.2		140	160	149	147				

Analyst: MM QA: Aug. 31/20

EC Alga Growth Inhibition Test **Nautilus Environmental**

Analysis ID:	08-9077-2161	**Endpoint:**	Cell Yield	**CETIS Version:**	CETISv1.9.4
Analyzed:	28 Aug-20 16:32	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1

Graphics



Analyst: MM QA: Aug. 31/20

EC Alga Growth Inhibition Test — **Nautilus Environmental**

Analysis ID:	10-4924-4862	**Endpoint:**	Cell Yield	**CETIS Version:**	CETISv1.9.4
Analyzed:	28 Aug-20 16:32	**Analysis:**	Parametric-Control vs Treatments	**Status Level:**	1
Batch ID:	04-6297-5060	**Test Type:**	Cell Growth	**Analyst:**	Mimi Tran
Start Date:	07 Aug-20 08:10	**Protocol:**	EC/EPS 1/RM/25	**Diluent:**	Deionized Water + nutrients
Ending Date:	10 Aug-20 08:10	**Species:**	Pseudokirchneriella subcapitata	**Brine:**	
Test Length:	72h	**Taxon:**	Chlorophyta	**Source:**	In-House Culture **Age:** 7d
Sample ID:	04-9667-2155	**Code:**	1D9A9D9B	**Project:**	
Sample Date:	04 Aug-20 06:10	**Material:**	Water Sample	**Source:**	ALS
Receipt Date:	06 Aug-20 16:29	**CAS (PC):**		**Station:**	WR2000608-001 W3
Sample Age:	74h (10.7 °C)	**Client:**	ALS		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C < T	<1.5	1.5	n/a	>66.67	17.70%

Dunnett Multiple Comparison Test

Control	vs	Control II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Negative Control		1.5*	3.327	2.526	8.541	10	CDF	0.0078	Significant Effect
		3*	8.577	2.526	8.541	10	CDF	<1.0E-37	Significant Effect
		6*	11.39	2.526	8.541	10	CDF	<1.0E-37	Significant Effect
		11.9*	17.6	2.526	8.541	10	CDF	<1.0E-37	Significant Effect
		23.8*	34.31	2.526	8.541	10	CDF	<1.0E-37	Significant Effect
		47.6*	31.28	2.526	8.541	10	CDF	<1.0E-37	Significant Effect
		95.2*	29.8	2.526	8.541	10	CDF	<1.0E-37	Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Extreme Value	Grubbs Extreme Value Test	2.228	2.991	0.7758	No Outliers Detected
Control Trend	Mann-Kendall Trend Test	2.228		1.0000	Non-Significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	68767.4	9823.91	7	322.3	<1.0E-37	Significant Effect
Error	853.5	30.4821	28			
Total	69620.9		35			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	4.408	18.48	0.7317	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9804	0.9166	0.7582	Normal Distribution

Cell Yield Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	N	8	48.25	44.77	51.73	49.5	41	53	1.473	8.63%	0.00%
1.5		4	59.5	55.29	63.71	59	57	63	1.323	4.45%	-23.32%
3		4	77.25	67.32	87.18	78	69	84	3.119	8.08%	-60.10%
6		4	86.75	78.19	95.31	87	80	93	2.689	6.20%	-79.79%
11.9		4	107.8	100.5	115	108	102	113	2.287	4.24%	-123.32%
23.8		4	164.2	154.8	173.7	165	157	170	2.955	3.60%	-240.41%
47.6		4	154	143.4	164.6	152.5	148	163	3.342	4.34%	-219.17%
95.2		4	149	135.8	162.2	148	140	160	4.143	5.56%	-208.81%

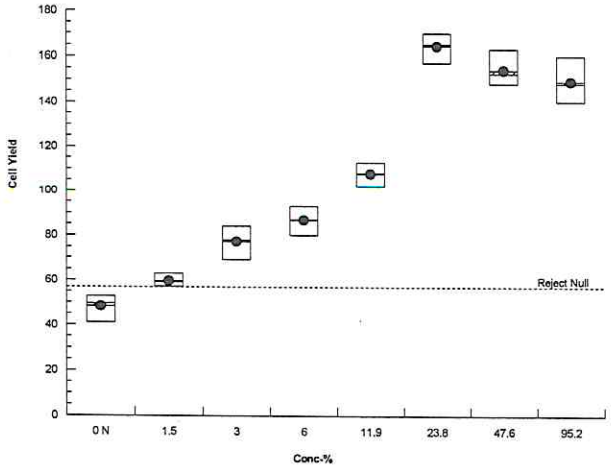
EC Alga Growth Inhibition Test **Nautilus Environmental**

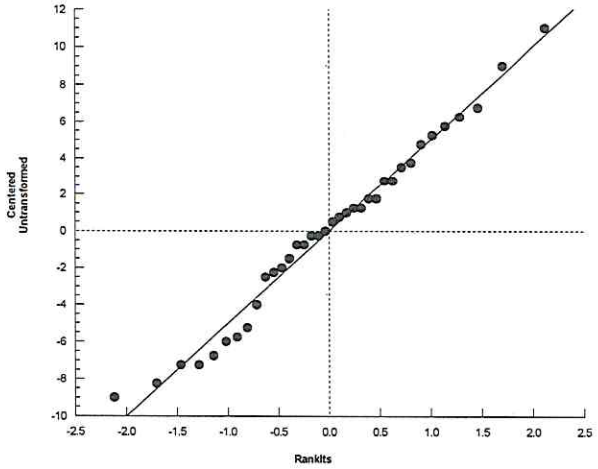
Analysis ID: 10-4924-4862 **Endpoint:** Cell Yield **CETIS Version:** CETISv1.9.4
Analyzed: 28 Aug-20 16:32 **Analysis:** Parametric-Control vs Treatments **Status Level:** 1

Cell Yield Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	N	50	41	51	53	48	43	51	49
1.5		57	60	58	63				
3		84	77	69	79				
6		93	80	86	88				
11.9		102	113	107	109				
23.8		157	162	168	170				
47.6		163	155	148	150				
95.2		140	160	149	147				

Graphics





Analyst: MN QA: Aug. 31/20

APPENDIX B – Chain-of-Custody Form

Chain of Custody

Whitehorse - Environmental
#12 151 Industrial Road
Whitehorse YT Canada Y1A 2V3

PREVIEW COC

Destination Lab:	**Nautilus Environmental (Burnaby)**
Address:	8664 Commerce Court Burnaby BC Canada V5A 4N7
Client:	Minto Explorations Ltd.
Work Order Number:	**WR2000608**
Original Receipt Date/Time	Instructions Received
04/08/2020 14:50	

Account Manager:

ALSEVDataSublet@ALSGlobal.com (PDF / EXCEL/ B2B)
ALS Vancouver Phone Number: 604-253-4188

Relinquished By	
Date/Time	
Received By	
Date/Time	
Receipt Temp	

Return as Indicated:	Results:	Invoice:	Electronic Data:
	Attention: Heather McKenzie		

ALS Sample ID	Client ID	Matrix	Container Type	Test Codes	Method Description	Due Date	Sampling Date and Time	Remarks
WR2000608-001	W3	Water	HDPE carboy LC50			24-08-2020	04/08/2020 06:10	
WR2000608-001	W3	Water	HDPE carboy LC50	DAP-LC50-48 , TRT-LC50-96	Survival/LC50 Daphnia Magna (48 hours), Survival/LC50 Rainbow Trout (96 hours)	24-08-2020	04/08/2020 06:10	
WR2000608-001	W3	Water	HDPE P/F	GRN-ALG-IC50	Green Algae Growth Potential/IC50 (P. subcapitata)	24-08-2020	04/08/2020 06:10	
WR2000608-001	W3	Water	HDPE P/F			24-08-2020	04/08/2020 06:10	
WR2000608-001	W3	Water	HDPE P/F			24-08-2020	04/08/2020 06:10	

~ regular TAT

TH
Aug. 6/20 @ 16:29

10.7-11.4

2 x 2.5 L
2 x 1 L
1 x 1 L

201491 - Rbt LC50 - cancelled, will resample
201492 - Dm LC50
201493 - Algae IC50

sample desc- clear, no colour, no odour, no particulates

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 2019-05-20 C

Page 1 of 1

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Ruth Cayetano

Report Format / Distribution	
Select Report Format:	☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	mintoenvironment@mintomine.com
Email 2	
Email 3	

Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	ap@mintomine.com
Email 2	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:		Major/Minor Code:	Routing Code:
PO / AFE:	232819 (MMER)	Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)		ALS Contact:	Sampler:

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)		EMERGENCY	
4 day [P4]	☐	1 Business day [E1]	☐
3 day [P3]	☐	Same Day, Weekend or Statutory holiday [E0]	☐
2 day [P2]	☐		

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	96hr LC50 RainbowTrout	48hr - LC50 Daphnia	7day - RainbowTroutEmbryoToxicity	7day - Ceriodaphnia	7day - Lemma minor	Alga 72-h Growth Inhibition	7day - Flathead Minnow	Ra226	Number of Containers
	W3	4-Aug-20	06:10	Water	R								2 /
	W3	4-Aug-20	06:10	Water		R							2 /
	W3	4-Aug-20	06:10	Water						R			1 /
	W3	4-Aug-20	06:10	Water								R	1 /

Environmental Division Whitehorse

Work Order Reference

WR2000608

Telephone : + 1 867 668 6689

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☑ NO	
Are samples for human drinking water use? ☐ YES ☑ NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
4	12	12			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Chris W	Date: 19-May-20	Time:	Received by:	Date: July 4/2020	Time: 2:58	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

END OF REPORT

Acute Toxicity Test Results

Sample WR2000608-001 W3,
collected August 4, 2020

Final Report

August 20, 2020

Submitted to: **ALS Environmental**
Burnaby, BC

8664 Commerce Court, Burnaby, BC V5A 4N7

SAMPLE INFORMATION

Sample ID	Dates				Receipt temperature
	Collected	Received	Rainbow trout test initiation	*Daphnia magna* test initiation	
WR2000608-001 W3	04-Aug-20 at 0610h	06-Aug-20 at 1629h	n/t	07-Aug-20 at 1245h	10.7 – 11.4°C

N/t = Not tested (insufficient suitable fish at laboratory; client will resample)

TESTS

- *Daphnia magna* 48-h LC50 test

RESULTS

Toxicity test results

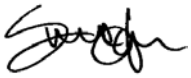
Sample ID	LC50 (% v/v)
WR2000608-001 W3	>100

LC = Lethal Concentration

QA/QC

QA/QC summary	*Daphnia magna*
Reference toxicant LC50 (95% CL)	6.8 (5.7 – 8.1) g/L NaCl[1]
Reference toxicant historical mean (2 SD range)	6.4 (4.9 – 8.4) g/L NaCl
Reference toxicant CV	13%
Organism health history	Acceptable
Protocol deviations	Yes (see below)
Water quality range deviations	None
Control performance	Acceptable
Test performance	Valid

[1] Test date: July 28, 2020, LC = Lethal Concentration, SD = Standard Deviation, CL = Confidence Limits, CV = Coefficient of Variation



Report By:
Yvonne Lam, B.Sc.
Laboratory Biologist



Reviewed By:
Andy Diewald, B.Sc.
Senior Analyst

This report has been prepared by Nautilus Environmental Company Inc. based on data and/or samples provided by our client and the results of this study are for their sole benefit. Any reliance on the data by a third party is at the sole and exclusive risk of that party. The results presented here relate only to the samples tested.

APPENDIX A – Summary of test conditions

Table 1. Summary of test conditions: 48-h *Daphnia magna* LC50 test.

Test species	*Daphnia magna*
Organism source	In-house culture
Organism age	<24-hour old neonates
Test type	Static
Test duration	48 hours
Test vessel	250-mL glass beaker
Test volume	200 mL
Test solution depth	6 cm
Test concentrations	Five concentrations, plus laboratory control
Test replicates	1 per treatment
Number of organisms	10 per replicate
Control/dilution water	Moderately-hard reconstituted water + 2.5 µg/L Se
Test solution renewal	None
Test temperature	20 ± 2°C
Feeding	None
Light intensity	400 to 800 lux
Photoperiod	16 hours light / 8 hours dark
Aeration	None
Test measurements	Temperature, dissolved oxygen and pH measured daily; salinity, hardness and alkalinity measured in the undiluted sample at test initiation; conductivity measured at test initiation and termination; survival checked daily
Test protocol	Environment Canada (2000), EPS 1/RM/14, with 2016 amendments
Statistical software	CETIS Version 1.9.4
Test endpoint	Survival (48-hour LC50)
Test acceptability criterion for controls	Survival ≥90%
Reference toxicant	Sodium chloride (NaCl)

APPENDIX B – Toxicity test data

Daphnia magna Summary Sheet

Client: ALS Environmental
Work Order No.: 201492

Start Date/Time: Aug 07/2020 @ 1245h
Test Species: *Daphnia magna*
Set up by: MK

Sample Information:

Sample ID: WR2000608-001 W3
Sample Date: Aug 04/2020
Date Received: Aug 06/2020
Sample Volume: 2 x 1L

Test Validity Criteria:

≥ 90% mean control survival and/or mobility and ≤2 daphnids exibit immobility and/or mortality in any single control replicate.

WQ Ranges:

T (°C) = 20 ± 2; DO (mg/L) = 3.6 to 9.4; pH = 6 to 8.5

Test Organism Information:

Broodstock No.:	071520B
Age of young (Day 0):	<24 h
Avg No. young per brood in previous 7 d:	24
Mortality (%) in previous 7 d:	0
Days to first brood:	6

NaCl Reference Toxicant Results:

Reference Toxicant ID:	DmDC54
Stock Solution ID:	20 NaCl 3
Date Initiated:	July 28/2020
48-h LC50 (95% CL):	6.8 (5.7 - 8.1) g/L NaCL

Reference Toxicant Mean and Historical Range: 6.4 (4.9 - 8.4) g/L NaCL
Reference Toxicant CV (%): 13

Test Results: The 48 h LC50 is estimated to be >100 % (v/v)

Reviewed by: A

Date reviewed: Aug 20/20

Freshwater Acute
48 Hour Toxicity Test Data Sheet

Client: ALS Environmental
Sample ID: WR2000608-001 W3
Work Order No.: 201492

Start Date/Time: Aug 07/2020 @ 1245
CER #: 5
No. Organisms/volume: 10/200mL
Test Organism: D.magna
Set up by: MF

Thermometer: CER#5 pH meter/probe: 6/6 DO meter/probe: 6/6 Cond./Salinity meter/probe: 6/6

Concentration % (v/v)	Rep	Number of Live Organisms 24	Number of Live Organisms 48	No. Immobilized 48	Temperature (°C) 0	Temperature (°C) 24	Temperature (°C) 48	Dissolved oxygen (mg/L) 0	Dissolved oxygen (mg/L) 24	Dissolved oxygen (mg/L) 48	pH 0	pH 24	pH 48	Conductivity (µS/cm) 0	Conductivity (µS/cm) 48
Control	A	10	10	0	19.5	19.5	19.5	8.6	8.1	8.1	8.1	8.2	8.1	345	348
	B														
	C														
	D														
6.25	A	10	10	0	19.5	19.5	19.5	8.6	8.1	8.2	8.0	8.2	8.2	357	359
	B														
	C														
	D														
12.5	A	10	10	0	19.5	19.5	19.5	8.6	8.1	8.2	8.0	8.3	8.3	370	374
	B														
	C														
	D														
25	A	10	10	0	20.0	19.5	19.5	8.6	8.2	8.2	8.0	8.3	8.4	395	397
	B														
	C														
	D														
50	A	10	10	0	20.0	19.5	19.5	8.7	8.2	8.2	8.0	8.4	8.4	446	447
	B														
	C														
	D				MF										
100	A	10	10	0	~~20.0~~	19.5	19.5	8.9	8.2	8.2	8.0	8.6	8.6	552	546
	B				20.0										
	C														
	D														
Technician Initials		M	SSK	MF	MF	M	MF	MF	M	SSK	MF	M	SSK	MF	SSK

	Hardness*	Alkalinity*
Concentration	*(mg/L as CaCo3)	
Control (MHW)	96	84.
Highest conc.	744	270
Hardness adjusted	—	—

	Initial WQ	Adjustment	Adjusted WQ
Temp (°C)	20.0		
DO (mg/L)	8.9		
pH	8.0		
Cond (µS/cm)	552		
Salinity (ppt)	0.3		

Comments: _____ Mortality: Heartbeat checked under microscope not req'd.

Sample Description: clear, no odour, no odour, no particulates

Batch#: 071520B 7-d previous # young/brood: 24 Previous 7-d Mortality (%): 0 Day of 1st Brood: 10.

Reviewed by: _____ Date reviewed: Aug 20/20

APPENDIX C – Chain-of-custody form

Chain of Custody
Whitehorse - Environmental
#12-451 Industrial Road
Whitehorse YT Canada Y1A 2V3

PREVIEW COC

Destination Lab:	**Nautilus Environmental (Burnaby)**
Address:	8664 Commerce Court Burnaby BC Canada V5A 4N7
Client:	Minto Explorations Ltd.
Work Order Number:	**WR2000608**
Original Receipt Date/Time	Instructions Received
04/08/2020 14:50	

Account Manager:
ALSEVDataSublet@ALSGlobal.com (PDF / EXCEL/ B2B)
ALS Vancouver Phone Number: 604-253-4188

Relinquished By	
Date/Time	
Received By	
Date/Time	
Receipt Temp	

Return as Indicated: Results: Invoice: Electronic Data:
Attention: Heather McKenzie

ALS Sample ID	Client ID	Matrix	Container Type	Test Codes	Method Description	Due Date	Sampling Date and Time	Remarks
WR2000608-001	W3	Water	HDPE carboy LC50			24-08-2020	04/08/2020 06:10	
WR2000608-001	W3	Water	HDPE carboy LC50	DAP-LC50-48 , TRT-LC50-96	Survival/LC50 Daphnia Magna (48 hours), Survival/LC50 Rainbow Trout (96 hours)	24-08-2020	04/08/2020 06:10	
WR2000608-001	W3	Water	HDPE P/F	GRN-ALG-IC50	Green Algae Growth Potential/IC50 (P. subcapitata)	24-08-2020	04/08/2020 06:10	
WR2000608-001	W3	Water	HDPE P/F			24-08-2020	04/08/2020 06:10	
WR2000608-001	W3	Water	HDPE P/F			24-08-2020	04/08/2020 06:10	

~ regular TAT

TH
Aug. 6/20 @ 16:29

10.7-11.4

2 x 2.5 L
2 x 1 L
1 x 1 L

201491 - Rbt LC50 - cancelled, will resample
201492 - Dm LC50
201493 - Algae IC50

sample desc- clear, no colour, no odour, no particulates

ALS Environmental

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

Affix ALS barcode label here (lab use only)

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3

Report Format / Distribution	
Select Report Format:	☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	mintoenvironment@mintomine.com
Email 2	
Email 3	

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)			EMERGENCY	
	4 day [P4]	☐	1 Business day [E1]	☐
	3 day [P3]	☐	Same Day, Weekend or Statutory holiday [E0]	☐
	2 day [P2]	☐		

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Ruth Cayetano

Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	ap@mintomine.com
Email 2	

Project Information	
ALS Account # / Quote #:	
Job #:	
PO / AFE:	232819 (MMER)
LSD:	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only)		ALS Contact:	Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	96hr LC50 RainbowTrout	48hr - LC50 Daphnia	7day - RainbowTroutEmbryoToxicity	7day - Ceriodaphnia	7day - Lemna minor	Alga 72-h Growth Inhibition	7day - Flathead Minnow	Ra226	Number of Containers
	W3	4-Aug-20	06:10	Water	R								2 /
	W3	4-Aug-20	06:10	Water		R							2 /
	W3	4-Aug-20	06:10	Water						R			1 /
	W3	4-Aug-20	06:10	Water								R	1 /

Environmental Division
Whitehorse
Work Order Reference
WR2000608

Telephone : + 1 867 668 6689

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☑ NO	
Are samples for human drinking water use? ☐ YES ☑ NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐		SIF Observations	Yes ☐ No ☐
Ice Packs ☐	Ice Cubes ☐	Custody seal intact	Yes ☐ No ☐
Cooling Initiated ☐			

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
4	12	12			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Chris W	Date: 19-May-20	Time:	Received by:	Date: July 4/2020	Time: 2:50	Received by:	Date:	Time:

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

END OF REPORT

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 2019-05-20 C

Page 1 of 1

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Ruth Cayetano

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: mintoenvironment@mintomine.com
Email 2:
Email 3:

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: ap@mintomine.com
Email 2:

Project Information

ALS Account # / Quote #:
Job #:
PO / AFE: 232819 (MMER)
LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#:
Major/Minor Code: Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only):

ALS Contact: Sampler:

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐

EMERGENCY: 1 Business day [E1] ☐ | Same Day, Weekend or Statutory holiday [E0] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	96hr LC50 RainbowTrout	48hr - LC50 Daphnia	7day - RainbowTroutEmbryoToxicity	7day - Ceriodaphnia	7day - Lemma minor	Alga 72-h Growth Inhibition	7day - Flathead Minnow	Ra226	Number of Containers
	W3	4-Aug-20	06:10	Water	R								2 /
	W3	4-Aug-20	06:10	Water		R							2 /
	W3	4-Aug-20	06:10	Water						R			1 /
	W3	4-Aug-20	06:10	Water								R	1 /

Environmental Division
Whitehorse
Work Order Reference
WR2000608

Telephone : +1 867 668 6689

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO

Are samples for human drinking water use? ☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
4	12	12			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Chris W	Date: 19-May-20	Time:	Received by:	Date: July 4/2020	Time: 2:50	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000608**	Page	: 1 of 2
Amendment	: **1**		
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 04-Aug-2020 14:50
PO	: 232819	Date Analysis Commenced	: 21-Aug-2020
C-O-C number	: 2019-05-20 C	Issue Date	: 03-Nov-2020 11:29
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Kaitlyn Gardner	Account Manager Assistant	External Subcontracting, Burnaby, British Columbia
Kaitlyn Gardner	Account Manager Assistant	Internal Subcontracting, Fort Collins, Colorado

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
Bq/L	Becquerels per litre

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Analytical Results

Sub-Matrix: **Water** (Matrix: **Water**)					*Client sample ID*	**W3**	**----**	**----**	**----**	**----**
					Client sampling date / time	04-Aug-2020 06:10	----	----	----	----
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*		**WR2000608-001**	--------	--------	--------	--------
						Result	----	----	----	----
Bioassays										
Daphnia magna LC50	----	DAP-LC50-48	-	-		see attached	----	----	----	----
green algae, growth	n/a	ALG-IC50-72h	-	-		see attached	----	----	----	----
Radiological Parameters										
radium-226	13982-63-3	RA226-MMER	0.0064	Bq/L		<0.0064	----	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WR2000608**	Page	: 1 of 5
Amendment	: 1		
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 04-Aug-2020 14:50
PO	: 232819	Issue Date	: 03-Nov-2020 11:30
C-O-C number	: 2019-05-20 C		
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Bioassays : Growth/IC50 Green Algae (P. subcapitata) 72 hour										
HDPE P/F										
W3	ALG-IC50-72h	04-Aug-2020	----	----	----		21-Aug-2020	----	----	
Bioassays : Survival/LC50 Daphnia Magna 48 hours										
HDPE carboy LC50										
W3	DAP-LC50-48	04-Aug-2020	----	----	----		21-Aug-2020	5 days	17 days	× EHT
Radiological Parameters : Radium-226 by Radon Emanation										
HDPE (nitric acid)										
W3	RA226-MMER	04-Aug-2020	----	----	----		25-Aug-2020	180 days	21 days	✓

Legend & Qualifier Definitions

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

- **No Quality Control data available for this section.**

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Growth/IC50 Green Algae (P. subcapitata) 72 hour	ALG-IC50-72h Nautilus Environmental (Burnaby) - 8664 Commerce Court Burnaby British Columbia Canada V5A 4N7	Water	EPS1/RM/25	See attached report.
Survival/LC50 Daphnia Magna 48 hours	DAP-LC50-48 Nautilus Environmental (Burnaby) - 8664 Commerce Court Burnaby British Columbia Canada V5A 4N7	Water	EPS1/RM/14	See attached report.
Radium-226 by Radon Emanation	RA226-MMER Fort Collins - Environmental - 225 Commerce Drive Fort Collins Colorado United States 80524	Water	EPA 903.1	Radium-226 in sample was analyzed according to the current revision of SOP 783.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **WR2000608**	Page	: 1 of 2
Amendment	: **1**		

Client	: Minto Explorations Ltd.	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 04-Aug-2020 14:50
PO	: 232819	Date Analysis Commenced	: 21-Aug-2020
C-O-C number	: 2019-05-20 C	Issue Date	: 03-Nov-2020 11:29
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Kaitlyn Gardner	Account Manager Assistant	External Subcontracting, Burnaby, British Columbia
Kaitlyn Gardner	Account Manager Assistant	Internal Subcontracting, Fort Collins, Colorado

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Wednesday, August 26, 2020

Heather McKenzie
ALS Environmental
8081 Lougheed Hwy, Suite 100
Burnaby, BC V5A 1W9

Re: ALS Workorder: 2008199
Project Name:
Project Number: WR2000608

Dear Ms. McKenzie:

One water sample was received from ALS Environmental, on 8/10/2020. The sample was scheduled for the following analysis:

Radium-226

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained from ALS Environmental.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental
Katie M. OBrien
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
AIHA	214884
Alaska (AK)	UST-086
Alaska (AK)	CO01099
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
PJ-LA (DoD ELAP/ISO 170250)	95377
Louisiana (LA)	05057
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280

2008199

Radium-226:

The sample was prepared and analyzed according to the current revision of SOP 783.

All acceptance criteria were met.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 2008199
Client Name: ALS Environmental
Client Project Name:
Client Project Number: WR2000608
Client PO Number: WR2000608

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
WR2000608-001	2008199-1		WATER	04-Aug-20	7:10

Chain of Custody

Whitehorse - Environmental
#12 151 Industrial Road
Whitehorse YT Canada Y1A
2V3

3717

2008199

Destination Lab:	**USA - Fort Collins**
Address:	225 Commerce Drive Fort Collins CO United States 80524
Client:	Minto Explorations Ltd.
Work Order Number:	**WR2000608**
Original Receipt Date/Time	Instructions Received
04/08/2020 15:50	

Relinquished By	
Date/Time	
Received By	
Date/Time	8/10/20 12:45
Receipt Temp	amb

Return as Indicated:	Results:	Invoice:	Electronic Data:
	Attention: Heather McKenzie		

ALS Sample ID	Client ID	Matrix	Container Type	Test Codes	Method Description	Due Date	Sampling Date and Time	Remarks
WR2000608-001	W3	Water	HDPE (nitric acid)	RA226-MMER	Radium-226 by Radon Emanation	24-08-2020	04/08/2020 07:10	

ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client Name/ID: ALS Burnaby Workorder No: 2008199

Project Manager: KMO Initials: TM Date: 8/10/20

1. Are airbills / shipping documents present and/or removable?	☐ Drop Off	☑ YES	☐ NO	
2. Are custody seals on **shipping** containers intact?	☑ NONE	☐ YES	☐ NO*	
3. Are custody seals on **sample** containers intact?	☑ NONE	☐ YES	☐ NO*	
4. Is there a COC (chain-of-custody) present?		☑ YES	☐ NO*	
5. Is the COC in agreement with samples received? (IDs, dates, times, # of samples, # of containers, matrix, requested analyses, etc.)		☑ YES	☐ NO*	
6. Are short-hold samples present?		☐ YES	☑ NO	
7. Are all samples within holding times for the requested analyses?		☑ YES	☐ NO*	
8. Were all sample containers received intact? (not broken or leaking)		☑ YES	☐ NO*	
9. Is there sufficient sample for the requested analyses?		☑ YES	☐ NO*	
10. Are samples in proper containers for requested analyses? (form 250, *Sample Handling Guidelines*)		☑ YES	☐ NO*	
11. Are all aqueous samples preserved correctly, if required?	☐ N/A	☐ YES	☑ NO*	
12. Were unpreserved samples pH checked, if required?	☑ N/A	☐ YES	☐ NO	
13. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, radon) free of bubbles > 6 mm in diameter?	☑ N/A	☐ YES	☐ NO	
14. Were the samples shipped on ice?		☐ YES	☑ NO	
15. Were cooler temperatures measured at 0.1 - 6.0°C? IR gun used+: ☐ #3 ☐ #5	☑ Rad Only	☐ YES	☑ NO	

Cooler #:	1	2	3	4	5
Temperature (°C):	amb	amb	amb	amb	amb
# of custody seals on cooler:	0	0	0	0	0
External mR/hr reading:	8	8	8	7	10
Background mR/hr reading:	13				

Were external mR/hr readings ≤ two times background and within DOT acceptance criteria? (If no, see Form 008) ☐ N/A ☑ YES ☐ NO

* Please provide details below for 'NO' responses in gray boxes above - for 2 thru 5 & 7 thru 12, notify PM & continue w/ login.

11.) sample read initial pH of 6: added 1.0mL HNO3 (lot# 234822) to achieve pH<2.0

All client bottle ID's vs ALS lab ID's double-checked by: TM

If applicable, was the client contacted? ☐ YES ☐ N/A Contact Name Date:

Project Manager Signature / Date: 8/11/20

Form 201r30.xls
(06/04/2020)

+IR Gun #3, VWR SN 170647571
+IR Gun #5, VWR SN 192272629

EXPRESS WORLDWIDE WPX DHL

2020-08-07 MYDHL+ 1.0 / *30-0821*

From : ALS Environmental
Paul Chandra
100 - 8081 Lougheed Highway

V5A 1W9 BURNABY BC
Canada

Origin:
YVR

To : ALS Environmental - Fort Collins
Sample Receiving
225 Commerce Drive

Contact:
Sample Receiving

3-0 amb

80524 FORT COLLINS Colorado
United States of America

US-DEN-DEN

C

Day Time

Ref: Sublets

Pce/Shpt Weight Piece
28.0/67.0 lbs 1 / 3

WAYBILL 50 2467 8772

Contents:
Environmental W ater
Samples for Research

(2L)US80524+48000001

(J) JD01 4600 0080 2871 7322

EXPRESS WORLDWIDE WPX DHL

2020-08-07 MYDHL+ 1.0 / *30-0821*

From : ALS Environmental
Paul Chandra
100 - 8081 Lougheed Highway

V5A 1W9 BURNABY BC
Canada

Origin:
YVR

To : ALS Environmental - Fort Collins
Sample Receiving
225 Commerce Drive

Contact:
Sample Receiving

80524 FORT COLLINS Colorado
United States of America

US-DEN-DEN

C

Day Time

Ref: Sublets

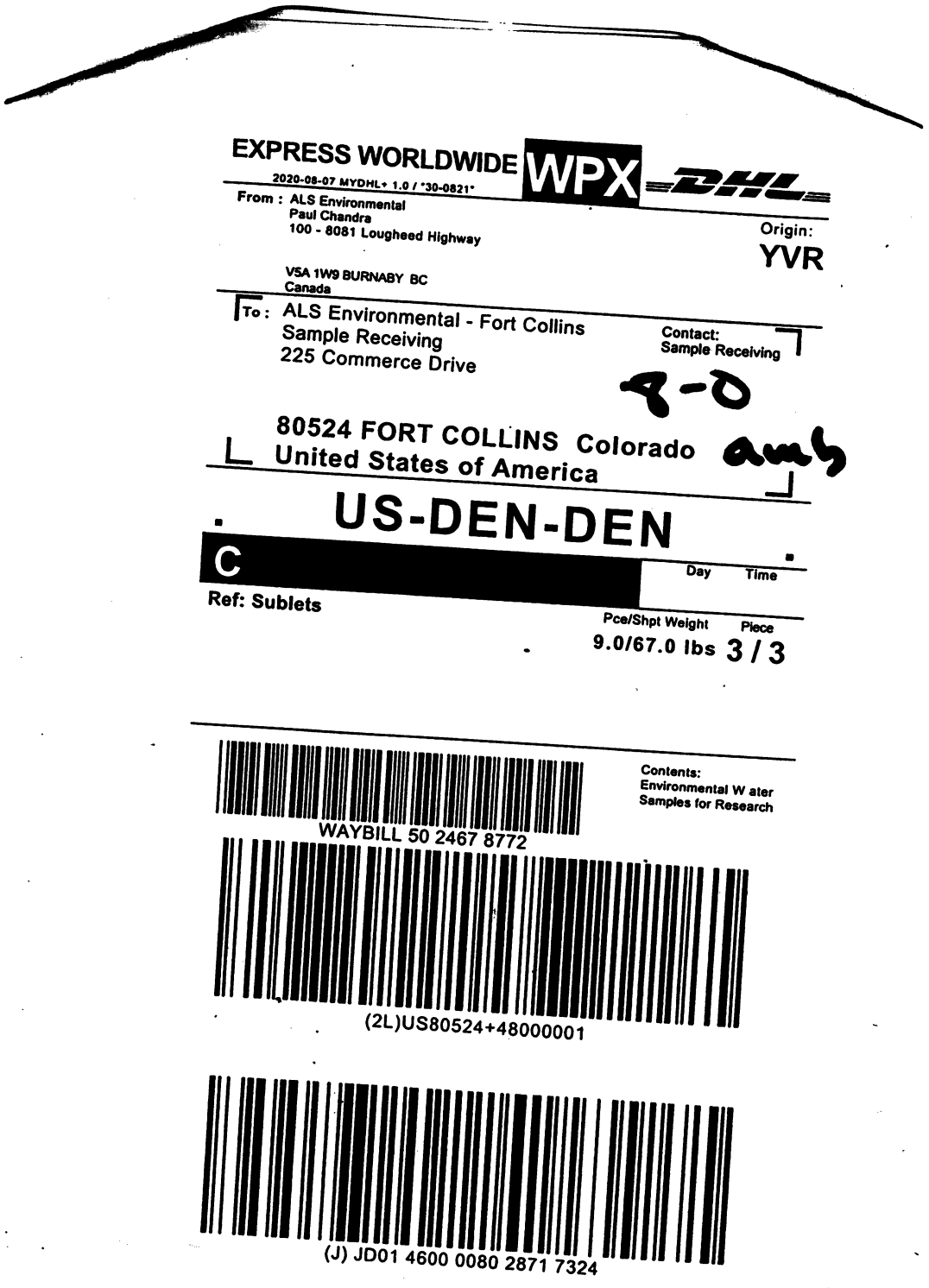
Pce/Shpt Weight Piece
30.0/67.0 lbs 2 / 3

WAYBILL 50 2467 8772

Contents:
Environmental W ater
Samples for Research

(2L)US80524+48000001

(J) JD01 4600 0080 2871 7323



EXPRESS WORLDWIDE WPX DHL

2020-08-07 MYDHL+ 1.0 / *30-0821*

From : ALS Environmental
Paul Chandra
100 - 8081 Lougheed Highway

V5A 1W9 BURNABY BC
Canada

Origin:
YVR

To : ALS Environmental - Fort Collins
Sample Receiving
225 Commerce Drive

Contact:
Sample Receiving

9-0

80524 FORT COLLINS Colorado
United States of America

amb

US-DEN-DEN

C

Day Time

Ref: Sublets

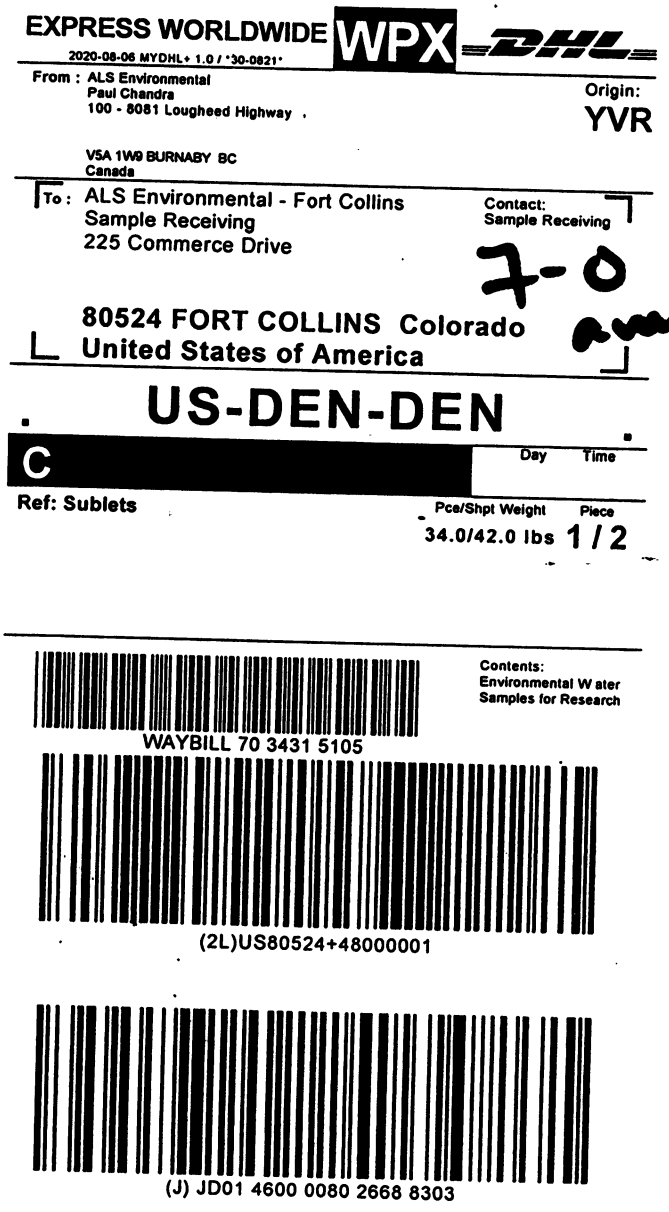
Pce/Shpt Weight Piece
9.0/67.0 lbs 3 / 3

Contents:
Environmental W ater
Samples for Research

WAYBILL 50 2467 8772

(2L)US80524+48000001

(J) JD01 4600 0080 2871 7324



EXPRESS WORLDWIDE WPX DHL

2020-08-06 MYDHL+ 1.0 / *30-0821*

From : ALS Environmental
Paul Chandra
100 - 8081 Lougheed Highway ,

V5A 1W9 BURNABY BC
Canada

Origin:
YVR

To : ALS Environmental - Fort Collins
Sample Receiving
225 Commerce Drive

Contact:
Sample Receiving

7-0
ams

80524 FORT COLLINS Colorado
United States of America

US-DEN-DEN

C

Day Time

Ref: Sublets

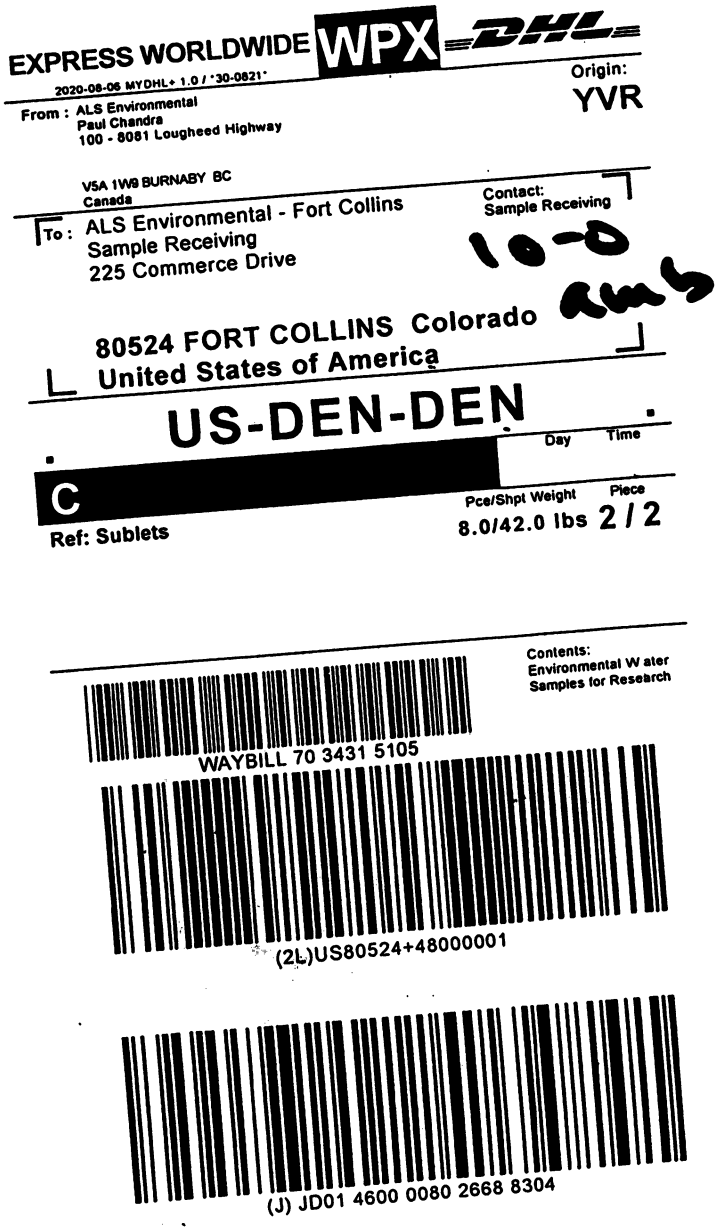
Pce/Shpt Weight Piece
34.0/42.0 lbs 1 / 2

Contents:
Environmental W ater
Samples for Research

WAYBILL 70 3431 5105

(2L)US80524+48000001

(J) JD01 4600 0080 2668 8303


EXPRESS WORLDWIDE WPX DHL

2020-08-06 MYDHL+ 1.0 / *30-0821*

Origin:
YVR

From : ALS Environmental
Paul Chandra
100 - 8081 Lougheed Highway

V5A 1W9 BURNABY BC
Canada

To : ALS Environmental - Fort Collins
Sample Receiving
225 Commerce Drive

Contact:
Sample Receiving

10-0 amb

80524 FORT COLLINS Colorado
United States of America

US-DEN-DEN

Day Time

C

Pce/Shpt Weight Piece
8.0/42.0 lbs 2 / 2

Ref: Sublets

Contents:
Environmental W ater
Samples for Research

WAYBILL 70 3431 5105

(2L)US80524+48000001

(J) JD01 4600 0080 2668 8304

Client:	ALS Environmental	**Date:**	*26-Aug-20*
Project:	WR2000608	**Work Order:**	2008199
Sample ID:	WR2000608-001	**Lab ID:**	2008199-1
Legal Location:		**Matrix:**	WATER
Collection Date:	8/4/2020 07:10	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**SOP 783**		Prep Date: **8/14/2020**		PrepBy: **TRW**
Ra-226	0.0053 (+/- 0.0046)	U	0.0064	BQ/l	NA	8/25/2020 13:47
Carr: BARIUM	*97*		*40-110*	*%REC*	DL = NA	8/25/2020 13:47

Client:	ALS Environmental	**Date:**	*26-Aug-20*
Project:	WR2000608	**Work Order:**	2008199
Sample ID:	WR2000608-001	**Lab ID:**	2008199-1
Legal Location:		**Matrix:**	WATER
Collection Date:	8/4/2020 07:10	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed

Explanation of Qualifiers

Radiochemistry:

- "Report Limit" is the MDC

U or ND - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.
# - Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.
G - Sample density differs by more than 15% of LCS density.
D - DER is greater than Control Limit

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).

U or ND - Indicates that the compound was analyzed for but not detected.

E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.

M - Duplicate injection precision was not met.

N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.

Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.

* - Duplicate analysis (relative percent difference) not within control limits.

S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

U or ND - Indicates that the compound was analyzed for but not detected.

B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.

E - Analyte concentration exceeds the upper level of the calibration range.

J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).

A - A tentatively identified compound is a suspected aldol-condensation product.

X - The analyte was diluted below an accurate quantitation level.

* - The spike recovery is equal to or outside the control criteria used.

+ - The relative percent difference (RPD) equals or exceeds the control criteria.

G - A pattern resembling gasoline was detected in this sample.

D - A pattern resembling diesel was detected in this sample.

M - A pattern resembling motor oil was detected in this sample.

C - A pattern resembling crude oil was detected in this sample.

4 - A pattern resembling JP-4 was detected in this sample.

5 - A pattern resembling JP-5 was detected in this sample.

H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.

L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.

Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
- gasoline
- JP-8
- diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

QC BATCH REPORT

Batch ID: **RE200814-1-1** Instrument ID **Alpha Scin** Method: **Radium-226 by Radon Emanation**

LCS Sample ID: **RE200814-1** Units: **BQ/l** Analysis Date: **8/25/2020 14:25**

Client ID: Run ID: **RE200814-1A** Prep Date: **8/14/2020** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.51 (+/- 0.378)	0.0142	1.719		87.9	67-120					P,Y1,M3
Carr: BARIUM	17300		17080		101	40-110					Y1

LCSD Sample ID: **RE200814-1** Units: **BQ/l** Analysis Date: **8/25/2020 14:25**

Client ID: Run ID: **RE200814-1A** Prep Date: **8/14/2020** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.62 (+/- 0.405)	0.0118	1.719		94.4	67-120		1.51	0.2	2.1	P,M3
Carr: BARIUM	17000		17090		99.6	40-110		17300			

MB Sample ID: **RE200814-1** Units: **BQ/l** Analysis Date: **8/25/2020 14:25**

Client ID: Run ID: **RE200814-1A** Prep Date: **8/14/2020** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	0.0017 (+/- 0.0038)	0.0067									Y1,U
Carr: BARIUM	17500		17090		103	40-110					Y1

The following samples were analyzed in this batch: 2008199-1

Toxicity Testing on Sample WR2000608-001 W3

Collected August 4, 2020

Final Report

September 11, 2020

Submitted to: **ALS Environmental**
Burnaby, BC

8664 Commerce Court, Burnaby, BC V5A 4N7

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SIGNATURE PAGE



Report By:
Jeslin Wijaya, B.Sc
Laboratory Biologist



Reviewed By:
Andreas Diewald, B.Sc
Senior Reviewer

This report has been prepared by Nautilus Environmental Company Inc. based on data and/or samples provided by our client and the results of this study are for their sole benefit. Any reliance on the data by a third party is at the sole and exclusive risk of that party. The results presented here relate only to the samples tested.

SUMMARY

Sample Information and Test Type

Sample ID	WR2000608-001 W3
Sample collection date	August 4, 2020
Sample receipt date	August 6, 2020
Sample receipt temperature	10.7 – 11.4°C
Test types	72-h *Pseudokirchneriella subcapitata* growth inhibition

Summary of Results

Cell Yield	% v/v
Growth IC25	>95.2
Growth IC50	>95.2

IC = Inhibition Concentration

1.0 INTRODUCTION

Nautilus Environmental Company Inc. conducted a 72-h *Pseudokirchneriella subcapitata* growth inhibition toxicity test for ALS Environmental on a sample identified as WR2000608-001 W3. The sample was collected on August 4, 2020 and delivered to the Nautilus Environmental laboratory in Burnaby, BC on August 6, 2020. The sample was transported in three 1L plastic containers and was received at a temperature of 10.7 – 11.4°C. The sample was stored in the dark at 4 ± 2°C prior to testing.

This report describes the results of the toxicity test. Copies of raw laboratory data sheets and statistical analyses are provided in Appendix A. The chain-of-custody form is provided in Appendix B.

2.0 METHODS

Methods for the toxicity test are summarized in Table 1. Testing was conducted according to procedures described by Environment Canada (2007). Statistical analyses were performed using CETIS (Tidepool Scientific Software, 2013).

Table 1. Summary of test conditions: 72-h *Pseudokirchneriella subcapitata* growth inhibition test.

Test species	*Pseudokirchneriella subcapitata*, strain CPCC #37
Organism source	In-house axenic culture, obtained from Canadian Phycological Culture Center, and originally isolated from Nivelta River, Norway.
Organism age	3-to 7-day old culture in logarithmic growth phase
Test type	Static
Test duration	72 hours
Test vessel	Microplate
Test volume	220 µL
Test concentrations	Seven concentrations, plus laboratory control
Test replicates	4 per treatment; 8 for laboratory control
Number of organisms	10,000 cells/mL
Control/dilution water	Deionized water supplemented with nutrients
Test solution renewal	None
Test temperature	24 ± 2°C
Feeding	None
Light intensity	3600 to 4400 lux
Photoperiod	24 hours light
Aeration	None
Test measurements	Test area temperature measured daily; temperature and pH measured at test initiation; pH of two control wells measured at test termination
Test protocol	Environment Canada (2007), EPS 1/RM/25
Statistical software	CETIS Version 1.9.4
Test endpoint	Algal cell growth inhibition
Test acceptability criteria for controls	>16-fold increase in number of algal cells; CV ≤ 20%; no trend when analyzed using Mann-Kendall test
Reference toxicant	Zinc (added as $ZnSO_4$)

3.0 RESULTS

Results of the toxicity test on sample WR2000608-001 W3 are summarized in Table 2. There were no adverse effects on cell yield of *P. subcapitata*, resulting in IC25 and IC50 values of >95.2%. In addition, stimulatory effects were observed in all test concentrations; stimulation ranged from 23.3 to 240.4%.

Table 2. Results: *Pseudokirchneriella subcapitata* growth inhibition test.

Concentration (% v/v)	Cell Yield (x 10^4 cells/mL) (Mean ± SD)	Stimulation (%)
Laboratory Control	48.2 ± 4.2	--
1.5	59.5 ± 2.6*	23.3
3.0	77.2 ± 6.2*	60.1
6.0	86.8 ± 5.4*	79.8
11.9	107.8 ± 4.6*	123.3
23.8	164.2 ± 5.9*	240.4
47.6	154.0 ± 6.7*	219.2
95.2	149.0 ± 8.3*	208.8
Test Endpoint (% v/v)		
IC25	>95.2	--
IC50	>95.2	--

SD = Standard Deviation, IC = Inhibition Concentration
* = Indicates cell yield was significantly greater than the laboratory control

4.0 QA/QC

The health history of the test organisms used in the exposure was acceptable and met the requirements of the Environment Canada protocol. The test met all control acceptability criteria and water quality parameters remained within ranges specified in the protocol throughout the tests. Uncertainty associated with the test is best described by the standard deviation around the mean and/or the confidence intervals around the point estimates.

Results of the reference toxicant test conducted during the testing program are summarized in Table 3. Results for this test fell within the range for organism performance of the mean and two standard deviations, based on historical results obtained by the laboratory with this test. Thus, the sensitivity of the organisms used in the test was appropriate. The reference toxicant test was performed under the same conditions as those used for the sample.

Table 3. Reference toxicant results.

Test Species	Endpoint	Historical Mean (2 SD Range)	CV (%)	Test Date
P. subcapitata	Growth (IC50): 29.7 µg/L Zn	30.4 (24.4 – 37.8)	11	August 11, 2020

SD = Standard Deviation, CV = Coefficient of Variation, IC = Inhibition Concentration

5.0 REFERENCES

Environment Canada. 2007. Biological test method: growth inhibition test using the freshwater alga. Environmental Protection Series, Report EPS 1/RM/25. Second Edition, March 2007. Environment Canada, Method Development and Application Section, Environmental Science and Technology Centre, Science and Technology Branch, Ottawa, ON. 53 pp.

Tidepool Scientific Software. 2013. CETIS comprehensive environmental toxicity information system, version 1.9.4.11 Tidepool Scientific Software, McKinleyville, CA. 275 pp.

APPENDIX A – *Pseudokirchneriella subcapitata* Toxicity Test Data

Pseudokirchneriella subcapitata Summary Sheet

Client: ALS
Work Order No.: 201493

Start Date: Aug 7/20
Set up by: MG

Sample Information:

Sample ID: WR2000 608-001 W3
Sample Date: Aug 4/20
Date Received: Aug 6/20
Sample Volume: 1 x 1L

Test Organism Information:

Culture Date: July 31/20
Age of culture (Day 0): 7d

Zinc Reference Toxicant Results:

Reference Toxicant ID: SC204
Stock Solution ID: 203101
Date Initiated: Aug 11/20

72-h IC50 (95% CL): 29.7 (24.8 - 33.1) mg/L Zn

72-h IC50 Reference Toxicant Mean and Range: 30.4 (24.4 - 37.8) mg/L Zn CV (%): 11

Test Results:

	Algal Growth
IC25 %(v/v) (95% CL)	>99.2
IC50 %(v/v) (95% CL)	>99.2

Reviewed by: JCh

Date reviewed: Aug. 31/20

72-h Algal Growth Inhibition Toxicity Test
Water Quality Measurements

Client: ALS | Setup by: MG

Sample ID: WR2000608-001W3 | Test Date/Time: Aug 7/20 0910h

Work Order No.: 201493 | CER #: 4

Test Species: *Pseudokirchneriella subcapitata*

Culture Date: July 31/20 | Age of Culture: 7d 5h | Culture Health: Good

Culture Count: 1 325 2 340 | Average: 332.5 | Culture Cell Density (c1): 332.5x10⁴ cells/mL

v1 = 220,000 cells/mL x 100 mL / (c1) 332.5x10⁴ cells/ml = 6.6 mL

Time Zero Counts: 1 22 2 23 | Average: 22.5

No. of Cells/mL: 22.5x10⁴ | Initial Density: # cells/mL ÷ 220 µL x 10 µL = 10227 cells/mL

Concentration %(v/v)	Water Quality pH 0 h	Water Quality Temp (°C) 0 h	Incubator Temperature (°C) 0 h	24 h	48 h	72 h	Microplates rotated 2X per day? 0 h	24 h	48 h	72 h
Control	7.0	23.0	25.0	25.0	25.0	25.0	✓	✓	✓	✓
1.5	7.1	23.0					✓	✓	✓	
3	7.1	23.0					✓	✓	✓	
6	7.3	23.0					✓	✓	✓	
11.9	7.7	23.0					✓	✓	✓	
23.8	7.9	23.0					✓	✓	✓	
47.6	8.0	23.0					✓	✓	✓	
95.8	8.2	23.0	↓	↓	↓	—	✓	✓	✓	—
Initials	MG	MG	MG	MF	SSK	[illegible]	MG	MF	SSK	[illegible]

Initial control pH: Well 1: 7.0 | Well 2: 7.0

Final control pH: Well 1: 7.3 | Well 2: 7.3

Light intensity (lux): 4160 | Date measured: Aug 7/20

Thermometer: 4 | Light meter: 1 | pH meter/probe: 11

Sample Description: clear, colourless, odourless, no particulates.

Comments:

Reviewed: JCM | Date reviewed: Aug. 31/20

Pseudokirchneriella subcapitata Toxicity Test Data Sheet
72-h Algal Cell Counts

Client: ALS
Start Date/Time: Aug 7/20 @ 0810h
Work Order #: 201493
Termination Date: Aug 10/20 @ 0810h
Sample ID: WR2000608-001 W3
Test set up by: MG
%(v/v)

Concentration	Rep	Count 1	Count 2	Count 3	Count 4	Comments	Initials
Control	A	51					MG
	B	42					
	C	52					
	D	54					
	E	49					
	F	44					
	G	52					
	H	50					
1.5	A	58					
	B	61					
	C	59					
	D	64					
3	A	85					
	B	78					
	C	70					
	D	80					
6	A	94					
	B	81					
	C	87					
	D	89					
11.9	A	103					
	B	114					
	C	108					
	D	110					
23.8	A	158					
	B	163					
	C	169					
	D	171					
47.6	A	164					
	B	156					
	C	149					
	D	151					
95.8	A	141					
	B	161					
	C	150					
	D	148					

Comments:

Reviewed by: JCh
Date Reviewed: Aug 31/20

Pseudokirchneriella subcapitata Algal Counts

Client: ALS
WO#: 201493
Sample ID: WR2000608-001 W3

Start Date/Time: 07-Aug-20 @ 0810h
Termination Date/Time: 10-Aug-20 @ 0810h

Initial Cell Density: 10227 cell/mL

									225000
									0.22
									0.01
Concentration %(v/v)	Rep	Count 1 (x 10^4)	Count 2 (x 10^4)	Count 3 (x 10^4)	Count 4 (x 10^4)	Mean (x 10^4)	Cell Yield (x 10^4) cell/mL		10227.27
Control	A	51				51	50.0	mean	48.2
	B	42				42	41.0	SD	4.16619
	C	52				52	51.0	CV	8.638661
	D	54				54	53.0		
	E	49				49	48.0		
	F	44				44	43.0		
	G	52				52	51.0		
	H	50				50	49.0		
1.5	A	58				58	57.0		
	B	61				61	60.0		
	C	59				59	58.0		
	D	64				64	63.0		
3	A	85				85	84.0		
	B	78				78	77.0		
	C	70				70	69.0		
	D	80				80	79.0		
6	A	94				94	93.0		
	B	81				81	80.0		
	C	87				87	86.0		
	D	89				89	88.0		
11.9	A	103				103	102.0		
	B	114				114	113.0		
	C	108				108	107.0		
	D	110				110	109.0		
23.8	A	158				158	157.0		
	B	163				163	162.0		
	C	169				169	168.0		
	D	171				171	170.0		
47.6	A	164				164	163.0		
	B	156				156	155.0		
	C	149				149	148.0		
	D	151				151	150.0		
95.2	A	141				141	140.0		
	B	161				161	160.0		
	C	150				150	149.0		
	D	148				148	147.0		

Reviewed by: _____

Date reviewed: Aug. 31/20

CETIS Analytical Report

Test Code/ID: 201493 / 02-0542-2354

EC Alga Growth Inhibition Test — **Nautilus Environmental**

Analysis ID:	08-9077-2161	**Endpoint:**	Cell Yield	**CETIS Version:**	CETISv1.9.4
Analyzed:	28 Aug-20 16:32	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1
Batch ID:	04-6297-5060	**Test Type:**	Cell Growth	**Analyst:**	Mimi Tran
Start Date:	07 Aug-20 08:10 ✓	**Protocol:**	EC/EPS 1/RM/25	**Diluent:**	Deionized Water + nutrients
Ending Date:	10 Aug-20 08:10 ✓	**Species:**	Pseudokirchneriella subcapitata	**Brine:**	
Test Length:	72h	**Taxon:**	Chlorophyta	**Source:**	In-House Culture **Age:** 7d ✓
Sample ID:	04-9667-2155	**Code:**	1D9A9D9B	**Project:**	
Sample Date:	04 Aug-20 06:10 ✓	**Material:**	Water Sample	**Source:**	ALS
Receipt Date:	06 Aug-20 16:29 ✓	**CAS (PC):**		**Station:**	WR2000608-001 W3 ✓
Sample Age:	74h (10.7 °C) ✓	**Client:**	ALS		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	1599297	200	Yes	Two-Point Interpolation

Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision(α:5%)
Extreme Value	Grubbs Extreme Value Test	2.228	2.991	0.7758	No Outliers Detected
Control Trend	Mann-Kendall Trend Test	2.228		1.0000	Non-Significant Trend in Controls

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	>95.2	n/a	n/a	<1.05	n/a	n/a
IC10	>95.2	n/a	n/a	<1.05	n/a	n/a
IC15	>95.2	n/a	n/a	<1.05	n/a	n/a
IC20	>95.2	n/a	n/a	<1.05	n/a	n/a
IC25	>95.2	n/a	n/a	<1.05	n/a	n/a
IC40	>95.2	n/a	n/a	<1.05	n/a	n/a
IC50	>95.2	n/a	n/a	<1.05	n/a	n/a

Cell Yield Summary

			Calculated Variate						Isotonic Variate	
Conc-%	Code	Count	Mean	Min	Max	Std Dev	CV%	%Effect	Mean	%Effect
0	N	8	48.25	41	53	4.166	8.64%	0.0%	105.8	0.0%
1.5		4	59.5	57	63	2.646	4.45%	-23.32%	105.8	0.0%
3		4	77.25	69	84	6.238	8.08%	-60.1%	105.8	0.0%
6		4	86.75	80	93	5.377	6.20%	-79.79%	105.8	0.0%
11.9		4	107.8	102	113	4.573	4.25%	-123.3%	105.8	0.0%
23.8		4	164.2	157	170	5.909	3.60%	-240.4%	105.8	0.0%
47.6		4	154	148	163	6.683	4.34%	-219.2%	105.8	0.0%
95.2		4	149	140	160	8.287	5.56%	-208.8%	105.8	0.0%

Cell Yield Detail

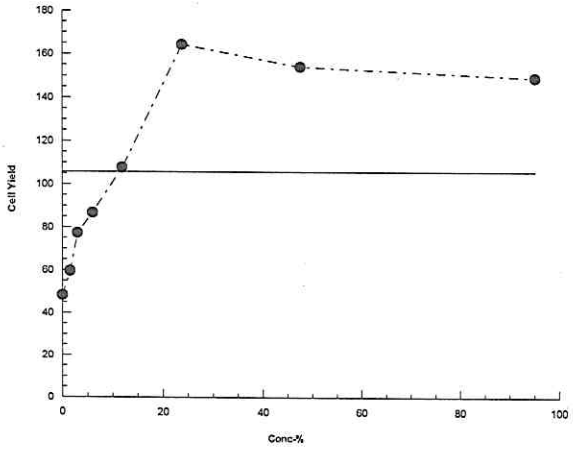
Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	N	50	41	51	53	48	43	51	49
1.5		57	60	58	63				
3		84	77	69	79				
6		93	80	86	88				
11.9		102	113	107	109				
23.8		157	162	168	170				
47.6		163	155	148	150				
95.2		140	160	149	147				

Analyst: MM QA: Aug. 31/20

EC Alga Growth Inhibition Test **Nautilus Environmental**

Analysis ID:	08-9077-2161	**Endpoint:**	Cell Yield	**CETIS Version:**	CETISv1.9.4
Analyzed:	28 Aug-20 16:32	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1

Graphics



Analyst: MM QA: Aug. 31/20

EC Alga Growth Inhibition Test — **Nautilus Environmental**

Analysis ID:	10-4924-4862	**Endpoint:**	Cell Yield	**CETIS Version:**	CETISv1.9.4
Analyzed:	28 Aug-20 16:32	**Analysis:**	Parametric-Control vs Treatments	**Status Level:**	1
Batch ID:	04-6297-5060	**Test Type:**	Cell Growth	**Analyst:**	Mimi Tran
Start Date:	07 Aug-20 08:10	**Protocol:**	EC/EPS 1/RM/25	**Diluent:**	Deionized Water + nutrients
Ending Date:	10 Aug-20 08:10	**Species:**	Pseudokirchneriella subcapitata	**Brine:**	
Test Length:	72h	**Taxon:**	Chlorophyta	**Source:**	In-House Culture **Age:** 7d
Sample ID:	04-9667-2155	**Code:**	1D9A9D9B	**Project:**	
Sample Date:	04 Aug-20 06:10	**Material:**	Water Sample	**Source:**	ALS
Receipt Date:	06 Aug-20 16:29	**CAS (PC):**		**Station:**	WR2000608-001 W3
Sample Age:	74h (10.7 °C)	**Client:**	ALS		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C < T	<1.5	1.5	n/a	>66.67	17.70%

Dunnett Multiple Comparison Test

Control	vs	Control II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Negative Control		1.5*	3.327	2.526	8.541	10	CDF	0.0078	Significant Effect
		3*	8.577	2.526	8.541	10	CDF	<1.0E-37	Significant Effect
		6*	11.39	2.526	8.541	10	CDF	<1.0E-37	Significant Effect
		11.9*	17.6	2.526	8.541	10	CDF	<1.0E-37	Significant Effect
		23.8*	34.31	2.526	8.541	10	CDF	<1.0E-37	Significant Effect
		47.6*	31.28	2.526	8.541	10	CDF	<1.0E-37	Significant Effect
		95.2*	29.8	2.526	8.541	10	CDF	<1.0E-37	Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Extreme Value	Grubbs Extreme Value Test	2.228	2.991	0.7758	No Outliers Detected
Control Trend	Mann-Kendall Trend Test	2.228		1.0000	Non-Significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	68767.4	9823.91	7	322.3	<1.0E-37	Significant Effect
Error	853.5	30.4821	28			
Total	69620.9		35			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	4.408	18.48	0.7317	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9804	0.9166	0.7582	Normal Distribution

Cell Yield Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	N	8	48.25	44.77	51.73	49.5	41	53	1.473	8.63%	0.00%
1.5		4	59.5	55.29	63.71	59	57	63	1.323	4.45%	-23.32%
3		4	77.25	67.32	87.18	78	69	84	3.119	8.08%	-60.10%
6		4	86.75	78.19	95.31	87	80	93	2.689	6.20%	-79.79%
11.9		4	107.8	100.5	115	108	102	113	2.287	4.24%	-123.32%
23.8		4	164.2	154.8	173.7	165	157	170	2.955	3.60%	-240.41%
47.6		4	154	143.4	164.6	152.5	148	163	3.342	4.34%	-219.17%
95.2		4	149	135.8	162.2	148	140	160	4.143	5.56%	-208.81%

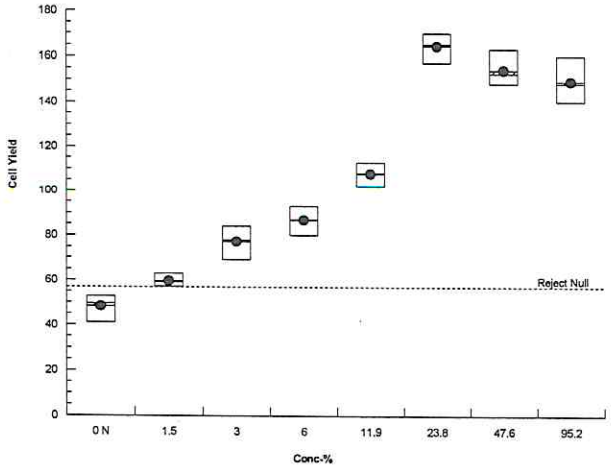
EC Alga Growth Inhibition Test **Nautilus Environmental**

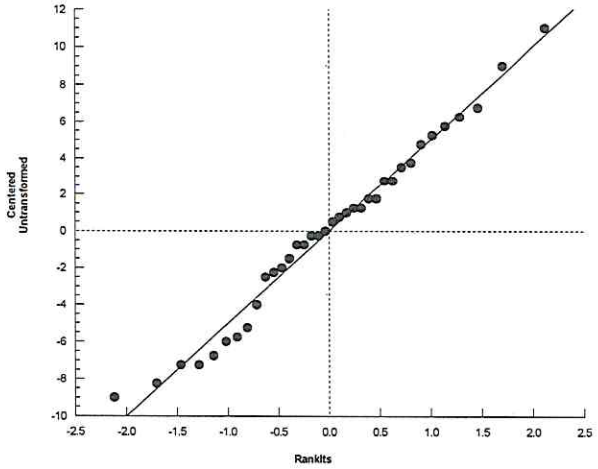
Analysis ID: 10-4924-4862 **Endpoint:** Cell Yield **CETIS Version:** CETISv1.9.4
Analyzed: 28 Aug-20 16:32 **Analysis:** Parametric-Control vs Treatments **Status Level:** 1

Cell Yield Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	N	50	41	51	53	48	43	51	49
1.5		57	60	58	63				
3		84	77	69	79				
6		93	80	86	88				
11.9		102	113	107	109				
23.8		157	162	168	170				
47.6		163	155	148	150				
95.2		140	160	149	147				

Graphics





Analyst: MN QA: Aug. 31/20

APPENDIX B – Chain-of-Custody Form

Chain of Custody

Whitehorse - Environmental
#12 151 Industrial Road
Whitehorse YT Canada Y1A 2V3

PREVIEW COC

Destination Lab:	**Nautilus Environmental (Burnaby)**
Address:	8664 Commerce Court Burnaby BC Canada V5A 4N7
Client:	Minto Explorations Ltd.
Work Order Number:	**WR2000608**
Original Receipt Date/Time	Instructions Received
04/08/2020 14:50	

Account Manager:

ALSEVDataSublet@ALSGlobal.com (PDF / EXCEL/ B2B)
ALS Vancouver Phone Number: 604-253-4188

Relinquished By	
Date/Time	
Received By	
Date/Time	
Receipt Temp	

Return as Indicated:	Results:	Invoice:	Electronic Data:
	Attention: Heather McKenzie		

ALS Sample ID	Client ID	Matrix	Container Type	Test Codes	Method Description	Due Date	Sampling Date and Time	Remarks
WR2000608-001	W3	Water	HDPE carboy LC50			24-08-2020	04/08/2020 06:10	
WR2000608-001	W3	Water	HDPE carboy LC50	DAP-LC50-48 , TRT-LC50-96	Survival/LC50 Daphnia Magna (48 hours), Survival/LC50 Rainbow Trout (96 hours)	24-08-2020	04/08/2020 06:10	
WR2000608-001	W3	Water	HDPE P/F	GRN-ALG-IC50	Green Algae Growth Potential/IC50 (P. subcapitata)	24-08-2020	04/08/2020 06:10	
WR2000608-001	W3	Water	HDPE P/F			24-08-2020	04/08/2020 06:10	
WR2000608-001	W3	Water	HDPE P/F			24-08-2020	04/08/2020 06:10	

~ regular TAT

TH
Aug. 6/20 @ 16:29

10.7-11.4

2 x 2.5 L
2 x 1 L
1 x 1 L

201491 - Rbt LC50 - cancelled, will resample
201492 - Dm LC50
201493 - Algae IC50

sample desc- clear, no colour, no odour, no particulates

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 2019-05-20 C

Page 1 of 1

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Ruth Cayetano

Report Format / Distribution	
Select Report Format:	☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	mintoenvironment@mintomine.com
Email 2	
Email 3	

Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	ap@mintomine.com
Email 2	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:		Major/Minor Code:	Routing Code:
PO / AFE:	232819 (MMER)	Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)		ALS Contact:	Sampler:

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)		EMERGENCY	
4 day [P4]	☐	1 Business day [E1]	☐
3 day [P3]	☐	Same Day, Weekend or Statutory holiday [E0]	☐
2 day [P2]	☐		

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	96hr LC50 RainbowTrout	48hr - LC50 Daphnia	7day - RainbowTroutEmbryoToxicity	7day - Ceriodaphnia	7day - Lemma minor	Alga 72-h Growth Inhibition	7day - Flathead Minnow	Ra226	Number of Containers
	W3	4-Aug-20	06:10	Water	R								2 /
	W3	4-Aug-20	06:10	Water		R							2 /
	W3	4-Aug-20	06:10	Water						R			1 /
	W3	4-Aug-20	06:10	Water								R	1 /

Environmental Division Whitehorse

Work Order Reference

WR2000608

Telephone : + 1 867 668 6689

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☑ NO	
Are samples for human drinking water use? ☐ YES ☑ NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
4	12	12			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Chris W	Date: 19-May-20	Time:	Received by:	Date: July 4/2020	Time: 2:58	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

END OF REPORT

Acute Toxicity Test Results

Sample WR2000608-001 W3,
collected August 4, 2020

Final Report

August 20, 2020
Revised November 2, 2020

Submitted to: **ALS Environmental**
Burnaby, BC

8664 Commerce Court, Burnaby, BC V5A 4N7

SAMPLE INFORMATION

Sample ID	Dates				Receipt temperature
	Collected	Received	Rainbow trout test initiation	*Daphnia magna* test initiation	
WR2000608-001 W3	04-Aug-20 at 0610h	06-Aug-20 at 1629h	n/t	07-Aug-20 at 1245h	10.7 – 11.4°C

N/t = Not tested (insufficient suitable fish at laboratory; client will resample)

TESTS

- *Daphnia magna* 48-h LC50 test

RESULTS

Toxicity test results

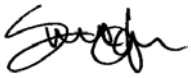
Sample ID	LC50 (% v/v)
WR2000608-001 W3	>100

LC = Lethal Concentration

QA/QC

QA/QC summary	*Daphnia magna*
Reference toxicant LC50 (95% CL)	6.8 (5.7 – 8.1) g/L NaCl[1]
Reference toxicant historical mean (2 SD range)	6.4 (4.9 – 8.4) g/L NaCl
Reference toxicant CV	13%
Organism health history	Acceptable
Protocol deviations	None
Water quality range deviations	None
Control performance	Acceptable
Test performance	Valid

[1] Test date: July 28, 2020, LC = Lethal Concentration, SD = Standard Deviation, CL = Confidence Limits, CV = Coefficient of Variation



Report By:
Yvonne Lam, B.Sc.
Laboratory Biologist



Reviewed By:
Andy Diewald, B.Sc.
Senior Analyst

This report has been prepared by Nautilus Environmental Company Inc. based on data and/or samples provided by our client and the results of this study are for their sole benefit. Any reliance on the data by a third party is at the sole and exclusive risk of that party. The results presented here relate only to the samples tested.

APPENDIX A – Summary of test conditions

Table 1. Summary of test conditions: 48-h *Daphnia magna* LC50 test.

Test species	*Daphnia magna*
Organism source	In-house culture
Organism age	<24-hour old neonates
Test type	Static
Test duration	48 hours
Test vessel	250-mL glass beaker
Test volume	200 mL
Test solution depth	6 cm
Test concentrations	Five concentrations, plus laboratory control
Test replicates	1 per treatment
Number of organisms	10 per replicate
Control/dilution water	Moderately-hard reconstituted water + 2.5 µg/L Se
Test solution renewal	None
Test temperature	20 ± 2°C
Feeding	None
Light intensity	400 to 800 lux
Photoperiod	16 hours light / 8 hours dark
Aeration	None
Test measurements	Temperature, dissolved oxygen and pH measured daily; salinity, hardness and alkalinity measured in the undiluted sample at test initiation; conductivity measured at test initiation and termination; survival checked daily
Test protocol	Environment Canada (2000), EPS 1/RM/14, with 2016 amendments
Statistical software	CETIS Version 1.9.4
Test endpoint	Survival (48-hour LC50)
Test acceptability criterion for controls	Survival ≥90%
Reference toxicant	Sodium chloride (NaCl)

APPENDIX B – Toxicity test data

Daphnia magna Summary Sheet

Client: ALS Environmental
Work Order No.: 201492

Start Date/Time: Aug 07/2020 @ 1245h
Test Species: *Daphnia magna*
Set up by: MK

Sample Information:

Sample ID: WR2000608-001 W3
Sample Date: Aug 04/2020
Date Received: Aug 06/2020
Sample Volume: 2 x 1L

Test Validity Criteria:

≥ 90% mean control survival and/or mobility and ≤2 daphnids exibit immobility and/or mortality in any single control replicate.

WQ Ranges:

T (°C) = 20 ± 2; DO (mg/L) = 3.6 to 9.4; pH = 6 to 8.5

Test Organism Information:

Broodstock No.:	071520B
Age of young (Day 0):	<24 h
Avg No. young per brood in previous 7 d:	24
Mortality (%) in previous 7 d:	0
Days to first brood:	6

NaCl Reference Toxicant Results:

Reference Toxicant ID:	DmDC54
Stock Solution ID:	20 NaCl 3
Date Initiated:	July 28/2020
48-h LC50 (95% CL):	6.8 (5.7 - 8.1) g/L NaCL

Reference Toxicant Mean and Historical Range: 6.4 (4.9 - 8.4) g/L NaCL
Reference Toxicant CV (%): 13

Test Results: The 48 h LC50 is estimated to be >100 % (v/v)

Reviewed by: A

Date reviewed: Aug 20/20

Freshwater Acute
48 Hour Toxicity Test Data Sheet

Client: ALS Environmental
Sample ID: WR2000608-001 W3
Work Order No.: 201492

Start Date/Time: Aug 07/2020 @ 1245
CER #: 5
No. Organisms/volume: 10/200mL
Test Organism: D.magna
Set up by: MF

Thermometer: CER#5 pH meter/probe: 6/6 DO meter/probe: 6/6 Cond./Salinity meter/probe: 6/6

Concentration % (v/v)	Rep	Number of Live Organisms 24	Number of Live Organisms 48	No. Immobilized 48	Temperature (°C) 0	Temperature (°C) 24	Temperature (°C) 48	Dissolved oxygen (mg/L) 0	Dissolved oxygen (mg/L) 24	Dissolved oxygen (mg/L) 48	pH 0	pH 24	pH 48	Conductivity (µS/cm) 0	Conductivity (µS/cm) 48
Control	A	10	10	0	19.5	19.5	19.5	8.6	8.1	8.1	8.1	8.2	8.1	345	348
	B														
	C														
	D														
6.25	A	10	10	0	19.5	19.5	19.5	8.6	8.1	8.2	8.0	8.2	8.2	357	359
	B														
	C														
	D														
12.5	A	10	10	0	19.5	19.5	19.5	8.6	8.1	8.2	8.0	8.3	8.3	370	374
	B														
	C														
	D														
25	A	10	10	0	20.0	19.5	19.5	8.6	8.2	8.2	8.0	8.3	8.4	395	397
	B														
	C														
	D														
50	A	10	10	0	20.0	19.5	19.5	8.7	8.2	8.2	8.0	8.4	8.4	446	447
	B														
	C														
	D				MF										
100	A	10	10	0	~~20.0~~	19.5	19.5	8.9	8.2	8.2	8.0	8.6	8.6	552	546
	B				20.0										
	C														
	D														
Technician Initials		M	SSK	MF	MF	M	MF	MF	M	SSK	MF	M	SSK	MF	SSK

	Hardness*	Alkalinity*
Concentration	*(mg/L as CaCo3)	
Control (MHW)	96	84.
Highest conc.	744	270
Hardness adjusted	—	—

	Initial WQ	Adjustment	Adjusted WQ
Temp (°C)	20.0		
DO (mg/L)	8.9		
pH	8.0		
Cond (µS/cm)	552		
Salinity (ppt)	0.3		

Comments: _____ Mortality: Heartbeat checked under microscope not req'd.

Sample Description: clear, no odour, no odour, no particulates

Batch#: 071520B 7-d previous # young/brood: 24 Previous 7-d Mortality (%): 0 Day of 1st Brood: 10.

Reviewed by: _____ Date reviewed: Aug 20/20

APPENDIX C – Chain-of-custody form

Chain of Custody
Whitehorse - Environmental
#12-451 Industrial Road
Whitehorse YT Canada Y1A 2V3

PREVIEW COC

Destination Lab:	**Nautilus Environmental (Burnaby)**
Address:	8664 Commerce Court Burnaby BC Canada V5A 4N7
Client:	Minto Explorations Ltd.
Work Order Number:	**WR2000608**
Original Receipt Date/Time	Instructions Received
04/08/2020 14:50	

Account Manager:
ALSEVDataSublet@ALSGlobal.com (PDF / EXCEL/ B2B)
ALS Vancouver Phone Number: 604-253-4188

Relinquished By	
Date/Time	
Received By	
Date/Time	
Receipt Temp	

Return as Indicated: Results: Invoice: Electronic Data:
Attention: Heather McKenzie

ALS Sample ID	Client ID	Matrix	Container Type	Test Codes	Method Description	Due Date	Sampling Date and Time	Remarks
WR2000608-001	W3	Water	HDPE carboy LC50			24-08-2020	04/08/2020 06:10	
WR2000608-001	W3	Water	HDPE carboy LC50	DAP-LC50-48 , TRT-LC50-96	Survival/LC50 Daphnia Magna (48 hours), Survival/LC50 Rainbow Trout (96 hours)	24-08-2020	04/08/2020 06:10	
WR2000608-001	W3	Water	HDPE P/F	GRN-ALG-IC50	Green Algae Growth Potential/IC50 (P. subcapitata)	24-08-2020	04/08/2020 06:10	
WR2000608-001	W3	Water	HDPE P/F			24-08-2020	04/08/2020 06:10	
WR2000608-001	W3	Water	HDPE P/F			24-08-2020	04/08/2020 06:10	

~ regular TAT

TH
Aug. 6/20 @ 16:29

10.7-11.4

2 x 2.5 L
2 x 1 L
1 x 1 L

201491 - Rbt LC50 - cancelled, will resample
201492 - Dm LC50
201493 - Algae IC50

sample desc- clear, no colour, no odour, no particulates

ALS Environmental

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

Affix ALS barcode label here (lab use only)

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3

Report Format / Distribution	
Select Report Format:	☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	mintoenvironment@mintomine.com
Email 2	
Email 3	

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)			EMERGENCY	
	4 day [P4]	☐	1 Business day [E1]	☐
	3 day [P3]	☐	Same Day, Weekend or Statutory holiday [E0]	☐
	2 day [P2]	☐		

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Ruth Cayetano

Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	ap@mintomine.com
Email 2	

Project Information	
ALS Account # / Quote #:	
Job #:	
PO / AFE:	232819 (MMER)
LSD:	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only)		ALS Contact:	Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	96hr LC50 RainbowTrout	48hr - LC50 Daphnia	7day - RainbowTroutEmbryoToxicity	7day - Ceriodaphnia	7day - Lemna minor	Alga 72-h Growth Inhibition	7day - Flathead Minnow	Ra226	Number of Containers
	W3	4-Aug-20	06:10	Water	R								2 /
	W3	4-Aug-20	06:10	Water		R							2 /
	W3	4-Aug-20	06:10	Water						R			1 /
	W3	4-Aug-20	06:10	Water								R	1 /

Environmental Division
Whitehorse
Work Order Reference
WR2000608

Telephone : + 1 867 668 6689

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☑ NO	
Are samples for human drinking water use? ☐ YES ☑ NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐		SIF Observations	Yes ☐ No ☐
Ice Packs ☐	Ice Cubes ☐	Custody seal intact	Yes ☐ No ☐
Cooling Initiated ☐			

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
4	12	12			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Chris W	Date: 19-May-20	Time:	Received by:	Date: July 4/2020	Time: 2:50	Received by:	Date:	Time:

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

END OF REPORT

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 2019-05-20 C

Page 1 of 1

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Ruth Cayetano

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: mintoenvironment@mintomine.com
Email 2:
Email 3:

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: ap@mintomine.com
Email 2:

Project Information

ALS Account # / Quote #:
Job #:
PO / AFE: 232819 (MMER)
LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#:
Major/Minor Code: Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only):

ALS Contact: Sampler:

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐

EMERGENCY: 1 Business day [E1] ☐ | Same Day, Weekend or Statutory holiday [E0] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	96hr LC50 RainbowTrout	48hr - LC50 Daphnia	7day - RainbowTroutEmbryoToxicity	7day - Ceriodaphnia	7day - Lemma minor	Alga 72-h Growth Inhibition	7day - Flathead Minnow	Ra226	Number of Containers
	W3	4-Aug-20	06:10	Water	R								2 /
	W3	4-Aug-20	06:10	Water		R							2 /
	W3	4-Aug-20	06:10	Water						R			1 /
	W3	4-Aug-20	06:10	Water								R	1 /

Environmental Division
Whitehorse
Work Order Reference
WR2000608

Telephone : +1 867 668 6689

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO

Are samples for human drinking water use? ☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
4	12	12			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Chris W	Date: 19-May-20	Time:	Received by:	Date: July 4/2020	Time: 2:50	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000664**	Page	: 1 of 2
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 11-Aug-2020 15:08
PO	: 232819 (MMER)	Date Analysis Commenced	: 25-Aug-2020
C-O-C number	: 2020-08-11 E	Issue Date	: 25-Aug-2020 16:11
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Kaitlyn Gardner	Account Manager Assistant	External Subcontracting, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Workorder Comments

Please see PDF attachment for toxicity data.

Analytical Results

Sub-Matrix: **Water** (Matrix: **Water**)					*Client sample ID*	**W3**	----	----	----	----
					Client sampling date / time	11-Aug-2020 06:45	----	----	----	----
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*		**WR2000664-001**	--------	--------	--------	--------
						Result	----	----	----	----
Bioassays										
trout bioassay LC50	----	TRT-LC50-96	-	-		see attached	----	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WR2000664**	Page	: 1 of 5
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 11-Aug-2020 15:08
PO	: 232819 (MMER)	Issue Date	: 25-Aug-2020 16:11
C-O-C number	: 2020-08-11 E		
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Bioassays : Survival/LC50 Rainbow Trout (96 hours)										
HDPE carboy P/F										
W3	TRT-LC50-96	11-Aug-2020	----	----	----		25-Aug-2020	----	----	

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

- **No Quality Control data available for this section.**

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by “mod”).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Survival/LC50 Rainbow Trout (96 hours)	TRT-LC50-96 Nautilus Environmental (Burnaby) - 8664 Commerce Court Burnaby British Columbia Canada V5A 4N7	Water	EPS1/RM/13	See attached report.

Acute Toxicity Test Results

Sample WR2000664-001 W3,
collected August 11, 2020

Final Report

August 25, 2020

Submitted to: **ALS Environmental**
Burnaby, BC

8664 Commerce Court, Burnaby, BC V5A 4N7

SAMPLE INFORMATION

Sample ID	Dates			Receipt temperature
	Collected	Received	Rainbow trout test initiation	
WR2000664-001 W3	11-Aug-20 at 0645h	12-Aug-20 at 1520h	14-Aug-20 at 1728h	13.9 – 14.1°C

TESTS

- Rainbow trout 96-h LC50 test

RESULTS

Toxicity test results

Sample ID	LC50 (% v/v)
WR2000664-001 W3	>100

LC = Lethal Concentration

QA/QC

QA/QC summary	Rainbow trout
Reference toxicant LC50 (95% CL)	93.3 (75.3 – 115.7) µg/L Zn[1]
Reference toxicant historical mean (2 SD range)	84.4 (32.0 – 222.5) µg/L Zn
Reference toxicant CV	51%
Organism health history	Acceptable
Protocol deviations	None
Water quality range deviations	None
Control performance	Acceptable
Test performance	Valid

[1]Test date: August 10, 2020, LC = Lethal Concentration, CL = Confidence Limits, SD = Standard Deviation, CV = Coefficient of Variation

Report By:
Yvonne Lam, B.Sc.
Laboratory Biologist

Reviewed By:
Andy Diewald, B.Sc.
Senior Analyst

This report has been prepared by Nautilus Environmental Company Inc. based on data and/or samples provided by our client and the results of this study are for their sole benefit. Any reliance on the data by a third party is at the sole and exclusive risk of that party. The results presented here relate only to the samples tested.

APPENDIX A – Summary of test conditions

Table 1. Summary of test conditions: 96-h rainbow trout (*Oncorhynchus mykiss*) LC50 test.

Test species	*Oncorhynchus mykiss*
Organism source	Hatchery
Organism age	Juvenile
Test type	Static
Test duration	96 hours
Test vessel	20-L glass aquarium
Test volume	10 to 20 L (depending on size of fish)
Test solution depth	≥15 cm
Test concentrations	Five concentrations, plus laboratory control
Test replicates	1 per treatment
Number of organisms	10 per replicate
Control/dilution water	Dechlorinated Metro Vancouver municipal tapwater
Test solution renewal	None
Test temperature	15 ± 1°C
Feeding	None
Light intensity	100 to 500 lux
Photoperiod	16 hours light / 8 hours dark
Aeration	6.5 ± 1 mL/min/L
Test measurements	Temperature, dissolved oxygen and pH measured daily; salinity measured in the undiluted sample at test initiation; conductivity measured at test initiation and termination; survival checked daily
Test protocol	Environment Canada (2000), EPS 1/RM/13, with 2007 & 2016 amendments
Statistical software	CETIS Version 1.9.4
Test endpoints	Survival (96-hour LC50)
Test acceptability criterion for controls	Survival ≥90%
Reference toxicant	Zinc (added as $ZnSO_4$)

APPENDIX B – Toxicity test data

Rainbow Trout Summary Sheet

Client: ALS Environmental

Start Date/Time: August 14, 2020; 1728h

Work Order No.: 201527

Test Species: *Oncorhynchus mykiss*

Test Validity Criteria:
≥ 90% control survival
WQ Ranges:
T (°C) = 15 ± 1; DO (mg/L) = 7.0 to 10.3; pH = 5.5 to 8.5

Sample Information:

Sample ID: WR2000664-001 W3
Sample Date: August 11, 2020
Date Received: August 12, 2020
Sample Volume: 2x30L
Other: -

Dilution Water:

Type: Dechlorinated Municipal Tap Water
Hardness (mg/L $CaCO_3$): 13
Alkalinity (mg/L $CaCO_3$): 16

Test Organism Information:

Batch No.: 072420
Source: Aqua Farms
No. Fish/Volume (L): 10/12L
Loading Density (g/L): 0.29
Mean Length ± SD (mm): 36 ± 4 Range: 30 – 42
Mean Weight ± SD (g): 0.35 ± 0.10 Range: 0.23 – 0.51

Zinc Reference Toxicant Results:

Reference Toxicant ID: RTZn191
Stock Solution ID: 20Zn02
Date Initiated: August 10, 2020
96-h LC50 (95% CL): 93.3 (75.3 – 115.7) µg/L Zn

Reference Toxicant Mean and Historical Range: 84.4 (32.0 – 222.5) µg/L Zn
Reference Toxicant CV (%): 51%

Test Results: The 96 hour LC50 is estimated to be >100% (v/v).

Reviewed by: [signature] Date reviewed: Aug 21/20

96-Hour Rainbow Trout Toxicity Test Data Sheet

Client/Project#: ALS Environmental
Sample I.D. WR2000664-001 W3
W.O. # 201527
RBT Batch #: 072420
Date Collected/Time: Aug 11/20 @ 06:45h
Date Setup/Time: Aug 14/20 @ 17:28h
CER #: 3
Sample Setup By:

Thermometer: CerT
D.O. meter/probe: 2/D2
Cond./Salinity meter/probe: 2/CP2
pH meter/probe: 2/P2

Number Fish/Volume: 10/12L
7-d % Mortality: 0.3
Total Pre-aeration Time (mins): 30
Aeration rate adjusted to 6.5 ± 1 mL/min/L? (Y/N): Y

Undiluted Sample WQ			
Parameters	Initial WQ	Adjustment	30 min WQ
Temp °C	16.0		16.0
D.O. (mg/L)	9.7		9.8
pH	7.8		7.9
Cond. (µS/cm)	550		551
Salinity (ppt)	0.3		0.3

Concentration	# Survivors							Temperature (°C)					Dissolved Oxygen (mg/L)					pH					Conductivity (µS/cm)	
(% v/v)	1	2	4	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	96
Ctrl				10	10	10	10	15.0	15.0	15.0	15.0	15.0	9.8	9.4	9.9	9.7	9.8	7.1	7.0	7.1	7.0	7.1	32	38
6.25				10	10	10	10	15.0	15.0	15.0	15.0	15.0	9.7	9.5	9.6	9.6	9.8	7.2	7.2	7.3	7.3	7.3	81	85
12.5				10	10	10	10	15.0	15.0	15.0	15.0	15.0	9.8	9.6	9.6	9.6	9.7	7.4	7.4	7.5	7.5	7.5	125	129
25				10	10	10	10	15.0	15.0	15.0	15.0	15.0	9.7	9.6	9.8	9.7	9.8	7.6	7.7	7.8	7.8	7.7	180	189 SM 184
50				10	10	10	10	15.5	15.0	15.0	15.0	15.0	9.8	9.7	9.8	9.7	9.7	7.7	7.9	8.0	8.0	8.0	302	304
100				10	10	10	10	16.0	15.0	15.0	15.0	15.0	9.8	9.7	9.6	9.7	9.7	7.9	8.2	8.4	8.3	8.3	551	549
Initials																								

Sample Description/Comments: clear yellow odourless liquid with no particulate

Fish Description at 96 h: all fish appear normal
Number of Stressed Fish at 96 h: 0
Other Observations:

Reviewed by:
Date Reviewed: Aug 21/20

APPENDIX C – Chain-of-custody form

Chain of Custody

Whitehorse - Environmental
#12 151 Industrial Road
Whitehorse YT Canada Y1A 2V3

3896

Destination Lab:	**Nautilus Environmental (Burnaby)**
Address:	8664 Commerce Court Burnaby BC Canada V5A 4N7
Client:	Minto Explorations Ltd.
Work Order Number:	**WR2000664**
Original Receipt Date/Time	Instructions Received
11/08/2020 15:08	12/08/2020 13:50

Relinquished By	
Date/Time	
Received By	
Date/Time	
Receipt Temp	

Return as Indicated: Results: Invoice: Electronic Data:

Attention: Heather McKenzie

ALS Sample ID	Client ID	Matrix	Container Type	Test Codes	Method Description	Due Date	Sampling Date and Time	Remarks
WR2000664-001	W3	Water	HDPE carboy P/F			19-08-2020	11/08/2020 06:45	

wo# 201527

2 x 20L

Temp: 13.9 - 14.1°C

@ 12Aug20 @ 1520h

Nautilus: Survival/LC50 Rainbow Trout (96 hours)

Heather McKenzie
Account Manager:

ALSEVDataSublet@ALSGlobal.com (PDF / EXCEL/ B2B)
ALS Vancouver Phone Number: 604-253-4188

END OF REPORT

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 2020-08-11 E

Page 1 of 1

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Ruth Cayetano

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: mintoenvironment@mintomine.com
Email 2:
Email 3:

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: ap@mintomine.com
Email 2:

Project Information

ALS Account # / Quote #:
Job #:
PO / AFE: 232819 (MMER)
LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#:
Major/Minor Code: Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only):
ALS Contact: Sampler:

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐

EMERGENCY: 1 Business day [E1] ☐ | Same Day, Weekend or Statutory holiday [E0] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	96hr LC50 RainbowTrout	48hr - LC50 Daphnia	7day - RainbowTroutEmbryoToxicity	7day - Ceriodaphnia	7day - Lemna minor	Alga 72-h Growth Inhibition	7day - Flathead Minnow	Ra226	Number of Containers
	W3	11-Aug-20	6:45	Water	R								2

Environmental Division Whitehorse
Work Order Reference
WR2000664

Telephone : +1 867 668 6689

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO
Are samples for human drinking water use? ☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C		FINAL COOLER TEMPERATURES °C	
11	9	10	10
11	8		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Ian Smith	Date: 2020-08-11	Time:	Received by:	Date: AUG 11 20	Time: 15:05	Received by: JC	Date: AUG 12 2020	Time: 13:50

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2001039**	Page	: 1 of 3
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 06-Oct-2020 13:45
PO	: 232819	Date Analysis Commenced	: 20-Oct-2020
C-O-C number	: 2020-10-06 C	Issue Date	: 02-Dec-2020 15:29
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Erin Gatdula	Account Manager Assistant	External Subcontracting, Burnaby, British Columbia
Erin Gatdula	Account Manager Assistant	Internal Subcontracting, Fort Collins, Colorado
Kaitlyn Gardner	Account Manager Assistant	External Subcontracting, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
Bq/L	Becquerels per litre
mg	milligram

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: W3	----	----	----	----
					Client sampling date / time: 06-Oct-2020 06:05	----	----	----	----
					WR2001039-001	--------	--------	--------	--------
					Result	----	----	----	----
Bioassays									
Ceriodaphnia dubia, growth	n/a	CER-SCR-7d	-	-	see attached	----	----	----	----
Ceriodaphnia dubia, survival	n/a	CER-SCR-7d	-	%	see attached	----	----	----	----
Daphnia magna LC50	----	DAP-LC50-48	-	-	See attached	----	----	----	----
green algae, growth	n/a	ALG-SCR-72h	-	-	see attached	----	----	----	----
lemna minor, dry weight	n/a	LEM-SCR-7d	-	mg	see attached	----	----	----	----
lemna minor, frond count	n/a	LEM-SCR-7d	-	-	see attached	----	----	----	----
trout bioassay LC50	----	TRT-LC50-96	-	-	See attached	----	----	----	----
trout, embryo viability	n/a	TRT-EA-SCR-7d	-	%	see attached	----	----	----	----
Radiological Parameters									
radium-226	13982-63-3	RA226-MMER	0.008	Bq/L	<0.008	----	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WR2001039**	Page	: 1 of 7
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 06-Oct-2020 13:45
PO	: 232819	Issue Date	: 02-Dec-2020 15:29
C-O-C number	: 2020-10-06 C		
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Bioassays : Embryo Development/Hatch/Screening Rainbow Trout Embryo-Alevin 7 days										
HDPE carboy LC50										
W3	TRT-EA-SCR-7d	06-Oct-2020	----	----	----		02-Dec-2020	----	----	
Bioassays : Growth/Screening Green Algae (P. subcapitata) 72 hours										
HDPE carboy LC50										
W3	ALG-SCR-72h	06-Oct-2020	----	----	----		02-Dec-2020	----	----	
Bioassays : Growth/Screening Lemna Minor (Duckweed) 7 days										
HDPE carboy LC50										
W3	LEM-SCR-7d	06-Oct-2020	----	----	----		02-Dec-2020	----	----	
Bioassays : Survival/LC50 Daphnia Magna 48 hours										
HDPE LC50										
W3	DAP-LC50-48	06-Oct-2020	----	----	----		20-Oct-2020	----	----	
Bioassays : Survival/LC50 Rainbow Trout (96 hours)										
HDPE carboy LC50										
W3	TRT-LC50-96	06-Oct-2020	----	----	----		20-Oct-2020	----	----	
Bioassays : Survival/Reproduction/Screening Ceriodaphnia dubia 7 days										
HDPE carboy LC50										
W3	CER-SCR-7d	06-Oct-2020	----	----	----		02-Dec-2020	----	----	
Radiological Parameters : Radium-226 by Radon Emanation										
HDPE (nitric acid)										
W3	RA226-MMER	06-Oct-2020	----	----	----		22-Oct-2020	180 days	16 days	✓

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

- **No Quality Control data available for this section.**

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Growth/Screening Green Algae (P. subcapitata) 72 hours	ALG-SCR-72h Nautilus Environmental (Burnaby) - 8664 Commerce Court Burnaby British Columbia Canada V5A 4N7	Water	EPS1/RM/25	See attached report.
Survival/Reproduction/Screening Ceriodaphnia dubia 7 days	CER-SCR-7d Nautilus Environmental (Burnaby) - 8664 Commerce Court Burnaby British Columbia Canada V5A 4N7	Water	EPS1/RM/21	See attached report.
Survival/LC50 Daphnia Magna 48 hours	DAP-LC50-48 Nautilus Environmental (Burnaby) - 8664 Commerce Court Burnaby British Columbia Canada V5A 4N7	Water	EPS1/RM/14	See attached report.
Growth/Screening Lemna Minor (Duckweed) 7 days	LEM-SCR-7d Nautilus Environmental (Burnaby) - 8664 Commerce Court Burnaby British Columbia Canada V5A 4N7	Water	EPS1/RM/37	See attached report.
Radium-226 by Radon Emanation	RA226-MMER Fort Collins - Environmental - 225 Commerce Drive Fort Collins Colorado United States 80524	Water	EPA 903.1	Radium-226 in sample was analyzed according to the current revision of SOP 783.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Embryo Development/Hatch/Screening Rainbow Trout Embryo-Alevin 7 days	TRT-EA-SCR-7d Nautilus Environmental (Burnaby) - 8664 Commerce Court Burnaby British Columbia Canada V5A 4N7	Water	EPS1/RM/28	See attached report.
Survival/LC50 Rainbow Trout (96 hours)	TRT-LC50-96 Nautilus Environmental (Burnaby) - 8664 Commerce Court Burnaby British Columbia Canada V5A 4N7	Water	EPS1/RM/13	See attached report.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **WR2001039**	Page	: 1 of 2
Client	: Minto Explorations Ltd.	Laboratory	: Whitehorse - Environmental
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Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 06-Oct-2020 13:45
PO	: 232819	Date Analysis Commenced	: 20-Oct-2020
C-O-C number	: 2020-10-06 C	Issue Date	: 02-Dec-2020 15:29
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Erin Gatdula	Account Manager Assistant	External Subcontracting, Burnaby, British Columbia
Erin Gatdula	Account Manager Assistant	Internal Subcontracting, Fort Collins, Colorado
Kaitlyn Gardner	Account Manager Assistant	External Subcontracting, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Toxicity Testing on Sample WR2001039-001 W3

Collected October 6, 2020

Final Report

December 1, 2020

Submitted to: **ALS Environmental**
Burnaby, BC

8664 Commerce Court, Burnaby, BC V5A 4N7

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SIGNATURE PAGE

Report By:
Jeslin Wijaya, B.Sc
Laboratory Biologist

Reviewed By:
Armando Tang, R.P. Bio
Senior Reviewer

This report has been prepared by Nautilus Environmental Company Inc. based on data and/or samples provided by our client and the results of this study are for their sole benefit. Any reliance on the data by a third party is at the sole and exclusive risk of that party. The results presented here relate only to the samples tested.

SUMMARY

Sample Information and Test Type

Sample ID	WR2001039-001 W3
Sample collection date	October 6, 2020
Sample receipt date	October 8, 2020
Sample receipt temperature	8.4 – 8.9°C
Test types	*Ceriodaphnia dubia* survival and reproduction 7-d rainbow trout (*Oncorhynchus mykiss*) embryo viability 7-d *Lemna minor* growth inhibition 72-h *Pseudokirchneriella subcapitata* growth inhibition

Summary of Results

Endpoint	% v/v
Ceriodaphnia. dubia	
Survival LC50	>100
Reproduction IC25	>100
Reproduction IC50	>100
Oncorhynchus mykiss	
Embryo viability EC25	>100
Embryo viability EC50	>100
Lemna minor	
Frond count IC25	>97
Frond count IC50	>97
Dry weight IC25	>97
Dry weight IC50	>97
Pseudokirchneriella subcapitata	
Growth IC25	>95.2
Growth IC50	>95.2

LC = Lethal Concentration, IC = Inhibition Concentration, EC = Effective Concentration

1.0 INTRODUCTION

Nautilus Environmental Company Inc. conducted sub-lethal toxicity tests for ALS Environmental on a sample identified as WR2001039-001 W3. The sample was collected on October 6, 2020 and delivered to the Nautilus Environmental laboratory in Burnaby, BC on October 8, 2020. The sample was transported in seven 20-L plastic containers and were received at temperatures ranging between 8.4 and 8.9 °C. The sample was stored in the dark at 4 ± 2°C prior to testing. The following sub-lethal toxicity tests were performed:

- *Ceriodaphnia dubia* survival and reproduction
- 7-d rainbow trout (*Oncorhynchus mykiss*) embryo viability
- 7-d *Lemna minor* growth inhibition
- 72-h *Pseudokirchneriella subcapitata* growth inhibition

Testing for all species was initiated on October 8, 2020. This report describes the results of these toxicity tests. Copies of raw laboratory data sheets and statistical analyses for each test species are provided in Appendices A to D. The chain-of-custody form is provided in Appendix E.

2.0 METHODS

Methods for the toxicity tests are summarized in Tables 1 to 4. Testing using *C. dubia*, *L. minor* and *P. subcapitata* were conducted according to procedures described by Environment Canada (2007a, 2007b and 2007c). The rainbow trout embryo viability test followed procedures described by Environment Canada (1998) and modified by Canaria et al. (1999). Statistical analyses for all the tests were performed using CETIS (Tidepool Scientific Software, 2013).

Table 1. Summary of test conditions: *Ceriodaphnia dubia* survival and reproduction test.

Test species	*Ceriodaphnia dubia*
Organism source	In-house culture
Organism age	<24 hour old neonates, produced within a 12 hour window
Test type	Static-renewal
Test duration	7 ± 1 day
Test vessel	20-mL glass test tube
Test volume	15 mL
Test solution depth	10 cm
Test concentrations	Seven concentrations, plus laboratory control
Test replicates	10 per treatment
Number of organisms	1 per replicate
Control/dilution water	20% Perrier water and 80% deionized water + 5 µg/L Se and 2 µg/L vitamin B12
Test solution renewal	Daily (100% renewal)
Test temperature	25 ± 1°C
Feeding	Daily with *Pseudokirchneriella subcapitata* and TCC (3:1 ratio)
Light intensity	100 to 600 lux at water surface
Photoperiod	16 hours light / 8 hours dark
Aeration	None
Test measurements	Temperature, dissolved oxygen, pH and conductivity measured daily; hardness and alkalinity of undiluted sample measured at test initiation; survival and reproduction checked daily
Test protocol	Environment Canada (2007a), EPS 1/RM/21
Statistical software	CETIS Version 1.9.4
Test endpoints	Survival and reproduction
Test acceptability criteria for controls	≥80% survival; ≥15 young per surviving control producing three broods; ≥60% of controls producing three or more broods; no ephippia present
Reference toxicant	Sodium chloride (NaCl)

Table 2. Summary of test conditions: rainbow trout (*Oncorhynchus mykiss*) embryo viability test.

Test species	*Oncorhynchus mykiss*
Organism source	Hatchery
Organism age	<30 minutes post fertilization, <24 hour old gametes
Test type	Static-renewal
Test duration	7 days
Test vessel	2-L plastic container
Test volume	2 L
Test solution depth	17 cm
Test concentrations	Five concentrations, plus laboratory control
Test replicates	4 per treatment
Number of organisms	30 per replicate
Control/dilution water	Dechlorinated Metro Vancouver municipal tapwater
Test solution renewal	Daily (80% renewal)
Test temperature	14 ± 1°C
Feeding	None
Light intensity	Dark
Photoperiod	24 hours dark
Aeration	Continuous gentle aeration
Test measurements	Temperature, dissolved oxygen, pH and conductivity measured daily; hardness and alkalinity of undiluted sample measured at test initiation; survival checked daily
Test protocol	Environment Canada (1998), EPS 1/RM/28; Canaria et al. (1999)
Statistical software	CETIS Version 1.9.4
Test endpoint	Embryo viability
Test acceptability criterion for controls	Embryo viability ≥70%
Reference toxicant	Sodium dodecyl sulphate (SDS)

Table 3. Summary of test conditions: *Lemna minor* growth inhibition test.

Test species	*Lemna minor*, strain CPCC# 490
Organism source	In-house axenic culture, obtained from Canadian Phycological Culture Centre, and originally isolated from Wainfleet, Stinking Barn, Niagara Peninsula, Ontario, Canada
Organism age	7- to 10-day old culture
Test type	Static
Test duration	7 days
Test vessel	250-mL glass container
Test volume	100 mL
Test solution depth	4 cm
Test concentrations	Seven concentrations, plus laboratory control
Test replicates	4 per treatment
Number of organisms	Two 3-frond plants per replicate
Control/dilution water	Modified APHA media (deionized water plus 1% of each APHA stock solution A, B and C)
Test solution renewal	None
Test temperature	25 ± 2°C
Feeding	None
Light intensity	4000 to 5600 lux
Photoperiod	24 hours light
Aeration	None
Test measurements	Test area temperature measured daily; temperature, pH and conductivity measured in all concentrations at test initiation; dissolved oxygen of highest concentration measured at test initiation; temperature and pH measured at test termination
Test protocol	Environment Canada (2007b), EPS 1/RM/37
Statistical software	CETIS Version 1.9.4
Test endpoints	Number of fronds and dry weight
Test acceptability criterion for controls	≥ 8-fold increase in number of fronds
Reference toxicant	Potassium chloride (KCl)

Table 4. Summary of test conditions: *Pseudokirchneriella subcapitata* growth inhibition test.

Test species	*Pseudokirchneriella subcapitata*, strain CPCC# 37
Organism source	In-house axenic culture, obtained from Canadian Phycological Culture Center, and originally isolated from Nivelta River, Norway.
Organism age	3-to 7-day old culture in logarithmic growth phase
Test type	Static
Test duration	72 hours
Test vessel	Microplate
Test volume	220 µL
Test concentrations	Seven concentrations, plus laboratory control
Test replicates	4 per treatment; 8 for laboratory control
Number of organisms	10,000 cells/mL
Control/dilution water	Deionized water supplemented with nutrients
Test solution renewal	None
Test temperature	24 ± 2°C
Feeding	None
Light intensity	3600 to 4400 lux
Photoperiod	24 hours light
Aeration	None
Test measurements	Test area temperature measured daily; temperature and pH measured at test initiation; pH of two control wells measured at test termination
Test protocol	Environment Canada (2007c), EPS 1/RM/25
Statistical software	CETIS Version 1.9.4
Test endpoint	Algal cell growth inhibition
Test acceptability criteria for controls	>16-fold increase in number of algal cells; CV ≤ 20%; no trend when analyzed using Mann-Kendall test
Reference toxicant	Zinc (added as $ZnSO_4$)

3.0 RESULTS

Results of the toxicity tests are summarized in Tables 5 to 8. There were no adverse effects observed on survival and reproduction of *C. dubia* (Table 5), embryo viability of *O. mykiss* (Table 6), frond count and dry weight of *L. minor* (Table 7) or cell yield of *P. subcapitata* (Table 8), resulting in LC, IC and EC values greater than the highest concentration tested.

Significant stimulation was observed in the growth of *P. subcapitata* and *L. minor*. Percent stimulation values are provided in detail in Tables 7 and 8.

Table 5. Results: *Ceriodaphnia dubia* survival and reproduction test.

Concentration (% v/v)	Survival (%)	Reproduction (Mean ± SD)
Laboratory Control	100	17.1 ± 4.3
1.56	100	23.0 ± 4.6
3.12	100	21.6 ± 6.3
6.25	100	20.3 ± 6.7
12.5	100	22.3 ± 2.9
25	100	22.5 ± 3.8
50	100	22.2 ± 2.2
100	100	18.4 ± 2.1
Test endpoint (% v/v)		
LC50	>100	--
IC25	--	>100
IC50	--	>100

SD = Standard Deviation, LC = Lethal Concentration, IC = Inhibition Concentration

Table 6. Results: rainbow trout (*Oncorhynchus mykiss*) embryo viability test.

Concentration (% v/v)	Embryo Viability (%) (Mean ± SD)
Laboratory Control	89.2 ± 12.6
6.25	93.3 ± 7.2
12.5	85.0 ± 16.0
25	85.0 ± 15.5
50	82.5 ± 16.0
100	79.2 ± 30.9
Test Endpoint (% v/v)	
EC25	>100
EC50	>100

SD = Standard Deviation, EC = Effective Concentration

Table 7. Results: *Lemna minor* growth inhibition test.

	(Mean ± SD)			
Concentration (% v/v)	**Frond Growth (No. of Fronds)**	**% Stimulation**	**Dry Weight (mg) (Mean ± SD)**	**% Stimulation**
Laboratory Control	88.0 ± 9.7	--	6.9 ± 0.8	--
1.5	105.2 ± 11.2	19.6	8.3 ± 1.4	20.8
3.0	107.5 ± 13.5	22.2	8.5 ± 1.4	22.8
6.1	127.0 ± 7.8 *	44.3	10.1 ± 1.0 *	46.0
12.1	135.0 ± 14.5 *	53.4	11.0 ± 1.6 *	58.9
24.2	146.0 ± 11.6 *	65.9	13.6 ± 1.3 *	97.8
48.5	138.8 ± 7.8 *	57.7	13.3 ± 1.7 *	92.7
97	129.2 ± 11.2 *	46.9	12.5 ± 2.2 *	80.6
Test endpoint (% v/v)				
IC25	>97	--	>97	--
IC50	>97	--	>97	--

SD = Standard Deviation, IC = Inhibition Concentration, CL = Confidence Limits
* = Indicates cell yield that are significantly greater than the laboratory control

Table 8. Results: *Pseudokirchneriella subcapitata* growth inhibition test.

Concentration (% v/v)	Cell Yield (x 10^4 cells/mL) (Mean ± SD)	Stimulation (%)
Laboratory Control	32.2 ± 2.1	--
1.5	52.8 ± 4.5 *	63.6
3.0	60.0 ± 5.7 *	86.0
6.0	63.5 ± 2.9 *	96.9
11.9	115.8 ± 5.3 *	258.9
23.8	154.5 ± 5.3 *	379.1
47.6	142.5 ± 6.2 *	341.9
95.2	149.2 ± 7.2 *	362.8
Test endpoint (% v/v)		
IC25	>95.2	--
IC50	>95.2	--

SD = Standard Deviation, IC = Inhibition Concentration

* = Indicates cell yield that are significantly greater than the laboratory control

4.0 QA/QC

The health history of the test organisms used in the exposures were acceptable and met the requirements of the Environment Canada protocols. There were no deviations from the test methodology. The tests met all control acceptability criteria and water quality parameters remained within ranges specified in the protocols throughout the tests. Uncertainty associated with these tests is best described by the standard deviation around the mean and/or the confidence intervals around the point estimates.

Results of the reference toxicant tests conducted during the testing program are summarized in Table 9. Results for these tests fell within the range for organism performance of the mean and two standard deviations, based on historical results obtained by the laboratory with these tests. Thus, the sensitivity of the organisms used in these tests was appropriate. The reference toxicant tests were performed under the same conditions as those used for the samples.

Table 9. Reference toxicant test results.

Test Species	Endpoint	Historical Mean (2 SD Range)	CV (%)	Test Date
C. dubia	Survival (LC50): 2.0 g/L NaCl	2.0 (1.9 – 2.2)	4	October 13, 2020
	Reproduction (IC50): 1.7 g/L NaCl	1.9 (1.5 – 2.3)	12	
O. mykiss	Viability (EC50): 6.8 mg/L SDS	4.4 (2.1 – 9.3)	38	October 8, 2020
L. minor	No. Fronds (IC50): 3.3 g/L KCl	3.4 (3.0 – 3.8)	6	October 16, 2020
P. subcapitata	Growth (IC50): 30.4 µg/L Zn	30.5 (24.6 – 37.8)	11	October 16, 2020

SD = Standard Deviation, CV = Coefficient of Variation, LC = Lethal Concentration, IC = Inhibition Concentration, EC = Effective Concentration

5.0 REFERENCES

Canaria, E.C., J.R. Elphick and H.C. Bailey. 1999. A simplified procedure for conducting small-scale short-term embryo toxicity tests with salmonids. Environ Toxicol 14:301-307.

Environment Canada. 1998. Biological test method: toxicity tests using early life stages of salmonid fish (rainbow trout). Environmental Protection Series EPS 1/RM/28. Second Edition, July 1998. Environment Canada, Method Development and Application Section, Environmental Technology Centre, Ottawa, ON. 102 pp.

Environment Canada. 2007a. Biological test method: test of reproduction and survival using the cladoceran *Ceriodaphnia dubia*. Environmental Protection Series. Report EPS 1/RM/21, Second Edition, February 2007. Environment Canada, Method Development and Application Section, Environmental Science and Technology Centre, Science and Technology Branch, Ottawa, ON. 74 pp.

Environment Canada. 2007b. Biological test method: tests for measuring the inhibition of growth using the freshwater macrophyte, *Lemna minor*. Environmental Protection Series, Report EPS 1/RM/37. Second Edition. January 2007. Environment Canada, Method Development and Application Section, Environmental Technology Centre, Ottawa, ON. 112 pp.

Environment Canada. 2007c. Biological test method: growth inhibition test using the freshwater alga. Environmental Protection Series, Report EPS 1/RM/25. Second Edition, March 2007. Environment Canada, Method Development and Application Section, Environmental Science and Technology Centre, Science and Technology Branch, Ottawa, ON. 53 pp.

Tidepool Scientific Software. 2013. CETIS comprehensive environmental toxicity information system, version 1.9.4.11 Tidepool Scientific Software, McKinleyville, CA. 275 pp.

APPENDIX A – *Ceriodaphnia dubia* Toxicity Test Data

Ceriodaphnia dubia Summary Sheet

Client: ALS Environmental
Work Order No.: 201947

Start Date/Time: Oct 8/2020 @ 1130h
Set up by: SAK.

Sample Information:

Sample ID: WR20010I9-001 W3
Sample Date: Oct 6/2020
Date Received: Oct 8/2020
Sample Volume: 7 x 20 L

Test Validity Criteria:

1) Mean survival of first generation controls is ≥80 %
2) At least 60% of controls have produced three broods within 8 days
3) An average of ≥15 live young produced per surviving female in the control solutions during the first three broods.
4) Invalid if ephippia observed in any control solution at any time.

WQ Ranges:

T (°C) = 25 ± 1; DO (mg/L) = 3.3 to 8.4 ; pH = 6.0 to 8.5

Test Organism Information:

Broodstock No.: BB 100120 A+B
Age of young (Day 0): <24-h (within 12-h)
Avg No. young in first 3 broods of previous 7 d: 22
Mortality (%) in previous 7 d: 5
Individual female # used ≥8 young on test day: # 1, 5, 7, 10, 12-17, 19-24

NaCl Reference Toxicant Results:

Reference Toxicant ID: Cd263
Stock Solution ID: 20NaCl4
Date Initiated: Oct. 13/20

7-d LC50 (95% CL): 2.0 (1.7 - 2.3) g/L NaCl
7-d IC50 (95% CL): 1.7 (1.3 - 1.9) g/L NaCl

7-d LC50 Reference Toxicant Mean and Historical Range: 2.0 (1.9 - 2.2) g/L NaCl CV (%): 4
7-d IC50 Reference Toxicant Mean and Historical Range: 1.9 (1.5 - 2.3) g/L NaCl CV (%): 12

Test Results:

	Survival	Reproduction
LC50 % (v/v) (95% CL)	>100	
IC25 % (v/v) (95% CL)		>100
IC50 % (v/v) (95% CL)		>100

Reviewed by: JCh

Date reviewed: Nov. 5/20

Chronic Freshwater Toxicity Test
Initial and Final Water Quality Measurements

Client: ALS (Mi A Co) **Start Date & Time:** Oct 8/20 @ 1130h
Sample ID: WR2001039-001 (W3) **Stop Date & Time:** Oct 14/20 @ 1400h
Work Order #: 201947 **CER #:** 4 & SM
Test Species: *Ceriodaphnia dubia*

0 % (v/v) Concentration: Control

	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	24.0	25.5	25.0	25.0	24.5	25.0	24.0	25.0	24.0	24.0	24.0	25.0		
DO (mg/L)	8.1	7.7	8.0	7.4	8.2	7.2	8.0	6.7	8.0	7.0	8.2	6.8		
pH	7.9	7.7	8.0	7.8	8.0	7.9	8.0	7.6	8.1	7.4	8.0	7.9		
Cond. (µS/cm)	215	215		213		212		212		215		218		
Initials	A	JZL	A	JW		JW		MD		JZL	A	SAH		

1.56 Concentration

	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	24.0	25.5	25.5	25.0	24.5	25.0	24.0	25.0	24.0	24.0	25.0	25.0		
DO (mg/L)	7.9	7.6	7.5	7.4	7.8	7.2	7.8	6.8	7.2	7.0	8.2	6.7		
pH	8.1	7.7	8.2	7.8	7.9	7.8	8.0	7.6	7.9	7.5	8.3	7.9		
Cond. (µS/cm)	219	216		214		218		225		219		221		
Initials	A	JZL	A	JW		JW		JZL		JZL	A	SAH		

12.5 Concentration

	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	24.0	25.5	25.5	25.0	24.5	25.0	24.0	25.0	24.0	24.0	25.0	25.0		
DO (mg/L)	8.0	7.5	7.7	7.0	7.8	7.0	7.9	6.8	7.4	7.0	8.1	6.7		
pH	8.1	7.8	8.1	7.8	8.0	7.9	8.1	7.7	8.0	7.6	8.3	7.9		
Cond. (µS/cm)	263	255		241		252		260		254		256		
Initials	A	JZL	A	JW		JW		JZL		JZL	A	SAH		

100 Concentration

	Days													
	0	1		2		3		4		5		6		7
	init.	old	new	old	new	old	new	old	new	old	new	old	new	final
Temperature (°C)	25.5	25.5	25.0	25.0	24.5	25.0	24.0	25.0	24.0	24.0	25.0	25.0		
DO (mg/L)	8.2	7.6	8.3	7.0	8.0	7.0	8.1	6.7	7.7	7.0	8.0	6.7		
pH	7.8	8.0	8.1	8.0	7.9	8.2	8.1	8.0	8.1	7.9	8.2	8.2		
Cond. (µS/cm)	510	516		506		511		512		516		508		
Initials	A	JZL	A	JW		JW		JZL		JZL	A	SAH		

Thermometer: CER #4 **DO meter/probe:** 2 / 2 **pH meter/probe:** 2 / 2 **Conductivity meter/probe:** 2 / 2

	Control	100%		
Hardness*	100	252		
Alkalinity*	99	230		

* mg/L as CaCO3

Analysts: SAH, JZL, AG, JW
Reviewed by: JZL
Date reviewed: Nov-5/20

Sample Description: clear, pale yellow liquid, no particulates, no odour.

Comments: **Broodboard Used:** BB100120A2B (#1, 5, 7, 10, 12-17, 19-24).

Chronic Freshwater Toxicity Test
C. dubia Reproduction Data

Client: ALS (Mississauga)
Sample ID: WR20010394-001 W3
Work Order: 201947

Start Date & Time: Oct 8/20 @ 1130h
Stop Date & Time: Oct 14/20 @ 1400h
Set up by: SAH

% (v/v)

Days	Concentration: Control										
	A	B	C	D	E	F	G	H	I	J	Init
1											JZL
2											JW
3	✓	✓	✓	✓	✓	✓	✓	✓	✓	4	JW
4	3	3	2	3	3	4	4	✓	4	✓	MG
5	5	7	7	9	9	8	7	—	8	7	SAH
6	8	8	7	8	6	9	8	6	8	6	SAH
7											
8											
Total	16	18	16	20	18	21	19	6	20	17	MG

Days	Concentration: 1.56										
	A	B	C	D	E	F	G	H	I	J	Init
1											JZL
2											JW
3	—	4	✓	✓	✓	✓	✓	✓	✓	✓	JW
4	4	✓	3	4	✓	4	3	4	4	5	MG
5	7	9	6	9	6	8	9	10	9	11	SAH
6	11	11	8	14	8	10	15	13	9	12	SAH
7											
8											
Total	22	24	17	27	14	22	27	27	22	28	MG

Days	Concentration: 3.12										
	A	B	C	D	E	F	G	H	I	J	Init
1											JZL
2											JW
3	—	—	—	—	—	—	—	—	—	—	JW
4	3	3	4	5	4	2	3	3	4	4	MG
5	10	9	6	7	8	8	8	9	10	10	SAH
6	11	12	—	—	14	8	11	12	15	13	SAH
7											
8											
Total	24	24	10	12	26	18	22	24	29	27	MG

Days	Concentration: 6.25										
	A	B	C	D	E	F	G	H	I	J	Init
1											JZL
2											JW
3	✓	✓	✓	2	✓	✓	✓	✓	✓	4	JW
4	✓	4	3	✓	3	4	4	3	3	✓	MG
5	2	7	8	10	7	9	8	7	9	7	SAH
6	—	11	11	13	12	7	11	10	13	11	SAH
7											
8											
Total	2	22	22	25	22	20	23	20	25	22	MG

Days	Concentration: 12.5										
	A	B	C	D	E	F	G	H	I	J	Init
1											JZL
2											JW
3	✓	✓	✓	✓	4	✓	✓	✓	✓	✓	JW
4	3	3	4	4	✓	4	2	4	4	4	MG
5	10	7	10	8	11	9	6	7	8	7	SAH
6	11	8	8	11	10	11	9	11	14	11	SAH
7											
8											
Total	24	18	22	23	25	24	17	22	26	22	MG

Days	Concentration: 25										
	A	B	C	D	E	F	G	H	I	J	Init
1											JZL
2											JW
3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	JW
4	3	3	4	5	4	5	3	3	4	3	MG
5	9	5	9	9	8	9	6	7	8	9	SAH
6	12	9	15	12	12	11	7	10	11	13	SAH
7										MD	
8											
Total	24	17	28	26	24	25	16	20	23	22	MG

Days	Concentration: 50										
	A	B	C	D	E	F	G	H	I	J	Init
1											JZL
2											JW
3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	JW
4	3	3	3	4	4	4	4	3	3	3	MG
5	6	8	8	7	8	9	8	10	11	9	SAH
6	9	12	12	11	10	13	8	10	10	9	SAH
7											
8											
Total	18	23	23	22	22	26	20	23	24	21	MG

Days	Concentration: 100										
	A	B	C	D	E	F	G	H	I	J	Init
1											JZL
2											JW
3	✓	✓	✓	✓	✓	✓	—	✓	✓	✓	JW
4	4	4	3	4	3	4	5	3	4	3	MG
5	7	8	8	7	9	8	7	8	8	9	SAH
6	5	8	7	9	7	4	8	7	9	7	SAH
7											
8											
Total	16	20	15	20	19	16	20	18	21	19	MG

Days	Concentration:										
	A	B	C	D	E	F	G	H	I	J	Init
1											
2											
3											
4											
5											
6											
7											
8											
Total											

Notes: X = mortality.

Comments: 1. Total # Young only based on the first 3 Broods. Fourth and subsequent broods not included in total count.

2. Ephippia present in Controls (Y), (N)?

Reviewed by: JW

Date reviewed: Nov. 5/20

CETIS Summary Report

Ceriodaphnia 7-d Survival and Reproduction Test — **Nautilus Environmental**

Batch ID:	18-5117-8245	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Marcus Lee-Fraizer		
Start Date:	08 Oct-20 11:30 ✓	**Protocol:**	EC/EPS 1/RM/21	**Diluent:**	20% Perrier Water		
Ending Date:	14 Oct-20 14:00 ✓	**Species:**	Ceriodaphnia dubia	**Brine:**			
Test Length:	6d 3h	**Taxon:**	Branchiopoda	**Source:**	In-House Culture	**Age:**	<24

Sample ID:	01-8948-0399	**Code:**	B4B3DCF	**Project:**	Minto Project		
Sample Date:	06 Oct-20 06:05 ✓	**Material:**	Water Sample	**Source:**	ALS		
Receipt Date:	08 Oct-20 08:34 ✓	**CAS (PC):**		**Station:**	WR2001039-001 W3 ✓		
Sample Age:	53h (8.4 °C) ✓	**Client:**	ALS ✓				

Point Estimate Summary

Analysis ID	Endpoint	Point Estimate Method	✓	Level	%	95% LCL	95% UCL	TU	S
12-0460-0485	6d Survival Rate	Linear Interpolation (ICPIN)		EC5	>100	n/a	n/a	<1	1
				EC10	>100	n/a	n/a	<1	
			✓	EC15	>100	n/a	n/a	<1	
			✓	EC20	>100	n/a	n/a	<1	
			✓	EC25	>100	n/a	n/a	<1	
			✓	EC40	>100	n/a	n/a	<1	
			✓	EC50	>100	n/a	n/a	<1	
03-2290-7240	Reproduction	Linear Interpolation (ICPIN)	✓	IC5	63.32	51.01	74.27	1.579	1
			✓	IC10	80.13	66.36	n/a	1.248	
			✓	IC15	>100	n/a	n/a	<1	
			✓	IC20	>100	n/a	n/a	<1	
			✓	IC25	>100	n/a	n/a	<1	
			✓	IC40	>100	n/a	n/a	<1	
			✓	IC50	>100	n/a	n/a	<1	
19-8726-3248	Reproduction	Linear Interpolation (ICPIN)		IC5	64.62	5.356	89.57	1.548	1
				IC10	83.42	60.95	n/a	1.199	
			✓	IC15	>100	n/a	n/a	<1	
			✓	IC20	>100	n/a	n/a	<1	
			✓	IC25	>100	n/a	n/a	<1	
			✓	IC40	>100	n/a	n/a	<1	
			✓	IC50	>100	n/a	n/a	<1	

6d Survival Rate Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
1.56		10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
3.12		10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
6.25		10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
12.5		10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
25		10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
50		10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
100		10	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%

Reproduction Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	10	17.1	14.06	20.14	6	21	1.345	4.254	24.88%	0.00%
1.56		10	23	19.68	26.32	14	28	1.468	4.643	20.19%	-34.50%
3.12		10	21.6	17.07	26.13	10	29	2.001	6.328	29.30%	-26.32%
6.25		10	20.3	15.54	25.06	2	25	2.103	6.651	32.76%	-18.71%
12.5		10	22.3	20.25	24.35	17	26	0.9074	2.869	12.87%	-30.41%
25		10	22.5	19.76	25.24	16	28	1.213	3.837	17.05%	-31.58%
50		10	22.2	20.63	23.77	18	26	0.696	2.201	9.91%	-29.82%
100		10	18.4	16.92	19.88	15	21	0.6532	2.066	11.23%	-7.60%

Ceriodaphnia 7-d Survival and Reproduction Test **Nautilus Environmental**

6d Survival Rate Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	N	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.56		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3.12		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
6.25		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
12.5		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
25		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
50		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
100		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Reproduction Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	N	16	18	16	20	18	21	19	6	20	17
1.56		22	24	17	27	14	22	27	27	22	28
3.12		24	24	10	12	26	18	22	24	29	27
6.25		2	22	22	25	22	20	23	20	25	22
12.5		24	18	22	23	25	24	17	22	26	22
25		24	17	28	26	24	25	16	20	23	22
50		18	23	23	22	22	26	20	23	24	21
100		16	20	15	20	19	16	20	18	21	19

6d Survival Rate Binomials

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	N	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
1.56		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
3.12		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
6.25		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
12.5		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
25		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
50		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
100		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

CETIS Analytical Report

Ceriodaphnia 7-d Survival and Reproduction Test — **Nautilus Environmental**

Analysis ID:	12-0460-0485	**Endpoint:**	6d Survival Rate	**CETIS Version:**	CETISv1.9.4
Analyzed:	29 Oct-20 15:43	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1
Batch ID:	18-5117-8245	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Marcus Lee-Fraizer
Start Date:	08 Oct-20 11:30	**Protocol:**	EC/EPS 1/RM/21	**Diluent:**	20% Perrier Water
Ending Date:	14 Oct-20 14:00	**Species:**	Ceriodaphnia dubia	**Brine:**	
Test Length:	6d 3h	**Taxon:**	Branchiopoda	**Source:**	In-House Culture **Age:** <24
Sample ID:	01-8948-0399	**Code:**	B4B3DCF	**Project:**	Minto Project
Sample Date:	06 Oct-20 06:05	**Material:**	Water Sample	**Source:**	ALS
Receipt Date:	08 Oct-20 08:34	**CAS (PC):**		**Station:**	WR2001039-001 W3
Sample Age:	53h (8.4 °C)	**Client:**	ALS		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	1237304	200	Yes	Two-Point Interpolation

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
EC5	>100	n/a	n/a	<1	n/a	n/a
EC10	>100	n/a	n/a	<1	n/a	n/a
EC15	>100	n/a	n/a	<1	n/a	n/a
EC20	>100	n/a	n/a	<1	n/a	n/a
EC25	>100	n/a	n/a	<1	n/a	n/a
EC40	>100	n/a	n/a	<1	n/a	n/a
EC50	>100	n/a	n/a	<1	n/a	n/a

6d Survival Rate Summary

			Calculated Variate(A/B)							Isotonic Variate	
Conc-%	Code	Count	Mean	Min	Max	Std Dev	CV%	%Effect	A/B	Mean	%Effect
0	N	10	1.0000	1.0000	1.0000	0.0000	0.00%	0.0%	10/10	1	0.0%
1.56		10	1.0000	1.0000	1.0000	0.0000	0.00%	0.0%	10/10	1	0.0%
3.12		10	1.0000	1.0000	1.0000	0.0000	0.00%	0.0%	10/10	1	0.0%
6.25		10	1.0000	1.0000	1.0000	0.0000	0.00%	0.0%	10/10	1	0.0%
12.5		10	1.0000	1.0000	1.0000	0.0000	0.00%	0.0%	10/10	1	0.0%
25		10	1.0000	1.0000	1.0000	0.0000	0.00%	0.0%	10/10	1	0.0%
50		10	1.0000	1.0000	1.0000	0.0000	0.00%	0.0%	10/10	1	0.0%
100		10	1.0000	1.0000	1.0000	0.0000	0.00%	0.0%	10/10	1	0.0%

6d Survival Rate Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	N	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.56		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3.12		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
6.25		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
12.5		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
25		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
50		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
100		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

6d Survival Rate Binomials

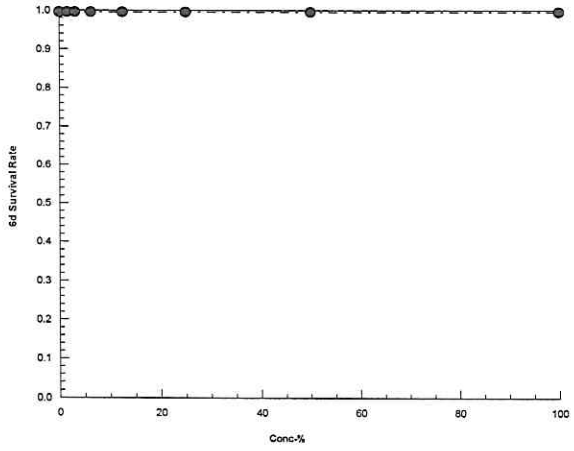
Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	N	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
1.56		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
3.12		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
6.25		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
12.5		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
25		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
50		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
100		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

Analyst: _____ QA: Nov-5/20

Ceriodaphnia 7-d Survival and Reproduction Test — **Nautilus Environmental**

Analysis ID:	12-0460-0485	**Endpoint:**	6d Survival Rate	**CETIS Version:**	CETISv1.9.4
Analyzed:	29 Oct-20 15:43	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1

Graphics



Ceriodaphnia 7-d Survival and Reproduction Test — **Nautilus Environmental**

Analysis ID:	19-8726-3248	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.9.4		
Analyzed:	29 Oct-20 15:44	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1		
Batch ID:	18-5117-8245	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Marcus Lee-Fraizer		
Start Date:	08 Oct-20 11:30	**Protocol:**	EC/EPS 1/RM/21	**Diluent:**	20% Perrier Water		
Ending Date:	14 Oct-20 14:00	**Species:**	Ceriodaphnia dubia	**Brine:**			
Test Length:	6d 3h	**Taxon:**	Branchiopoda	**Source:**	In-House Culture	**Age:**	<24
Sample ID:	01-8948-0399	**Code:**	B4B3DCF	**Project:**	Minto Project		
Sample Date:	06 Oct-20 06:05	**Material:**	Water Sample	**Source:**	ALS		
Receipt Date:	08 Oct-20 08:34	**CAS (PC):**		**Station:**	WR2001039-001 W3		
Sample Age:	53h (8.4 °C)	**Client:**	ALS				

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	593463	200	Yes	Two-Point Interpolation

Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision(α:5%)
Extreme Value	Grubbs Extreme Value Test	4.341	3.306	2.9E-04	Outlier Detected

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	64.62	5.356	89.57	1.548	1.116	18.67
IC10	83.42	60.95	n/a	1.199	n/a	1.641
IC15	>100	n/a	n/a	<1	n/a	n/a
IC20	>100	n/a	n/a	<1	n/a	n/a
IC25	>100	n/a	n/a	<1	n/a	n/a
IC40	>100	n/a	n/a	<1	n/a	n/a
IC50	>100	n/a	n/a	<1	n/a	n/a

Reproduction Summary

			Calculated Variate						Isotonic Variate	
Conc-%	Code	Count	Mean	Min	Max	Std Dev	CV%	%Effect	Mean	%Effect
0	N	10	17.1	6	21	4.254	24.88%	0.0%	21.29	0.0%
1.56		10	23	14	28	4.643	20.19%	-34.5%	21.29	0.0%
3.12		10	21.6	10	29	6.328	29.30%	-26.32%	21.29	0.0%
6.25		10	20.3	2	25	6.651	32.76%	-18.71%	21.29	0.0%
12.5		10	22.3	17	26	2.869	12.87%	-30.41%	21.29	0.0%
25		10	22.5	16	28	3.837	17.05%	-31.58%	21.29	0.0%
50		10	22.2	18	26	2.201	9.91%	-29.82%	21.29	0.0%
100		10	18.4	15	21	2.066	11.23%	-7.6%	18.4	13.56%

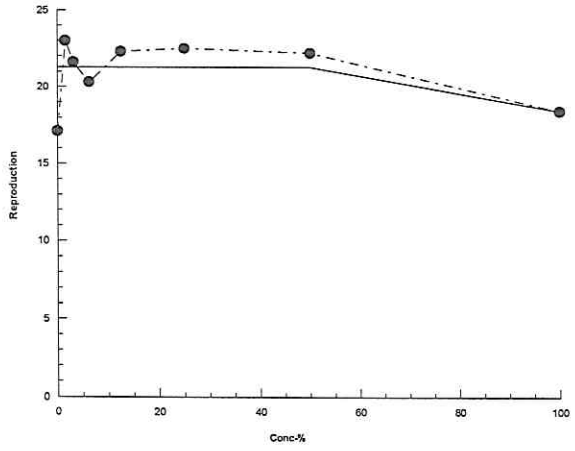
Reproduction Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	N	16	18	16	20	18	21	19	6	20	17
1.56		22	24	17	27	14	22	27	27	22	28
3.12		24	24	10	12	26	18	22	24	29	27
6.25		2	22	22	25	22	20	23	20	25	22
12.5		24	18	22	23	25	24	17	22	26	22
25		24	17	28	26	24	25	16	20	23	22
50		18	23	23	22	22	26	20	23	24	21
100		16	20	15	20	19	16	20	18	21	19

Ceriodaphnia 7-d Survival and Reproduction Test **Nautilus Environmental**

Analysis ID:	19-8726-3248	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.9.4
Analyzed:	29 Oct-20 15:44	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1

Graphics



Analyst: _____ QA: Nov 5/20

Ceriodaphnia 7-d Survival and Reproduction Test

Nautilus Environmental

Analysis ID:	03-2290-7240	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.9.4
Analyzed:	29 Oct-20 15:44	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1
Batch ID:	18-5117-8245	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Marcus Lee-Fraizer
Start Date:	08 Oct-20 11:30	**Protocol:**	EC/EPS 1/RM/21	**Diluent:**	20% Perrier Water
Ending Date:	14 Oct-20 14:00	**Species:**	Ceriodaphnia dubia	**Brine:**	
Test Length:	6d 3h	**Taxon:**	Branchiopoda	**Source:**	In-House Culture **Age:** <24
Sample ID:	01-8948-0399	**Code:**	B4B3DCF	**Project:**	Minto Project
Sample Date:	06 Oct-20 06:05	**Material:**	Water Sample	**Source:**	ALS
Receipt Date:	08 Oct-20 08:34	**CAS (PC):**		**Station:**	WR2001039-001 W3
Sample Age:	53h (8.4 °C)	**Client:**	ALS		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	1069825	200	Yes	Two-Point Interpolation

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	63.32	51.01	74.27	1.579	1.346	1.961
IC10	80.13	66.36	n/a	1.248	n/a	1.507
IC15	>100	n/a	n/a	<1	n/a	n/a
IC20	>100	n/a	n/a	<1	n/a	n/a
IC25	>100	n/a	n/a	<1	n/a	n/a
IC40	>100	n/a	n/a	<1	n/a	n/a
IC50	>100	n/a	n/a	<1	n/a	n/a

Reproduction Summary

			Calculated Variate						Isotonic Variate	
Conc-%	Code	Count	Mean	Min	Max	Std Dev	CV%	%Effect	Mean	%Effect
0	N	10	17.1	6	21	4.254	24.88%	0.0%	21.58	0.0%
1.56		10	23	14	28	4.643	20.19%	-34.5%	21.58	0.0%
3.12		10	21.6	10	29	6.328	29.30%	-26.32%	21.58	0.0%
6.25		9	22.33	20	25	1.803	8.07%	-30.6%	21.58	0.0%
12.5		10	22.3	17	26	2.869	12.87%	-30.41%	21.58	0.0%
25		10	22.5	16	28	3.837	17.05%	-31.58%	21.58	0.0%
50		10	22.2	18	26	2.201	9.91%	-29.82%	21.58	0.0%
100		10	18.4	15	21	2.066	11.23%	-7.6%	18.4	14.72%

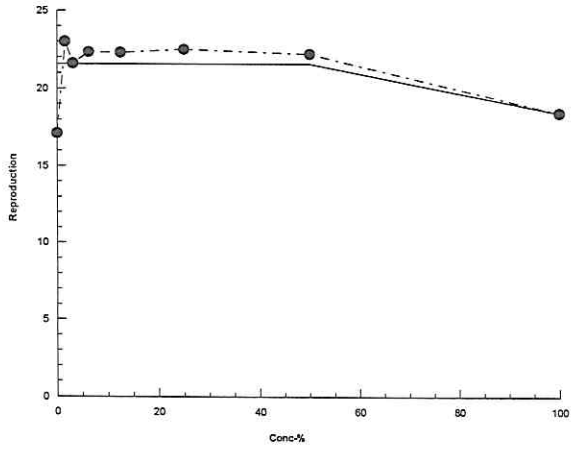
Reproduction Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	N	16	18	16	20	18	21	19	6	20	17
1.56		22	24	17	27	14	22	27	27	22	28
3.12		24	24	10	12	26	18	22	24	29	27
6.25		Outlier	22	22	25	22	20	23	20	25	22
12.5		24	18	22	23	25	24	17	22	26	22
25		24	17	28	26	24	25	16	20	23	22
50		18	23	23	22	22	26	20	23	24	21
100		16	20	15	20	19	16	20	18	21	19

Ceriodaphnia 7-d Survival and Reproduction Test — **Nautilus Environmental**

Analysis ID:	03-2290-7240	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.9.4
Analyzed:	29 Oct-20 15:44	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1

Graphics



Analyst: MW QA: Nov-5/20

Client: ALS (minto)

W.O.#: 201947

Hardness and Alkalinity Datasheet

	Alkalinity						Hardness			
Sample ID	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H_2SO_4 used to pH 4.5	(mL) of 0.02N HCL/H_2SO_4 used to pH 4.2	Total Alkalinity ($mg/LCaCO_3$)	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness ($mg/L\ CaCO_3$)	Technician
WR2001039-001 ~~W3~~ W3	Oct.8/20 →		50	11.8	12.1	230	50	12.6	252	JZ
~~Oct~~ Control Water (20% Perrier)	Oct.8/20 →		100	10.2	10.5	99	50	5.0	100	SHH

Notes:

Reviewed by: [signature] Date Reviewed: Nov. 5/20

APPENDIX B – *Oncorhynchus mykiss* Toxicity Test Data

Rainbow Trout Early Life Stage Summary Sheet

Client: ALS Environmental Start Date/Time: October 8, 2020 @ 1330h

Work Order No.: 201946 Test Species: *Oncorhynchus mykiss*

Sample Information:

Sample ID: WR200[illegible]1039-001 W3
Sample Date: October 6, 2020
Date Received: October 8, 2020
Sample Volume: 7 x 20L

Dilution Water:

Type: Dechlorinated Tap Water
Hardness (mg/L $CaCO_3$): 6
Alkalinity (mg/L $CaCO_3$): 12

Test Organism Information:

Batch No.: 100820
Source: Lyndon Trout Hatchery, New Dundee, ON
Loading Density: 1.01 g/L

Number of male broodstock used: 4
Number of female broodstock used: 4
Sperm motility check: Verification of sperm motility using a compound microscope

SDS Reference Toxicant Results:

Reference Toxicant ID: RTE141
Stock Solution ID: 20502
Date Initiated: October 8, 2020
7-d EC50 (95% CL): 6.8 (6.5 - 7.1) mg/L SDS

Reference Toxicant Mean and Range: 4.4 (2.1 - 9.3) mg/L SDS
Reference Toxicant CV (%): 38

Test Results:

	Sample ID		
	WR200[illegible]1039-001	W3	
EC25 % (v/v) (95% CL)	>100		
EC50 % (v/v) (95% CL)	>100		

Reviewed by: JCh Date reviewed: Nov. 2/20

7-d Chronic Freshwater Toxicity Test
Initial and Final Water Quality Measurements

Client: ALS Environmental
Sample ID: WR200039-001 W3
Work Order #: 201946

Start Date & Time: October 8, 2020 @ 1330h
Stop Date & Time: October 15, 2020 @ 1015h
CER #: 3
Test Species: *Oncorhynchus mykiss*

CONT Concentration (% v/v)

	Days													
	0	1		2		3		4		5		6		7
	init.	new	old	new	old	new	old	new	old	new	old	new	old	final
Temperature (°C)	14.5	15.0	14.5	14.5	14.0	14.0	14.0	14.0	14.0	14.5	14.0	14.5	14.5	14.0
DO (mg/L)	9.9	10.0	9.8	10.2	10.0	10.0	9.9	10.0	9.8	9.8	10.0	10.1	9.7	9.8
pH	7.2	7.1	7.4	7.2	7.3	7.0	7.2	6.9	7.2	6.9	7.0	7.1	6.8	6.7
Cond. (µS/cm)	35	34		36		34		35		34		34		35
Initials	MM	IMC		IMC		HEC/MM		HEC		MM		IMC		MM

6.25 Concentration

	Days													
	0	1		2		3		4		5		6		7
	init.	new	old	new	old	new	old	new	old	new	old	new	old	final
Temperature (°C)	14.5	15.0	14.5	14.0	14.0	14.0	14.0	14.0	14.0	14.5	14.0	15.0	14.5	14.0
DO (mg/L)	9.9	10.0	9.9	10.0	10.0	9.9	10.0	10.0	9.8	9.9	10.0	10.0	9.9	9.8
pH	7.4	7.4	7.6 7.4	7.5	7.4	7.1	7.3	7.1	7.5	6.8	7.1	6.8	6.8	7.0
Cond. (µS/cm)	68	70		70		71		69		70		68		70
Initials	MM	IMC		IMC		HEC/MM		HEC		MM		IMC		MM

25 Concentration

	Days													
	0	1		2		3		4		5		6		7
	init.	new	old	new	old	new	old	new	old	new	old	new	old	final
Temperature (°C)	14.0	15.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	15.0	14.5	14.0
DO (mg/L)	10.0	10.0	10.0	10.1	10.1	10.0	10.0	9.8	9.9	9.9	10.1	9.9	10.0	9.9
pH	7.5	7.6	7.6	7.6	7.5	7.5	7.7	7.3	7.9	7.2	7.5	7.5	7.4	7.5
Cond. (µS/cm)	159	163		165		170		157		164		187		178
Initials	MM	IMC		IMC		HEC/MM		HEC		MM		IMC		MM

100 Concentration

	Days													
	0	1		2		3		4		5		6		7
	init.	new	old	new	old	new	old	new	old	new	old	new	old	final
Temperature (°C)	14.0	15.0	14.0	14.0	14.0	14.0	14.0	15.0	14.0	14.0	14.0	15.0	14.5	14.0
DO (mg/L)	10.1	10.1	10.1	10.2	10.1	10.0	10.0	9.7	9.9	9.8	10.0	9.6	10.0	9.7
pH	7.7	7.6	8.6	7.6	7.6	7.7	8.2	7.6	8.3	7.6	7.9	7.7	8.5	8.3
Cond. (µS/cm)	506	506		504		502		511		507		505		502
Initials	MM	IMC		IMC		HEC/MM		HEC		MM		IMC		MM

Thermometer: CER#3 **DO meter/probe:** 6 / 6 **pH meter/probe:** 6 / 6 **Conductivity meter/probe:** 6 / 6

	Control	100%		
Hardness*	6	240		
Alkalinity*	12	210		

* mg/L as CaCO3

Analysts: IMC, HEC, MM
Reviewed by: JGC
Date reviewed: Nov. 2/20

Sample Description: clear, light yellow, no odour, no particulates.

Comments:

Embryo Toxicity Test
Daily Mortality

Client: ALS Environmental
Sample ID: WR2001039-001 W3
Work Order #: 201946

Start Date & Time: October 8, 2020 @ 1330h
Stop Date & Time: October 15, 2020 @ 1015h
Test Species: *Oncorhynchus mykiss*

Concentration (% v/v)	Rep	Day of Test - No. of Mortalities							Total Dead Eggs	Total Undeveloped	Total No. Embryo	Total Exposed
		1	2	3	4	5	6	7				
Control	1	0	0	0	0	0	0	0	0	0	30	30
	2	↓	↓	↓	↓	0	0	↓	0	0	30	30
	3	↓	↓	↓	↓	1	1	1	3	4	23	30
	4	↓	↓	↓	↓	1	0	0	1	5	24	30
6.25	1	0	0	↓	↓	0	0	0	0	0	30	30
	2	↓	↓	↓	↓	0	0	↓	0	1	29	30
	3	↓	↓	↓	↓	1	0	↓	1	1	28	30
	4	↓	↓	↓	↓	0	1	↓	1	4	25	30
12.5	1	0	0	↓	↓	↓	0	↓	0	1	29	30
	2	↓	↓	↓	↓	↓	↓	↓	0	0	30	30
	3	↓	↓	↓	↓	1	↓	↓	1	9	20	30
	4	↓	↓	↓	↓	0	↓	↓	0	7	23	30
25	1	0	0	↓	↓	↓	0	↓	0	0	30	30
	2	↓	↓	↓	↓	1	0	↓	0	1	29	30
	3	↓	↓	↓	↓	3	1	↓	4	5	21	30
	4	↓	↓	↓	↓	0	1	1	2	6	22	30
50	1	0	0	↓	↓	↓	0	0	0	0	31	31
	2	↓	↓	↓	↓	↓	↓	0	0	3	27	30
	3	↓	↓	↓	↓	↓	↓	1	1	6	23	30
	4	↓	↓	↓	↓	↓	↓	2	2	9	19	30
100	1	0	0	↓	↓	↓	↓	0	0	0	30	30
	2	↓	↓	↓	↓	↓	↓	↓	0	3	27	30
	3	↓	↓	↓	↓	1	↓	↓	1	1	29	31
	4	↓	↓	↓	↓	0	1	2	3	17	10	30
	1							Ø IMC				
	2							↓				
	3							↓				
	4							↓				
	1											
	2											
	3											
	4											
Tech Initials		IMC	IMC	HEC/ IMC	HEC/ MM	MM	IMC	IMC	MM	MM	MM	MM

Comments:

Reviewed by: JCh **Date reviewed:** Nov. 2/20

CETIS Analytical Report

Salmonid Embryo Survival and Development Test — **Nautilus Environmental**

Analysis ID:	14-6818-4667	**Endpoint:**	Proportion Normal	**CETIS Version:**	CETISv1.9.4
Analyzed:	01 Nov-20 13:17	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1
Batch ID:	09-0311-5780	**Test Type:**	Development	**Analyst:**	Yvonne Lam
Start Date:	08 Oct-20 13:30 ✓	**Protocol:**	EC/EPS 1/RM/28	**Diluent:**	Dechlorinated Tap Water
Ending Date:	15 Oct-20 10:15 ✓	**Species:**	Oncorhynchus mykiss	**Brine:**	
Test Length:	6d 21h	**Taxon:**	Actinopterygii	**Source:**	Lyndon Fish Hatcheries **Age:**
Sample ID:	01-8948-0399	**Code:**	B4B3DCF	**Project:**	Minto Project
Sample Date:	06 Oct-20 06:05 ✓	**Material:**	Water Sample	**Source:**	ALS ✓
Receipt Date:	08 Oct-20 08:34 ✓	**CAS (PC):**		**Station:**	WR2001039-001 W3 ✓
Sample Age:	55h (8.4 °C) ✓	**Client:**	ALS		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	1360604	200	Yes	Two-Point Interpolation

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
EC5	10.41	0.181	n/a	9.603	n/a	552.5
EC10	55.78	n/a	n/a	1.793	n/a	n/a
EC15	>100	n/a	n/a	<1	n/a	n/a
EC20	>100	n/a	n/a	<1	n/a	n/a
EC25	>100	n/a	n/a	<1	n/a	n/a
EC40	>100	n/a	n/a	<1	n/a	n/a
EC50	>100	n/a	n/a	<1	n/a	n/a

Proportion Normal Summary

			Calculated Variate(A/B)							Isotonic Variate	
Conc-%	Code	Count	Mean	Min	Max	Std Dev	CV%	%Effect	A/B	Mean	%Effect
0	N	4	0.8917	0.7667	1.0000	0.1258	14.11%	0.0%	107/120	0.9125	0.0%
6.25		4	0.9333	0.8333	1.0000	0.0720	7.72%	-4.67%	112/120	0.9125	0.0%
12.5		4	0.8500	0.6667	1.0000	0.1599	18.81%	4.67%	102/120	0.85	6.85%
25		4	0.8500	0.7000	1.0000	0.1552	18.25%	4.67%	102/120	0.85	6.85%
50		4	0.8250	0.6333	1.0000	0.1596	19.34%	7.48%	100/121	0.825	9.59%
100		4	0.7922	0.3333	1.0000	0.3087	38.97%	11.15%	96/121	0.7922	13.18%

Proportion Normal Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	N	1.0000	1.0000	0.7667	0.8000
6.25		1.0000	0.9667	0.9333	0.8333
12.5		0.9667	1.0000	0.6667	0.7667
25		1.0000	0.9667	0.7000	0.7333
50		1.0000	0.9000	0.7667	0.6333
100		1.0000	0.9000	0.9355	0.3333

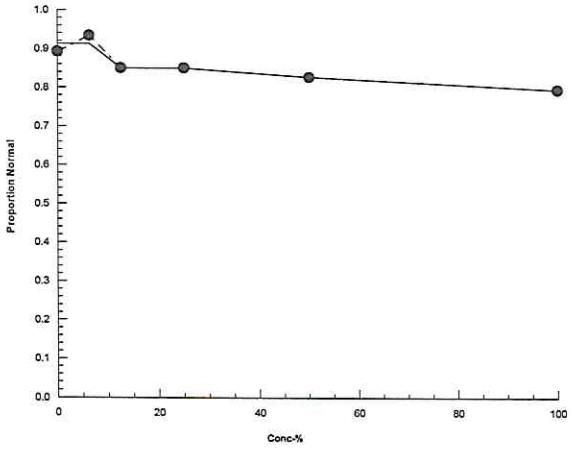
Proportion Normal Binomials

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	N	30/30	30/30	23/30	24/30
6.25		30/30	29/30	28/30	25/30
12.5		29/30	30/30	20/30	23/30
25		30/30	29/30	21/30	22/30
50		31/31	27/30	23/30	19/30
100		30/30	27/30	29/31	10/30

Salmonid Embryo Survival and Development Test **Nautilus Environmental**

Analysis ID:	14-6818-4667	**Endpoint:**	Proportion Normal	**CETIS Version:**	CETISv1.9.4
Analyzed:	01 Nov-20 13:17	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1

Graphics



Analyst: _____ QA: Nov-2 / 20

Client: ALS Environmental

W.O.#: 201946

Hardness and Alkalinity Datasheet

	Alkalinity						Hardness			
Sample ID	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H_2SO_4 used to pH 4.5	(mL) of 0.02N HCL/H_2SO_4 used to pH 4.2	Total Alkalinity ($mg/LCaCO_3$)	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness ($mg/L\ CaCO_3$)	Technician
WR2001039-001	Oct. 8/20	Oct 8/20	50	11.0	11.5	210	50	12.0	240	MM
W3										
~~Duplicate~~ Dechlor	Oct. 8/20	Oct. 8/20	100	1.3	1.4	12	100	0.6	6	MM

Notes:

Reviewed by: JCu Date Reviewed: Nov. 2/20

APPENDIX C – *Lemna minor* Toxicity Test Data

Lemna minor Summary Sheet

Client: ALS
Work Order No.: 201948

Start Date: 8-Oct-20
Set up by: MLT

Sample Information:

Sample ID: WR 200 (W) 1039-001 W3
Sample Date: 6-Oct-20
Date Received: 8-Oct-20
Sample Volume: 7 x 20L

Test Organism Information:

Culture Date: 30-Sep-20
Age of culture (Day 0): 8 days
>8X growth in APHA?: Y (48 fronds)

KCl Reference Toxicant Results:

Reference Toxicant ID: Lm 196
Date Initiated: 16-Oct-20

7-d No. of Fronds IC50 (95% CL): 3.3 (3.0-3.7) g/L KCl

7-d No. Fronds IC50 Reference Toxicant Mean (2 SD Range): 3.4 (3.0-3.8) g/L KCl CV (%): 6

Test Results:

	Number of Fronds	Dry Weight
IC25 %(v/v) (95% CL)	>97	>97
IC50 %(v/v) (95% CL)	>97	>97

Reviewed by: JCM

Date reviewed: Nov. 9/20

Plant Growth Inhibition Toxicity Test
Water Quality Measurements

Client :	ALS (Minto)	**Setup by:**	MG
Sample ID:	WR JW #1038 - 001 W3	**Test Date:**	Oct 8/20
Work Order No.:	201948	**CER #:**	9
Culture Source:	CPCC #480	**Test Species:**	*Lemna minor*
Test Culture Age:	8 days	**> 8X Growth? (Y/N):**	Y (48 Fronds)
Light Intensity Range:	4600 - 4980 lux	**Date Measured:**	Oct 7/20

Day	0	1	2	3	4	5	6	7
Shelf Temp (°C)	25.0	24.0	25.0	25.0	24.0 ~~25.0~~	24.0	24.0	24.0
Initials	MG	MG	MG	MG	MG	MG	MG	MG

Sample Characteristics:	Initial Water Quality		Adjusted Water Quality
Temperature (°C)	25.5	Aeration?: 20 min	24.0
DO (mg/L)	8.2	Nutrients added?[1]: Y	8.1
pH	7.8	→	8.5
Conductivity (µS)	510		1284

[1] 10 mL of each APHA stock (A,B and C) added to 970 mL sample.

Concentration %(v/v)	Temperature (°C)		pH		Conductivity (µS)
	Day 0	Day 7	Day 0	Day 7	0 h
Control	24.0	24.0	8.2	8.9	871
1.5	24.0	24.0	8.2	9.0	881
3	24.0	24.0	8.3	8.9	887
6.1	24.0	24.0	8.3	8.8	901
12.1	24.0	24.0	8.3	9.0	926
24.2	24.0	24.0	8.4	9.3	982
48.5	24.0	24.0	8.4	9.3	1084
97	24.0	24.0	8.5	9.4	1284
Initials	MG	MG	MG	MG	MG

Thermometer: 9 Light meter: 1 pH meter/probe: 1 / 1 DO meter/probe: 1 / 1 Conductivity meter/probe: 1 / 1

Sample Description: clear, pale yellow, odourless, no particulates.

Comments:

Reviewed: JCK **Date Reviewed:** Nov. 5/20

Lemna minor Toxicity Test Data Sheet - 7-d Frond Counts

Client: ALS (Minto)
Sample ID: WR20091039-001W3
Work Order #: VN 201948

Start Date: Oct 8/20
Termination Date: Oct 15/20
Test set up by: MG

Concentration o/o (v/v)	Rep	No. of fronds		Chlorosis	Necrosis	Yellow	Abnormal size	Gibbosity	Single fronds	Root destruction	Loss of buoyancy	Comments	Initials
		Day 0	Day 7										
control	A	6	105										MG
	B	6	99										
	C	6	84										
	D	6	88										
1.5	A	6	110										
	B	6	124										
	C	6	97										
	D	6	114										
3	A	6	105										
	B	6	126										
	C	6	99										
	D	6	124										
6.1	A	6	137										
	B	6	141										
	C	6	131										
	D	6	123										
12.1	A	6	120										
	B	6	152										
	C	6	144										
	D	6	147										
24.2	A	6	136										
	B	6	163										
	C	6	157										
	D	6	152										

Comments:

Reviewed by: JBh

Date Reviewed: Nov. 5/20

Lemna minor Toxicity Test Data Sheet - 7-d Frond Counts

Client: ALS (Minto)
Sample ID: WR200138-001 W3
Work Order #: 201948

Start Date: Oct 8/20
Termination Date: Oct 15/20
Test set up by: MW

Concentration o/o(v/v)	Rep	No. of fronds		Chlorosis	Necrosis	Yellow	Abnormal size	Gibbosity	Single fronds	Root destruction	Loss of buoyancy	Comments	Initials
		Day 0	Day 7										
48.5	A	6	139										MW
	B	6	144										
	C	6	140										
	D	6	156										
97	A	6	126										
	B	6	138										
	C	6	127										
	D	6	150										
	A												
	B												
	C												
	D												
	A												
	B												
	C												
	D												
	A												
	B												
	C												
	D												
	A												
	B												
	C												
	D												

Comments:

Reviewed by: JCh

Date Reviewed: Nov. 5/20

7-d *Lemna minor* Weight Data Sheet

Client: ALS (Minto) | Start Date: Oct 8/20
Sample ID: WR 20091039-001 W3 | Termination Date: Oct 15/20
WO #: 201948 | Balance ID: Bal - 1
% (v/v) BG Black

Concentration	Rep	Pan No.	Pan weight (mg)	Pan + plant (mg)	Initials
Control	A	1	998.90	1006.36	JZL / TM
	B	2	1004.16	1011.46	
	C	3	1005.04	1010.83	
	D	4	1003.30	1010.34	
1.5	A	5	1005.70	1014.04	
	B	6	1004.07	1013.00	
	C	7	1009.61	1015.99	
	D	8	1016.74	1026.42	
3	A	9	1014.68	1022.52	
	B	10	1011.27	1020.95	
	C	11	1018.99	1025.84	
	D	12	1009.82	1019.34	
6.1	A	13	1009.43	1019.69	
	B	14	1013.49	1024.95	
	C	15	1015.19	1024.56	
	D	16	1006.64	1015.82	
12.1	A	17	1005.17	1014.22	
	B	18	999.83	1011.34	
	C	19	1006.61	1017.09	
	D	20	1009.40	1022.20	
24.2	A	21	1004.33	1016.95	
	B	22	1005.82	1020.98	
	C	23	1007.00	1021.29	
	D	24	1005.53	1018.02	
48.5	A	25	1005.15	1017.03	
	B	26	1014.41	1028.07	
	C	27	1011.40	1023.43	
	D	28	1010.61	1026.21	✓ ✓

Comments: 10% Re-weigh: # 4 : 1010.28 (mg) # 26 : 1027.98
17 : 1014.13 # 32 : 1015.18

Reviewed by: JZL Date Reviewed: Nov 5/20

7-d *Lemna minor* Weight Data Sheet

Client: ALS (Minto) Start Date: Oct 8/20
Sample ID: WR2008 1039-001 W3 Termination Date: Oct 15/20
WO #: JN 201948 Balance ID: Bal - 1

% (v/v) BG Blank

Concentration	Rep	Pan No.	Pan weight (mg)	Pan + plant (mg)	Initials
97	A	29	1010.92	1021.06	JEL/TH
	B	30	1013.27	1026.03	↓
	C	31	1010.21	1021.83	↓
	D	32	999.59	1014.89	↓
	A				
	B				
	C				
	D				
	A				
	B				
	C				
	D				
	A				
	B				
	C				
	D				
	A				
	B				
	C				
	D				
	A				
	B				
	C				
	D				
	A				
	B				
	C				
	D				

Comments:

Reviewed by: JGR Date Reviewed: Nov. 5/20

Lemna Growth Inhibition Test — **Nautilus Environmental**

Analysis ID:	08-8144-1395	**Endpoint:**	Frond Count	**CETIS Version:**	CETISv1.9.4
Analyzed:	31 Oct-20 17:55	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1
Batch ID:	17-7841-5567	**Test Type:**	Lemna Growth	**Analyst:**	Jeslin Wijaya
Start Date:	08 Oct-20 ✓	**Protocol:**	EC/EPS 1/RM/37 ✓	**Diluent:**	Modified APHA
Ending Date:	15 Oct-20 ✓	**Species:**	Lemna minor	**Brine:**	
Test Length:	7d 0h	**Taxon:**	Tracheophyta	**Source:**	CPCC#490 **Age:** 8d
Sample ID:	01-8948-0399	**Code:**	B4B3DCF	**Project:**	Minto Project
Sample Date:	06 Oct-20 06:05 ✓	**Material:**	Water Sample	**Source:**	ALS ✓
Receipt Date:	08 Oct-20 08:34 ✓	**CAS (PC):**		**Station:**	WR2001039-001 W3 ✓
Sample Age:	42h (8.4 °C) ✓	**Client:**	ALS		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	1701331	200	Yes	Two-Point Interpolation

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	>97	n/a	n/a	<1.031	n/a	n/a
IC10	>97	n/a	n/a	<1.031	n/a	n/a
IC15	>97	n/a	n/a	<1.031	n/a	n/a
IC20	>97	n/a	n/a	<1.031	n/a	n/a
IC25	>97	n/a	n/a	<1.031	n/a	n/a
IC40	>97	n/a	n/a	<1.031	n/a	n/a
IC50	>97	n/a	n/a	<1.031	n/a	n/a

Frond Count Summary

			Calculated Variate						Isotonic Variate	
Conc-%	Code	Count	Mean	Min	Max	Std Dev	CV%	%Effect	Mean	%Effect
0	N	4	88	78	99	9.695	11.02%	0.0%	122.1	0.0%
1.5		4	105.2	91	118	11.18	10.62%	-19.6%	122.1	0.0%
3		4	107.5	93	120	13.53	12.58%	-22.16%	122.1	0.0%
6.1		4	127	117	135	7.832	6.17%	-44.32%	122.1	0.0%
12.1		4	135	114	147	14.49	10.73%	-53.41%	122.1	0.0%
24.2		4	146	130	157	11.58	7.93%	-65.91%	122.1	0.0%
48.5		4	138.8	133	150	7.805	5.63%	-57.67%	122.1	0.0%
97		4	129.2	120	144	11.24	8.69%	-46.88%	122.1	0.0%

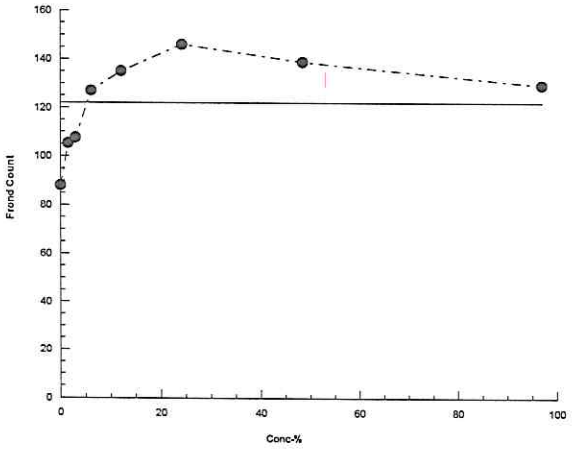
Frond Count Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	N	99	93	78	82
1.5		104	118	91	108
3		99	120	93	118
6.1		131	135	125	117
12.1		114	147	138	141
24.2		130	157	151	146
48.5		133	138	134	150
97		120	132	121	144

Lemna Growth Inhibition Test **Nautilus Environmental**

Analysis ID:	08-8144-1395	**Endpoint:**	Frond Count	**CETIS Version:**	CETISv1.9.4
Analyzed:	31 Oct-20 17:55	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1

Graphics



Analyst: JW QA: Nov. 5/20

Lemna Growth Inhibition Test — **Nautilus Environmental**

Analysis ID:	00-5617-0251	**Endpoint:**	Frond Count	**CETIS Version:**	CETISv1.9.4
Analyzed:	31 Oct-20 17:54	**Analysis:**	Parametric-Control vs Treatments	**Status Level:**	1
Batch ID:	17-7841-5567	**Test Type:**	Lemna Growth	**Analyst:**	Jeslin Wijaya
Start Date:	08 Oct-20	**Protocol:**	EC/EPS 1/RM/37	**Diluent:**	Modified APHA
Ending Date:	15 Oct-20	**Species:**	Lemna minor	**Brine:**	
Test Length:	7d 0h	**Taxon:**	Tracheophyta	**Source:**	CPCC#490 **Age:** 8d
Sample ID:	01-8948-0399	**Code:**	B4B3DCF	**Project:**	Minto Project
Sample Date:	06 Oct-20 06:05	**Material:**	Water Sample	**Source:**	ALS
Receipt Date:	08 Oct-20 08:34	**CAS (PC):**		**Station:**	WR2001039-001 W3
Sample Age:	42h (8.4 °C)	**Client:**	ALS		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C < T	3	6.1	4.278	33.33	22.23%

Dunnett Multiple Comparison Test

Control	vs	Conc-%	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Negative Control		1.5	2.188	2.482	19.57	6	CDF	0.0881	Non-Significant Effect
		3	2.473	2.482	19.57	6	CDF	0.0509	Non-Significant Effect
		6.1*	4.947	2.482	19.57	6	CDF	1.5E-04	Significant Effect
		12.1*	5.962	2.482	19.57	6	CDF	1.3E-05	Significant Effect
		24.2*	7.357	2.482	19.57	6	CDF	1.2E-06	Significant Effect
		48.5*	6.437	2.482	19.57	6	CDF	4.6E-06	Significant Effect
		97*	5.232	2.482	19.57	6	CDF	7.4E-05	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	10999.5	1571.35	7	12.64	1.1E-06	Significant Effect
Error	2983.25	124.302	24			
Total	13982.7		31			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	1.846	18.48	0.9679	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9544	0.9081	0.1916	Normal Distribution

Frond Count Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	N	4	88	72.57	103.4	87.5	78	99	4.848	11.02%	0.00%
1.5		4	105.2	87.47	123	106	91	118	5.588	10.62%	-19.60%
3		4	107.5	85.97	129	108.5	93	120	6.764	12.58%	-22.16%
6.1		4	127	114.5	139.5	128	117	135	3.916	6.17%	-44.32%
12.1		4	135	111.9	158.1	139.5	114	147	7.246	10.73%	-53.41%
24.2		4	146	127.6	164.4	148.5	130	157	5.788	7.93%	-65.91%
48.5		4	138.8	126.3	151.2	136	133	150	3.902	5.63%	-57.67%
97		4	129.2	111.4	147.1	126.5	120	144	5.618	8.69%	-46.88%

Frond Count Detail

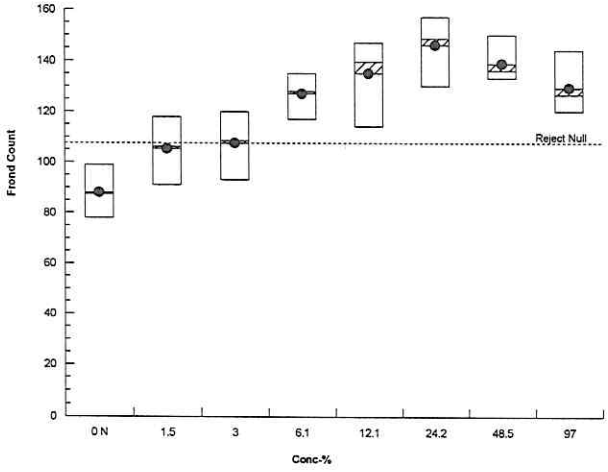
Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	N	99	93	78	82
1.5		104	118	91	108
3		99	120	93	118
6.1		131	135	125	117
12.1		114	147	138	141
24.2		130	157	151	146
48.5		133	138	134	150
97		120	132	121	144

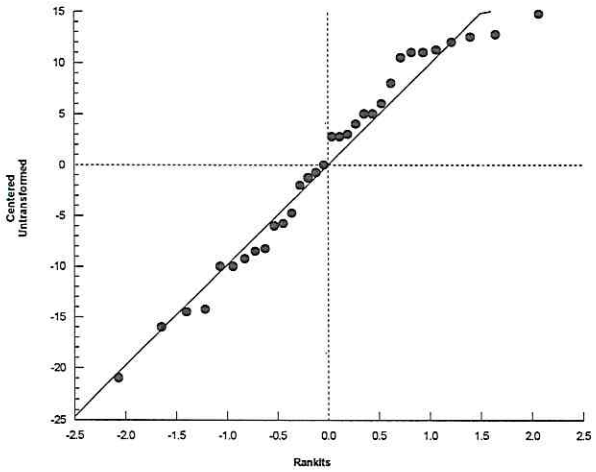
Analyst: JW QA: Nov. 5/20

Lemna Growth Inhibition Test — **Nautilus Environmental**

Analysis ID:	00-5617-0251	**Endpoint:**	Frond Count	**CETIS Version:**	CETISv1.9.4
Analyzed:	31 Oct-20 17:54	**Analysis:**	Parametric-Control vs Treatments	**Status Level:**	1

Graphics





Lemna Growth Inhibition Test — Nautilus Environmental

Analysis ID:	08-7709-6437	Endpoint:	Total Dry Weight-mg	CETIS Version:	CETISv1.9.4
Analyzed:	09 Nov-20 12:19	Analysis:	Linear Interpolation (ICPIN)	Status Level:	1
Batch ID:	17-7841-5567	Test Type:	Lemna Growth	Analyst:	Jeslin Wijaya
Start Date:	08 Oct-20	Protocol:	EC/EPS 1/RM/37	Diluent:	Modified APHA
Ending Date:	15 Oct-20	Species:	Lemna minor	Brine:	
Test Length:	7d 0h	Taxon:	Tracheophyta	Source:	CPCC#490 Age: 8d
Sample ID:	01-8948-0399	Code:	B4B3DCF	Project:	Minto Project
Sample Date:	06 Oct-20 06:05	Material:	Water Sample	Source:	ALS
Receipt Date:	08 Oct-20 08:34	CAS (PC):		Station:	WR2001039-001 W3
Sample Age:	42h (8.4 °C)	Client:	ALS		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	78115	200	Yes	Two-Point Interpolation

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	>97	n/a	n/a	<1.031	n/a	n/a
IC10	>97	n/a	n/a	<1.031	n/a	n/a
IC15	>97	n/a	n/a	<1.031	n/a	n/a
IC20	>97	n/a	n/a	<1.031	n/a	n/a
IC25	>97	n/a	n/a	<1.031	n/a	n/a
IC40	>97	n/a	n/a	<1.031	n/a	n/a
IC50	>97	n/a	n/a	<1.031	n/a	n/a

Total Dry Weight-mg Summary

			Calculated Variate						Isotonic Variate	
Conc-%	Code	Count	Mean	Min	Max	Std Dev	CV%	%Effect	Mean	%Effect
0	N	4	6.898	5.79	7.46	0.7583	10.99%	0.0%	10.51	0.0%
1.5		4	8.333	6.38	9.68	1.412	16.95%	-20.8%	10.51	0.0%
3		4	8.473	6.85	9.68	1.365	16.11%	-22.83%	10.51	0.0%
6.1		4	10.07	9.18	11.46	1.041	10.34%	-45.96%	10.51	0.0%
12.1		4	10.96	9.05	12.8	1.588	14.49%	-58.9%	10.51	0.0%
24.2		4	13.64	12.49	15.16	1.303	9.56%	-97.75%	10.51	0.0%
48.5		4	13.29	11.88	15.6	1.737	13.07%	-92.71%	10.51	0.0%
97		4	12.46	10.14	15.3	2.179	17.49%	-80.57%	10.51	0.0%

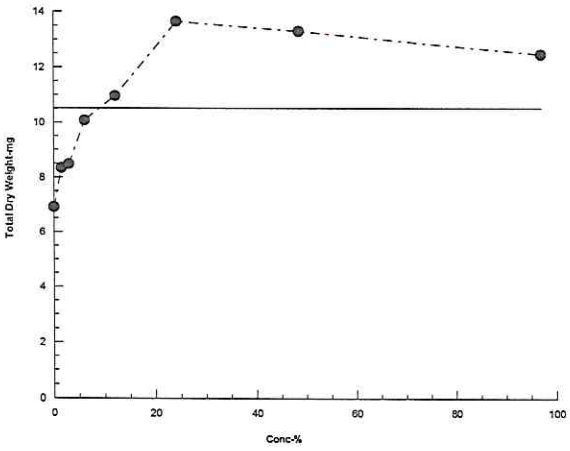
Total Dry Weight-mg Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	N	7.46	7.3	5.79	7.04
1.5		8.34	8.93	6.38	9.68
3		7.84	9.68	6.85	9.52
6.1		10.26	11.46	9.37	9.18
12.1		9.05	11.51	10.48	12.8
24.2		12.62	15.16	14.29	12.49
48.5		11.88	13.66	12.03	15.6
97		10.14	12.76	11.62	15.3

Lemna Growth Inhibition Test **Nautilus Environmental**

Analysis ID:	08-7709-6437	**Endpoint:**	Total Dry Weight-mg	**CETIS Version:**	CETISv1.9.4
Analyzed:	09 Nov-20 12:19	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1

Graphics



CETIS Analytical Report

Lemna Growth Inhibition Test — **Nautilus Environmental**

Analysis ID:	01-2428-1586	**Endpoint:**	Total Dry Weight-mg	**CETIS Version:**	CETISv1.9.4
Analyzed:	09 Nov-20 12:19	**Analysis:**	Parametric-Control vs Treatments	**Status Level:**	1
Batch ID:	17-7841-5567	**Test Type:**	Lemna Growth	**Analyst:**	Jeslin Wijaya
Start Date:	08 Oct-20	**Protocol:**	EC/EPS 1/RM/37	**Diluent:**	Modified APHA
Ending Date:	15 Oct-20	**Species:**	Lemna minor	**Brine:**	
Test Length:	7d 0h	**Taxon:**	Tracheophyta	**Source:**	CPCC#490 **Age:** 8d
Sample ID:	01-8948-0399	**Code:**	B4B3DCF	**Project:**	Minto Project
Sample Date:	06 Oct-20 06:05	**Material:**	Water Sample	**Source:**	ALS
Receipt Date:	08 Oct-20 08:34	**CAS (PC):**		**Station:**	WR2001039-001 W3
Sample Age:	42h (8.4 °C)	**Client:**	ALS		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C < T	3	6.1	4.278	33.33	37.63%

Dunnett Multiple Comparison Test

Control	vs	Conc-%	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Negative Control		1.5	1.372	2.482	2.596	6	CDF	0.3172	Non-Significant Effect
		3	1.506	2.482	2.596	6	CDF	0.2658	Non-Significant Effect
		6.1*	3.031	2.482	2.596	6	CDF	0.0155	Significant Effect
		12.1*	3.884	2.482	2.596	6	CDF	0.0021	Significant Effect
		24.2*	6.447	2.482	2.596	6	CDF	4.5E-06	Significant Effect
		48.5*	6.115	2.482	2.596	6	CDF	9.1E-06	Significant Effect
		97*	5.314	2.482	2.596	6	CDF	6.1E-05	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	174.652	24.9503	7	11.41	2.7E-06	Significant Effect
Error	52.5027	2.18761	24			
Total	227.155		31			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	3.484	18.48	0.8369	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.979	0.9081	0.7696	Normal Distribution

Total Dry Weight-mg Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	N	4	6.898	5.691	8.104	7.17	5.79	7.46	0.3792	10.99%	0.00%
1.5		4	8.333	6.085	10.58	8.635	6.38	9.68	0.7062	16.95%	-20.80%
3		4	8.473	6.301	10.64	8.68	6.85	9.68	0.6824	16.11%	-22.83%
6.1		4	10.07	8.411	11.72	9.815	9.18	11.46	0.5204	10.34%	-45.96%
12.1		4	10.96	8.433	13.49	11	9.05	12.8	0.7941	14.49%	-58.90%
24.2		4	13.64	11.57	15.71	13.45	12.49	15.16	0.6516	9.55%	-97.75%
48.5		4	13.29	10.53	16.06	12.84	11.88	15.6	0.8684	13.07%	-92.71%
97		4	12.46	8.988	15.92	12.19	10.14	15.3	1.089	17.49%	-80.57%

Total Dry Weight-mg Detail

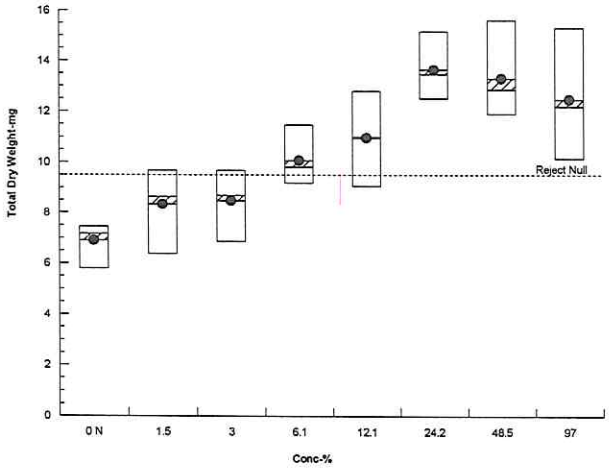
Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	N	7.46	7.3	5.79	7.04
1.5		8.34	8.93	6.38	9.68
3		7.84	9.68	6.85	9.52
6.1		10.26	11.46	9.37	9.18
12.1		9.05	11.51	10.48	12.8
24.2		12.62	15.16	14.29	12.49
48.5		11.88	13.66	12.03	15.6
97		10.14	12.76	11.62	15.3

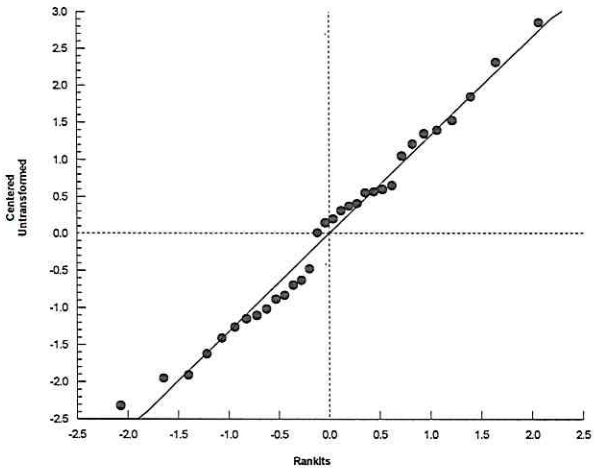
Analyst: JW QA: Nov-9/20

Lemna Growth Inhibition Test — **Nautilus Environmental**

Analysis ID:	01-2428-1586	**Endpoint:**	Total Dry Weight-mg	**CETIS Version:**	CETISv1.9.4
Analyzed:	09 Nov-20 12:19	**Analysis:**	Parametric-Control vs Treatments	**Status Level:**	1

Graphics





APPENDIX D – *Pseudokirchneriella subcapitata* Toxicity Test Data

Pseudokirchneriella subcapitata Summary Sheet

Client: ALS
Work Order No.: 201949

Start Date: Oct 8/20
Set up by: MN

Sample Information:

Sample ID: ~~WR200138-001~~ MT WR200138-001 W3
Sample Date: Oct 6/20
Date Received: Oct 8/20
Sample Volume: 5 x 1L

Test Organism Information:

Culture Date: Oct 2/20
Age of culture (Day 0): 6d

Zinc Reference Toxicant Results:

Reference Toxicant ID: SC207
Stock Solution ID: 20Zn01
Date Initiated: Oct 16/20

72-h IC50 (95% CL): ~~30.3~~ JN 30.4 (26.9 - 33.6) mg/L Zn

72-h IC50 Reference Toxicant Mean and Range: 30.5 (24.6 - 37.8) mg/L Zn CV (%): 11

Test Results:

	Algal Growth
IC25 %(v/v) (95% CL)	>95.2
IC50 %(v/v) (95% CL)	>95.2

Reviewed by: [signature]

Date reviewed: Oct. 29, 2020

72-h Algal Growth Inhibition Toxicity Test
Water Quality Measurements

Client: ALS (Minto) | Setup by: MD

Sample ID: WR2001038-001 W3 | Test Date/Time: Oct 8/20 @ 1000h

Work Order No.: 201949 | CER #: 4

Test Species: *Pseudokirchneriella subcapitata*

Culture Date: Oct 2/20 | Age of Culture: 6d | Culture Health: Good

Culture Count: 1 275 2 250 | Average: 262.5 | Culture Cell Density (c1): 262.5 x 10⁴ cells/mL

v1 = 220,000 cells/ml x 100 ml / (c1) 262.5x10⁴ cells/ml = 8.38 mL

Time Zero Counts: 1 20 2 24 | Average: 22

No. of Cells/mL: 22 x 10⁴ | Initial Density: # cells/mL ÷ 220 µL x 10 µL = 10000 cells/mL

Concentration %(v/v)	Water Quality pH 0 h	Water Quality Temp (°C) 0 h	Incubator Temperature (°C) 0 h	24 h	48 h	72 h	Microplates rotated 2X per day? 0 h	24 h	48 h	72 h
Control	7.1	24.0	24.0	24.0	24.0	24.0	✓	✓	✓	✓
1.5	7.3	24.0	↓	↓	↓	↓	✓	✓	✓	✓
3	7.4	24.0					✓	✓	✓	✓
6	7.5	24.0					✓	✓	✓	✓
11.9	7.6	24.0					✓	✓	✓	✓
23.8	7.8	24.0					✓	✓	✓	✓
47.6	7.9	24.0					✓	✓	✓	✓
95.2	8.1	24.0	↓	↓	↓	↓	✓	✓	✓	✓
Initials	MD	MD	MD	MD	MD	MD	MD	MD	MD	MD

Initial control pH: Well 1: 7.1 Well 2: 7.1

Final control pH: Well 1: 7.2 Well 2: 7.2

Light intensity (lux): 3900 Date measured: Oct 8/20

Thermometer: 4 Light meter: 1 pH meter/probe: 1 / 1

Sample Description: clear, pale yellow, no odour, no particulates

Comments:

Reviewed: [signature] Date reviewed: Oct. 29, 2020

Pseudokirchneriella subcapitata Toxicity Test Data Sheet
72-h Algal Cell Counts

Client: ALS (Minto) Start Date/Time: Oct 8/20 @ 1000h
Work Order #: 201949 Termination Date: Oct 11/20 @ 1500h
Sample ID: WR2001039-001 W3 Test set up by: MD
%(v/v)

Concentration	Rep	Count 1	Count 2	Count 3	Count 4	Comments	Initials
Control	A	35					MD
	B	36					
	C	31					
	D	35					
	E	33					
	F	32					
	G	30					
	H	34					
1.5	A	50					
	B	56					
	C	50					
	D	59					
3	A	64					
	B	67					
	C	54					
	D	59					
6	A	64					
	B	65					
	C	61					
	D	68					
11.9	A	123					
	B	111					
	C	114					
	D	119					
23.8	A	152					
	B	159					
	C	161					
	D	150					
47.6	A	136					
	B	151					
	C	142					
	D	145					
95.2	A	146					
	B	153					
	C	143					
	D	159					

Comments:

Reviewed by: Date Reviewed: Oct. 29, 2020

Pseudokirchneriella subcapitata Algal Counts

Client: ALS
WO#: 201949
Sample ID: WR2001039-001 W3

Start Date/Time: 08-Oct-20 @ 1000h
Termination Date/Time: 11-Oct-20 @ 1000h

Initial Cell Density: 10000 cell/mL

									220000
									0.22
									0.01
Concentration %(v/v)	Rep	Count 1 (x 10^4)	Count 2 (x 10^4)	Count 3 (x 10^4)	Count 4 (x 10^4)	Mean (x 10^4)	Cell Yield (x 10^4) cell/mL		10000
Control	A	35				35	34.0	mean	32.3
	B	36				36	35.0	SD	2.12132
	C	31				31	30.0	CV	6.577737
	D	35				35	34.0		
	E	33				33	32.0		
	F	32				32	31.0		
	G	30				30	29.0		
	H	34				34	33.0		
1.5	A	50				50	49.0		
	B	56				56	55.0		
	C	50				50	49.0		
	D	59				59	58.0		
3	A	64				64	63.0		
	B	67				67	66.0		
	C	54				54	53.0		
	D	59				59	58.0		
6	A	64				64	63.0		
	B	65				65	64.0		
	C	61				61	60.0		
	D	68				68	67.0		
11.9	A	123				123	122.0		
	B	111				111	110.0		
	C	114				114	113.0		
	D	119				119	118.0		
23.8	A	152				152	151.0		
	B	159				159	158.0		
	C	161				161	160.0		
	D	150				150	149.0		
47.6	A	136				136	135.0		
	B	151				151	150.0		
	C	142				142	141.0		
	D	145				145	144.0		
95.2	A	146				146	145.0		
	B	153				153	152.0		
	C	143				143	142.0		
	D	159				159	158.0		

Reviewed by: _____

Date reviewed: Oct 29, 2020

CETIS Analytical Report

EC Alga Growth Inhibition Test — **Nautilus Environmental**

Analysis ID:	20-9794-0391	**Endpoint:**	Cell Yield	**CETIS Version:**	CETISv1.9.4
Analyzed:	27 Oct-20 11:30	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1
Batch ID:	13-5097-6687	**Test Type:**	Cell Growth	**Analyst:**	Mimi Tran
Start Date:	08 Oct-20 10:00	**Protocol:**	EC/EPS 1/RM/25	**Diluent:**	Deionized Water + nutrients
Ending Date:	11 Oct-20 10:00	**Species:**	Pseudokirchneriella subcapitata	**Brine:**	
Test Length:	72h	**Taxon:**	Chlorophyta	**Source:**	In-House Culture **Age:** 6d
Sample ID:	01-8948-0399	**Code:**	B4B3DCF	**Project:**	Minto Project
Sample Date:	06 Oct-20 06:05	**Material:**	Water Sample	**Source:**	ALS
Receipt Date:	08 Oct-20 08:34	**CAS (PC):**		**Station:**	WR2001039-001 W3
Sample Age:	52h (8.4 °C)	**Client:**	ALS		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	799137	200	Yes	Two-Point Interpolation

Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision(α:5%)
Extreme Value	Grubbs Extreme Value Test	2.02	2.991	1.0000	No Outliers Detected
Control Trend	Mann-Kendall Trend Test	2.02		0.1788	Non-Significant Trend in Controls

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	>95.2	n/a	n/a	<1.05	n/a	n/a
IC10	>95.2	n/a	n/a	<1.05	n/a	n/a
IC15	>95.2	n/a	n/a	<1.05	n/a	n/a
IC20	>95.2	n/a	n/a	<1.05	n/a	n/a
IC25	>95.2	n/a	n/a	<1.05	n/a	n/a
IC40	>95.2	n/a	n/a	<1.05	n/a	n/a
IC50	>95.2	n/a	n/a	<1.05	n/a	n/a

Cell Yield Summary

			Calculated Variate						Isotonic Variate	
Conc-%	Code	Count	Mean	Min	Max	Std Dev	CV%	%Effect	Mean	%Effect
0	N	8	32.25	29	35	2.121	6.58%	0.0%	96.31	0.0%
1.5		4	52.75	49	58	4.5	8.53%	-63.57%	96.31	0.0%
3		4	60	53	66	5.715	9.53%	-86.05%	96.31	0.0%
6		4	63.5	60	67	2.887	4.55%	-96.9%	96.31	0.0%
11.9		4	115.8	110	122	5.315	4.59%	-258.9%	96.31	0.0%
23.8		4	154.5	149	160	5.323	3.45%	-379.1%	96.31	0.0%
47.6		4	142.5	135	150	6.245	4.38%	-341.9%	96.31	0.0%
95.2		4	149.2	142	158	7.182	4.81%	-362.8%	96.31	0.0%

Cell Yield Detail

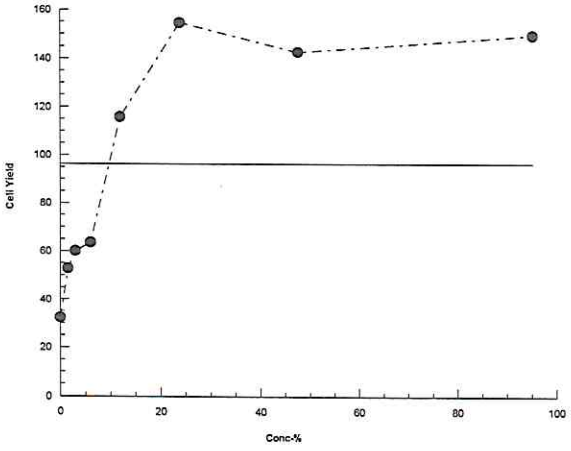
Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	N	34	35	30	34	32	31	29	33
1.5		49	55	49	58				
3		63	66	53	58				
6		63	64	60	67				
11.9		122	110	113	118				
23.8		151	158	160	149				
47.6		135	150	141	144				
95.2		145	152	142	158				

Analyst: MT QA: Oct 29/20

EC Alga Growth Inhibition Test **Nautilus Environmental**

Analysis ID:	20-9794-0391	**Endpoint:**	Cell Yield	**CETIS Version:**	CETISv1.9.4
Analyzed:	27 Oct-20 11:30	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1

Graphics



Analyst: [illegible] QA: 10/29/20

CETIS Analytical Report

EC Alga Growth Inhibition Test — **Nautilus Environmental**

Analysis ID:	06-6813-0293	**Endpoint:**	Cell Yield	**CETIS Version:**	CETISv1.9.4
Analyzed:	27 Oct-20 11:30	**Analysis:**	Parametric-Control vs Treatments	**Status Level:**	1
Batch ID:	13-5097-6687	**Test Type:**	Cell Growth	**Analyst:**	Mimi Tran
Start Date:	08 Oct-20 10:00	**Protocol:**	EC/EPS 1/RM/25	**Diluent:**	Deionized Water + nutrients
Ending Date:	11 Oct-20 10:00	**Species:**	Pseudokirchneriella subcapitata	**Brine:**	
Test Length:	72h	**Taxon:**	Chlorophyta	**Source:**	In-House Culture **Age:** 6d
Sample ID:	01-8948-0399	**Code:**	B4B3DCF	**Project:**	Minto Project
Sample Date:	06 Oct-20 06:05	**Material:**	Water Sample	**Source:**	ALS
Receipt Date:	08 Oct-20 08:34	**CAS (PC):**		**Station:**	WR2001039-001 W3
Sample Age:	52h (8.4 °C)	**Client:**	ALS		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C < T	<1.5	1.5	n/a	>66.67	23.23%

Dunnett Multiple Comparison Test

Control vs	Control II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Negative Control	1.5*	6.912	2.526	7.492	10	CDF	<1.0E-37	Significant Effect
	3*	9.357	2.526	7.492	10	CDF	<1.0E-37	Significant Effect
	6*	10.54	2.526	7.492	10	CDF	<1.0E-37	Significant Effect
	11.9*	28.15	2.526	7.492	10	CDF	<1.0E-37	Significant Effect
	23.8*	41.22	2.526	7.492	10	CDF	<1.0E-37	Significant Effect
	47.6*	37.17	2.526	7.492	10	CDF	<1.0E-37	Significant Effect
	95.2*	39.45	2.526	7.492	10	CDF	<1.0E-37	Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Extreme Value	Grubbs Extreme Value Test	2.02	2.991	1.0000	No Outliers Detected
Control Trend	Mann-Kendall Trend Test	2.02		0.1788	Non-Significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	82976.9	11853.8	7	505.4	<1.0E-37	Significant Effect
Error	656.75	23.4554	28			
Total	83633.6		35			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	8.147	18.48	0.3198	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9754	0.9166	0.5887	Normal Distribution

Cell Yield Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	N	8	32.25	30.48	34.02	32.5	29	35	0.75	6.58%	0.00%
1.5		4	52.75	45.59	59.91	52	49	58	2.25	8.53%	-63.57%
3		4	60	50.91	69.09	60.5	53	66	2.858	9.53%	-86.05%
6		4	63.5	58.91	68.09	63.5	60	67	1.443	4.55%	-96.90%
11.9		4	115.8	107.3	124.2	115.5	110	122	2.658	4.59%	-258.91%
23.8		4	154.5	146	163	154.5	149	160	2.661	3.45%	-379.07%
47.6		4	142.5	132.6	152.4	142.5	135	150	3.122	4.38%	-341.86%
95.2		4	149.2	137.8	160.7	148.5	142	158	3.591	4.81%	-362.79%

Analyst: MM QA: 02-29/20

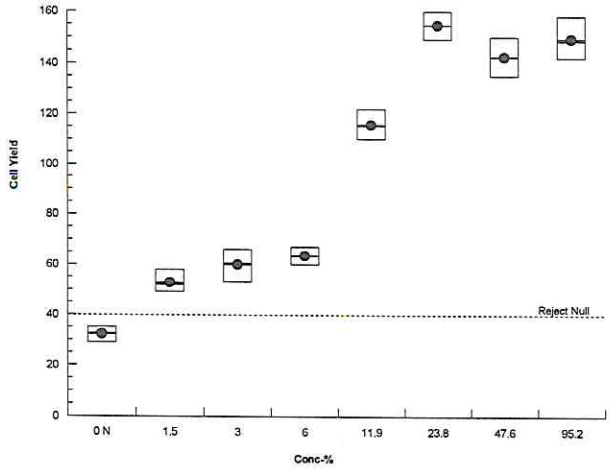
EC Alga Growth Inhibition Test **Nautilus Environmental**

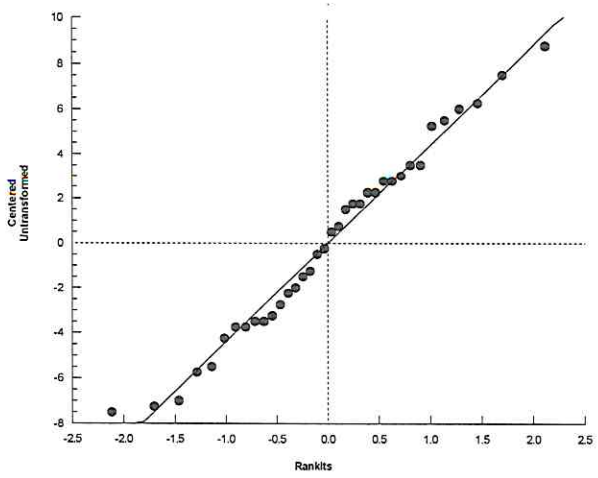
Analysis ID: 06-6813-0293 **Endpoint:** Cell Yield **CETIS Version:** CETISv1.9.4
Analyzed: 27 Oct-20 11:30 **Analysis:** Parametric-Control vs Treatments **Status Level:** 1

Cell Yield Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	N	34	35	30	34	32	31	29	33
1.5		49	55	49	58				
3		63	66	53	58				
6		63	64	60	67				
11.9		122	110	113	118				
23.8		151	158	160	149				
47.6		135	150	141	144				
95.2		145	152	142	158				

Graphics





APPENDIX E – Chain-of-Custody Form

Chain of Custody
Whitehorse - Environmental
#2 151 Industrial Road
Whitehorse YT Canada Y1A 2V3

6158

Destination Lab:	**Nautilus Environmental (Burnaby)**
Address:	8664 Commerce Court Burnaby BC Canada V5A 4N7
Client:	Minto Explorations Ltd.
Work Order Number:	**WR2001039**
Original Receipt Date/Time	Instructions Received
06/10/2020 13:45	

Relinquished By
Date/Time
Received By
Date/Time
Receipt Temp

Return as Indicated: Results: Invoice: Electronic Data:

Attention: Heather McKenzie

ALS Sample ID	Client ID	Matrix	Container Type	Test Codes	Method Description	Due Date Reg TAT	Sampling Date and Time	Remarks
WR2001039-001	W3	Water	HDPE carboy LC50	TRT-LC50-96	Survival/LC50 Rainbow Trout (96 hours)	~~14-10-2020~~	06/10/2020 06:05	
WR2001039-001	W3	Water	HDPE carboy LC50			~~14-10-2020~~	06/10/2020 06:05	
WR2001039-001	W3	Water	HDPE carboy LC50			~~14-10-2020~~	06/10/2020 06:05	
WR2001039-001	W3	Water	HDPE carboy LC50			~~14-10-2020~~	06/10/2020 06:05	
WR2001039-001	W3	Water	HDPE carboy LC50			~~14-10-2020~~	06/10/2020 06:05	
WR2001039-001	W3	Water	HDPE carboy LC50			~~14-10-2020~~	06/10/2020 06:05	
WR2001039-001	W3	Water	HDPE carboy LC50			~~14-10-2020~~	06/10/2020 06:05	
WR2001039-001	W3	Water	HDPE LC50	DAP-LC50-48	Survival/LC50 Daphnia Magna (48 hours)	~~14-10-2020~~	06/10/2020 06:05	
WR2001039-001	W3	Water	HDPE LC50			~~14-10-2020~~	06/10/2020 06:05	
WR2001039-001	W3	Water	HDPE LC50			~~14-10-2020~~	06/10/2020 06:05	
WR2001039-001	W3	Water	HDPE LC50			~~14-10-2020~~	06/10/2020 06:05	
WR2001039-001	W3	Water	HDPE LC50			~~14-10-2020~~	06/10/2020 06:05	

Account Manager:

ALSEV.DataSublet@ALSGlobal.com (PDF / EXCEL/ B2B)
ALS Vancouver Phone Number: 604-253-4188

Please reference attached CoC for analysis parameters.

201944 - Rbt LC50
201945 - Dm LC50
201946 - 7d Rbt Embryo
201947 - 7d Cerio
201948 - 7d L. minor
201949 - 72h Algae

8.4 - 8.9°C
TH
Del. 8/20 @ 8:34
7x 20L + 5x 1L

Sample Description: clear, pale yellow liquid no particulates, no odour

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number: 2020-10-06 C

Page 1 of 1

Environmental Division
Whitehorse
Work Order Reference
WR2001039

Telephone : +1 867 668 6689

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Ruth Cayetano

Report Format / Distribution	
Select Report Format:	☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	mintoenvironment@mintomine.com
Email 2	
Email 3	

Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	ap@mintomine.com
Email 2	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

Select Service Level Below - Please confirm all E&P TATs wit

Regular [R] ☑ Standard TAT if receive

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐ | EMERGENCY

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service l

Project Information	
ALS Account # / Quote #:	
Job #:	
PO / AFE:	232819 (MMER)
LSD:	
ALS Lab Work Order # (lab use only)	
ALS Contact:	Sampler: CR/CW

Analysis

Indicate Filtered (F), Preserved (P) or Filtered

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	96hr LC50 RainbowTrout	48hr - LC50 Daphnia	7day - RainbowTroutEmbryoToxicity	7day - Ceriodaphnia	7day - Lemma minor	Alga 72-h Growth Inhibition	7day - Flathead Minnow	[redacted]	Algae Growth						Number of Containers
	W3	6-Oct-20	6:05	Water	R	R	R	R	R	R									13

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☑ NO	
Are samples for human drinking water use? ☐ YES ☑ NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C	FINAL COOLER TEMPERATURES °C
1/3/2/2/2/2/2/2/2	

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Ian Smith	Date: 2020-10-06	Time:	Received by:	Date: OCT 6/20	Time: 13:45	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

END OF REPORT

Acute Toxicity Test Results

Sample WR2001039-001 W3,
collected October 6, 2020

Final Report

October 20, 2020

Submitted to: **ALS Environmental**
Burnaby, BC

8664 Commerce Court, Burnaby, BC V5A 4N7

SAMPLE INFORMATION

Sample ID	Dates				Receipt temp.
	Collected	Received	Rainbow trout test initiation	*Daphnia magna* test initiation	
WR2001039-001 W3	06-Oct-20 at 0605h	08-Oct-20 at 0834h	09-Oct-20 at 1150h	08-Oct-20 at 1230h	8.4-8.9°C

TESTS

- Rainbow trout 96-h LC50 test
- *Daphnia magna* 48-h LC50 test

RESULTS

Toxicity test results

Sample ID	LC50 (% v/v)	
	Rainbow trout	*Daphnia magna*
WR2001039-001 W3	>100	>100

LC = Lethal Concentration

QA/QC

QA/QC summary	Rainbow trout	*Daphnia magna*
Reference toxicant LC50 (95% CL)	201.0 (146.3 – 284.6) µg/L Zn[1]	6.8 (5.7 – 8.1) g/L NaCl[2]
Reference toxicant historical mean (2 SD range)	76.2 (32.2 – 180.4) µg/L Zn	6.4 (5.0 – 8.3) g/L NaCl
Reference toxicant CV	45%	13%
Organism health history	Acceptable	Acceptable
Protocol deviations	None	None
Water quality range deviations	None	None
Control performance	Acceptable	Acceptable
Test performance	Valid	Valid

[1] Test date: October 7, 2020; [2] Test Date: October 2, 2020, LC = Lethal Concentration, CL = Confidence Limits, SD = Standard Deviation, CV = Coefficient of Variation
The rainbow trout reference toxicant test was outside of the historical 2SD range but within the acceptable 3SD range.



Report By:
Marcus Lee-Fraizer, B.Sc.
Laboratory Biologist



Reviewed By:
Edmund Canaria, R.P. Bio.
Senior Analyst

This report has been prepared by Nautilus Environmental Company Inc. based on data and/or samples provided by our client and the results of this study are for their sole benefit. Any reliance on the data by a third party is at the sole and exclusive risk of that party. The results presented here relate only to the samples tested.

APPENDIX A – Summary of test conditions

Table 1. Summary of test conditions: 96-h rainbow trout (*Oncorhynchus mykiss*) LC50 test.

Test species	*Oncorhynchus mykiss*
Organism source	Hatchery
Organism age	Juvenile
Test type	Static
Test duration	96 hours
Test vessel	20-L glass aquarium
Test volume	10 to 20 L (depending on size of fish)
Test solution depth	≥15 cm
Test concentrations	Five concentrations, plus laboratory control
Test replicates	1 per treatment
Number of organisms	10 per replicate
Control/dilution water	Dechlorinated Metro Vancouver municipal tapwater
Test solution renewal	None
Test temperature	15 ± 1°C
Feeding	None
Light intensity	100 to 500 lux
Photoperiod	16 hours light / 8 hours dark
Aeration	6.5 ± 1 mL/min/L
Test measurements	Temperature, dissolved oxygen and pH measured daily; salinity measured in the undiluted sample at test initiation; conductivity measured at test initiation and termination; survival checked daily
Test protocol	Environment Canada (2000), EPS 1/RM/13, with 2007 & 2016 amendments
Statistical software	CETIS Version 1.9.4
Test endpoints	Survival (96-hour LC50)
Test acceptability criterion for controls	Survival ≥90%
Reference toxicant	Zinc (added as $ZnSO_4$)

Table 2. Summary of test conditions: 48-h *Daphnia magna* LC50 test.

Test species	*Daphnia magna*
Organism source	In-house culture
Organism age	<24-hour old neonates
Test type	Static
Test duration	48 hours
Test vessel	250-mL glass beaker
Test volume	200 mL
Test solution depth	6 cm
Test concentrations	Five concentrations, plus laboratory control
Test replicates	1 per treatment
Number of organisms	10 per replicate
Control/dilution water	Moderately-hard reconstituted water + 2.5 µg/L Se
Test solution renewal	None
Test temperature	20 ± 2°C
Feeding	None
Light intensity	400 to 800 lux
Photoperiod	16 hours light / 8 hours dark
Aeration	None
Test measurements	Temperature, dissolved oxygen and pH measured daily; salinity, hardness and alkalinity measured in the undiluted sample at test initiation; conductivity measured at test initiation and termination; survival checked daily
Test protocol	Environment Canada (2000), EPS 1/RM/14, with 2016 amendments
Statistical software	CETIS Version 1.9.4
Test endpoints	Survival (48-hour LC50)
Test acceptability criterion for controls	Survival ≥90%
Reference toxicant	Sodium chloride (NaCl)

APPENDIX B – Toxicity test data

Rainbow Trout Summary Sheet

Client: ALS Environmental

Start Date/Time: 090ct20 @ 1150h

Work Order No.: 201944

Test Species: *Oncorhynchus mykiss*

Test Validity Criteria:
≥ 90% control survival
WQ Ranges:
T (°C) = 15 ± 1; DO (mg/L) = 7.0 to 10.3; pH = 5.5 to 8.5

Sample Information:

Sample ID: WR20010039-001 W3
Sample Date: 060ct20
Date Received: 080ct20
Sample Volume: 7x20L, 5x1L
Other: —

Dilution Water:

Type: Dechlorinated Municipal Tap Water
Hardness (mg/L $CaCO_3$): 6
Alkalinity (mg/L $CaCO_3$): 11

Test Organism Information:

Batch No.: 092320a
Source: Lyndon Fish Hatcheries
No. Fish/Volume (L): 10/12L
Loading Density (g/L): 0.32
Mean Length ± SD (mm): 36 ± 3 Range: 31 – 40
Mean Weight ± SD (g): 0.38 ± 0.13 Range: 0.20 – 0.57

Zinc Reference Toxicant Results:

Reference Toxicant ID: RTZnL066
Stock Solution ID: 202n03
Date Initiated: 070ct20
96-h LC50 (95% CL): 201.0 (146.3 - 284.6) µg/L Zn
(LC50 value outside of 2SD but within acceptable 3SD historical range)
Reference Toxicant Mean and Historical Range: 76.2 (32.2 - 180.4) µg/L Zn
Reference Toxicant CV (%): 45%

Test Results: The 96h LC50 is estimated to be > 100% (v/v).

Reviewed by: [signature]

Date reviewed: Oct. 15, 2020

96-Hour Rainbow Trout Toxicity Test Data Sheet

Client/Project#: ALS Environmental
Sample I.D. WR2001039-001 W3
W.O. # 201944
RBT Batch #: 092320A
Date Collected/Time: Oct 6/20 @ 06:05h
Date Setup/Time: Oct 9/20 @ 1150h
CER #: 2
Sample Setup By: JR, GJU

Thermometer: CER
D.O. meter/probe: S / DS
Cond./Salinity meter/probe: S / CPS
pH meter/probe: S / PS

Number Fish/Volume: 10/12L
7-d % Mortality: 1.2
Total Pre-aeration Time (mins): 30
Aeration rate adjusted to 6.5 ± 1 mL/min/L? (Y/N): Y

Undiluted Sample WQ			
Parameters	Initial WQ	Adjustment	30 min WQ
Temp °C	15.0		15.0
D.O. (mg/L)	10.4		10.1
pH	7.9		8.1
Cond. (µS/cm)	505		504
Salinity (ppt)	7.2		0.2

Concentration	# Survivors							Temperature (°C)					Dissolved Oxygen (mg/L)					pH					Conductivity (µS/cm)	
(% v/v)	1	2	4	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	96
Ctrl				10	10	10	10	15.0	15.0	15.0	15.0	15.0	9.6	9.4	9.3	9.4	9.5	7.2	7.1	6.7	6.8	6.7	41	47
6.25				10	10	10	10	15.0	15.0	15.0	15.0	15.0	9.7	9.5	9.5	9.6	9.8	7.2	7.3	6.9	6.9	6.9	74	79
12.5				10	10	10	10	15.0	15.0	15.0	15.0	15.0	9.8	9.8	9.3	9.6	9.8	7.7	7.6	6.9	7.0	7.1	136	142
25				10	10	10	10	15.0	15.0	15.0	15.0	15.0	9.8	9.7	9.1	9.5	9.4	7.8	7.8	7.0	7.1	7.2	152	166
50				10	10	10	10	15.0	15.0	15.0	15.0	15.0	10.0	9.5	9.4	9.6	9.7	7.9	8.0	7.6	7.6	7.7	284	287
100				10	10	10	10	15.0	15.0	15.0	15.0	15.0	10.1	9.7	9.5	9.6	9.7	8.1	8.3	8.0	8.0	8.1	504	503
Initials				IMC	HEC	HEC	HEC	DK/GJU	IMC	HEC	HEC	HEC	DK/GJU	IMC	HEC	HEC	HEC	DK/GJU	IMC	HEC	HEC	AEC	DK/GJU	HEC

Sample Description/Comments: clear pale yellow liquid, no particulates, no odours

Fish Description at 96 h: All fish appear normal. Number of Stressed Fish at 96 h: 0

Other Observations:

Reviewed by: [signature] Date Reviewed: Oct - 15, 2020

Daphnia magna Summary Sheet

Client: ALS Environmental
Work Order No.: 201945

Start Date/Time: OCT 8 / 2020 @ 1230h
Test Species: *Daphnia magna*
Set up by: JZL, RZS, GJU

Test Validity Criteria:
≥ 90% mean control survival and/or mobility and ≤2 daphnids exibit immobility and/or mortality in any single control replicate.

WQ Ranges:
T (°C) = 20 ± 2; DO (mg/L) = 3.6 to 9.4; pH = 6 to 8.5

Sample Information:

Sample ID: WR2001039-001 WS
Sample Date: OCT 6 / 2020
Date Received: OCT 8 / 2020
Sample Volume: 5 x 1L

Test Organism Information:

Broodstock No.: 092320B
Age of young (Day 0): <24 h
Avg No. young per brood in previous 7 d: 20
Mortality (%) in previous 7 d: 0
Days to first brood: 8

NaCl Reference Toxicant Results:

Reference Toxicant ID: DmDC59
Stock Solution ID: 20Na03
Date Initiated: October 2, 2020
48-h LC50 (95% CL): 6.8 (5.7-8.1) g/LNaCL

Reference Toxicant Mean and Historical Range: 6.4 (5.0-8.3) g/L NaCL
Reference Toxicant CV (%): 13

Test Results: The 48h LC50 is estimated to be > 100 % (v/v).

Reviewed by: [signature]
Date reviewed: Oct. 15, 2020

Freshwater Acute
48 Hour Toxicity Test Data Sheet

Client: ALS Environmental
Sample ID: WR2001039-001 W3
Work Order No.: 201945
CER #: 5

Start Date/Time: October 8, 2020 @ 1230h
Test Organism: *D.magna*
Organisms/volume: 10/200mL
Set up by: JZL / RZS / GJU

Thermometer: CER#5 pH meter/probe: 6 / 6 DO meter/probe: 6 / 6 Cond./Salinity meter/probe: 6 / 6

Concentration % (v/v)	Rep	Number of Live Organisms 24	Number of Live Organisms 48	No. Immobilized 48	Temperature (°C) 0	Temperature (°C) 24	Temperature (°C) 48	Dissolved oxygen (mg/L) 0	Dissolved oxygen (mg/L) 24	Dissolved oxygen (mg/L) 48	pH 0	pH 24	pH 48	Conductivity (µS/cm) 0	Conductivity (µS/cm) 48
Control	A	10	10	0	19.0	19.5	20.0	9.1	8.2	8.4	7.8	8.0	7.9	346	354
	B														
	C														
	D														
6.25	A	10	10	0	19.5	19.5	20.0	8.7	8.4	8.4	7.7	8.0	7.9	~~354~~	363
	B													357	
	C														
	D														
12.5	A	10	10	6	19.5	19.5	20.0	8.8	8.4	8.6	7.8	8.0	8.0	~~359~~	376
	B													371	
	C														
	D														
25	A	10	10	0	19.5	19.5	20.0	8.9	8.4	8.7	7.8	8.0	8.1	~~352~~	396
	B													389	
	C														
	D														
50	A	10	10	0	19.5	19.5	20.0	9.1	8.4	8.8	7.9	8.1	8.2	~~406~~	435
	B													432	
	C														
	D			DSM											
100	A	10	10	0	18.0	19.6	20.0	9.3	8.5	8.8	7.8	8.2	8.3	508	509
	B														
	C														
	D														
Technician Initials		A	JW	SM	RZS	[illegible]	JW	RZS	[illegible]	SM	RZS	[illegible]	SM	RZS	SM

Concentration	Hardness*	Alkalinity*
	*(mg/L as CaCo3)	
Control (MHW)	96	76
Highest conc.	240	200
Hardness adjusted	—	

	Initial WQ	Adjustment	Adjusted WQ
Temp (°C)	18.0		18.0
DO (mg/L)	10.2	aerated for	9.3
pH	7.8	5 mins	7.8
Cond (µS/cm)	505		505
Salinity (ppt)	0.2		0.2

Sample Description: Clear, pale yellow liquid, no particulates, no odour.

Comments:

Mortality: Heartbeat checked under microscope N/A.

Batch#: 092320B 7-d previous # young/brood: 20 Previous 7-d Mortality (%): 0 Day of 1st Brood: 8

Reviewed by: [signature] Date reviewed: Oct. 15, 2020

APPENDIX C – Chain-of-custody form

Chain of Custody

Whitehorse - Environmental
#12 151 Industrial Road
Whitehorse YT Canada Y1A 2V3

6158

Destination Lab:	**Nautilus Environmental (Burnaby)**
Address:	8664 Commerce Court Burnaby BC Canada V5A 4N7
Client:	Minto Explorations Ltd.
Work Order Number:	**WR2001039**
Original Receipt Date/Time	Instructions Received
06/10/2020 13:45	

COPY

Relinquished By	
Date/Time	
Received By	
Date/Time	
Receipt Temp	

Return as Indicated: Results: Invoice: Electronic Data:

Attention: Heather McKenzie

ALS Sample ID	Client ID	Matrix	Container Type	Test Codes	Method Description	Due Date Reg TAT	Sampling Date and Time	Remarks
WR2001039-001	W3	Water	HDPE carboy LC50	TRT-LC50-96	Survival/LC50 Rainbow Trout (96 hours)	~~14-10-2020~~	06/10/2020 06:05	
WR2001039-001	W3	Water	HDPE carboy LC50			~~14-10-2020~~	06/10/2020 06:05	
WR2001039-001	W3	Water	HDPE carboy LC50			~~14-10-2020~~	06/10/2020 06:05	
WR2001039-001	W3	Water	HDPE carboy LC50			~~14-10-2020~~	06/10/2020 06:05	
WR2001039-001	W3	Water	HDPE carboy LC50			~~14-10-2020~~	06/10/2020 06:05	
WR2001039-001	W3	Water	HDPE carboy LC50			~~14-10-2020~~	06/10/2020 06:05	
WR2001039-001	W3	Water	HDPE carboy LC50			~~14-10-2020~~	06/10/2020 06:05	
WR2001039-001	W3	Water	HDPE LC50	DAP-LC50-48	Survival/LC50 Daphnia Magna (48 hours)	~~14-10-2020~~	06/10/2020 06:05	
WR2001039-001	W3	Water	HDPE LC50			~~14-10-2020~~	06/10/2020 06:05	
WR2001039-001	W3	Water	HDPE LC50			~~14-10-2020~~	06/10/2020 06:05	
WR2001039-001	W3	Water	HDPE LC50			~~14-10-2020~~	06/10/2020 06:05	
WR2001039-001	W3	Water	HDPE LC50			~~14-10-2020~~	06/10/2020 06:05	

Account Manager:

ALSEV.DataSublet@ALSGlobal.com (PDF / EXCEL/ B2B)
ALS Vancouver Phone Number: 604-253-4188

Please reference attached CoC for analysis parameters.

201944 - Rbt LC50
201945 - Dm LC50
201946 - 7d Rbt Embryo
201947 - 7d Ceriod
201948 - 7d L. minor
201949 - 72h Algae

8.4 - 8.9°C
TH
Oct 8/20 @ 8:34
7x 20L + 5x 1L

Sample Description: clear, pale yellow liqui
no particulates, no odour

END OF REPORT

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number: 2020-10-06 C

Page 1 of 1

Environmental Division
Whitehorse
Work Order Reference
WR2001039

Telephone : +1 867 668 6689

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Ruth Cayetano

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax mintoenvironment@mintomine.com
Email 2
Email 3

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax ap@mintomine.com
Email 2

Project Information

ALS Account # / Quote #:
Job #:
PO / AFE: 232819 (MMER)
LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#
Major/Minor Code: Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only)

ALS Contact: **Sampler:** CR/CW

Select Service Level Below - Please confirm all E&P TATs wil

Regular [R] ☑ Standard TAT if receive

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐ | EMERGENCY

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service l

Analysis

Indicate Filtered (F), Preserved (P) or Filtered

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	96hr LC50 RainbowTrout	48hr - LC50 Daphnia	7day - RainbowTroutEmbryoToxicity	7day - Ceriodaphnia	7day - Lemma minor	Alga 72-h Growth Inhibition	7day - Flathead Minnow	Ra226	Algae Growth					Number of Containers
	W3	6-Oct-20	6:05	Water	R	R	R	R	R	R		R						13

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?
☐ YES ☑ NO

Are samples for human drinking water use?
☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C								FINAL COOLER TEMPERATURES °C		
1	3	2	2	2	2	2	2			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Ian Smith	Date: 2020-10-06	Time:	Received by:	Date: Oct 6/20	Time: 13:45	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Appendix L – Minto Creek Sediment, Periphyton and Benyhic Invertebrate Community Assessment – 2020



Minto Creek Sediment, Periphyton, and Benthic Invertebrate Community Assessment – 2020

Prepared for:
Minto Explorations Ltd.
Whitehorse, Yukon

Prepared by:
Minnow Environmental Inc.
Victoria, British Columbia

March 2021

Minto Creek Sediment, Periphyton, and Benthic Invertebrate Community Assessment - 2020

Sarah Latimer, H.B.Sc.
Junior Aquatic Scientist

Lisa Bowron, M.Sc., R.P.Bio.
Aquatic Scientist

Pierre Stecko, M.Sc., EP, R.P. Bio.
Senior Project Advisor

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ACRONYMS AND ABBREVIATIONS

AMP - Adaptive Management Plan
AEMP - Aquatic Effects Monitoring Program
ANOVA - Analysis of Variance
BCWQG - British Columbia Water Quality Guideline
CA - Correspondence Analysis
CES - Critical Effect Size
CI - Control-Impact
CRC ICP-MS - Collision/Reaction Cell-Inductively Coupled Plasma Mass Spectrometry
CVAFS - Cold Vapor Generation Atomic Fluorescence Spectrometry
CWQG - Canadian Water Quality Guidelines
dbRDA - Distance-Based Redundancy Analysis
DOC - Dissolved Organic Carbon
DQR - Data Quality Review
DSTSF - Dry Stack Tailing Storage Facility
EEM - Environmental Effects Monitoring
EMSRP - Environmental Monitoring, Surveillance, and Reporting Plan
EPT - Ephemeroptera-mayflies, Plecoptera-stoneflies, and Trichoptera-caddisflies
FL - Family Level
GPS - Global Positioning System
ICP-MS - Inductively Coupled Plasma Mass Spectrometry
ISQG - Interim Sediment Quality Guideline
K-M - Kaplan-Meir
LBC - Lower Big Creek
LMC - Lower Minto Creek
LOI - Loss on Ignition
LPL - Lowest Practicable Level
LRL - Laboring Reporting Limits
LWC - Lower Wolverine Creek
MAD - Median Absolute Deviation
MCT - Measure of Central Tendency
MDMER - Metal and Diamond Mining Effluent Regulations
MOD - Magnitude of Difference
MVFE - Mill Valley Fill Extension
PEL - Probable Effect Level

QA/QC - Quality Assurance/Quality Control

RCA - Reference Condition Approach

SD - Standard Deviation

SFN - Selkirk First Nation

SQG - Sediment Quality Guidelines

SSWQO - Site Specific Water Quality Objectives

TOC - Total Organic Carbon

UMC - Upper Minto Creek

URC - Upper McGinty Creek

UTM - Universal Transverse Mercator

WSP - Water Storage Pond

WUL - Water Use Licence

YSI - Yellow Springs Instruments

1 INTRODUCTION

1.1 Site Description

The Minto Mine is a high-grade copper mine owned and operated by Minto Explorations Ltd. and located within Selkirk First Nation (SFN) Category A Settlement Land Parcel R-6A approximately 240 km northwest of Whitehorse, Yukon Territory (62°37'N latitude and 137°15'W longitude; Figure 1.1). Development of the Minto Mine was initiated in 1997 and commercial operations started in October 2007. The mine was in continuous production from October 2007 to October 2018 when it was placed on temporary care and maintenance. Operations recommenced in October 2019. The facility was permitted to conduct open pit and underground mining with milling at a rate of 4,200 tonnes per day of copper/gold/silver ore. Minto Mine produced 17.8 million pounds of copper in 2020. Copper reserves are approximately 15 million tonnes (measured and indicated). Mill tailings are stored in the Main Pit, Area 2 Pit, and the Dry Stack Tailing Storage Facility (DSTSF; Figure 1.2). Mine-impacted seepage from the DSTSF and under the Mill Valley Fill Extension (MVFE) is collected at the toe of the MVFE and pumped to the Main Pit (Figure 1.2). Non-impacted water and treated mine-impacted water are collected in a Water Storage Pond (WSP; Figure 1.2).

Effluent from the WSP is periodically discharged to Minto Creek under conditions specified in Water Use Licence (WUL; QZ14-031; Yukon Water Board 2015). Minto Creek, in turn, discharges to the Yukon River approximately 7.7 km south-east of the WSP (Figure 1.2).

1.2 Overview of Aquatic Environmental Monitoring

Under Minto Mine's WUL, the Minto Mine implements an Environmental Monitoring, Surveillance, and Reporting Plan (EMSRP). The EMSRP is completed by the mine and includes routine water quality monitoring during the ice-free period (typically from April to October or November) in Minto Creek and reference tributaries at sampling frequencies varying from weekly to monthly. In accordance with the WUL, the Minto Mine submits water quality data to the Yukon Water Board as original laboratory reports and monthly summary reports within 30 days of month end. The WUL specifies effluent discharge concentrations and volumes based on the receiving aquatic environment assessment (WUL; QZ14-031; August 2015). Additionally, site specific water quality objectives (SSWQO) have been developed for Minto Creek based on background geological conditions, bioavailability considerations, and behavioral impact studies (Minnow 2009; Kennedy et al. 2012). These SSWQO are used to evaluate water quality from the EMSRP and the Aquatic Effects Monitoring Program (AEMP), and act as triggers under the operational Adaptive Management Plan (AMP).



Map of Canada



Location of the Minto Mine

0 100 200 400 km

Projection: North American Datum 1983 UTM Zone 8V

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N W E S

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Figure 1.1

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LEGEND

- Final Effluent Discharge Point
- Mine Footprint
- Water Retention Dam
- Building

0 0.25 0.5 1 km

N W E S

Projection: North American Datum 1983 UTM Zone 8V
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Minto Mine Site Layout and Receiving Environment

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Figure 1.2

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Biological monitoring is implemented under the EMSRP and includes the AEMP and Environmental Effects Monitoring (EEM) which is required under the federal *Fisheries Act*.

The AEMP evaluates potential mine-related effects to Minto Creek, with sampling areas located in upper Minto Creek and lower Minto Creek. These Minto Creek areas are evaluated in comparison to matching reference areas: upper McGinty Creek as reference for upper Minto Creek and lower Wolverine Creek and lower Big Creek as references for lower Minto Creek (Table 1.1; Figure 1.3). The annual AEMP includes monitoring of water, sediment, periphyton, benthic invertebrates, fish, and fish habitat. Data from 1994 (baseline) and 2006 to 2019 have been reported previously (e.g., HKP 1994), including annually since 2006 (e.g., Minnow 2020), with some program modifications over time.

EEM is required by the mine under the federal Metal and Diamond Mining Effluent Regulations (MDMER; Environment Canada 2012) and includes additional effluent characterization, sublethal toxicity testing (Environment Canada 1997, 2013) and biological monitoring in Minto Creek. Biological monitoring under EEM is implemented every three years and the Phase 5 EEM was completed in the fall of 2019 and an Interpretive Report was submitted in January 2021 (Minnow 2021a).

1.3 Overview of Previous Findings

The Minto Mine has implemented the AEMP annually since 2006. AEMP monitoring in 2019 (Minnow 2020) was limited by an absence of flow in lower Minto Creek and no mine effluent discharge. No periphyton or benthic invertebrate community monitoring was possible and the program therefore served to compare water quality (field measures and chemistry) and sediment quality of upper Minto Creek (the only wetted area of Minto Creek) to the corresponding upper creek reference (McGinty Creek) and previous data.

Supporting field measures collected in September 2019 indicated relatively good Minto Creek water quality. The influence of the Minto Mine was evident with higher specific conductance and pH than reference as also observed in previous years. All water quality measures met WUL objectives and Canadian Water Quality Guidelines for the protection of aquatic life (CWQG; CCME 1999). Concentrations of total copper at upper Minto Creek were higher than concentrations at the reference creek, as observed in previous years, but were below the CWQG. Dissolved copper concentrations were well below the WUL site-specific water quality objective (SSWQO), as observed in all previous years of monitoring. Based on levels of chlorophyll-a, Minto Creek has been classified as mesotrophic (e.g., Minnow 2019a).

Concentrations of several metals in upper Minto Creek sediments were significantly higher than those in the upper reference site sediments in 2019, particularly copper, molybdenum,

Table 1.1: Minto Mine AEMP Sediment, Periphyton, and Benthic Invertebrate Monitoring Program Overview, September 2020

Area Type	Area	Station	Minto Mine AEMP								
			Water	Sediment by Spoon[a]	Sediment by Hand Corer/Petite Ponar[b]	Sediment Toxicity Testing	Periphyton Chlorophyll-a	Periphyton Community	Periphyton Tissue[c]	Benthic Community by Surber Sampler[d]	Benthic Invertebrate Tissue[c]
Lower Creek Areas	Lower Wolverine Creek (Reference)	LWC-1	✓	-	✓	✓	✓	✓	✓	✓	✓
		LWC-2		-	✓	✓	✓	✓	✓	✓	✓
		LWC-3		-	✓	✓	✓	✓	✓	✓	✓
		LWC-4		-	✓	✓	✓	✓	✓	✓	✓
		LWC-5		-	✓	✓	✓	✓	✓	✓	✓
	Lower Big Creek (Reference)	LBC-1	✓	-	-	-	-	-	✓	✓	✓
		LBC-2		-	-	-	-	-	✓	✓	✓
		LBC-3		-	-	-	-	-	✓	✓	✓
		LBC-4		-	-	-	-	-	✓	✓	✓
		LBC-5		-	-	-	-	-	✓	✓	✓
	Lower Minto Creek (Exposed)	LMC-1	✓	✓	-	✓	✓	✓	✓	✓	✓
		LMC-2		✓	-	✓	✓	✓	✓	✓	✓
		LMC-3		✓	-	✓	✓	✓	✓	✓	✓
		LMC-4		✓	-	✓	✓	✓	✓	✓	✓
		LMC-5		✓	-	✓	✓	✓	✓	✓	✓
Upper Creek Areas	Upper McGinty Creek (Reference)	URC-1	✓	✓	-	-	-	-	-	-	-
		URC-2		✓	-	-	-	-	-	-	-
		URC-3		✓	-	-	-	-	-	-	-
		URC-4		✓	-	-	-	-	-	-	-
		URC-5		✓	-	-	-	-	-	-	-
	Upper Minto Creek (Exposed)	UMC-1	✓	✓	-	-	-	-	-	-	-
		UMC-2		✓	-	-	-	-	-	-	-
		UMC-3		✓	-	-	-	-	-	-	-
		UMC-4		✓	-	-	-	-	-	-	-
		UMC-5		✓	-	-	-	-	-	-	-

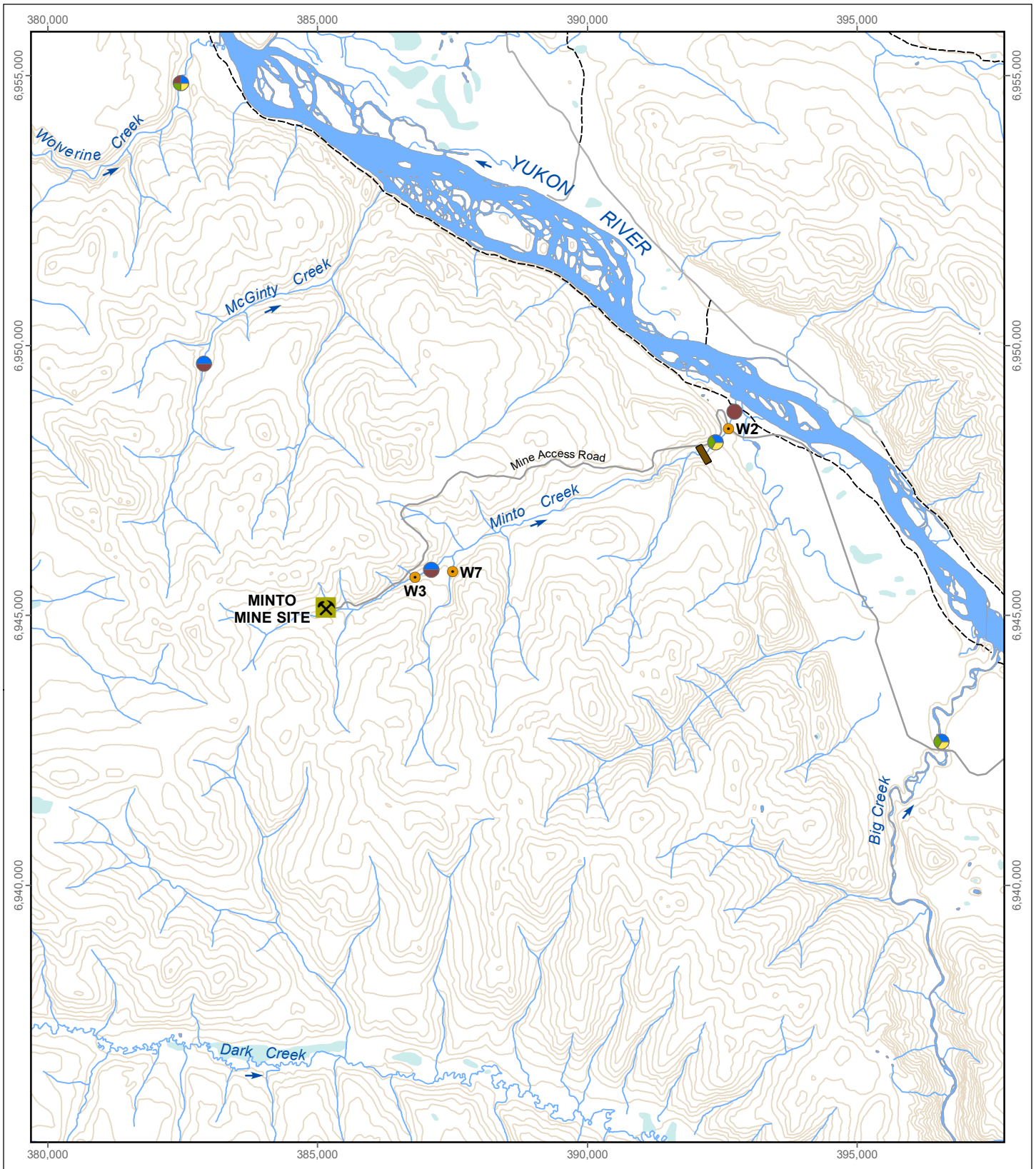
Notes: ✓ = included in monitoring program, - = not included in monitoring program.

[a] Top 2 centimeters collected; minimum 3-grab composite.

[b] Top 2 centimeters collected; 3-grab composite.

[c] Productivity permitting; in some cases, replication (of 5) may not be achieved with reasonable effort.

[d] 500 µm mesh; 3-grab composite.



LEGEND

Samples Collected

- Water
- Sediment
- Periphyton
- Benthos

- Routine Water Station
- Fish Barrier

Water, Sediment, Periphyton, and Benthic Invertebrate Monitoring Areas, 2020

0 1.25 2.5 5
Kilometers

Datum: NAD 83 Map Projection: UTM Zone 8V
Data Source: National Topographic Data Base (NTDB) compiled by Department of Natural Resources Canada at a scale of 1:50,000. All rights reserved.

N W E S

Date: January 2021
Project 207202.0070

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Figure 1.3

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and cadmium. Average concentrations of copper in Minto Creek sediment were greater than the Interim Sediment Quality Guideline (ISQG; CCME 1999) and the reference creek sediment. Copper concentration in one sediment sample in Minto Creek (one of five) was above the probable effect level. Similar concentrations were observed in previous years (Minnow 2019) and low sediment volume within predominantly erosional habitat limits the exposure of aquatic biota. Minto Creek sediment has consistently shown elevated copper concentrations relative to reference and guideline (including occasional exceedances of the probable effect level), but concentrations have been stable over time (Minnow 2019a). Sediment toxicity testing completed to date has shown some influence on the survival (but not growth) of *Chironomus dilutus* relative to reference sediments but no influence on *Hyalella azteca* (e.g., Minnow 2019).

Periphyton biomass, density, and community characteristics have shown high spatial and temporal variability and no consistent differences between lower Minto Creek and reference (lower Wolverine Creek and lower Big Creek; Minnow 2019). Benthic invertebrate community monitoring has shown limited influence of the Minto Mine on communities in lower Minto Creek and high temporal variability in lower Minto Creek and the reference creek (lower Wolverine Creek). The benthic invertebrate community of lower Minto Creek has typically been moderately different than reference based on Bray-Curtis Index, which was mainly due to more EPT taxa (Ephemeroptera-mayflies, Plecoptera-stoneflies, and Trichoptera-caddisflies). Although there appeared to have been some decreases in benthic invertebrate density from 2012 to 2014, numbers have increased subsequent to that (2015 to 2018). Lastly, concentrations of selenium have been slightly higher in periphyton and benthic invertebrate tissue in lower Minto Creek than lower Wolverine Creek, but at concentrations below effect levels (e.g., BCMOE 2014).

The Minto Mine has now completed five phases of EEM. Under Phase 5 of the EEM (Minnow 2021a), some mine influence was observed in routine water quality monitoring and water samples collected in conjunction with benthic invertebrate sampling. Analytes with concentrations higher than reference (or the range of 10 reference sites; Minnow 2021a), included conductivity, chloride, and sulphate, which were the only analytes with mean concentrations in 2017, 2018, and/or 2019 greater than the reference 95th percentile (Minnow 2021a). These analytes indicated no pattern of higher concentrations at the exposed Minto Creek station (Station W2) during periods of discharge, suggesting that concentrations of these analytes may have been associated with base, surface, and/or groundwater inputs. Concentrations of chloride and sulphate were well below Canadian Water Quality Guidelines (CWQG; CCME 1999) for the protection of aquatic life at the effluent-exposed station and the reference station. Annual mean total concentrations of several metals were greater than CWQG or SSWQO at the effluent-exposed station and the reference station (aluminum, chromium, copper, iron,

and thallium), with concentrations at the effluent-exposed station generally lower than at the reference station suggesting no or very limited effluent-related influence in Minto Creek.

Under EEM, benthic invertebrate communities have been evaluated using a Reference Condition Approach (RCA) and Control-Impact (CI) comparisons (e.g., Minnow 2021a). Based on RCA, none of the primary EEM metrics (density, taxon richness, Simpson's Evenness, and Bray-Curtis index) were identified as impaired relative to the reference condition (Minnow 2021a). However, for taxon richness and Simpson's evenness, one of the five effluent-exposed sites was classified as "uncertain" based on relatively lower family level (FL) richness at UMC-2 and lower FL richness at UMC-3. Evaluation by CI indicated that mean density and taxon richness at upper Minto Creek did not differ from reference area REF-2. Simpson's evenness of the upper Minto Creek benthic invertebrate community was significantly lower than REF-2 at FL taxonomy, but not at lowest practicable level taxonomy (LPL), at a magnitude of -1.3 reference standard deviations, which is within the applicable Critical Effect Size (CES) for EEM. Bray-Curtis index of dissimilarity differed significantly between upper Minto Creek and REF-2 at both FL and LPL taxonomy. This appeared to be due to proportions of EPT that were significantly lower at upper Minto Creek than at REF-2, whereas proportions of Chironomidae were significantly higher. The difference in percent EPT was primarily driven by Plecoptera (stoneflies), which were sparse at upper Minto Creek but dominant at REF-2. The combination of lower percent EPT and higher percent Chironomidae at upper Minto Creek, as was also observed at a subset of stations in the RCA evaluation, were in directions consistent with some impairment. Correlation analysis did not yield strong evidence of an effluent-related chemical effect to the benthic invertebrate community of upper Minto Creek (physical and chemical factors were of similar importance in their influence on benthic invertebrate communities). Overall, the results of the Phase 5 EEM benthic invertebrate studies were consistent with previous phases and indicated that Minto Creek benthic invertebrate communities are temporally variable and within the reference range.

The Phase 5 EEM laboratory-based fish study indicated that fish exposed to effluent concentrations of 14% and 25% were significantly larger (13% longer and 60 to 72% heavier) and of better condition (12 to 16%) than those reared in reference water, suggesting a stimulatory influence of Minto Mine effluent on fish growth and condition at magnitudes greater than CES. However, observations of unusual behaviour and physical condition in the reference group fish (including fish with peduncle disease) suggested possible myxobacterial infection in the reference group. The magnitude of the differences observed in the Phase 5 EEM were inconsistent with previous EEM results which indicated a very slight growth stimulation in mine effluent (Minnow 2012, 2018b).

1.4 Aquatic Effects Monitoring Program Components and Objectives

The AEMP implemented by Minto Mine on an annual basis is more comprehensive than specified under the WUL. The portion of the AEMP that Minnow Environmental Inc. (Minnow) conducts (as reported herein) includes:

1. sediment (chemistry and toxicity testing);
2. periphyton (chlorophyll-a, community, and tissue quality); and
3. benthic invertebrate (community and tissue quality).

Separate monitoring of the use of Minto Creek (and a reference creek) by fish is completed by the Minto Mine. Thus, this program is referred to as the Sediment, Periphyton, and Benthic Assessment and it is conducted every year in September. Supporting conditions (e.g., field meter measures, water quality samples, depth, flow, habitat observations) are collected at all sampling areas. Under the WUL, the AEMP program design is reviewed every three years and refined through annual recommendations.

The objectives of this AEMP study and report are to characterize and interpret current (2020) sediment quality, periphyton and benthic invertebrate community condition, and tissue quality (periphyton and benthic invertebrate) of Minto Creek relative to reference and previous years' conditions. Supporting environmental data are also reported.

2 METHODS

2.1 Overview

Minnow Environmental Inc. implemented the Minto Creek AEMP sediment, periphyton, and benthic invertebrate assessment from September 10 to 16, 2020. Due to dry conditions in 2019, the last discharge by Minto Mine prior to implementation of the 2020 AEMP was August 31, 2018 and the mine did not resume discharge until October 2020 (i.e., after the AEMP had been completed). The study was completed in accordance with specifications of the Minto Mine WUL (QZ14-031; Table 1.1; Figure 1.3). Sediment sampling was undertaken in upper and lower Minto Creek, and corresponding reference areas. Toxicity tests were run on sediment from lower Minto and lower Wolverine creeks. Periphyton and benthic invertebrate community and tissue sampling were undertaken in erosional habitat of lower Minto Creek and their corresponding reference areas, lower Wolverine and Big creeks. Supporting measures (e.g., field meter measures, water quality samples, depth, flow, habitat observations) were collected at all biological sampling areas.

2.2 Supporting Measures

2.2.1 Field Collection

Many environmental variables were measured to support the data collected for the AEMP. The location of each station was recorded using a handheld Global Positioning System (GPS) with coordinates recorded in Universal Transverse Mercator (UTM) units (using the North American Datum of 1983).

Supporting measures collected concurrent with sediment sampling (i.e., at depositional areas) included core penetration depth (lower creek areas only), sample texture, and the presence or absence of organic detritus. *In situ* measurements including temperature, dissolved oxygen, specific conductance, and pH were taken at each station using a YSI field meter (Yellow Springs Instruments, Yellow Springs, OH).

At periphyton and benthic invertebrate stations (community and tissue), *in situ* water quality measurements (by field meter as described above), water depth (by meter stick) and water velocity (by HACH FH950 handheld flow meter [HACH Company, Loveland, CO]) were measured. Habitat was characterized at each periphyton and benthic invertebrate sampling area and included elevation, gradient (clinometer), creek wetted and bankfull widths (by tape measure or range finder), water appearance, creek morphology, bank condition, substrate texture, instream cover and features, overhead canopy, aquatic vegetation, riparian vegetation, and surrounding land use.

Water samples for chemical analysis were collected at each sampling area (Table 1.1; Figure 1.3). Samples were collected using a master bottle from which the collected water was poured into pre-labeled sample bottles and preservatives were added, as required. A field duplicate was collected from one area using a split sample method; water from the master bottle was poured into one bottle and then into a duplicate bottle. Water samples for dissolved organic carbon (DOC) and for dissolved metals were filtered in the field using 0.45 micrometer (µm) polypropylene filters. Immediately after collection, water samples were placed in a cooler and refrigerated at approximately 4 degrees Celsius (°C) until submission to ALS Environmental in Whitehorse, YT, for analysis (refer to Appendix C for analytical methods).

The productivity of lower Minto and lower Wolverine creeks was evaluated using measurements of chlorophyll-a in periphyton. Chlorophyll-a is the primary photosynthetic pigment of all oxygen-evolving photosynthetic organisms (Wetzel 2001) and therefore provides an indicator of the standing stock of photosynthetic organisms representing the lowest trophic level. Minto Creek is a lotic system and measuring chlorophyll-a in periphyton was considered more representative of productivity than measuring it in water. A stainless-steel razor blade was used to scrape periphyton from five rocks and then periphyton was transferred to filter paper which was placed in a prelabeled opaque sampling jar. The surface area sampled was measured and recorded. All samples were maintained in coolers with ice packs during transport and then kept frozen on site until submission to ALS Environmental (Whitehorse, YT).

2.2.2 Data Analysis

A formal data quality review (DQR) was completed to assess data quality and by extension, the confidence with which the data can be used to derive conclusions relative to the program objectives (Appendix A). The quality of the data was evaluated by comparing laboratory reporting limits (LRLs) to pre-determined program targets (LRLs are ideally ≤ 1/10th of guideline values) observing relative percent differences of field duplicates and reviewing field blanks for potential contamination during sampling or transport. The accredited laboratory conducted their own Quality Assurance/Quality Control (QA/QC) analysis, including method blanks, laboratory duplicates, matrix spikes, spiked blanks, and certified reference materials.

Water quality from Minto Creek was evaluated relative to: WUL objectives, concentrations measured at reference areas, applicable Canadian Water Quality Guidelines (CWQG; CCME 1999), and historical water quality conditions. Sample-specific toxicity modifying factors, such as hardness, alkalinity, pH, DOC and temperature were used to calculate environmental quality guidelines for the protection of aquatic health where required. Seasonal summary statistics for mine related indicators in upper Minto Creek were also reviewed for context .

2.2.2.1 Water Chemistry

Supporting field measures (temperature, dissolved oxygen, pH, and specific conductance) were tested for differences between lower Minto Creek and reference areas (lower Wolverine and lower Big creeks) using two-sample t-tests. The assumption of normality was assessed using the Shapiro Wilks' test (α = 0.05) and homogeneity of variance was assessed using Levene's Test (α = 0.05). Data were $\log_{10}$ transformed when required to meet the assumption of normality. A value of 1 was added before taking the logarithm if values of zero were in the data set. When the assumption of normality could not be met, a non-parametric Mann–Whitney test was used. If variances were unequal, then the two-sample t-test for unequal variances was conducted (Ruxton 2006). A significance level (α) of 0.05 was used for all statistical tests. Statistical comparisons were conducted in R Studio version 1.2.5001 (2020). A magnitude of difference (MOD) was reported for statistical comparisons that were significant as:

$$MOD = \frac{\left(MCT_{Exp} - MCT_{Ref}\right)}{MCT_{Ref}} \times 100\%$$

where *MCT* is the measure of central tendency (i.e., mean for the t-test after back-transforming to original data units when a transformation was used).

Summary statistics (means and standard deviations) were calculated using R and the Kaplan-Meir (K-M) method to accommodate values for analytes with values at the LRL value (non-detections). This method was applied to avoid bias introduced by substitution methods (Helsel 2012; Lee 2017). The K-M method involves transforming the left censored (i.e., < value) dataset to a right censored (i.e., > value) dataset, and then using the K-M estimator (used to estimate the mean survival time in survival analysis) to estimate the mean. The calculation was conducted using the survfit function in the survival package (Therneau 2017) in R and involves calculating the area under the K-M survival curve. The K-M method is non-parametric and can accommodate multiple LRLs. This method of estimating the mean is equivalent to using the distribution of detectable values below the LRL to represent values that are < LRL. When a standard deviation could not be estimated (e.g., when all data were below the LRL), it was not reported. When a value was reported below a poor LRL (defined as a LRL that exceeded the maximum detected value), it was removed from the dataset.

2.2.2.2 Chlorophyll-a

Chlorophyll-a in periphyton was compared to the British Columbia Water Quality Guideline (BC WQG) for streams. Creek productivity was characterized by comparing chlorophyll-a concentrations to the Dodds et al. (1998) productivity classification system for temperate streams.

Statistical analyses were conducted using chlorophyll-a concentrations from lower Minto Creek (LMC; exposed) and reference areas, lower Wolverine Creek (LWC) and lower Big Creek (LBC). Analyses were used to determine whether concentrations of chlorophyll-a, an indicator of primary productivity, have changed at these areas over time and/or the differences from reference have changed over time. Spatial and temporal statistical comparisons were conducted using Analysis of Variance (ANOVA) with factors *Year* and *Area* and their interaction. Residuals of the ANOVA were tested for normality using the Shapiro Wilks' test ($\alpha = 0.05$) and homogeneity of variance was assessed using a Levene's Test ($\alpha = 0.05$). Concentrations were $\log_{10}$-transformed when required to meet the assumptions of normality and homogeneity of variances or rank-transformed when these assumptions could not be met. The significance of the main effects and interaction terms were assessed, and the results determined the post-hoc comparisons that were conducted. When the interaction between *Year* and *Station* was significant, it suggested that the differences between the stations changed in each year and post-hoc comparisons were conducted to:

1. test for differences between the first year of sampling and all other years for both stations individually; and
2. test for differences between the stations in each year.

For all significant comparisons, a magnitude of difference (MOD) was calculated as a percent difference using: (Exposed – Reference) x 100% with back-transformed least-squares means (or medians for rank-transformations). When the *Year* term was significant in the absence of an interaction, post-hoc comparisons were conducted to test for differences between the first year of sampling and all other years for both stations combined. Temporal MODs were then calculated by pooling over stations for significant comparisons. Similarly, when *Area* was significant, without an interaction, it suggested that the difference between the stations was consistent among years and a MOD was calculated using pooled, back-transformed least-squares means (or medians for rank-transformations) across all years. An α of 0.05 was used for these temporal comparisons, as was used for statistical analyses of all chemical data in this report. Post-hoc comparisons were corrected for the number of comparisons using Tukey's honestly significant differences method.

2.3 Sediment Quality

2.3.1 Sample Collection and Laboratory Analysis

Sediment samples were collected for particle size and chemical analysis at depositional areas within Minto Creek and reference creeks (Table 1.1, Figure 1.3). At lower Minto and lower Wolverine creeks, sediment samples for particle size analysis were collected using a 15.24 centimetre (cm) x 15.24 cm (6 inches [“] x 6”) stainless steel petite ponar grab sampler

(0.023 square metres [m^2] sampling area). A composite sample was created by collecting the surficial 2 cm of sediment from each of three acceptable grabs (i.e., full to each edge of the sampler) using a stainless-steel spoon. Each sample that formed the composite was added to a plastic bin and mixed together. The mixed composite samples were placed into pre-labeled glass sampling jars. Sediment samples for chemical analyses were collected by carefully inserting a 4.7 cm (2"; inside diameter) Lexan™ core tube into sediment deposits, capping the end with a fitted plastic cap, and retrieving by hand. From each acceptable core (i.e., each core containing an intact, representative sediment-water interface), the surficial 2 cm of sediment was manually extruded upwards into a graded core collar, cut with a stainless-steel core knife, and placed into a pre-labeled glass sampling jar. Samples from three cores were composited to form a single sample from each station.

At upper Minto and upper McGinty creeks, sediment deposits were rare and typically very shallow (i.e., deposits were less than 1 centimeter in depth). Sediment was therefore collected using a stainless-steel spoon instead of a ponar or coring equipment and only one composite sample was collected for particle size analysis (versus five samples for all other analytes). At locations of sediment deposition, surficial sediment was carefully collected by slowly spooning the sediment into a pre-labeled glass jar, with care taken to avoid the loss of fine material. In order to be as consistent as possible with the sediment collected in the lower creek areas, samples included no more than the top 2 cm of deposited sediment. Immediately after collection, sediment samples were placed in a cooler and later into a refrigerator at approximately 4°C. They were later submitted to ALS Environmental in Whitehorse, YT or Burnaby, BC, for analysis of particle size by dry and wet sieving and pipette sedimentation method, total organic carbon and loss on ignition by combustion, inorganic carbon derived from a calculation, metals by collision/reaction cell-inductively coupled plasma mass spectrometry (CRC ICP-MS), mercury by Cold Vapor Generation Atomic Fluorescence Spectrometry (CVAFS), total Kjeldahl nitrogen by colorimetric analysis, and pH by probe (refer to Appendix C for methods, laboratory certificates, and field notes).

Toxicity tests (10-day *Chironomus dilutus* and 14-day *Hyalella azteca* survival and growth) at lower Minto and lower Wolverine creeks (Environment Canada 1997, 2013). Sediment for toxicity testing at lower Wolverine Creek was collected using a 15.24 cm x 15.24 cm (6" x 6") stainless steel petite ponar grab sampler (0.023 m^2 sampling area) and the top 2 cm from three grabs was collected to form a composite sample from each station (five stations formed the replicates in the toxicity tests). Sediment for toxicity testing at lower Minto Creek was collected using a stainless-steel spoon instead of ponar equipment as sediment deposits were shallow. At locations of sediment deposition, the top 2 cm of sediment was collected by slowly spooning the sediment into a pre-labeled bag. Sediment was composited from each station (five stations

formed the replicates in the toxicity tests), mixed with a stainless-steel spoon, and samples from each station were placed into a pre-labeled 1 L jar. Immediately after collection, samples were placed in a cooler, then later transferred to a refrigerator and stored at approximately 4°C until they were submitted to Nautilus Environmental Inc. in Burnaby, BC for sediment toxicity testing.

2.3.2 Data Analysis

A formal DQR was completed to assess sediment data quality (Appendix A). LRLs were compared to study target limits and were generally defined as ≤ 1/10th guideline values for the analytes of interest. The relative percent difference of field duplicates for various analytes were also collected and compared as a part of the DQR as a measure of field precision. Laboratory QA/QC analysis included method blanks, laboratory duplicates, spiked blanks, and certified reference materials (Appendix A).

Sediment chemistry data were summarized by reporting mean, standard deviation, minimum, and maximum for each area. Sediment quality data were evaluated relative to sediment quality guidelines (SQGs) for the protection of aquatic life (e.g., CCME 1999) and reference concentrations to identify metals with the potential to adversely affect aquatic life and/or that could be elevated due to mine activity. Sediment chemistry data were also generally compared to historical data for analytes of interest (1994, and 2006 to 2019). Interpretation was focused on results using the whole sediment data collection methods (described above in Section 2.2.1) used in the program from 2010 to 2019 and SQGs for the protection of aquatic life (e.g., CCME 1999) apply to whole sediment. Sediment collection methods prior to 2010 were either not specified (1994) or only focused on the fraction of sediment that passed through a mesh sieve (< 63 µm; silt and clay). Details of this historical method and rationale for the method change are previously described in earlier annual reports (e.g., Minnow 2019a).

The laboratory performed QA/QC on sediment toxicity tests by comparing results to reference toxicant tests. Total ammonia was monitored in lower Minto and lower Wolverine sediment toxicity test vessels. If un-ionized ammonia (as N) rose above 0.20 milligram per litre (mg/L) in reference treatments (lower Wolverine Creek) renewal of overlying water was required. Sediment toxicity from lower Minto Creek were compared to lower Wolverine Creek and laboratory control sediment. Results were also compared to previous sediment toxicity testing conducted in 2011 and 2015 to 2018 (Minnow 2012, 2016, 2017, 2018a, 2019a). Statistical analyses were conducted and summarized in a report by Nautilus Environmental (Nautilus 2020; Appendix C).

2.3.2.1 Statistics for 2020 Results

Differences between 2020 sediment samples from Minto Creek and the reference area were tested using a two-sample t-test, with a p-value < 0.05 for statistical tests. The assumption of normality was assessed using the Shapiro Wilks' test (α = 0.05) and homogeneity of variance was assessed using Levene's Test (α = 0.05). If variances were unequal, then the two-sample t-test for unequal variances was conducted (Ruxton 2006). Data that could not be normalized were log transformed. A value of 1 was added before taking the logarithm if values of zero were in the data set. If data could not be normalized after transformation, a non-parametric Mann-Whitney test was applied. Statistical comparisons were conducted using R (R Core Team 2020). A magnitude of difference (MOD) was calculated for each metric as:

$$MOD = \frac{\left(MCT_{Exp} - MCT_{Ref}\right)}{MCT_{Ref}} \times 100\%$$

Where the measures of central tendency (MCT) were means (untransformed), geometric means (log_{10} transformed), or medians (Mann-Whitney test).

In cases where there was a value below the reported detection limit, the value was replaced with the detection limit and a non-parametric Mann-Whitney test was conducted. If all values for a parameter were below the detection limit, no statistical analysis was conducted.

2.3.2.2 Statistics for Temporal Analysis

Statistical analyses of sediments from upper Minto Creek (UMC; exposed) and Upper McGinty Creek (URC; reference) areas were conducted to evaluate whether concentrations of copper, an analyte of interest, have changed at these areas over time and/or the differences from reference have changed over time. Spatial and temporal statistical comparisons were conducted using Analysis of Variance (ANOVA) with factors *Year* and *Area* and their interaction using the same approach as described for Chlorophyll-a in section 2.2.2.2. For all significant comparisons, a magnitude of difference (MOD) was calculated in number of reference standard deviations using:

$$MOD = \frac{\left(MCT_{Exp} - MCT_{Ref}\right)}{SD}$$

where MCTs were means (untransformed), geometric means (log_{10} transformed), or medians (rank transformation) and the standard deviation (SD) is an estimate of the reference area standard deviation, or median absolute deviation (MAD) for rank transformations. When the Year

term was significant in the absence of an interaction, post-hoc comparisons were conducted to test for differences between the first year of sampling and all other years for both stations combined. Temporal MODs were calculated by pooling over stations for significant comparisons.

2.4 Hydrology

During the 2019 AEMP, lower Minto Creek was dry so monitoring was limited to sediment and water quality sampling at upper sites. The 2019 AEMP report included flow and local climate data for regional context in data interpretation. For the 2020 AEMP, flow and climate data were also presented, as the dry conditions in 2019 could possibly impact findings in 2020. A summary of flow conditions for lower Minto Creek Stations was provided by Minto Mine staff (Minto Mine 2021; Appendix B). Climate data (i.e., temperature and precipitation) for 2020 were compared to Climate Normals (1981 to 2010) recorded at the Pelly Ranch weather station (Government of Canada 2021, Minnow 2020).

2.5 Periphyton Community

2.5.1 Sample Collection and Laboratory Analysis

Periphyton is the assemblage of algae, bacteria, fungi, and meiofauna attached to submerged substrate in freshwaters. However, periphyton communities are generally characterized based on the attached algal community, which represent the lowest trophic level and are indicators of primary productivity. Periphyton community samples were collected in erosional habitat of lower Minto, lower Wolverine, and lower Big creeks (Table 1.1, Figure 1.3). A stainless-steel razor blade was used to scrape periphyton from five randomly selected rocks in each of the five replicate stations per area. The area sampled was measured and recorded. Samples preserved with Lugol's iodine solution were placed in pre-labeled sampling jars. The samples were placed in a cooler, then later transferred to a refrigerator and stored at approximately 4°C until they were shipped to Plankton R Us Inc. (Winnipeg, MB) for analysis to species level.

2.5.2 Data Analysis

A formal DQR was completed to assess the quality of the periphyton community data (Appendix A). Laboratory duplicate samples were collected on 10% of the periphyton community samples. Periphyton communities were compared between lower Minto Creek and reference areas, lower Wolverine Creek, and lower Big Creek. Temporal comparisons were made between 2020 data and historical data from 1994, 2011 to 2018 (sampling did not occur in 2019 due to dry conditions).

Total organism density (cells per centimetre squared [cells/cm^2]) and biomass (microgram per centimetre squared [µg/cm^2]) were calculated for periphyton community samples. The diversity metric "number of taxa" (also known as taxon richness) included all separate taxa identified to the species level. Simpson's Diversity and Evenness indices were computed according to formulae presented by Smith and Wilson (1996) and recommended by Environment Canada (2012). These indices take into account the relative abundance of taxa and number of taxa, with values ranging from 0 (low diversity or evenness) to 1 (high diversity or evenness). The Bray-Curtis index was also calculated according to Borcard and Legendre (2013). This metric considers the abundance of each taxon at each station compared to the median reference abundance (lower Wolverine Creek), to compute an index of the relative "dissimilarity" of each station from the hypothetical reference median station. Larger Bray-Curtis index values indicate greater dissimilarity from reference.

2.5.2.1 Statistics for 2020 Results

Periphyton community endpoints were summarized by reporting mean, median, minimum, maximum, and standard deviation for each study area. Differences among Minto Creek and the reference areas were tested using a two-sample t-test, with a p-value <0.10. A p-value of 0.10 was used as per suggested EEM guidelines (Environment Canada 2012). The assumption of normality was assessed using the Shapiro Wilks' test ($\alpha = 0.05$) and homogeneity of variance was assessed using Levene's Test ($\alpha = 0.05$). If variances were unequal, then the two-sample t-test for unequal variances was conducted (Ruxton 2006). Data that could not be normalized were log, square root, or fourth root transformed. A value of 1 was added before taking the logarithm if values of zero were in the data set. If data could not be normalized after transformation, a non-parametric Mann-Whitney test was applied. Statistical comparisons were conducted using R (R Core Team 2020). A magnitude of difference (MOD) was calculated for each community metric as:

$$MOD = \frac{\left(\bar{X}_{Exp} - \bar{X}_{Ref}\right)}{SD}$$

where the SD is an estimate of the reference standard deviation. The estimate of the reference standard deviation was the pooled standard deviation in the two-sample t-test for equal variances or the reference standard deviation when the two-sample t-test for unequal variances was applied.

The MOD for the Mann-Whitney test was calculated using medians instead of means and the pooled median absolute deviation (MAD) instead of the SD. The MAD is calculated as the median of the absolute values of the differences between each observation and the median observation for that area (and corrected by a factor of 1.4826 to scale the MAD to a comparable magnitude to the SD). A study design with two areas and n = 5 samples per area has an approximate power

of 0.9 to detect a two standard deviation difference between areas using $\alpha = 0.1$ (Environment Canada 2012).

Periphyton data collected in 2020 were compared to data collected in from 2011 to 2018. Due to differences in reporting of periphyton community data in the 1994 baseline report (e.g., taxa were only identified as present, common, or dominant), 1994 data was omitted form tables and figures.

2.6 Benthic Invertebrate Community

2.6.1 Sample Collection and Laboratory Analysis

Benthic invertebrate community samples were collected in erosional habitat of lower Minto, lower Wolverine, and lower Big creeks as required under the WUL (Table 1.1, Figure 1.3). Benthic invertebrate community samples were collected from riffle/run habitat with cobble and gravel substrate using a Surber sampler (0.093 m^2) outfitted with 500 µm mesh. Three grab composites (0.279 m^2 area in total) were collected at five replicate stations within each sampling area. For each grab, the substrate within the sampler was disturbed and scrubbed (by hand rake and nail brush) with care taken to ensure that all dislodged organic material was swept into the sampler collection net. The substrate was disturbed to a depth of approximately 5 to 8 cm over a period of approximately eight minutes. This procedure was repeated at new subsampling locations for the second and third grab, following which all of the material contained in the collection net was carefully transferred to a pre-labeled 1 litre (L) wide-mouth plastic jar using a stainless-steel spoon and a wash bottle while working over a plastic bin to avoid any potential loss of organisms. Any organisms that adhered to the sieve bag were removed by hand and added to the sample. All samples were labeled internally (using wooden sticks) and externally with the station number, area identifier, Minnow project number, date, and field personnel in order to ensure correct identification at the laboratory. Samples were preserved within six hours of collection using buffered formalin solution to a nominal concentration of 10% in ambient water.

All benthic invertebrate samples were shipped to Cordillera Consulting in Summerland, BC. Each sample was elutriated to remove sand, gravel, clay, and the remaining organic material was preserved in 70% ethanol. Elutriate was examined for any mollusc or Trichoptera cases, then each sample was examined to estimate the total number of invertebrates. If the estimated number of organisms were greater than 600 and the sample was fine and non-clumping, a subsample was taken using a Folsom Plankton Splitter (Motodo 1959; Van Guelpen et al. 1982). Empty snail or bivalve shells, empty caddisfly cases, and invertebrate fragments such as legs, gills, antennae etc. were kept but excluded from the count. When organism fragments were encountered, only the heads were counted towards the total. Larval and pupal exuviae were excluded while terrestrial stages and terrestrial drop-ins were indicated as such but excluded from the total count.

Benthic invertebrates were identified to the LPL (which in most cases were genus) and counted. Following identification and counting, representative specimens of each new taxon were preserved in a museum quality vial with a polyseal lid and added to the Minto Mine voucher collection. Internal labels were used to identify the taxa, the client, date collected, site code, and the project.

2.6.2 Data Analysis

A formal DQR was completed to assess the benthic invertebrate community data quality (Appendix A). Laboratory QA/QC included an assessment of sub-sampling error and sorting efficiency on at least 10% of the samples (Appendix A). Benthic invertebrate communities were evaluated using summary metrics, including invertebrate density (number of organisms per m^2, calculated based on a sample area of 0.279 m^2), number of taxa, Simpson's Diversity and Evenness, and Bray-Curtis index.

One consequence of the LPL of taxonomic resolution is that the "species list" from any site contains a mixture of taxonomic resolutions, some as low as species, others at the family, order or class level, resulting in redundant or "ambiguous" taxa. Redundant or "ambiguous" taxa occur when the same taxon is identified to different levels of resolution, for instance, some specimens may be identified to a higher or *parent* level (e.g., *Baetis*) while others are identified to a lower or child level (e.g., *Baetis tricaudatus*). Such instances can occur when complete taxonomic keys only exist for certain life stages, damaged specimens are present, or when limited resources result in only a subset of a sample being fully identified to species. The presence of these ambiguous taxa may result in inflated estimates of richness or distorted patterns of diversity across sites (Cuffney *et al.* 2007; Meredith *et al.* 2019). If ambiguous taxa are not resolved, then the coarser-resolution taxon (i.e., the parent, *Baetis*) is counted as a unique taxon when it may actually be the same species as one of the lower-level taxa (i.e., the child, *B. tricaudatus*). Two commonly applied solutions for dealing with ambiguous taxa are:

1. apportion them among the identified organisms according to the ratio of abundances (i.e. distribute parent taxa among children); or
2. sum them to the lowest consistently identified taxon (i.e. merge children with parent taxa).

The preferred option for analysis depends on the distribution of the organisms among taxa. For instance, with option two, *B. tricaudatus* and *B. bicaudatus* might be lumped together and analyzed as *Baetis*. If identified specimens in the two species constitute only 10% of the total abundance, it may be most appropriate to lump them together with the other 90% in the unidentified *Baetis*. Conversely, if 90% of the identified organisms fall into the two species, it is more parsimonious to apportion the remainder among them. We implemented a decisions key

for resolving ambiguously identified taxa that uses abundance and richness criteria for when options 1 (roll-down) and 2 (roll-up) are applied for each level in the taxonomic hierarchy. This method preserves as much detailed taxonomic information as possible, while addressing issues of taxonomic ambiguities. The decision key was modified from Weakland et al. (2018).

Total organism density (individuals/m^2), taxon richness, Simpson's Diversity and Evenness, and Bray-Curtis index were calculated in the same manner as periphyton community data (Section 2.5.1). It was noted that in previous years total organism density did not always account for area sampled (2013 to 2017). All density samples were re-calculated to include area and total organism density now represents individuals/m^2. Bray-Curtis dissimilarity was compared against each reference area at both the family and lowest-practical-level using Mantel and distance-based Redundancy Analysis (dbRDA), as outlined in Borcard and Legendre (2013).

The relative proportions of the most abundant taxa were calculated relative to the total number of organisms in the sample. Dominant taxon groups were defined as groups representing greater than 10% of total organism abundance in one or more areas or any groups considered important indicators of environmental stress. In this study, relative proportions of the major groups, such as chironomids, EPT taxa (Ephemeroptera [mayfly], Plecoptera [stonefly], Trichoptera [caddisfly] taxa), Oligochaetes (worms), and Acari (mites) were examined. It is often possible to relate low relative abundance of sensitive taxonomic groups (e.g., EPT taxa) to environmental stress (e.g., Taylor and Bailey 1997). Similarly, high relative abundance of tolerant taxonomic groups (e.g., oligochaetes) may also indicate higher environmental stress (Chapman et al. 1982a,b).

2.6.2.1 Statistics for 2020 Results

Differences among Minto Creek and the reference areas were tested using ANOVA with $\alpha = 0.1$ as per EEM guidelines (Environment Canada 2012). Prior to ANOVA, all data were $\log_{10}$ transformed as necessary to meet assumptions of normality (Shapiro Wilks' test; $\alpha = 0.05$) and homogeneity of variance (Levene's test; $\alpha = 0.05$). If these assumptions were not met the equivalent non-parametric test was conducted. A value of 1 was added before taking the logarithm if values of zero were in the data set. If data failed the assumptions of normality and homogeneity of variance, then a non-parametric Kruskal-Wallis test was conducted. Post-hoc contrasts following the ANOVA were conducted between the exposed area and each reference area using the contrast methods described in Oehlert (2010). Contrasts following the Kruskal-Wallis test were conducted using Dunn's test using the *dunn.test* package in R (Dinno 2017; R Core Team 2020). A magnitude of difference (MOD) for each comparison and community metric was calculated using the same approach as described for the periphyton (Section 2.5.2).

Correspondence Analyses (CA; a multivariate ordination method) was used to further examine the 2020 benthic invertebrate community structure at the lower areas. CA is a multivariate ordination method that is used to reduce complex multivariate data into a smaller number of independent variables (Gauch 1984; Pielou 1984). The analysis extracts theoretical values (CA axis scores) that capture the variation in the abundance of benthic taxa. The CA ordination produces axis scores for each station. Taxa scores are also produced as the sum of weighted averages of their abundances across stations. The structure of the data can then be depicted in scatter plots of one CA axis against another, showing both taxa and station scores. Taxa that tend to co-occur plot together and those that rarely co-occur plot farther apart. Thus, CA can be used to describe which benthic invertebrate taxa best account for observed differences in the overall benthic invertebrate community between stations. The CA analysis was conducted at the LPL of taxonomic organization using $ln_{(x+1)}$-transformed density data. CA is sensitive to the presence of rare taxa (Legendre and Legendre 1983; Poos and Jackson 2012). Taxa occurring in two or fewer samples or those that made up less than 15% of the total abundance of the dataset were excluded from the analysis (Dolédec and Chessel 1991). The ordination was conducted using the cca() function in the vegan package (Oksanen et al. 2020) of R statistical software (R Core Team 2020). Results of the CA were summarized by sampling area in 2020. Taxa with the highest magnitude weights on the CA axes were identified and used in interpretation of the separation of areas on the CA axes.

Spearman rank correlations were conducted between benthic invertebrate community endpoints that differed among areas and in-situ habitat conditions that differed among areas. Benthic community endpoints of density, richness, Simpson's Diversity, % Ephemeroptera, % Plecoptera, % EPT, % Chironomidae, % Acari, CA1, and CA2) were evaluated relative to *in situ* parameters of depth sampler pushed into substrate, depth of substrate sampled, % cobble, % gravel, temperature, specific conductivity, and pH. Significance was determined by comparing p-values against an unadjusted p-value (p=0.05) and a Bonferroni-corrected p-value for 77 tests (p=0.00065).

2.6.2.2 Statistics for Temporal Analysis

Benthic invertebrate community data were also evaluated in comparison to results obtained in previous years of sampling (1994, 2006, 2008, and 2010 to 2018). Summary metrics from earlier years were previously re-calculated (Minnow 2011) to ensure consistency and appropriate comparisons over time.

Statistical analyses of benthic community endpoints from lower Minto Creek (LMC) and reference areas (LWC and LBC) were conducted to evaluate whether community composition has changed at these areas over time and/or the differences from reference have changed

over time. Spatial and temporal statistical comparisons were conducted using Analysis of Variance (ANOVA) with factors *Year* and *Area* and their interaction using the same approach as described for Chlorophyll-a in Section 2.2.2.2. For all significant comparisons, a magnitude of difference (MOD) was calculated in number of reference standard deviations using:

$$MOD = \frac{(MCT_{Exp} - MCT_{Ref})}{SD}$$

where MCTs were means (untransformed), geometric means (log_{10} transformed), or medians (rank transformation) and the SD is an estimate of the reference area standard deviation, or MAD for rank transformations (see periphyton community statistics in Section 2.5.2.1). When the *Year* term was significant in the absence of an interaction, post-hoc comparisons were conducted to test for differences between the first year of sampling and all other years for both stations combined. Temporal MODs were calculated by pooling over stations for significant comparisons. Similarly, when *Area* was significant, without an interaction, it suggested that the difference between the stations was consistent among years and a MOD was calculated using pooled, back-transformed least-squares means across all years. An α of 0.10 was used for these temporal comparisons. Post-hoc comparisons were corrected for the number of comparisons using Tukey's honestly significant differences method.

2.7 Tissue Chemistry

2.7.1 Sample Collection and Laboratory Analysis

Periphyton and benthic invertebrate tissue samples were collected from lower Minto (exposed), lower Wolverine (reference), and lower Big creeks (reference; Table 1.1, Figure 1.3). Periphyton samples were collected by scraping submerged cobble-size rocks with a stainless-steel razor blade. Scraped material (periphyton) was placed in pre-labeled sample jars. Benthic invertebrate tissue samples were collected in areas with cobble substrate using a kick-net, and by overturning rocks and collecting organisms by hand. Periphyton and benthic invertebrate tissue samples (1 to 3 grams [g]) were placed into pre-labeled sample jars and Whirl-Pak™ bags, respectively. A total of five periphyton and five benthic invertebrate samples were collected at each area. Immediately after collection, all tissue samples were placed in a cooler, and later in a freezer until they were submitted to ALS Environmental in Burnaby, BC. Samples were analyzed for percent moisture and for metals by High-Resolution ICP-MS, and later converted to dry weight using percent moisture.

2.7.2 Data Analysis

Summary statistics were calculated for each metal by area and tissue type (periphyton and benthic invertebrates). The follow summary statistics were reported: sample size, percent of

values below the LRL, mean, standard deviation, minimum value, median, and maximum value. Commonly used substitution methods (e.g., substituting values < LRL with half the LRL) for censored data introduces bias in summary statistics (Helsel 2012). Means and standard deviations were therefore estimated used the Kaplan-Meier (K-M) method. This method involves transforming the left censored (i.e., < value) dataset to a right censored (i.e., > value) dataset, and then using the K-M estimator (used to estimate the mean survival time in survival analysis) to estimate the mean. The calculation was conducted using the *survfit* function in the *survival* package (Therneau 2017) in R and involves calculating the area under the K-M survival curve. The K-M method is non-parametric and can accommodate multiple LRLs. This method of estimating the mean is equivalent to using the distribution of detectable values below the LRL to represent values that are < LRL. For example, the mean of the data set {1, 2, < 4, 5} is estimated as the mean of 1, 2, [½×1 + ½×2], and 5 which is 2.375. The value < 4 is replaced by the distribution of values below 4 (i.e., 1 and 2 with equal weight of ½). Similarly, the mean of the data set {1, 1.6, 2, 2.1, < 4, 5} is estimated as the mean of 1, 1.6, 2, 2.1, [¼×1 + ¼×1.6 + ¼×2 + ¼×2.1], and 5 which is 2.229. Again, the value < 4 is replaced by the distribution of values below 4 (i.e., 1, 1.6, 2, and 2.1 with equal weight of ¼). If the minimum value in the data set is below the LRL then it is replaced with the LRL. Therefore, if there is only one LRL and no detected values below the LRL, then the K-M estimate of the mean is equivalent to replacing the value below the LRL with the LRL (i.e., the best guess for the values < LRL is the LRL). When a standard deviation could not be estimated (e.g., when all data were below the LRL), it was not reported. When a value was reported below a poor LRL (defined as a LRL that exceeded the maximum detected value), the value was removed from the dataset.

2.7.2.1 Statistics for 2020 Results

The primary objective of tissue collection was to support a selenium assessment reported under a separate cover. Accordingly, data are reported herein for future reference with limited interpretation. Tissue metal concentrations for periphyton and benthic invertebrates from lower Minto Creek (LMC; exposed) were compared relative to LWC and LBC (lower Wolverine and lower Big Creeks, respectively; reference) using analysis of variance (ANOVA). The comparisons were conducted using ANOVA on untransformed or $\log_{10}$-transformed data (whichever best fit the data identified using Shapiro-Wilk's test). When assumptions of normality and homogeneity of variances were not met (Shapiro-Wilk's test and Levene's test on the median, respectively), the Kruskal-Wallis test was used. Post-hoc contrasts following the ANOVA were conducted between the exposed area and each reference area using the contrast methods described in Oehlert (2010). Contrasts following the Kruskal-Wallis test were conducted using Dunn's test using the *dunn.test* package in R (Dinno 2017; R Core Team 2020). P-values for the

contrasts were corrected for the number of comparisons using Tukey's honestly significant differences method.

A magnitude of difference (MOD) was reported for statistical comparisons that were significant as:

$$MOD = \frac{(MCT_{Exp} - MCT_{Ref})}{MCT_{Ref}} \times 100\%$$

where MCT is the measure of central tendency (i.e., mean for the ANOVA after back-transforming to original data units when a transformation was used, and median for the Mann-Whitney test). In cases where there was a value below the reported detection limit, the value was replaced with the detection limit and a non-parametric Mann-Whitney test was conducted.

2.7.2.2 Statistics for Temporal Analysis

Statistical analyses of metal concentrations in tissue samples collected at lower Minto Creek (LMC; exposed) and reference areas, lower Wolverine Creek (LWC) and lower Big Creek (LBC), were conducted to evaluate whether concentrations of copper and selenium, analytes of interest, have changed at these areas over time and/or become more similar to reference over time. Spatial and temporal statistical comparisons were conducted using Analysis of Variance (ANOVA) with factors *Year* and *Area* and their interaction using the same approach as described for Chlorophyll-a in Section 2.2.2.2

3 SUPPORTING MEASURES

3.1 Hydrology and Climate

In September of 2020, the field crew was able to complete sampling at the lower Minto Creek and reference creek areas as there was sufficient water depth (unlike in 2019). Water flow was measured by Minto Mine staff from April 26 and October 13, 2020, with the latter date representing freeze up (Minto Mine 2021b). Flow and gage height decreased significantly at Station W1 (located just upstream of water quality monitoring Stations W2) after spring freshet, with a maximum of 0.519 m^3/s on May 3, 2020 which had dropped to 0.167 m^3/s by May 12, 2020 (Appendix B). There were small fluctuations in flow from May 25, 2020 (0.0224 m^3/s) onwards, until October 13, 2020 (0.0334 m^3/s). Compared to the Climate Normals collected from 1981 to 2010 (Appendix B; Government of Canada 2021), 2020 temperatures were comparable, and precipitation was generally lower, except for April, July, and August (Figure 3.1).

3.2 Field Measures

Mean specific conductance at the sediment sampling area of upper Minto Creek (508.4 micro Siemens per centimeter [µS/cm]) was significantly higher than in upper McGinty Creek (96.1 µS/cm) while dissolved oxygen (mg/L) was significantly lower (10.05 mg/L vs.10.90 mg/L; Figure 3.2, Table 3.1; Appendix Table B.3). Mean temperature, pH, and dissolved oxygen (percent saturation) were not statistically different between upper Minto Creek and upper McGinty Creek (Figure 3.2, Table 3.1; Appendix Table B.3).

Temperature at the sediment sampling area of lower Minto Creek (2.2°C) was significantly lower than in lower Wolverine Creek (5.50°C). Specific conductance and pH at lower Minto Creek (306 µS/cm, 7.92) were significantly higher compared to lower Wolverine Creek (168 µS/cm, 7.41). Mean dissolved oxygen at the sediment sampling area of lower Minto Creek (79.9% saturation and 11.0 mg/L) was significantly higher compared to lower Wolverine Creek (45.2% saturation and 5.70 mg/L; Figure 3.2, Table 3.2; Appendix Table B.3). Lower dissolved oxygen at lower Wolverine Creek could be attributed to sampling in side-channel areas, which were the only areas that support sediment deposition (but receive less flow and have consequent lower dissolved oxygen concentrations). Lower Minto Creek had significantly higher pH (7.92) than lower Wolverine Creek (7.41; Figure 3.2, Table 3.2; Appendix Table B.3).

Physico-chemical measurements were also taken in erosional areas of lower Minto, lower Wolverine, and lower Big creeks in support of benthic invertebrate community sampling. Temperature was significantly lower at lower Minto Creek (2.2°C) compared to both reference areas, lower Wolverine (3.9°C) and lower Big Creek (3.9°C; Figure 3.3, Table 3.3; Appendix Table B.4). Specific conductivity and pH at lower Minto Creek (264.3 µS/cm, 7.87)

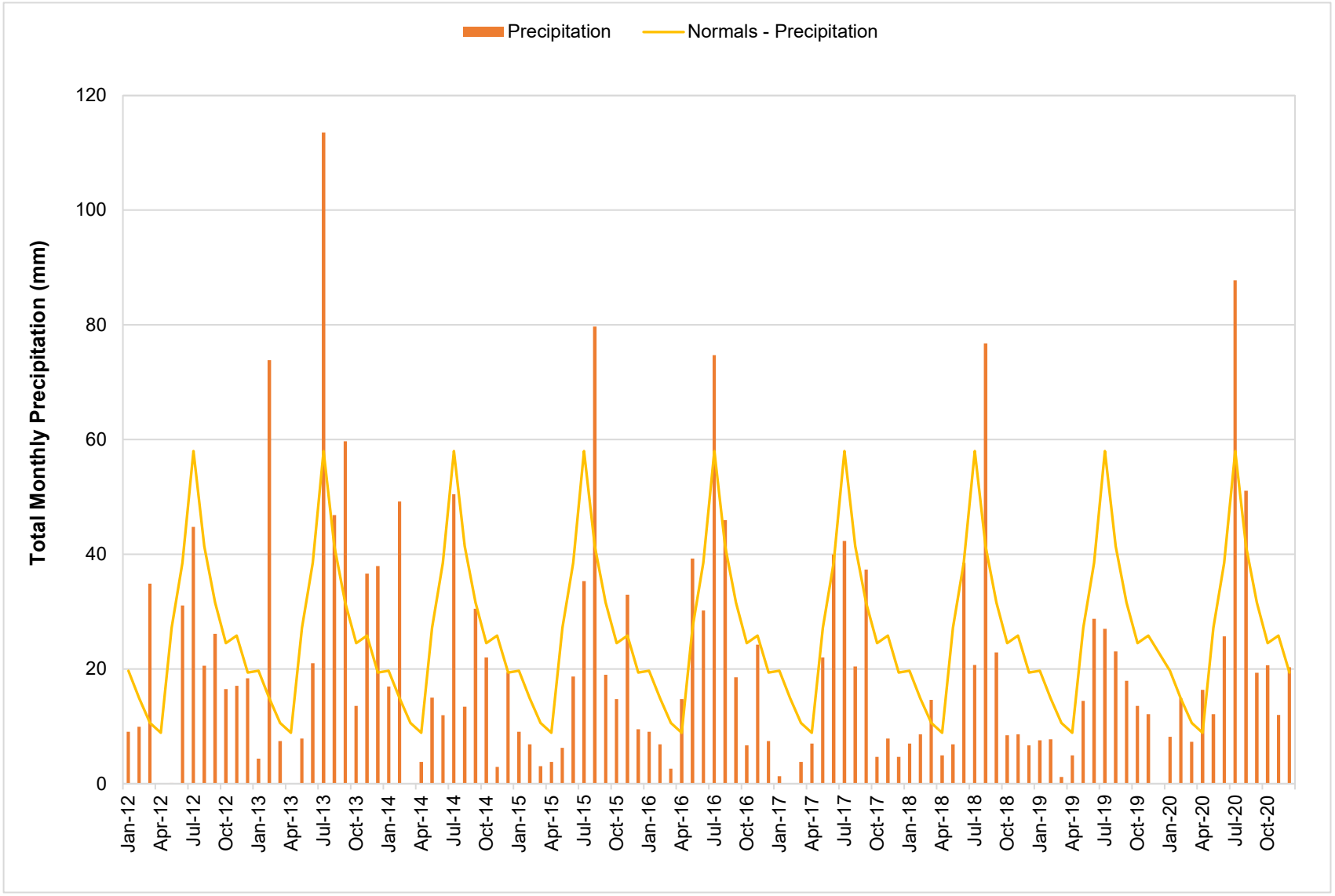


Figure 3.1: Total Monthly Precipitation at Minto Mine Compared to Canada Climate Normals, 2012 to 2020

Notes: Canada Climate Normals from 1981 to 2010 (Government of Canada 2019). Climate normals are from the Pelly Ranch weather station.

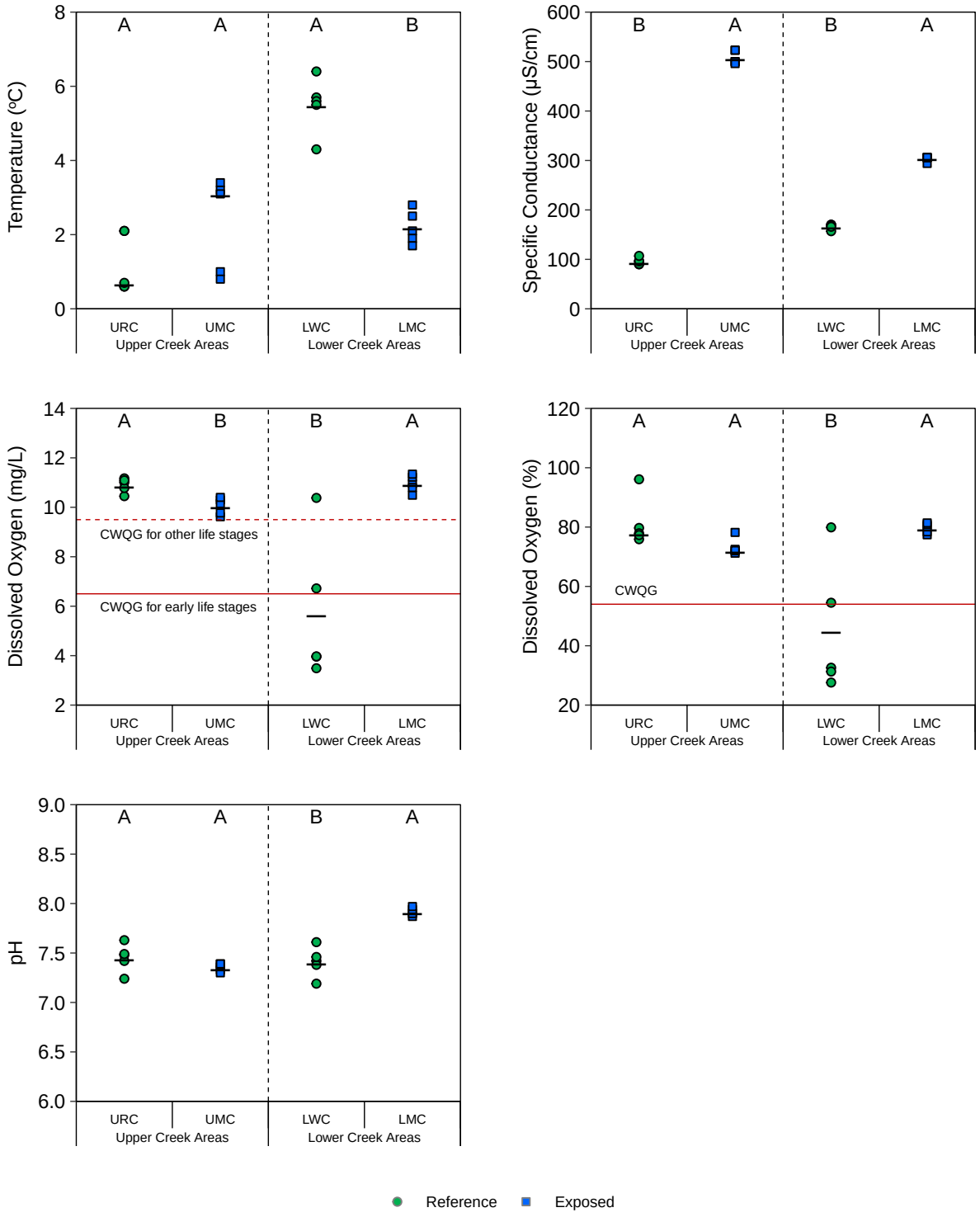


Figure 3.2: Physico−chemical Measurements in Depositional Areas of Upper and Lower Minto Creek Relative to Reference Areas, Minto Mine, 2020

Notes: Different letters indicate areas are significantly different ($p < 0.05$) within each creek area. Horizontal bars indicate the measure of central tendency (MCT). MCT is the mean for parameters where statistics were conducted on the raw scale, the geometric mean when statistics were $\log_{10}$ transformed to meet the assumptions of normality, and the median when rank transformed. Numbers indicate the number of overlapping points. URC = upper McGinty Creek. UMC = upper Minto Creek. LWC = lower Wolverine Creek. LMC = lower Minto Creek.

Table 3.1: Statistical Comparisons of *In Situ* Water Quality taken with Sediment Samples, Upper Areas, 2020

Endpoint	Data Transformation	Test	Test P-Value	MCT[a]		MOD (%)[b]
				URC (Reference)	UMC (Exposed)	
Temperature (°C)	rank	M-W	0.093	0.700	3.10	ns
Specific Conductance (µS/cm)	none	tequal	0.001	96.1	508	429
Dissolved Oxygen (mg/L)	none	tequal	0.003	10.9	10.1	-7.8
Dissolved Oxygen (%)	rank	M-W	0.056	77.9	72.1	ns
pH	none	tequal	0.173	7.45	7.35	ns

P-value < 0.05

P-value < 0.05 and MOD > 0

P-value < 0.05 and MOD < 0

Notes: URC = Upper McGinty Creek. UMC = Upper Minto Creek. M-W = Mann-Whitney test. tequal = t-test for equal variance. tunequal = t-test for unequal variance. ns = not significant.

[a] Measure of Central Tendency (MCT) is the mean for parameters where statistics were conducted on the raw scale, the geometric mean when statistics were $\log_{10}$ transformed to meet the assumptions of normality, and the median when rank transformed.

[b] MOD = magnitude of difference. MOD = MCT_{exp} - MCT_{ref}/MCT_{ref}*100.

Table 3.2: Statistical Comparisons of *In Situ* Water Quality taken with Sediment Samples, Lower Areas, 2020

Endpoint	Data Transformation	Test	Test P-Value	MCT[a]		MOD (%)[b]
				LWC (Reference)	LMC (Exposed)	
Temperature (°C)	none	tequal	0.001	5.50	2.20	-60
Specific Conductance (µS/cm)	rank	M-W	0.011	168	306	82
Dissolved Oxygen (mg/L)	none	tequal	0.004	5.70	11.0	92
Dissolved Oxygen (%)	none	tequal	0.008	45.2	79.7	76
pH	none	tequal	0.001	7.41	7.92	6.8

P-value < 0.05

P-value < 0.05 and MOD > 0

P-value < 0.05 and MOD < 0

Notes: URC = Upper McGinty Creek. UMC = Upper Minto Creek. M-W = Mann-Whitney test. tequal = t-test for equal variance. tunequal = t-test for unequal variance.

[a] Measure of Central Tendency (MCT) is the mean for parameters where statistics were conducted on the raw scale, the geometric mean when statistics were $\log_{10}$ transformed to meet the assumptions of normality, and the median when rank transformed.

[b] MOD = magnitude of difference. MOD = MCT_{exp} - MCT_{ref}/MCT_{ref}*100.

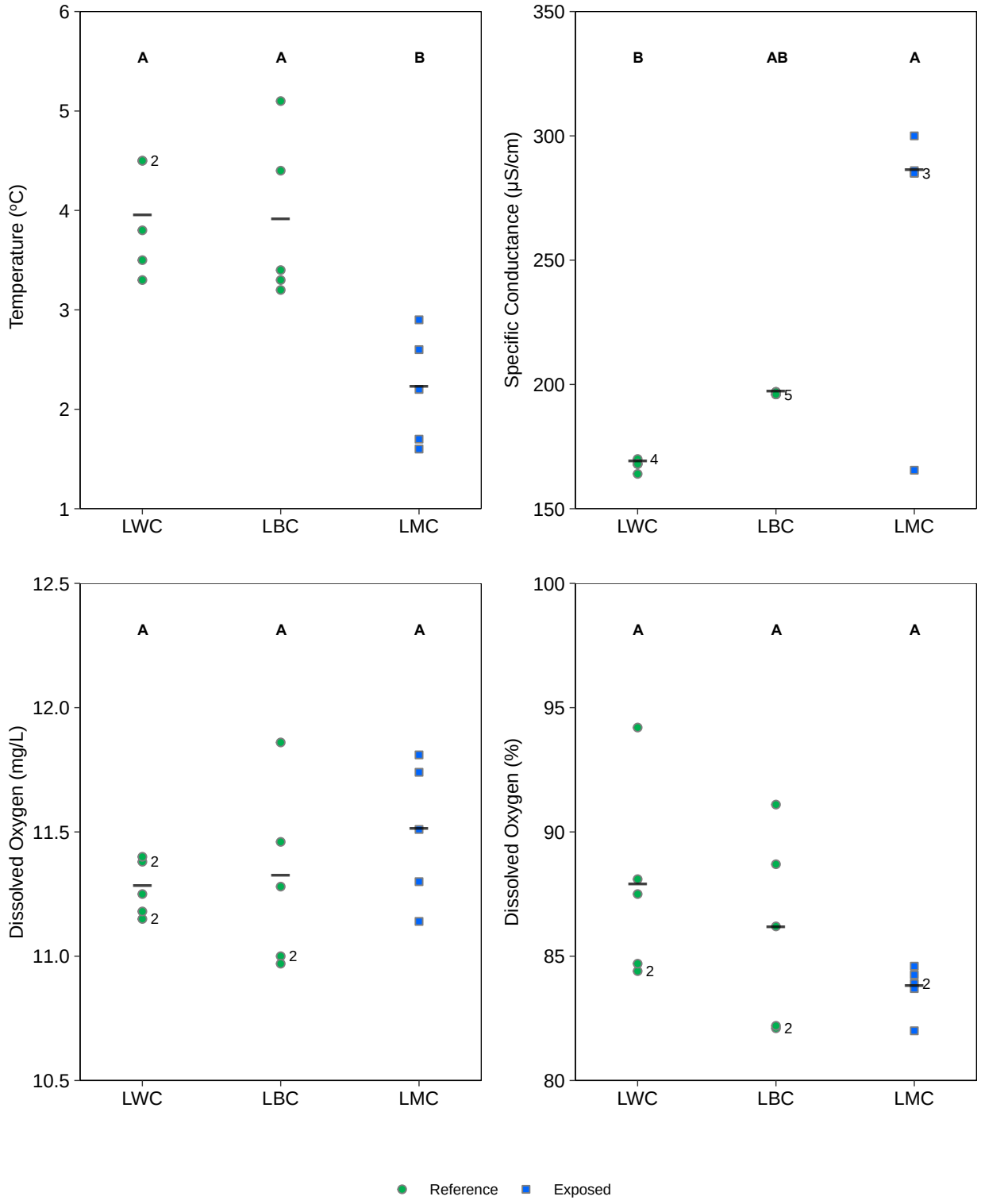


Figure 3.3: Physico−chemical Measurements in Erosional Areas in Lower Minto Creek and Reference Areas, Minto Mine, 2020

Notes: Different letters indicate areas are significantly different (p-value <0.05). Horizontal bars indicate the measure of central tendency. MCT is the mean for parameters where statistics were conducted on the raw scale, the geometric mean when statistics were log_{10} transformed to meet the assumptions of normality, and the median when rank transformed. Numbers indicate the number of overlapping points. LWC = lower Wolverine Creek. LBC = lower Big Creek. LMC = lower Minto Creek.

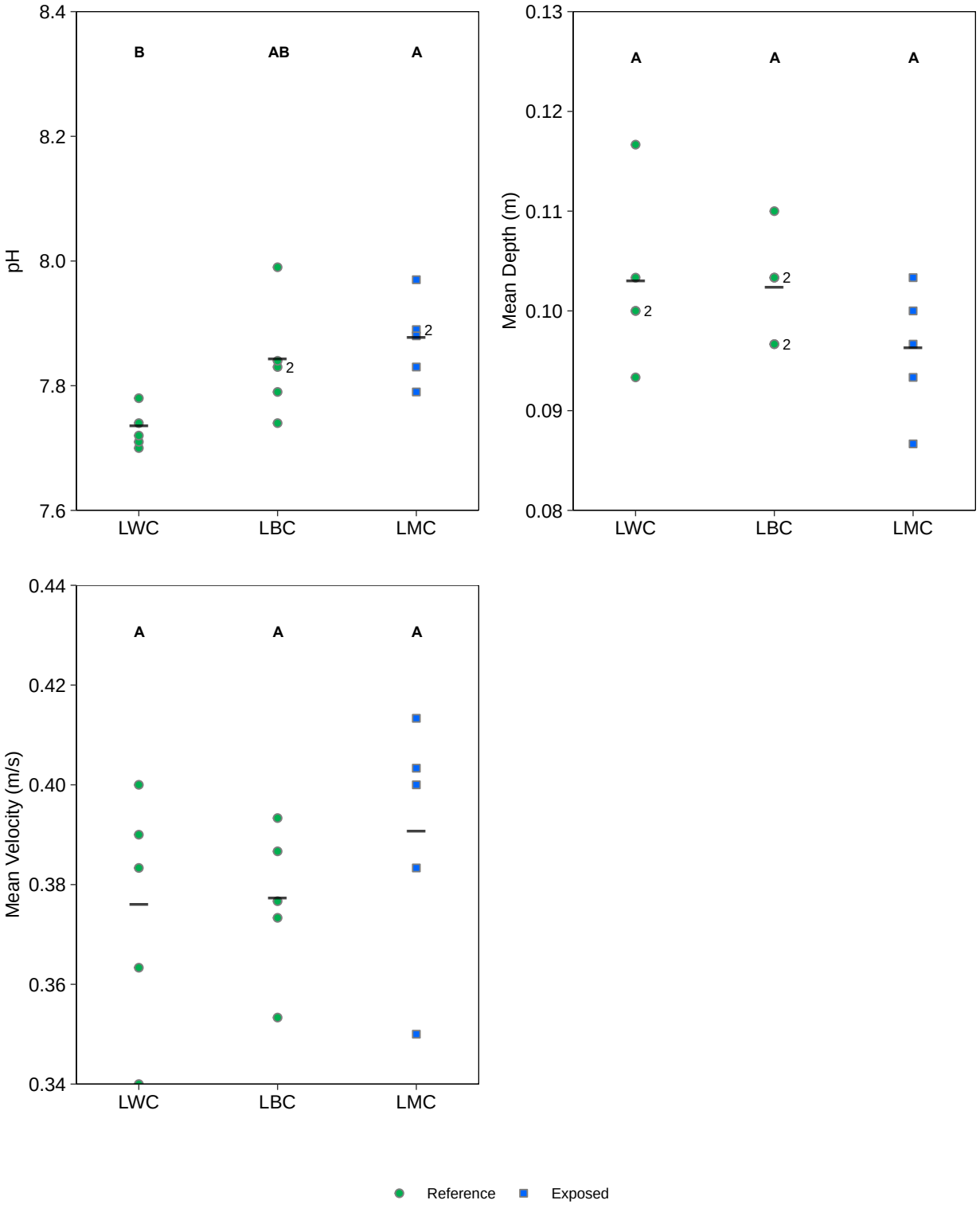


Figure 3.3: Physico−chemical Measurements in Erosional Areas in Lower Minto Creek and Reference Areas, Minto Mine, 2020

Notes: Different letters indicate areas are significantly different (p-value <0.05). Horizontal bars indicate the measure of central tendency. MCT is the mean for parameters where statistics were conducted on the raw scale, the geometric mean when statistics were $\log_{10}$ transformed to meet the assumptions of normality, and the median when rank transformed. Numbers indicate the number of overlapping points. LWC = lower Wolverine Creek. LBC = lower Big Creek. LMC = lower Minto Creek.

Table 3.3: Statistical Comparisons of In Situ Water Quality taken with Benthic Invertebrate Samples, Lower Areas, 2020

Endpoint	Data Transformation	Test	Test P-Value	MCT[a]			MOD (%)[b]		
				LWC (Reference)	LBC (Reference)	LMC (Exposed)	LWC vs. LBC	LMC vs. LWC	LMC vs. LBC
Temperature (°C)	none	ANOVA	0.002	3.92	3.88	2.20	ns	-44	-43
Specific Conductance (µS/cm)	rank	K-W	0.025	168	196	285	ns	70	ns
Dissolved Oxygen (mg/L)	none	ANOVA	0.408	11.3	11.3	11.5	ns	ns	ns
Dissolved Oxygen (%)	none	ANOVA	0.184	87.8	86.1	83.7	ns	ns	ns
pH	none	ANOVA	0.018	7.73	7.84	7.87	ns	1.8	ns
Mean Depth (m)	none	ANOVA	0.289	0.103	0.102	0.0960	ns	ns	ns
Mean Velocity (m/s)	none	ANOVA	0.518	0.375	0.377	0.390	ns	ns	ns

P-value < 0.05

P-value < 0.05 and MOD > 0

P-value < 0.05 and MOD < 0

Notes: ANOVA = Analysis of Variance. K-W = Kruskal-Wallis. ns = not significant. LWC = Lower Wolverine Creek. LBC = Lower Big Creek. LMC = Lower Minto Creek.

[a] Measure of Central Tendency (MCT) is the mean for parameters where statistics were conducted on the raw scale, the geometric mean when statistics were log $_{10}$ transformed to meet the assumptions of normality, and the median when rank transformed.

[b] MOD = magnitude of difference. MOD = MCT_{exp} - MCT_{ref}/MCT_{ref}*100.

was significantly higher compared to lower Wolverine Creek (264.3 µS/cm, 7.73) but not lower Big Creek. No significant differences were observed between lower Minto Creek and reference creeks for dissolved oxygen (percentage and mg/L; Figure 3.3; Table 3.3). All areas were within the range of the CWQG guidelines and WUL objectives for pH and dissolved oxygen.

3.3 Water Chemistry and Chlorophyll-a

The quality of water chemistry data was assessed prior to data analysis and interpretation, which was judged as good based on good analyte detectability, precision, and accuracy, and an absence of contamination (Appendix A). All analytes were below the CWQG except for total copper, a metal of particular interest at the Minto Mine. Total copper concentrations exceeded the CWQG at upper Minto Creek, lower Minto Creek, and at both lower and upper reference sites (Table 3.4). However, dissolved copper was well below SSWQO set out in the WUL (Table 3.4, Appendix Table B.7).

Hardness, total dissolved solids, and total alkalinity in 2020 were generally higher in upper Minto Creek than in McGinty Creek (Table 3.4). However, hardness, total dissolved solids, and total alkalinity in Lower Minto Creek were lower than both reference areas while dissolved organic carbon (DOC) was higher. Hardness, dissolved organic carbon (DOC), and alkalinity can modify (reduce) the toxicity of certain metals (e.g., copper).

Chlorophyll-a data quality was assessed prior to data analysis and interpretation and was judged as good based on good analyte detectability, precision, and accuracy, and an absence of contamination (Appendix A). The mean chlorophyll-a concentration in 2018 was higher (but not significantly so), at lower Minto Creek (55 mg/m^2) than at lower Wolverine Creek (43 mg/m^2). In 2020, mean concentrations of periphyton chlorophyll-a were significantly lower at lower Minto Creek (16 mg/m^2) than at lower Wolverine Creek (32 mg/m^2; Figure Appendix Figure B.1, Appendix Table B.8).

When comparing chlorophyll-a concentrations over the years, lower Minto creek had higher chlorophyll-a concentrations than lower Wolverine Creek in 2014, 2015, 2017, and 2018 while results were not significantly different in 2013 and 2016 (Table B.8). Since monitoring commenced in 2012, concentrations have been statistically lower at Minto Creek than Wolverine Creek in only two years: 2012 and 2020 (Table B.8). Significance of the interaction term *Area x Year* confirms that differences among years varied. Overall, this suggests no mine-related influence beyond natural variability.

In 2020, results at both areas were lower than 2018 concentrations and were well below the BCWQG of 100 mg/m^2 for the protection of aquatic life (BCMOE 1985). Dodds et al. (1998) classification system sets the trophic status of lower Minto (16 mg/m^2) as oligotrophic and lower

Table 3.4: Water Quality Results at Exposed and Reference Areas, Minto Mine AEMP, September 2020

	Analyte	Units	CCME Water Quality Guidelines[a]		WUL Objectives at W2	Upper McGinty Creek	Upper Minto Creek	Lower Wolverine Creek	Lower Big Creek	Lower Minto Creek
			Long-term	Short-term		Reference	Exposed	Reference	Reference	Exposed
Physical Tests	Conductivity	µS/cm	-	-	-	106	524	1,370	194	172
	Hardness (as $CaCO_3$)	mg/L	-	-	-	54.2	256	151	89.9	83.8
	pH	pH Units	6.5 - 9.0	-	6.0 - 9.0	7.58	8.22	8.14	8.07	7.98
	Total Suspended Solids	mg/L	-	-	-	<3	<3	<3	5.10	<3
	Total Dissolved Solids	mg/L	-	-	-	96.4	326	210	131	126
Anions , Nutrients, Other	Total Alkalinity	mg/L	-	-	-	42.0	234	166	86.7	75.4
	Total Ammonia (as N)	mg/L	1.27 - 6.02[b]	-	0.25	<0.005	<0.005	0.00590	<0.005	0.00630
	Bromide (Br)	mg/L	-	-	-	-	-	-	-	-
	Chloride (Cl)	mg/L	120	640	-	0.130	4.49	1.39	0.430	0.200
	Fluoride (F)	mg/L	0.12	-	-	-	-	-	-	-
	Nitrate (as N)	mg/L	3.0	124	9.1	0.0225	0.0437	0.00960	0.0465	<0.005
	Nitrite (as N)	mg/L	0.060	-	0.060	<0.001	<0.001	<0.001	<0.001	<0.001
	Sulfate (SO_4)	mg/L	-	-	-	7.50	49.4	17.0	11.9	11.7
	Dissolved Organic Carbon	mg/L	-	-	-	23.0	10.8	13.2	11.1	19.5
Total Metals	Total Aluminum (Al)	mg/L	0.10[c]	-	-	0.0913	0.00960	0.0458	0.142	0.0818
	Total Antimony (Sb)	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	0.000180	0.000110
	Total Arsenic (As)	mg/L	0.005	-	-	0.000550	0.000360	0.000630	0.000960	0.000540
	Total Barium (Ba)	mg/L	-	-	-	0.0337	0.0616	0.0612	0.0660	0.0345
	Total Beryllium (Be)	mg/L	-	-	-	<0.00002	<0.00002	<0.00002	<0.00002	0.0000260
	Total Bismuth (Bi)	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
	Total Boron (B)	mg/L	1.5	29	-	<0.01	0.0210	<0.01	<0.01	<0.01
	Total Cadmium (Cd)	mg/L	0.0000953 - 0.000346[d]	0.00113 - 0.00545[e]	-	0.00000770	<0.00001	<0.000005	0.0000142	0.00000540
	Total Calcium (Ca)	mg/L	-	-	-	15.3	60.7	40.2	22.8	19.6
	Total Chromium (Cr)	mg/L	0.0010[f]	-	-	0.000710	0.000320	0.000500	0.000670	0.000850
	Total Cobalt (Co)	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	0.000140	0.000110
	Total Copper (Cu)	mg/L	0.0020 - 0.0040[g]	-	-	0.00317	0.00444	0.00266	0.00290	0.00261
	Total Iron (Fe)	mg/L	0.30	-	-	0.263	0.0310	0.135	0.220	0.225
	Total Lead (Pb)	mg/L	0.0010 - 0.0070[h]	-	-	<0.00005	<0.00005	<0.00005	0.0000930	<0.00005
	Total Lithium (Li)	mg/L	-	-	-	<0.001	0.00300	0.00170	0.00160	0.00170
	Total Magnesium (Mg)	mg/L	-	-	-	4.44	27.4	13.8	9.40	9.86
	Total Manganese (Mn)	mg/L	-	-	-	0.00934	0.0580	0.00733	0.0147	0.00858
	Total Molybdenum (Mo)	mg/L	0.073	-	-	0.000618	0.00518	0.00141	0.00124	0.000459
	Total Nickel (Ni)	mg/L	0.025 - 0.15[i]	-	-	0.00145	0.00154	0.00120	0.00150	0.00201
	Total Phosphorus (P)	mg/L	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05
	Total Potassium (K)	mg/L	-	-	-	0.302	2.32	1.18	0.742	0.533
	Total Selenium (Se)	mg/L	0.0010	-	-	0.000261	0.000312	0.000143	0.0000980	0.000161
	Total Silicon (Si)	mg/L	-	-	-	7.16	6.56	6.77	7.18	5.92
	Total Silver (Ag)	mg/L	0.00025	-	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Total Sodium (Na)	mg/L	-	-	-	3.75	17.4	9.29	7.16	6.64
	Total Strontium (Sr)	mg/L	-	-	-	0.104	0.784	0.412	0.264	0.191
	Total Sulfur (S)	mg/L	-	-	-	3.17	18.4	7.22	4.59	4.45
	Total Thallium (Tl)	mg/L	0.00080	-	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Total Thorium (Th)	mg/L	-	-	-	-	-	-	-	-
	Total Tin (Sn)	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Total Titanium (Ti)	mg/L	-	-	-	0.00296	0.000480	<0.0024	0.00599	0.00231
	Total Uranium (U)	mg/L	0.015	0.033	-	0.000199	0.00245	0.00136	0.00222	0.000682
	Total Vanadium (V)	mg/L	-	-	-	0.00104	0.000640	0.00113	0.00172	0.00152
	Total Zinc (Zn)	mg/L	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003
	Total Zirconium (Zr)	mg/L	-	-	-	0.000730	<0.0002	0.000230	0.000410	0.000580
Dissolved Metals	Dissolved Aluminum (Al)	mg/L	-	-	0.10	0.0693	0.00450	0.00810	0.0326	0.0401
	Dissolved Antimony (Sb)	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	0.000140	<0.0001
	Dissolved Arsenic (As)	mg/L	-	-	0.0050	0.000410	0.000270	0.000510	0.000730	0.000420
	Dissolved Barium (Ba)	mg/L	-	-	-	0.0292	0.0577	0.0565	0.0586	0.0322
	Dissolved Beryllium (Be)	mg/L	-	-	-	<0.00002	<0.00002	<0.00002	<0.00002	0.0000300
	Dissolved Bismuth (Bi)	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
	Dissolved Boron (B)	mg/L	-	-	-	<0.01	0.0260	<0.01	<0.01	<0.01
	Dissolved Cadmium (Cd)	mg/L	-	-	0.000135 - 0.422[j]	<0.000005	<0.000005	<0.000005	0.00000610	<0.000005
	Dissolved Calcium (Ca)	mg/L	-	-	-	14.3	57.4	37.7	21.3	18.1
	Dissolved Chromium (Cr)	mg/L	-	-	0.0010	0.000580	0.000230	0.000280	0.000380	0.000620
	Dissolved Cobalt (Co)	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Dissolved Copper (Cu)	mg/L	-	-	0.020[k]	0.00276	0.00384	0.00215	0.00226	0.00222
	Dissolved Iron (Fe)	mg/L	-	-	1.1	0.194	0.0230	0.0740	0.0640	0.148
	Dissolved Lead (Pb)	mg/L	-	-	0.0040	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
	Dissolved Lithium (Li)	mg/L	-	-	-	<0.001	0.00270	0.00140	0.00130	0.00150
	Dissolved Magnesium (Mg)	mg/L	-	-	-	4.46	27.3	13.7	8.93	9.39
	Dissolved Manganese (Mn)	mg/L	0.35 - 0.64[l]	3.89 - 15.2[m]	-	0.00874	0.0528	0.00620	0.00949	0.00592
	Dissolved Molybdenum (Mo)	mg/L	-	-	0.073	0.000544	0.00486	0.00129	0.00111	0.000432
	Dissolved Nickel (Ni)	mg/L	-	-	0.11	0.00130	0.00140	0.00111	0.00118	0.00177
	Dissolved Phosphorus (P)	mg/L	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05
	Dissolved Potassium (K)	mg/L	-	-	-	0.297	2.32	1.22	0.717	0.527
	Dissolved Selenium (Se)	mg/L	-	-	0.0020	0.000202	0.000258	0.000147	0.0000730	0.000117
	Dissolved Silicon (Si)	mg/L	-	-	-	6.46	6.32	6.16	6.41	5.45
	Dissolved Silver (Ag)	mg/L	-	-	0.00010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Dissolved Sodium (Na)	mg/L	-	-	-	3.55	16.7	9.15	6.70	6.29
	Dissolved Strontium (Sr)	mg/L	-	-	-	0.0934	0.706	0.374	0.238	0.176
	Dissolved Sulfur (S)	mg/L	-	-	-	2.66	17.3	6.42	4.24	4.18
	Dissolved Thallium (Tl)	mg/L	-	-	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Dissolved Tin (Sn)	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Dissolved Titanium (Ti)	mg/L	-	-	-	0.00128	<0.0003	0.000390	0.000610	0.000820
	Dissolved Uranium (U)	mg/L	-	-	-	0.000178	0.00214	0.00119	0.00194	0.000623
	Dissolved Vanadium (V)	mg/L	-	-	-	0.000560	<0.0005	0.000640	0.000930	0.000980
	Dissolved Zinc (Zn)	mg/L	0.0294 - 0.125[n]	0.0933 - 0.298[o]	0.030	<0.001	<0.001	<0.001	<0.001	<0.001
	Dissolved Zirconium (Zr)	mg/L	-	-	-	0.000710	<0.0002	0.000220	0.000400	0.000570

Exceeds CCME long-term Water Quality Guideline
Exceeds CCME short-term Water Quality Guideline
Exceeds Water Use Licence objectives
Exceeds both Water Quality Guideline (short- or long-term) and Water Use Licence objectives

Note: "-" = no guideline available / no data available.

[a] CCME (Canadian Council of Ministers of the Environment; 1999). See Appendix Table B.5 for values and explanatory notes on selected water quality guidelines.

[b] Guideline based on field temperature and pH at each area.

[c] Guideline based on field pH at each area. If pH < 6.5 = 5 µg/L and if pH ≥ 6 = 100 µg/L.

[d] Total cadmium long-term guideline is based on hardness (as $CaCO_3$). At hardness ≥ 17 to ≤ 280 mg/L, the equation is CWQG (µg/L) = $10^{\{0.83(\log[\text{hardness}]) - 2.46\}}$.

[e] Total cadmium short-term guideline is based on hardness at hardness (as $CaCO_3$). At hardness ≥ 5.3 to ≤ 360 mg/ the equation is CWQG (µg/L) = $10^{\{1.016(\log[\text{hardness}]) - 1.71\}}$.

[f] Total chromium guideline is for hexavalent chromium, Cr(VI).

[g] Total copper guideline is based on hardness and is calculated using the equation CWQG (µg/L) = 0.2 x $e^{\{0.8545[\ln(\text{hardness})]-1.465\}}$.

[h] Total lead guideline is based on hardness (as $CaCO_3$). At hardness 0 to ≤ 60 mg/L, the CWQG is 1 µg/L. At hardness > 60 to ≤ 180 mg/L the equation is CWQG (µg/L)= $e^{[(1.273\{\ln[\text{hardness}]\}-4.705)]}$. At hardness > 180 mg/L, CWQG = 7 µg/L.

[i] Total nickel guideline is based on hardness (as $CaCO_3$). At hardness 0 to ≤ 60 mg/L the CWQG is 25 µg/L. At hardness > 60 to ≤ 180 mg/L the CWQG is calculated using the equation CWQG (µg/L) = $e^{\{0.76[\ln(\text{hardness})]+1.06\}}$. At hardness > 180 mg/L, the CWQG is 150 µg/L.

[j] Dissolved cadmium (µg/L) objective is based on the following formula using the lowest hardness: $e^{(0.736(\ln(\text{hardness}))-4.943)}$.

[k] Dissolved copper objective is based on dissolved organic carbon (DOC). If DOC is > 10 mg/L, objective is 0.02 mg/L Cu. If DOC≤ 10 mg/L, objective is 0.013 mg/L Cu.

[l] Dissolved manganese long-term guideline is calculated using CCME benchmark calculator or look-up table. Values dependent on hardness and field pH

[m] Dissolved manganese short-term guideline is based on hardness and is calculated using the equation CWQG (µg/L) = $e^{(0.878[\ln(\text{hardness})] + 4.76)}$.

[n] Dissolved zinc long-term guideline is based on hardness, pH, and DOC. For hardness 23.4 and 399 mg/L, pH 6.5 to 8.13, and DOC 0.3 to 22.9 mg/L, the equation is CWQG (µg/L) = $e^{(0.947[\ln(\text{hardness mg/L})] - 0.815[\text{pH}] + 0.398[\ln(\text{DOC mg/L})] + 4.625}$

[o] Dissolved zinc short-term benchmark is based on hardness and DOC. For hardness 13.8 to 250.5 mg/L and DOC 0.3 and 17.3 mg/L, the equation is CWQG (µg/L)= $e^{(0.833[\ln(\text{hardness mg/L})] + 0.240[\ln(\text{DOC mg/L})] + 0.526)}$.

Wolverine creeks (32 mg/m^2) as mesotrophic. Based on only total phosphorus, both creeks would be defined as oligotrophic as was observed in previous years (Dodds et al. 1998).

3.4 Summary

Supporting measures collected in September 2020 indicated good Minto Creek water quality. Influence of the Minto Mine was evident through higher specific conductance and pH in Minto Creek in comparison to in the reference creeks. However, water quality concentrations were lower than SSWQO. Total copper concentrations exceeded the CWQG at all sites while dissolved copper concentrations were all below the SSWQO. Total copper concentrations exceeded the CWQG at all sites, including the reference, indicating that high copper concentrations might be natural (as observed in previous years).

Mean concentrations of chlorophyll-a were significantly different between areas and were below BCWQG. Temporal variability in chlorophyll-a concentrations was evident among samples taken from Minto Creek and the reference. Historically, chlorophyll-a values have been below the BCWQG of 100 mg/m^2 and concentrations have been (generally) higher at Minto Creek than the reference. Concentrations at both areas were lower in 2020 than in 2018 but this was especially noticeable at lower Minto (55 mg/m^2 to 16 mg/m^2). It is difficult to determine the cause of the lowered concentrations, but it is possible that the dry conditions at lower Minto in 2019 contributed to lower concentrations. Production classification at the exposure and reference areas (lower Minto Creek as oligotrophic and lower Wolverine Creek as mesotrophic) were different from 2017 (when lower Minto Creek was mesotrophic and lower Wolverine Creek was oligotrophic) and 2018 (both Minto and Wolverine creeks were mesotrophic).

4 SEDIMENT QUALITY

4.1 Sediment Particle Size and Chemistry

Sediment data quality was assessed prior to data analysis and interpretation and was judged as excellent based on good analyte detectability, precision, and accuracy for metals and other analytes (Appendix A). It should be noted that duplicates for particle size were not taken due to low volumes of sediment available for sampling (Appendix A). At lower creek stations, particle size samples were collected at each station and particle size composition is expressed as the mean of five replicates.

Sediments collected in 2020 were largely composed of fine particles of silt/clay (>60%) and sand (>23%) (Figure 4.1; Appendix C). There were relatively fewer fine particles (silt /clay category) at the upper Minto Creek depositional area than at the upper reference area, upper McGinty Creek (60.5% vs 72%; Figure 4.1, Appendix C). Lower Minto Creek and the lower reference area, Wolverine Creek, had similar mean proportions of fine particles (76.8% vs. 71.9%; Figure 4.1, Appendix C).

Mean total organic carbon (TOC) content, loss on ignition (LOI), and total carbon content of sediment collected from upper Minto Creek were slightly lower than at the upper McGinty Creek reference area, but the differences were not significant (Table 4.1). Similarly, lower Minto Creek had lower TOC, LOI, and total carbon than the lower Wolverine Creek reference area but the difference was not significant (Table 4.2).

Concentrations of several metals were significantly higher in upper Minto Creek than in upper McGinty Creek sediments (Table 4.1). Sediment concentrations of copper, strontium, and potassium had the highest magnitude of difference between the upper creeks (798%, 109%, and 103%, respectively). Arsenic concentrations were not significantly different between upper Minto Creek and upper McGinty Creek (Table 4.1). Concentrations of several metals were found to be significantly higher in lower Minto Creek than lower Wolverine Creek sediments (Table 4.2). Sediment concentrations of manganese, copper, and selenium had the highest magnitude of difference between the upper creeks (156%, 95%, and 76%, respectively).

Though several analytes were higher at exposed (Minto Creek) versus reference areas (upper McGinty Creek reference for upper Minto Creek and lower Wolverine Creek and lower Big Creek references for lower Minto Creek), only arsenic and copper had mean concentrations greater than Interim Sediment Quality Guidelines (ISQG) for the protection of aquatic life (CCME 1999) in Minto Creek (Table 4.3, Appendix Table C.1). Mean arsenic concentration in upper Minto Creek was above the Interim Sediment Quality Guideline (ISQG) but below the Probable Effect Level (PEL) and lower than 2x the mean at upper McGinty Creek reference area.

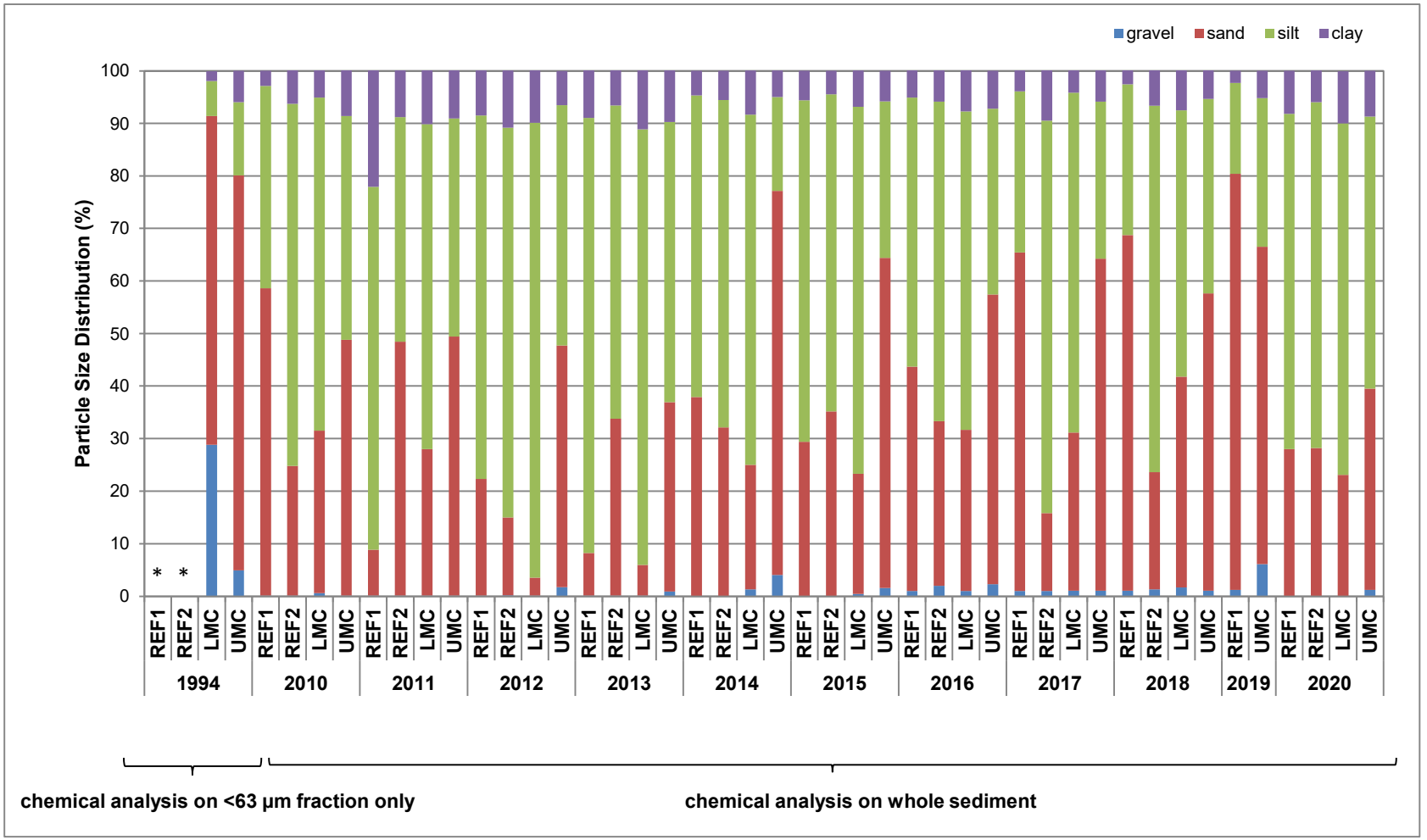


Figure 4.1: Particle Size Distribution of Sediment Collected in Upper Minto Creek and Reference Location, 1994 to 2020[a,b]

Notes: Methods used in 1994 were not specified, fine sediment was collected in triplicate in the mainstem of Minto Creek (HKP 1994), * = no data.

[a] REF1 = Station W6 (south-flowing tributary) in 2006 to 2008 and McGinty Creek in 2010 to 2020; UMC = Upper Minto Creek.

[b] REF2 = Station W7 (north-flowing tributary) in 2006 to 2009 and Wolverine Creek in 2010 to 2020; LMC = Lower Minto Creek.

Table 4.1: Statistical Comparisons Between Upper McGinty Creek (Reference) and Upper Minto Creek (Mine-Exposed) Sediment Chemistry, 2020

Analyte	Data Transformation	Test	Test P-value	MCT[a]		MOD[b] (%)
				Upper McGinty Creek (Reference)	Upper Minto Creek (Exposed)	
Loss on Ignition (%)	none	tequal	0.182	11.6	7.68	-
ph 1:2 Soil:Water Ratio	none	tequal	0.001	6.64	7.92	19
Total Kjeldahl Nitrogen (%)	none	tequal	0.236	0.282	0.217	-
Total Inorganic Carbon (%)	none	tequal	0.121	0.128	0.184	-
Inorganic Carbon (as $CaCO_3$; %)	none	tequal	0.117	1.07	1.54	-
Total Carbon (%)	none	tequal	0.109	5.48	3.83	-
Total Organic Carbon (%)	none	tequal	0.091	5.36	3.65	-
Organic Matter (%)	none	tequal	0.091	9.22	6.28	-
Aluminum (mg/kg)	none	tequal	0.771	12,848	13,420	-
Antimony (mg/kg)	none	tequal	0.111	0.444	0.496	-
Arsenic (mg/kg)	none	tequal	0.089	5.32	6.45	-
Barium (mg/kg)	none	tequal	0.097	223	406	-
Beryllium (mg/kg)	none	tequal	0.064	0.356	0.460	-
Boron (mg/kg)	rank	M-W	0.424	5.00	5.00	-
Cadmium (mg/kg)	none	tunequal	0.086	0.170	0.317	-
Calcium (mg/kg)	none	tequal	0.102	8,114	10,170	-
Chromium (mg/kg)	none	tequal	0.261	24.9	27.9	-
Cobalt (mg/kg)	none	tequal	0.045	9.10	12.3	36
Copper (mg/kg)	none	tunequal	0.019	23.7	213	798
Iron (mg/kg)	none	tequal	0.091	21,140	25,300	-
Lead (mg/kg)	none	tequal	0.034	4.71	5.88	25
Lithium (mg/kg)	none	tequal	0.1	7.02	8.58	-
Magnesium (mg/kg)	none	tequal	0.001	4,426	7,226	63
Manganese (mg/kg)	none	tunequal	0.072	496	6321	-
Mercury (mg/kg)	rank	M-W	0.18	0.0500	0.0500	-
Molybdenum (mg/kg)	none	tunequal	0.081	0.590	3.50	-
Nickel (mg/kg)	none	tequal	0.001	18.1	31.3	73
Phosphorus (mg/kg)	none	tequal	0.015	817	1,016	24
Potassium (mg/kg)	none	tequal	0.001	700	1,422	103
Selenium (mg/kg)	none	tequal	0.141	0.516	0.814	-
Silver (mg/kg)	rank	M-W	0.072	0.100	0.140	-
Sodium (mg/kg)	none	tequal	0.001	203	313	54
Strontium (mg/kg)	none	tequal	0.006	64.8	135	109
Thallium (mg/kg)	rank	M-W	0.016	0.0710	0.0920	30
Titanium (mg/kg)	none	tequal	0.95	663	659	-
Uranium (mg/kg)	none	tequal	0.099	1.30	1.01	-
Vanadium (mg/kg)	none	tequal	0.207	49.0	54.4	-
Zinc (mg/kg)	none	tequal	0.009	45.3	69.2	53
Zirconium (mg/kg)	none	tequal	0.709	2.40	2.54	-

P-value < 0.05

Magnitude of Difference (MOD) > 0

Magnitude of Difference (MOD) < 0

Notes: "-" indicates not significant. M-W = Mann-Whitney test. tequal = t-test for equal variance. tunequal = t-test for unequal variance.

[a] Measure of Central Tendency (MCT) is the mean for parameters where statistics were conducted on the raw scale, the geometric mean when statistics were log_{10} transformed to meet the assumtions of normality, and the median when rank tranformed.

[b] MOD = magnitude of difference. MOD = MCT_{EXP} - MCT_{REF}/MCT_{REF}*100.

Table 4.2: Statistical Comparisons Between Lower Wolverine Creek (Reference) and Lower Minto Creek (Mine-Exposed) Sediment Chemistry, 2020

Analyte	Data Transformation	Test	Test P-value	MCT[a]		MOD[b] (%)
				Lower Wolverine Creek (Reference)	Lower Minto Creek (Exposed)	
Loss on Ignition (%)	none	tequal	0.542	10.4	9.06	-
ph 1:2 Soil:Water Ratio	none	tequal	0.001	7.01	7.94	13
Total Kjeldahl Nitrogen (%)	none	tequal	0.754	0.291	0.276	-
Total Inorganic Carbon (%)	none	tequal	0.122	0.143	0.171	-
Inorganic Carbon (as $CaCO_3$; %)	none	tequal	0.121	1.19	1.42	-
Total Carbon (%)	none	tequal	0.525	5.06	4.56	-
Total Organic Carbon (%)	none	tequal	0.493	4.92	4.39	-
Organic Matter (%)	none	tequal	0.496	8.47	7.57	-
Aluminum (mg/kg)	none	tequal	0.206	16,440	14,380	-
Antimony (mg/kg)	none	tequal	0.165	0.432	0.498	-
Arsenic (mg/kg)	none	tequal	0.024	5.48	7.53	37
Barium (mg/kg)	none	tequal	0.241	221	259	-
Beryllium (mg/kg)	none	tequal	0.002	0.720	0.462	-36
Cadmium (mg/kg)	none	tequal	0.663	0.228	0.213	-
Calcium (mg/kg)	none	tequal	0.668	9,384	9,946	-
Chromium (mg/kg)	none	tequal	0.001	46.2	30.9	-33
Cobalt (mg/kg)	none	tequal	0.009	13.1	10.7	-19
Copper (mg/kg)	none	tequal	0.004	27.5	53.5	95
Iron (mg/kg)	none	tequal	0.329	28,000	26,220	-
Lead (mg/kg)	none	tequal	0.558	6.08	5.76	-
Lithium (mg/kg)	none	tequal	0.649	10.4	9.98	-
Magnesium (mg/kg)	none	tequal	0.002	9,674	7,110	-26
Manganese (mg/kg)	none	tequal	0.004	467	1,195	156
Mercury (mg/kg)	rank	M-W	0.424	0.0500	0.0500	-
Molybdenum (mg/kg)	none	tequal	0.056	0.586	0.756	-
Nickel (mg/kg)	none	tequal	0.006	37.1	28.0	-24
Phosphorus (mg/kg)	none	tequal	0.020	1,066	902	-15
Potassium (mg/kg)	none	tequal	0.033	1,056	1,254	19
Selenium (mg/kg)	none	tequal	0.011	0.324	0.572	76
Silver (mg/kg)	rank	M-W	0.424	0.100	0.100	-
Sodium (mg/kg)	none	tequal	0.001	403	285	-29
Strontium (mg/kg)	none	tequal	0.716	98.0	104	-
Sulfur (mg/kg)	rank	M-W	0.180	1,000	1,000	-
Thallium (mg/kg)	none	tequal	0.323	0.0800	0.0898	-
Titanium (mg/kg)	none	tequal	0.001	827	669	-19
Uranium (mg/kg)	none	tequal	0.003	2.56	1.11	-56
Vanadium (mg/kg)	none	tequal	0.001	68.7	57.5	-16
Zinc (mg/kg)	none	tequal	0.328	64.3	59.4	-
Zirconium (mg/kg)	none	tequal	0.007	4.34	2.82	-35

P-value < 0.05

Magnitude of Difference (MOD) > 0

Magnitude of Difference (MOD) < 0

Notes: "-" indicates not significant. M-W = Mann-Whitney test. tequal = t-test for equal variance. tunequal = t-test for unequal variance.

[a] Measure of Central Tendency (MCT) is the mean for parameters where statistics were conducted on the raw scale, the geometric mean when statistics were $\log_{10}$ transformed to meet the assumtions of normality, and the median when rank tranformed.

[b] MOD = magnitude of difference. MOD = MCT_{EXP} - MCT_{REF}/MCT_{REF}*100.

Table 4.3: Summary of Sediment Chemistry Data, Minto Mine, September 2020

	Analytes	Units	CSQG[a]		Upper McGinty Creek (Reference)				Upper Minto Creek (Exposed)				Lower Wolverine Creek (Reference)				Lower Minto Creek (Exposed)			
			ISQG	PEL	Mean	Standard Deviation	Minimum	Maximum	Mean	Standard Deviation	Minimum	Maximum	Mean	Standard Deviation	Minimum	Maximum	Mean	Standard Deviation	Minimum	Maximum
TKN, carbon analytes and pH	Loss on Ignition @ 550 °C	%	-	-	11.6	5.25	3.40	15.3	7.68	2.98	4.30	12.1	10.4	3.76	4.80	14.0	9.06	2.83	5.20	13.1
	pH (1:2 soil:water)	pH units	-	-	6.64	0.274	6.34	7.06	7.92	0.0748	7.84	8.04	7.01	0.360	6.56	7.54	7.94	0.0803	7.83	8.01
	Gravel (> 2 mm)	%	-	-	<1	-	<1	<1	1.20	-	1.20	1.20	<1	-	<1	<1	<1	-	<1	<1
	Sand (2.0 mm - 0.063 mm)	%	-	-	15.9	-	15.9	15.9	23.3	-	23.3	23.3	18.0	10.9	4.10	30.3	13.1	5.71	6.90	22.4
	Sand (1.0 mm - 0.2 mm)	%	-	-	12.1	-	12.1	12.1	15.0	-	15.0	15.0	10.2	7.69	1.40	21.9	10.0	7.29	4.50	22.6
	Sand (2.0mm - 0.063mm)	%	-	-	28.0	-	28.0	28.0	38.3	-	38.3	38.3	28.2	17.6	5.50	52.2	23.1	12.3	16.8	45.0
	Silt (0.063 mm - 4 µm)	%	-	-	63.8	-	63.8	63.8	51.8	-	51.8	51.8	65.8	16.5	43.3	87.4	66.9	10.6	48.0	72.7
	Clay (< 4 µm)	%	-	-	74.0	-	74.0	74.0	63.5	-	63.5	63.5	73.6	16.8	50.2	95.1	78.5	11.7	57.5	84.3
	Total Kjeldahl Nitrogen (TKN)	%	-	-	0.282	0.0913	0.136	0.376	0.217	0.0684	0.132	0.288	0.291	0.0881	0.168	0.383	0.276	0.0564	0.205	0.357
	Inorganic Carbon	%	-	-	0.1280	0.0303	0.0840	0.156	0.184	0.0651	0.105	0.241	0.143	0.0274	0.102	0.168	0.171	0.0239	0.138	0.200
	Inorganic Carbon (as $CaCO_3$ Equivalent)	%	-	-	1.07	0.252	0.700	1.30	1.54	0.542	0.880	2.01	1.19	0.229	0.850	1.40	1.42	0.199	1.15	1.67
	Total Carbon by Combustion	%	-	-	5.48	1.74	2.75	7.26	3.83	1.08	2.54	4.98	5.06	1.39	3.13	6.16	4.56	0.933	3.45	6.00
	Total Organic Carbon	%	-	-	5.36	1.71	2.67	7.10	3.65	1.01	2.44	4.76	4.92	1.37	3.03	6.00	4.39	0.912	3.31	5.80
Total Metals	Aluminum (Al)	mg/kg	-	-	12,848	3,507	7,140	16,200	13,420	2,405	11,000	16,200	16,440	1,689	13,900	18,400	14,380	2,886	10,600	17,900
	Antimony (Sb)	mg/kg	-	-	0.444	0.0493	0.390	0.520	0.496	0.0422	0.440	0.550	0.432	0.0531	0.370	0.510	0.498	0.0807	0.400	0.600
	Arsenic (As)	mg/kg	5.9	17	5.32	0.850	4.41	6.50	6.45	0.977	5.31	7.66	5.48	1.12	4.27	7.02	7.53	1.21	6.04	9.07
	Barium (Ba)	mg/kg	-	-	223	64.1	115	278	406	207	178	608	221	33.7	175	255	259	56.8	188	338
	Beryllium (Be)	mg/kg	-	-	0.356	0.0902	0.230	0.480	0.460	0.0596	0.410	0.530	0.720	0.103	0.590	0.850	0.462	0.0750	0.380	0.580
	Bismuth (Bi)	mg/kg	-	-	<0.2	-	<0.2	<0.2	<0.2	-	<0.2	<0.2	<0.2	-	<0.2	<0.2	<0.2	-	<0.2	<0.2
	Boron (B)	mg/kg	-	-	<5	-	<5	<5	5.04	-	<5	5.20	<5	-	<5	<5	<5	-	<5	<5
	Cadmium (Cd)	mg/kg	0.60	3.5	0.170	0.0398	0.106	0.215	0.317	0.145	0.157	0.467	0.228	0.0488	0.170	0.280	0.213	0.0572	0.139	0.299
	Calcium (Ca)	mg/kg	-	-	8,114	1,769	5,230	10,000	10,170	1,757	7,890	12,500	9,384	1,720	7,570	12,100	9,946	2,233	7,070	13,200
	Chromium (Cr)	mg/kg	37	90	24.9	5.27	16.3	30.3	27.9	1.74	25.2	29.4	46.2	4.60	39.0	51.2	30.9	4.51	25.0	36.2
	Cobalt (Co)	mg/kg	-	-	9.10	1.76	6.36	10.8	12.3	2.49	9.63	15.1	13.1	0.783	12.1	14.2	10.7	1.37	9.02	12.6
	Copper (Cu)	mg/kg	36	197	23.7	5.86	14.0	29.8	213	112	87.7	351	27.5	5.43	20.3	32.0	53.5	13.3	38.1	71.8
	Iron (Fe)	mg/kg	-	-	21,140	3,205	16,000	23,800	25,300	3,624	22,200	29,600	28,000	2,790	25,100	32,500	26,220	2,620	23,200	29,600
	Lead (Pb)	mg/kg	35	91	4.71	0.863	3.39	5.71	5.88	0.543	5.36	6.62	6.08	0.763	4.99	6.98	5.76	0.888	4.69	6.86
	Lithium (Li)	mg/kg	-	-	7.02	1.38	4.80	8.50	8.58	1.27	7.20	10.0	10.4	1.05	8.80	11.6	9.98	1.57	7.90	11.7
	Magnesium (Mg)	mg/kg	-	-	4,426	827	3,160	5,370	7,226	896	6,240	8,210	9,674	593	8,670	10,200	7,110	1,119	5,580	8,440
	Manganese (Mn)	mg/kg	-	-	496	218	352	874	6,321	5,361	837	12,100	467	250	219	785	1,195	316	847	1,700
	Mercury (Hg)	mg/kg	0.17	0.49	0.0520	0.00396	<0.05	0.0584	<0.05	-	<0.05	<0.05	0.0501	-	<0.05	0.0504	<0.05	-	<0.05	<0.05
	Molybdenum (Mo)	mg/kg	-	-	0.590	0.122	0.460	0.780	3.50	2.81	0.920	6.52	0.586	0.136	0.480	0.810	0.756	0.102	0.640	0.900
	Nickel (Ni)	mg/kg	-	-	18.1	2.88	13.7	21.7	31.3	3.36	26.5	35.2	37.1	2.73	32.7	39.3	28.0	4.66	21.9	34.4
	Phosphorus (P)	mg/kg	-	-	817	129	626	979	1,016	62.8	943	1,100	1,066	30.5	1,030	1,100	902.2	123	721	997
	Potassium (K)	mg/kg	-	-	700	129	480	810	1,422	299	1,160	1,770	1,056	74.0	940	1,140	1,254	155	1,020	1,420
	Selenium (Se)	mg/kg	2.0	-	0.516	0.163	0.300	0.720	0.814	0.374	0.430	1.29	0.324	0.0820	0.240	0.440	0.572	0.147	0.430	0.790
	Silver (Ag)	mg/kg	-	-	<0.1	-	<0.1	<0.1	0.138	0.0286	<0.1	0.200	0.100	-	<0.1	0.100	0.104	0.0113	<0.1	0.120
	Sodium (Na)	mg/kg	-	-	203	42.0	133	243	313	20.0	286	337	403	17.1	383	426	285	24.9	257	315
	Strontium (Sr)	mg/kg	-	-	64.8	13.9	40.4	74.1	135	39.7	93.9	189	98.0	23.2	78.8	138	104	25.5	74.7	144
	Sulfur (S)	mg/kg	-	-	<1,000	-	<1,000	<1,000	<1,000	-	<1,000	<1,000	1,420	396	<1,000	2,400	<1,000	-	<1,000	<1,000
	Thallium (Tl)	mg/kg	-	-	0.0686	0.00602	<0.05	0.0810	0.0964	0.0157	0.0760	0.115	0.0800	0.0153	0.0560	0.0970	0.0898	0.0141	0.0710	0.106
	Tin (Sn)	mg/kg	-	-	<2	-	<2	<2	<2	-	<2	<2	<2	-	<2	<2	<2	-	<2	<2
	Titanium (Ti)	mg/kg	-	-	663	119	464	776	659	72.2	572	758	827	61.5	739	912	669	37.5	617	706
	Uranium (U)	mg/kg	-	-	1.30	0.282	0.863	1.57	1.01	0.218	0.724	1.27	2.56	0.752	1.76	3.71	1.11	0.211	0.837	1.43
	Vanadium (V)	mg/kg	-	-	49.0	7.65	36.9	57.9	54.4	4.21	49.4	59.2	68.7	3.45	64.0	72.4	57.5	3.77	53.0	61.4
	Zinc (Zn)	mg/kg	123	315	45.3	8.39	32.1	54.8	69.2	13.0	55.5	84.7	64.3	7.15	55.4	73.8	59.4	7.66	49.3	69.1
	Zirconium (Zr)	mg/kg	-	-	2.40	0.616	1.80	3.40	2.54	0.522	1.80	3.20	4.34	0.695	3.60	5.10	2.82	0.642	2.20	3.80

Indicates sediment concentration exceeding CSQG ISQG or BCMOE Se guideline.
Indicates sediment concentration exceeding CSQG PEL.
Indicates sediment concentration exceeding higher reference mean by more than two times.
Indicates sediment concentration exceeding higher reference mean by more than two times and higher than CSQG ISQG, PEL, or BCMOE Se guideline.

Note: "-" = no guideline or not possible to calculate from non detectable data.

[a] CSQG (CCME 1999, plus updates) and BC Sediment Quality Guideline for Selenium (BCMOE 2014). ISQG = interim sediment quality guideline. PEL = probably effect level.

This suggests that arsenic concentrations were unrelated to the Minto Mine. Mean copper concentration in upper Minto Creek was above the ISQG as well as the PEL; the PEL is considered to be a level above which adverse biological effects are likely to occur[1]. However, due to the predominantly erosional habitat in upper Minto Creek, there are few areas of deposited sediment which may have only occurred in small quantities that likely washed away each year during freshet. Therefore, elevated copper in fine sediment in the upper reaches of Minto Creek may be of limited importance in terms of exposure and potential effects to biota (i.e., sediment copper is of limited importance as an exposure route in this erosional environment where sediment sparsely distributed). In lower Minto Creek, fine sediment deposits were somewhat more common and therefore more relevant to aquatic life.

Mean concentrations of arsenic and copper in lower Minto Creek were greater than the ISQG but below the PEL. Mean concentrations of arsenic and copper in lower Minto Creek were less than 2x the mean at lower Wolverine Creek. With progression from upper to lower Minto Creek, sediment copper concentrations decreased from a mean of 213 to 53.5 milligram per kilogram (mg/kg), respectively, indicating improvement with distance downstream.

4.2 Temporal Comparisons

Particle size distribution in 2020 indicated more fine particles in the silt/clay category than in previous years (Figure 4.1). Sand was generally the dominant particle size in upper Minto Creek as observed over the more recent historical data (post-2010). Particle size distribution observed from 2010 onwards was notably different from data collected prior to 2010, which employed different sampling methodology (described in Minnow 2019a). Upper McGinty particle distribution is noticeably more variable in clay and sand percentages (Appendix B), perhaps reflecting more dynamic hydrology in this system.

Mean concentrations of copper at upper Minto Creek have not changed significantly since 2011. Concentrations in upper McGinty Creek have fluctuated over the years but have not differed significantly during the 2011 to 2020 period (Figure 4.2a; Table 4.4). Mean copper concentration in upper Minto Creek has been significantly higher than upper McGinty Creek since 2011. The magnitude of difference between upper Minto Creek and upper McGinty Creek in 2020 was lowest it has been since 2015, but this difference was not statistically significant (Figure 4.2a; Table 4.4) and results were within the range observed since 2011.

Mean concentrations of copper in lower Minto Creek have fluctuated over the years but have not changed significantly since 2012. Concentrations in lower Wolverine Creek have not changed

[1] It is recognized that guideline exceedances, even of probable effect levels, can occur naturally in highly mineralized areas.

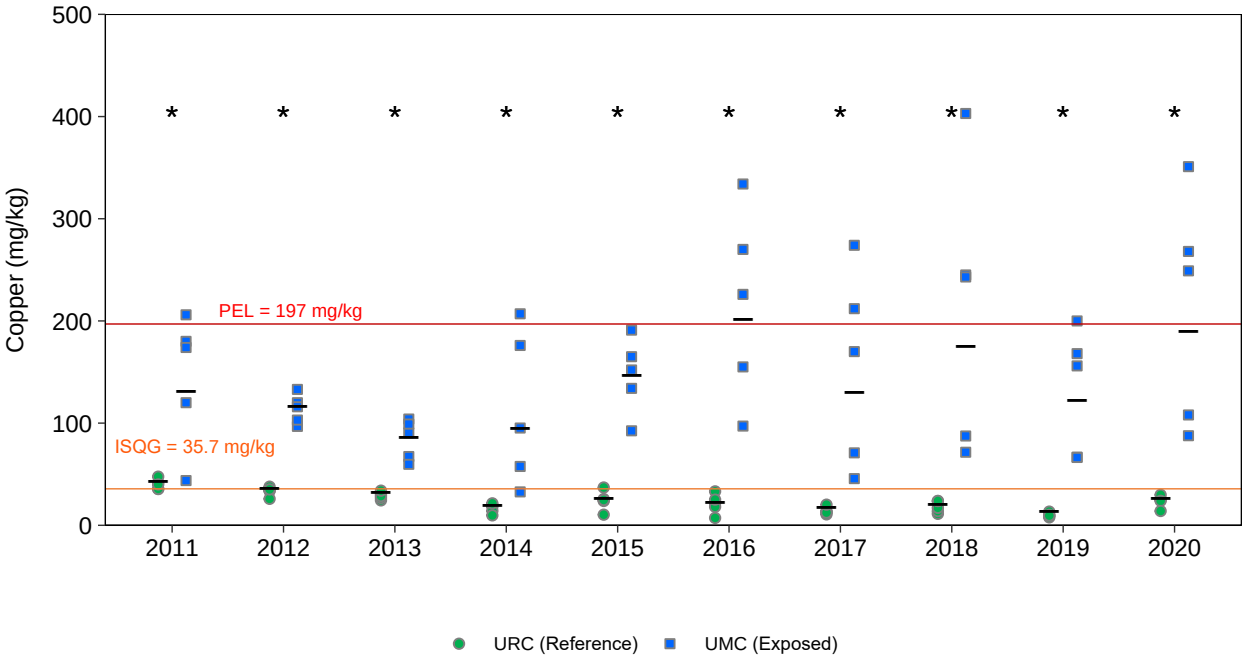


Figure 4.2a: Sediment Copper Concentrations Over Time for Upper Areas, 2011 to 2020

Notes: Black horizontal bars indicate the Measure of Central Tendency (MCT). The MCT is the mean for non−transformed data, geometric mean for $\log_{10}$ transformed data and median for rank transformed data. An * indicates stations were significantly different for that year. Interim Sediment Quality Guideline (ISQG) = 35.7 mg/kg is shown in orange and Probable Effect Limit (PEL) = 197 mg/kg is shown in red. URC = Upper McGinty Creek. UMC = Upper Minto Creek.

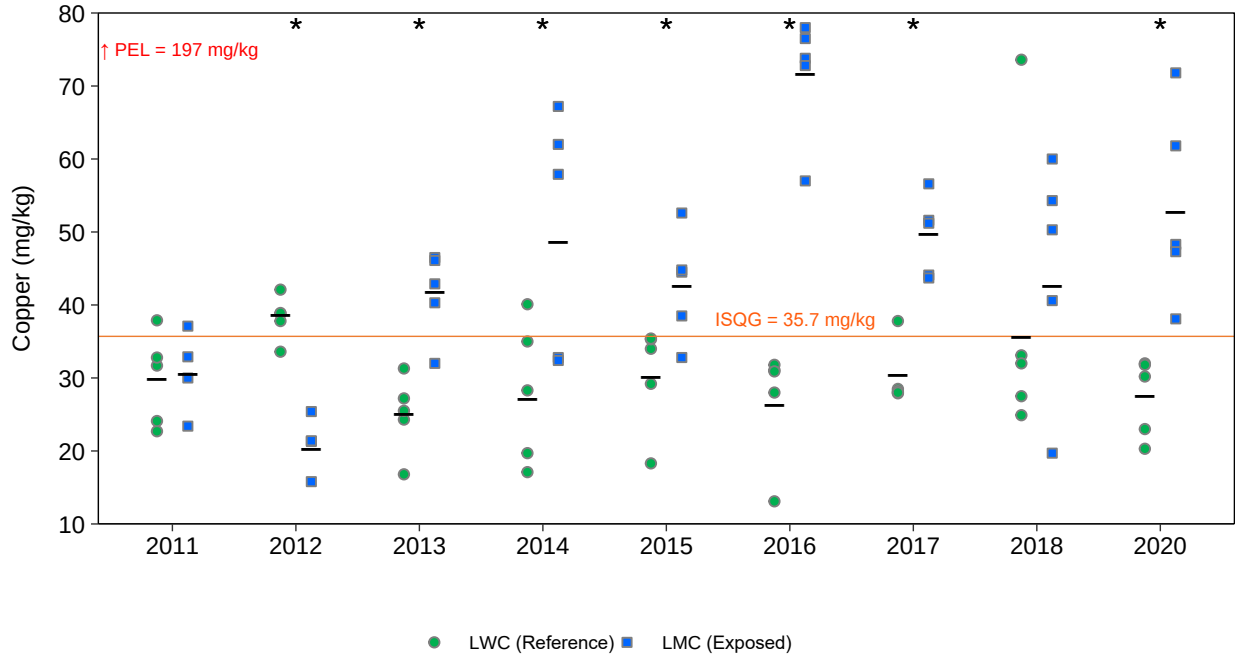


Figure 4.2b: Sediment Copper Concentrations Over Time for Lower Areas, 2011 to 2020[a]

Notes: Black horizontal bars indicate the Measure of Central Tendency (MCT). The MCT is the mean for non−transformed data, geometric mean for $\log_{10}$ transformed data and median for rank transformed data. An * indicates stations were significantly different for that year. Interim Sediment Quality Guideline (ISQG) = 35.7 mg/kg is shown in orange and Probable Effect Limit (PEL) = 197 mg/kg is shown in red. LWC = Lower Wolverine Creek. LMC = Lower Minto Creek.

[a] Sampling was not completed in 2019 due to dry conditions.

Table 4.4: Statistical Comparison Sediment Metal Concentrations, Upper Areas, Minto, 2011 to 2020

Endpoint	ANOVA Model				Year	Do Concentrations Differ Among Years for Each Area?[a]		Do Concentrations Differ Between Areas?
	Transformation	Area	Year	Area x Year		URC (Reference)	UMC (Exposed)	MOD (%)[b]
Copper (mg/kg)	log10	<0.001	0.006	0.001	2011	A	A	220
					2012	AB	A	242
					2013	AB	A	187
					2014	ABC	A	472
					2015	ABC	A	533
					2016	ABC	A	953
					2017	BC	A	819
					2018	ABC	A	899
					2019	C	A	1,097
					2020	ABC	A	708

P-value < 0.05

Magnitude of Difference (MOD) > 0

Magnitude of Difference (MOD) < 0

Notes: "-" indicates no data for comparison, "ns" indicates a non-significant post-hoc contrast.

[a] Years that do not share a letter were significantly different from each other in a Tukey's Honestly Significant Difference post-hoc test ($\alpha = 0.05$).

[b] MOD = $(MCT_{UMC}-MCT_{URC})/MCT_{URC}$ *100; where the measures of central tendency (MCT) were geometric means because the data was $\log_{10}$ transformed.

significantly since 2011 (Figure 4.2b; Table 4.5). The mean concentration of copper at lower Minto Creek has been significantly higher than lower Wolverine Creek since 2013 (Figure 4.2b; Table 4.5). The highest magnitude of difference (MOD) between lower Minto and lower Wolverine was observed in 2016.

Historically, higher copper concentrations (than observed in 2020) have been measured and reported in both upper and lower Minto Creek sediments (Figure 4.2a,b; Minnow 2019a). Mean copper concentrations in upper Minto Creek have historically (2016, 2018) exceeded the probable effect level (Figure 4.2a). Mean copper concentrations have also been historically greater than the ISGQ in lower Minto Creek sediment during most years (Figure 4.2a,b; Table 4.1; Appendix Table C) and have generally been stable since 2011 or 2012.

4.3 Sediment Toxicity

Sediment toxicity test conditions and supporting water quality parameters were all within the range outlined in the test protocols, and testing was judged to be acceptable (Appendix A). Survival and growth were evaluated using the 10-day test of *Chironomus dilutus* (midge) and the 14-day test of *Hyalella azteca* (amphipod).

Some reductions in survival but not growth were observed for both test organisms (Table 4.4). Survival of *C. dilutus* was significantly lower in sediment collected from lower Minto Creek than in laboratory control sediment (sand) but was not significantly different than field reference sediment (lower Wolverine Creek; Table 4.6). Mean survival at lower Minto Creek was leveraged by the result at one station that had a higher mortality rate (60%), while the remaining four replicates had mortality ≤20%. The absence of a significant difference from the field reference suggests no significant effect of lower Minto Creek sediment on *C. dilutus*. Low mortalities were observed in both lab control and field reference sediment (Nautilus Environmental [Appendix C]).

Survival of *H. azteca* in lower Minto sediment was significantly lower than both laboratory control and field reference sediment (lower Wolverine Creek; Table 4.4), indicating a significant effect of lower Minto Creek sediment on *H. azteca*. However, mean survival at lower Minto Creek was leveraged by two stations that had mortalities ≥60%. The remaining three stations did not have any mortalities. No mortalities were not observed in lab control or field reference sediment (Nautilus Environmental [Appendix C]).

In previous monitoring, effects on survival of *C. dilutus* were also observed in 2017 and 2018, and an effect on growth has only been observed in 2017 (Minnow 2019a)[2]. Average mortality in 2020 was lower than in 2018. No effects to *H. azteca* were observed in 2018, which was similar

[2] Sediment toxicity tests were not conducted in 2019 due to low flows and associated creek drying.

Table 4.5: Statistical Comparison Sediment Metal Concentrations, Lower Creek Areas, Minto, 2011 to 2020

Endpoint	ANOVA Model				Year	Do Concentrations Differ Among Years for Each Area?[a]		Do Concentrations Differ Between Areas?
	Transformation	Area	Year	Area x Year		LWC (Reference)	LMC (Exposed)	MOD (%)[b]
Copper (mg/kg)	log10	<0.001	0.009	<0.001	2011	A	CD	ns
					2012	A	D	-48
					2013	A	BC	68
					2014	A	ABC	81
					2015	A	ABC	42
					2016	A	A	177
					2017	A	ABC	65
					2018	A	ABC	ns
					2020	A	AB	93

P-value < 0.05
Magnitude of Difference (MOD) > 0
Magnitude of Difference (MOD) < 0

Notes: "-" indicates no data for comparison, "ns" indicates a non-significant post-hoc contrast.

[a] Years that do not share a letter were significantly different from each other in a Tukey's Honestly Significant Difference post-hoc test (α = 0.05).

[b] MOD = $(MCT_{LMC}-MCT_{LWC})/MCT_{LWC}$ *100; where the measures of central tendency (MCT) were geometric means because the data was log_{10} transformed.

Table 4.6: Minto Mine Sediment Toxicity Test Results Collected for Lower Wolverine and Lower Minto Creeks, September 2020

Area	*Hyalella azteca*		*Chironomus dilutus*	
	Survival (%)	**Dry Weight (mg)**	**Survival (%)**	**Dry Weight (mg)**
Control Sediment	100 ± 0.0	0.14 ± 0.02	90.0 ± 10.0	1.74 ± 0.18
Lower Wolverine Creek (Reference)	100 ± 0.0	0.14 ± 0.01	94.0 ± 13.4	2.40 ± 0.31
Lower Minto Creek (Exposed)	74.0 ± 35.8	0.13 ± 0.01	76.0 ± 20.7	2.65 ± 0.27

Significantly different than control sediment
Significantly different than reference sediment
Significantly different than reference and control sediment

Note: Data presented as mean ± standard deviation.

to results from 2011, 2015 to 2017 (Minnow 2019a). Temporal comparisons show differences in responses despite similar sediment chemistry.

4.4 Summary

Overall, the concentrations of metals in upper Minto Creek sediments were generally higher than those in McGinty Creek but lower than sediment quality guidelines, with the exception of arsenic (which exceeded ISQG) and copper (which exceeded ISQG and PEL). Copper at upper Minto Creek also exceeded the reference mean concentration by more than two times. Metal concentrations in lower Minto Creek sediments were generally similar to those in lower Wolverine Creek with the exception of arsenic, copper, and manganese (of which arsenic and copper were greater than ISQG but lower than PEL).

Copper concentrations at both upper Minto and lower Minto Creek have been statistically higher than their respective reference areas since 2011 and 2013, respectively. Although concentrations of arsenic and copper in both upper and lower Minto Creek exceeded sediment quality guidelines, temporal analyses of copper concentrations since 2011 indicate that there has not been a significant increase in copper over the years at either upper or lower Minto Creek.

Sediment toxicity testing indicated an effect of lower Minto Creek sediment on *H. azteca* survival, but not on *H. azteca* growth or the survival and growth of *C. dilutus*. However, survival of *H. azteca* was spatially variable, with ≥60% mortality at two stations and no mortality at the remaining three stations.

5 PERIPHYTON COMMUNITY

5.1 Primary Metrics and Community Composition

The quality of periphyton community data, assessed prior to data analysis and interpretation, was judged as good based on precision (Appendix A). Analysis of the periphyton community on the basis of density (cells/cm^2) and biomass (µg/cm^2) indicated that three out of five periphyton community metrics (taxon richness, Simpson's Diversity, and Simpson's Evenness) were not significantly different between lower Minto and lower Wolverine creeks.

Density was found to be significantly lower at lower Minto Creek than at lower Wolverine Creek (Table 5.1a,b, Appendix Tables D.1 and D.3). The Bray-Curtis index for periphyton community based on both density and biomass indicated a significant difference between lower Minto Creek and lower Wolverine Creek (Table 5.2). This indicates that periphyton community composition at lower Minto Creek differed from reference (Table 5.1a,b, Appendix Tables D.2 and D.4).

Dominant phyla in lower Minto and Wolverine creeks were Bacillariophycae (diatoms) and Cyanophyta (blue-green algae). Cyanophyta were dominant at lower Minto Creek (63%) with Bacillariophycae as the sub-dominant (29%). Bacillariophycae were dominant at lower Wolverine Creek (54% of the community; Figure 5.1). Little information is available regarding sensitivities of specific periphyton taxon groups and tolerances to mining activities to assist in interpretation of these data based on relative proportions of taxon groups (Deniseger et al. 1986, De Jonge et al. 2008).

5.2 Temporal Comparisons

Substantial temporal variability in periphyton community composition was evident among samples taken in Minto Creek and reference since 1994 (Figure 5.1). For example, at lower Minto Creek, Bacillariophycae (diatoms) were dominant in 1994, 2013, 2014, 2016, and 2018, Rhodophyta (red algae) in 2012, and Cyanophyta (blue-green algae) in 2011, 2015, 2017, and 2020 (Figure 5.1). Similar temporal variability was also observed at the lower Wolverine Creek reference area, with Cyanophyta dominant in 2011 and 2013 and Bacillariophycae in 2012, 2014 to 2018, and 2020 (Figure 5.1).

5.3 Summary

Evaluation of both periphyton community biomass (µg/cm^2) and density (cell/cm^2) indicated that three of five community metrics were not significantly different in lower Minto Creek relative to the lower Wolverine Creek reference. Density and the Bray-Curtis Index were the only metrics that differed between the two areas. It is possible that the lower density at lower Minto Creek and community dissimilarities between lower Minto Creek and lower Wolverine Creek can be partially



Table 5.1: Statistical Contrasts of Periphyton Density (cells/cm^2) and Biomass (µg/cm^2) based Community Metrics between Lower Wolverine Creek and Lower Minto Creek Areas, Minto Mine AEMP, 2020

A) Density based (cells/cm^2)

Endpoint	Data Transformation	Test	Test P-Value	Measure of Central Tendency [a]		Magnitude of Difference [b]
				LWC (Reference)	LMC (Exposed)	(LMC - LWC) /SD_P
Taxon Richness	log10	tequal	0.964	13.0	13.0	ns
Density	none	tunequal	0.003	108,111	12,547	-3.9
Simpson's Evenness	none	tequal	0.171	0.235	0.307	ns
Simpson's Diversity	none	tequal	0.180	0.658	0.731	ns

B) Biomass based (µg/cm^2)

Endpoint	Data Transformation	Test	Test P-Value	Measure of Central Tendency [a]		Magnitude of Difference [b]
				LWC (Reference)	LMC (Exposed)	(LMC - LWC) /SD_P
Taxon Richness	log10	tequal	0.964	13.0	13.0	ns
Density	log10	tequal	<0.001	34.7	2.86	-4.2
Simpson's Evenness	log10	tequal	0.033	0.257	0.396	1.6
Simpson's Diversity	none	tequal	0.045	0.693	0.797	1.5

P-value < 0.10

Effect size magnitude > 2

Notes: tequal = two-sample t-test for equal variance. MW = Mann Whitney test. tunequal = two-sample t-test for unequal variance. SD_P = pooled standard deviation.

[a] Measure of Central Tendency = back-transformed mean for two-sample t-tests and medians for MW tests.

[b] Magnitude of difference computed on transformed means and SD on transformed scale. Means and SD are replaced with medians and the median absolute deviation (MAD) for the MW test.

Table 5.2: Statistical Comparison of Bray-Curtis Index for the Periphyton Community at Lower Minto Creek (LMC; Exposed) and Lower Wolverine Creek (LWC; Reference), 2020

Group	Comparison	n		Betadisper P-Value	Mantel Test			dbRDA			
		Reference	Mine-Exposed		r	R^2	P-Value	F-Value	R^2	R^2_{adj}	P-Value
Density	LWC vs. LMC	5	5	0.368	0.617	0.381	0.008	5.03	0.386	0.309	0.007
Biomass	LWC vs. LMC	5	5	0.778	0.705	0.497	0.008	5.85	0.422	0.350	0.006

P-Value < 0.1

Notes: n = sample size, dbRDA = distance-based redundancy analysis, See Section 2.5.2 for statistical analysis details.

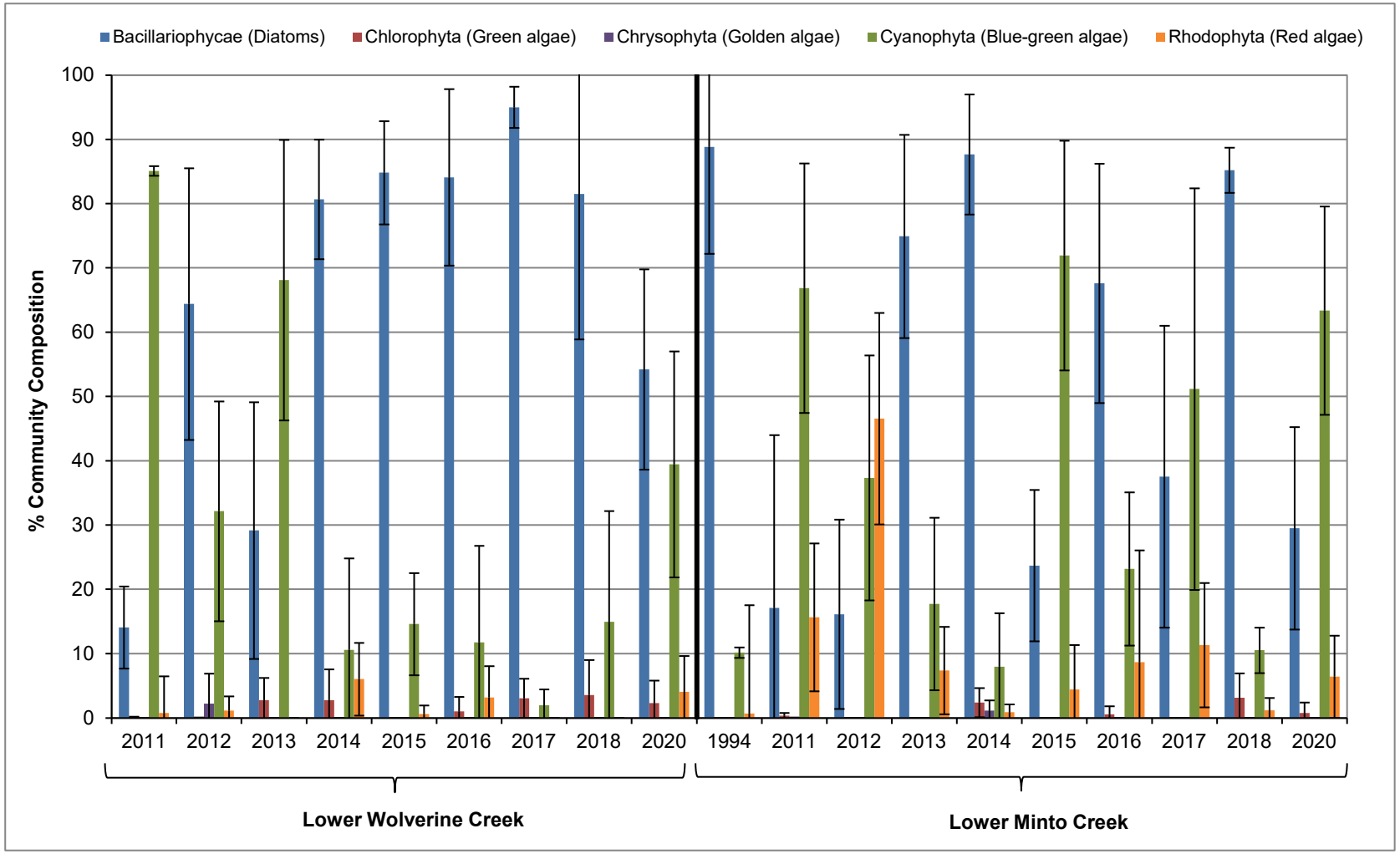


Figure 5.1: Periphyton Community Composition in Lower Wolverine Creek (2011 to 2020) and Lower Minto Creek (1994, 2011 to 2020[a])

Note: Data presented as mean ± standard deviation.
[a] Due to dry conditions at lower Minto Creek in 2019, sampling was not conducted.

explained by the dry conditions in 2019 (i.e., environmental stress). Apart from the dry conditions, substantial differences in periphyton community summary metrics and community composition were apparent over the years at both lower Minto and lower Wolverine creeks, indicating substantial temporal variability. The differences observed in the periphyton communities of lower Minto Creek and lower Wolverine Creek in 2020 were within natural temporal variability and do not suggest a mine influence.

6 BENTHIC INVERTEBRATE COMMUNITY

6.1 Primary Metrics and Community Composition

Benthic invertebrate community data quality, assessed prior to data analysis and interpretation, was judged as good based on organism recovery and sub-sampling precision (Appendix A). All endpoints were evaluated at the LPL. Benthic invertebrate community metrics of density, richness (number of taxa), and Simpson's Diversity differed significantly among areas (lower Minto Creek and the two reference areas), while there was no significant different in Simpson's Evenness (Table 6.1, Figure 6.1, Appendix Table E.3). Post-hoc testing indicated that density, richness, and Simpson's Diversity of lower Minto Creek did not differ from both reference areas (lower Wolverine Creek and lower Big Creek; Table 6.1; Appendix Table E.3). Bray-Curtis index was the only community metric that differed significantly at lower Minto Creek relative to both reference areas (Table 6.2, Figure 6.2). Overall, the primary metrics suggest limited mine influence (Table 6.1, Appendix Table E.3).

The dominant taxonomic group in lower Minto, lower Wolverine, and lower Big creeks was chironomids (non-biting midges), except for one station. Oligochaetes (worms), acari (mites), and EPT (Ephemeroptera - mayflies, Plecoptera - stoneflies, and Trichoptera - caddisflies) were subdominant at individual stations. Percent chironomids was significantly higher at lower Minto Creek than at lower Big Creek (but not lower Wolverine Creek), while percent EPT was significantly lower at lower Minto Creek than both reference areas (Figure 6.3, Table 6.1, Appendix Tables E.1 to E.3). The significantly higher proportion of chironomids and lower proportion of EPT taxa could suggest mine influence on benthic invertebrate community (Chapman et al. 1982b, Rosenberg and Resh 1993, Taylor and Bailey 1997). However, given that the mine was not actively discharging between August 2018 and October 2020 (i.e., after the 2020 field campaign), it is unlikely that mine effluent was the cause; rather this may be a result of the creek drying observed in 2019.

Correspondence Analysis (CA) explained 63.1% of the total community variance in the first two CA axes (Appendix Table E.5). The first CA axis explained 47.5% of the total variation in the original benthic abundance data, and significantly separated lower Minto Creek from lower Wolverine and lower Big creeks (Appendix Table E.3, Figure 6.4). Lower Minto Creek had positive CA Axis-1 scores and stations were separated from lower Wolverine and lower Big creeks by high relative abundance of Collembola, *Cardiocladius* (Family Chironomidae), Hydrophilidae (Coleoptera), *Limnophyes* (Family Chironomidae), and *Hydrobaenus* (Family Chironomidae; Figure 6.4, Appendix Tables E.4 and E.5). The reference areas (lower Wolverine and lower Big creeks) had strong negative CA Axis-1 scores that were

Table 6.1: Statistical Comparison of Benthic Invertebrate Community Endpoints, Minto, 2012 to 2020

Endpoint	ANOVA Model				Year	Do Values Differ Among Years for Each Area?[a]			Do Values Differ Between Reference and Exposed Areas?	
	Transformation	Area	Year	Area x Year		LWC (Reference)	LBC (Reference)	LMC (Exposed)	MOD[b] LWC	MOD[b] LBC
Density (# organisms/m²)	rank	0.421	<0.001	<0.001	2012	A	-	BC	-2.9	-
					2013	AB	-	C	-1.6	-
					2014	CD	-	BC	5.6	-
					2015	D	C	BC	9.9	4.3
					2016	BC	A	BC	ns	ns
					2017	CD	B	BC	ns	ns
					2018	BC	AB	AB	5.2	ns
					2020	A	AB	A	ns	4.7
Richness (# Taxa)	log10	<0.001	<0.001	0.069	2012	CD	-	A	1.9	-
					2013	ABC	-	AB	ns	-
					2014	D	-	B	ns	-
					2015	ABC	B	AB	ns	ns
					2016	A	A	AB	ns	-2.6
					2017	BC	AB	AB	ns	ns
					2018	BC	B	AB	ns	ns
					2020	AB	AB	A	ns	ns
Simpson's Evenness	rank	0.115	<0.001	<0.001	2012	BC	-	A	ns	-
					2013	C	-	A	4.9	-
					2014	AB	-	A	ns	-
					2015	A	A	A	-5.1	-1.6
					2016	BC	AB	A	ns	ns
					2017	BC	AB	A	ns	ns
					2018	AB	B	A	ns	4.0
					2020	C	B	A	ns	ns
Simpson's Diversity	none	<0.001	<0.001	<0.001	2012	C	-	A	1.1	-
					2013	C	-	AB	1.8	-
					2014	BC	-	AB	ns	-
					2015	A	A	A	-3.4	-5.9
					2016	AB	A	AB	ns	-3.7
					2017	BC	A	A	ns	ns
					2018	BC	A	A	ns	ns
					2020	C	A	B	ns	-1.8
EPT (%)	rank	<0.001	<0.001	<0.001	2012	CD	-	C	ns	-
					2013	D	-	BC	16	-
					2014	BCD	-	A	5.0	-
					2015	A	AB	AB	ns	ns
					2016	AB	AB	BC	ns	ns
					2017	BC	A	ABC	12	ns
					2018	BCD	AB	ABC	4.9	ns
					2020	CD	B	D	ns	-3.4
Ephemeroptera (%)	rank	<0.001	<0.001	<0.001	2012	CDE	-	BC	-7.0	-
					2013	E	-	B	ns	-
					2014	BCD	-	C	-1.8	-
					2015	A	A	C	-2.5	-2.5
					2016	BC	AB	C	-1.3	-1.6
					2017	BCD	B	C	-1.2	-1.9
					2018	AB	A	A	ns	-3.4
					2020	DE	B	BC	-5.4	-4.8
Plecoptera (%)	rank	<0.001	<0.001	<0.001	2012	ABCD	-	B	8.2	-
					2013	D	-	B	28	-
					2014	BCD	-	A	15	-
					2015	A	B	AB	5.5	7.3
					2016	AB	B	AB	ns	6.7
					2017	ABC	A	AB	9.4	ns
					2018	CD	B	AB	28	17
					2020	CD	B	C	ns	-2.2
Trichoptera (%)	rank	0.048	0.022	0.002	2012	C	-	A	ns	-
					2013	BC	-	A	13	-
					2014	BC	-	A	ns	-
					2015	AB	A	A	ns	ns
					2016	A	A	A	-0.68	ns
					2017	BC	A	A	ns	positive[c]
					2018	BC	A	A	ns	ns
					2020	AB	A	A	-14	ns
Oligochaeta (%)	rank	<0.001	0.005	<0.001	2012	CD	-	A	ns	-
					2013	ABCD	-	A	ns	-
					2014	ABC	-	A	-1.2	-
					2015	D	A	A	ns	-1.6
					2016	AB	A	A	-3.0	-1.9
					2017	A	A	A	-10	-5.1
					2018	BCD	B	A	ns	ns
					2020	BCD	AB	A	ns	ns
Chironomidae (%)	none	0.308	<0.001	<0.001	2012	A	-	ABC	-1.5	-
					2013	A	-	AB	ns	-
					2014	BC	-	D	ns	-
					2015	CD	C	BCD	ns	1.6
					2016	CD	ABC	AB	6.1	1.4
					2017	D	BC	CD	9.5	ns
					2018	AB	A	CD	-1.4	-4.0
					2020	A	AB	A	ns	1.3
Acari (%)	rank	<0.001	0.616	<0.001	2012	A	-	ABC	positive[c]	-
					2013	A	-	ABC	13	-
					2014	A	-	ABC	ns	-
					2015	A	AB	BC	ns	ns
					2016	A	A	ABC	ns	ns
					2017	A	B	A	14	13
					2018	A	AB	AB	ns	ns
					2020	A	A	C	ns	-1.2

P-value < 0.1
Magnitude of Difference (MOD) <-2
Magnitude of Difference (MOD) >2

Notes: "-" indicates no data for comparison, "ns" indicates a non-significant post-hoc contrast.

[a] Years that do not share a letter were significantly different in a Tukey's Honestly Significant Difference post-hoc test ($\alpha = 0.05$).

[b] MOD = $(MCT_{EXP}-MCT_{REF})/SD_{REF}$; where the measures of central tendency (MCT) were geometric means for log-10 transformed data, medians for rank transformed data, and means for untransformed data.

[c] MOD was positive but the magnitude could not be calculated as the standard deviation for the reference area was 0.

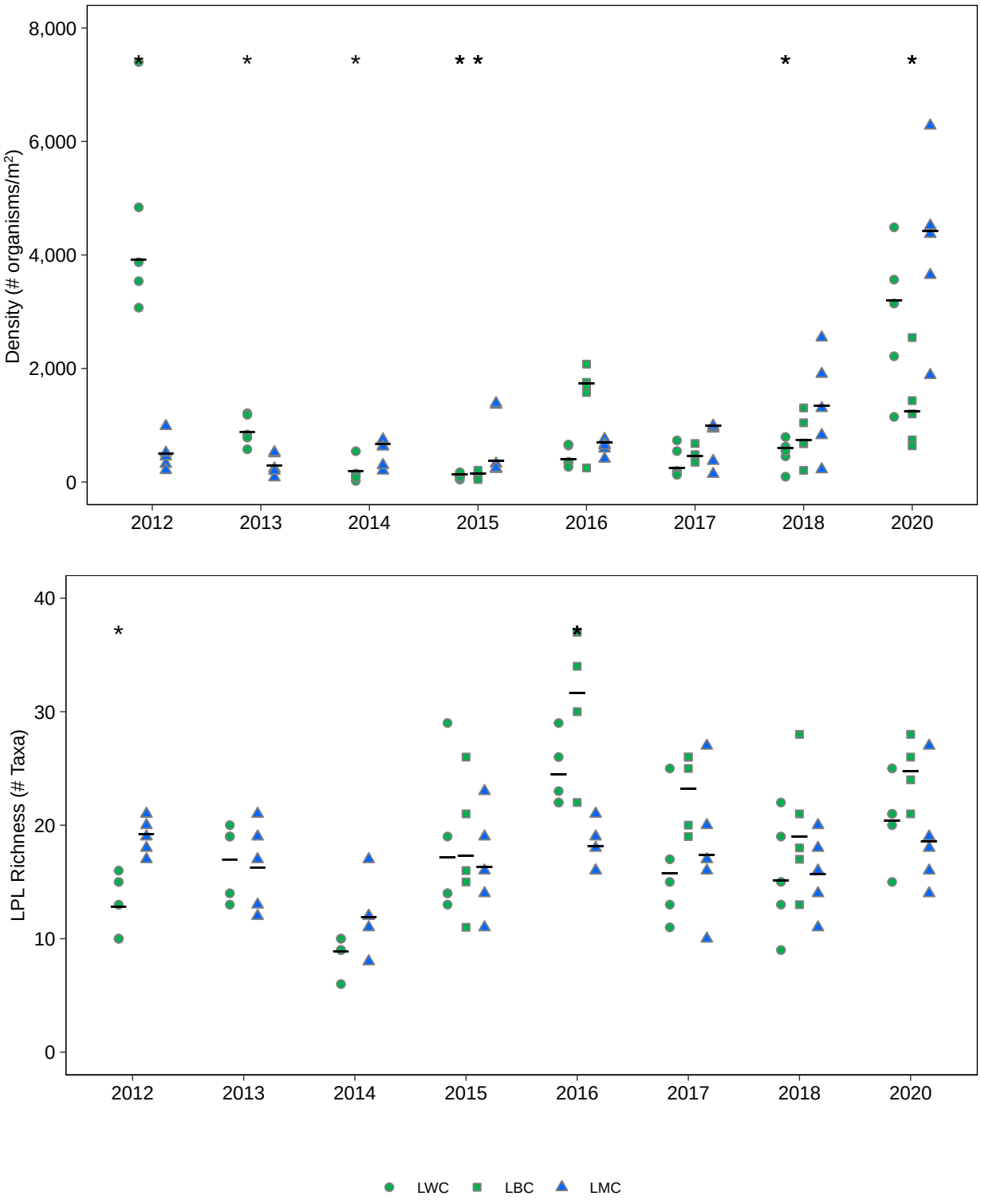


Figure 6.1: Benthic Invertebrate Community Primary Endpoints at Lower Minto Creek and Reference Areas, 2012 to 2020

Notes: LWC = lower Wolverine Creek (Reference). LBC = lower Big Creek (Reference). LMC = lower Minto Creek (Exposed). Black horizontal bars indicate the Measure of Central Tendency (MCT). The MCT is the mean for non-transformed data, geometric mean for log_{10} transformed data and median for rank transformed data. An * indicates the reference station was significantly different from the exposed station for that year.

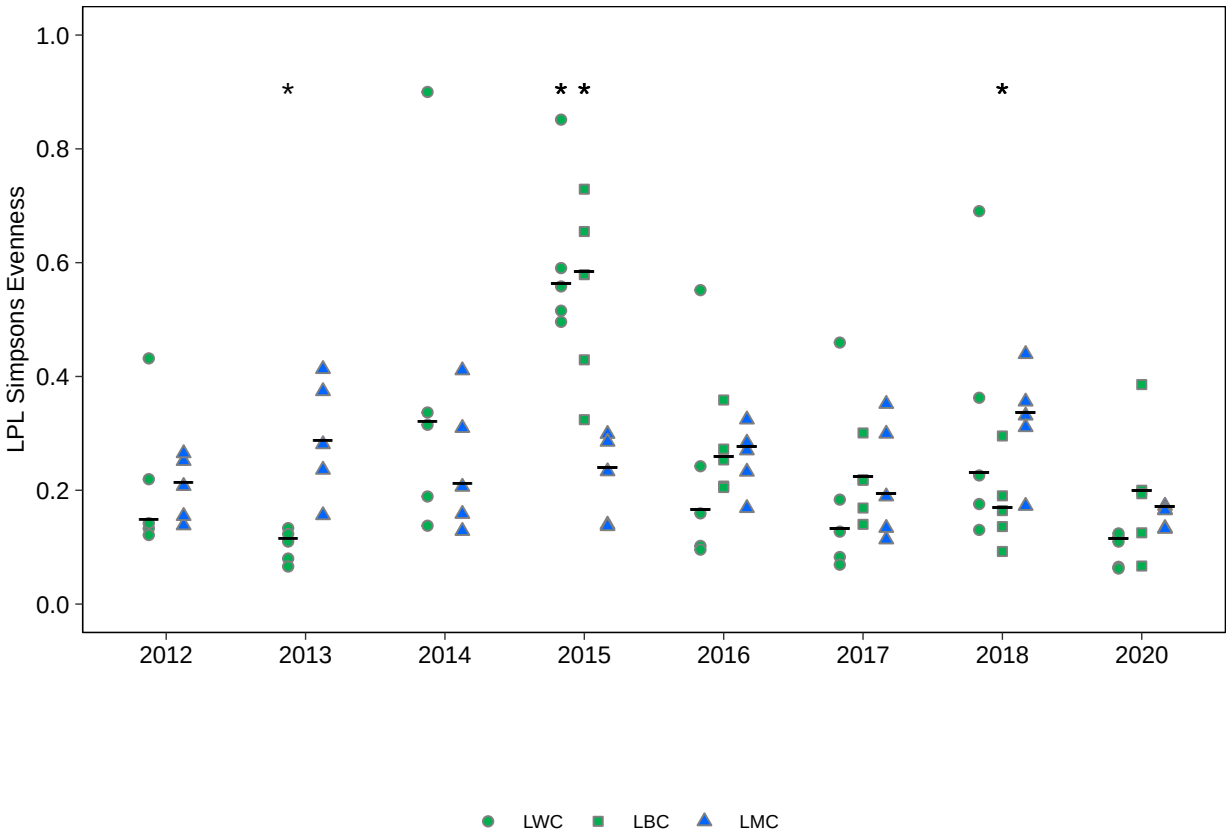


Figure 6.1: Benthic Invertebrate Community Primary Endpoints at Lower Minto Creek and Reference Areas, 2012 to 2020

Notes: LWC = lower Wolverine Creek (Reference). LBC = lower Big Creek (Reference). LMC = lower Minto Creek (Exposed). Black horizontal bars indicate the Measure of Central Tendency (MCT). The MCT is the mean for non-transformed data, geometric mean for $\log_{10}$ transformed data and median for rank transformed data. An * indicates the reference station was significantly different from the exposed station for that year.

Table 6.2: Statistical Comparison of Bray-Curtis Index for Lower Minto Creek and Reference Areas, Minto Mine, 2020

Taxonomic Resolution	Comparison	n		Betadisper P-Value	Mantel Test			dbRDA			
		Reference	Mine-Exposed		r	R^2	P-Value	F-Value	R^2	R^2_{adj}	P-Value
LPL	LBC vs LMC	5	5	0.224	0.91	0.82	0.008	12	0.60	0.55	0.008
LPL	LWC vs LMC	5	5	0.274	0.89	0.79	0.008	11	0.58	0.53	0.007

P-Value < 0.1

Notes: LPL = lowest practicable level, LBC = lower Big Creek (Reference), LMC = lower Minto Creek (Exposed), LWC = lower Wolverine Creek (Reference), n = sample size, dbRDA = distance-based redundancy analysis, See Section 2.6.2.1 for statistical analysis details.

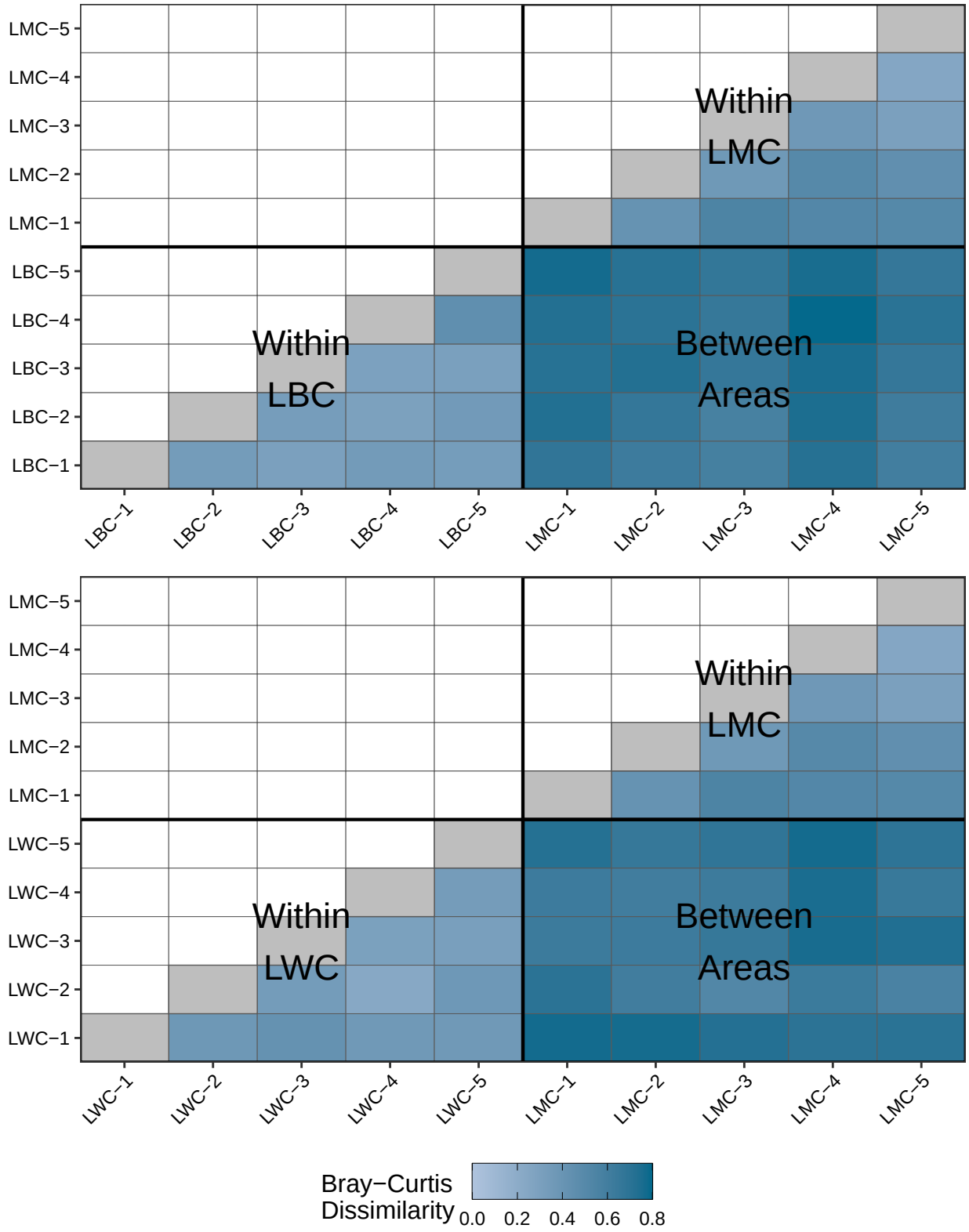


Figure 6.2: Heatmap of Lowest Practical Level Benthic Invertebrate Bray−Curtis Dissimilarities among Lower Minto Creek and Reference Areas, Minto Mine, 2020

Notes: LBC = lower Big Creek (reference). LWC = lower Wolverine Creek (reference). LMC = Lower Minto Creek (exposed).

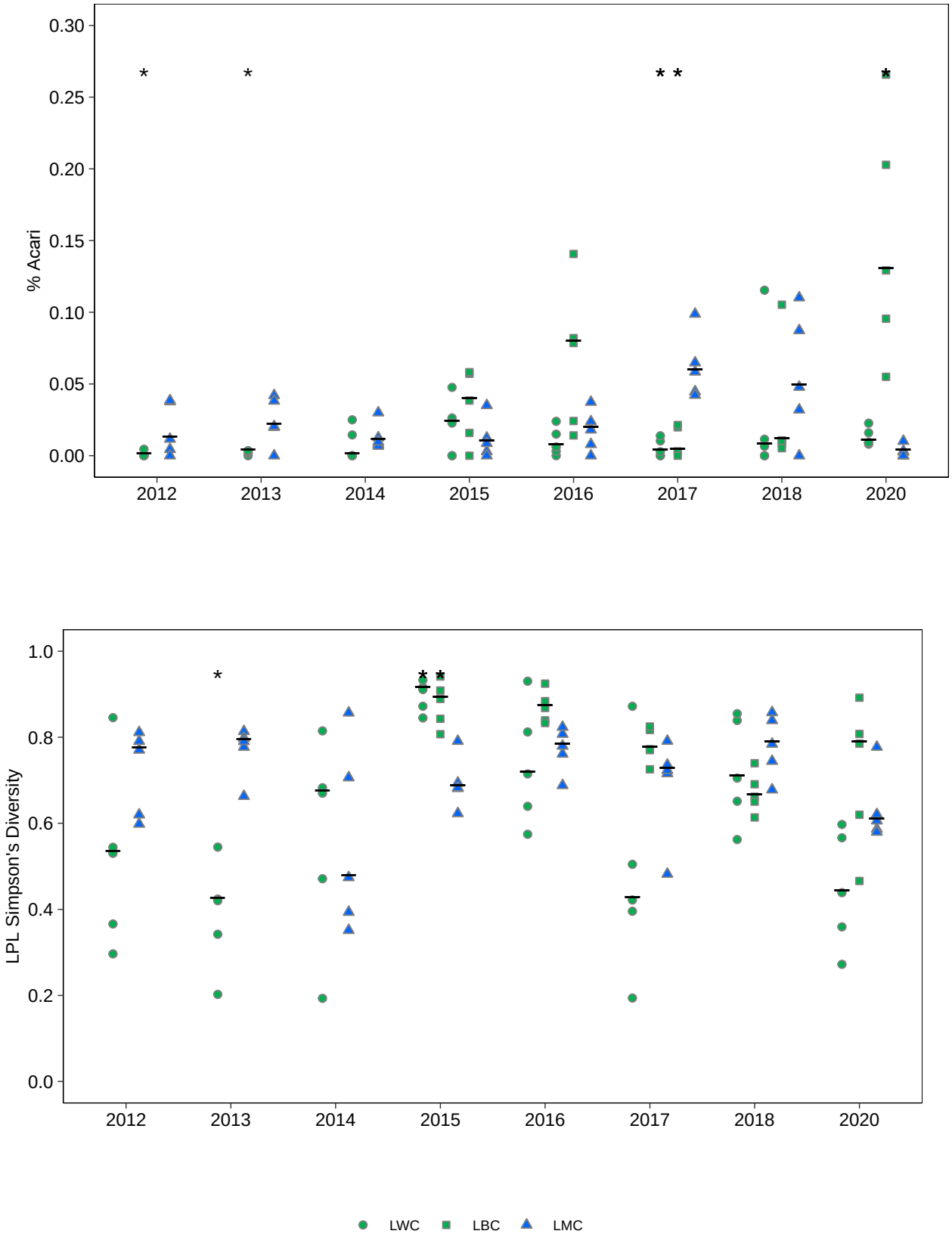


Figure 6.3: Benthic Invertebrate Community Supporting Endpoints at Lower Minto Creek and Reference Areas, 2012 to 2020

Notes: LWC = lower Wolverine Creek (Reference). LBC = lower Big Creek (Reference). LMC = lower Minto Creek (Exposed). Black horizontal bars indicate the Measure of Central Tendency (MCT). The MCT is the mean for non-transformed data, geometric mean for $\log_{10}$ transformed data and median for rank transformed data. An * indicates the reference station was significantly different from the exposed station for that year.

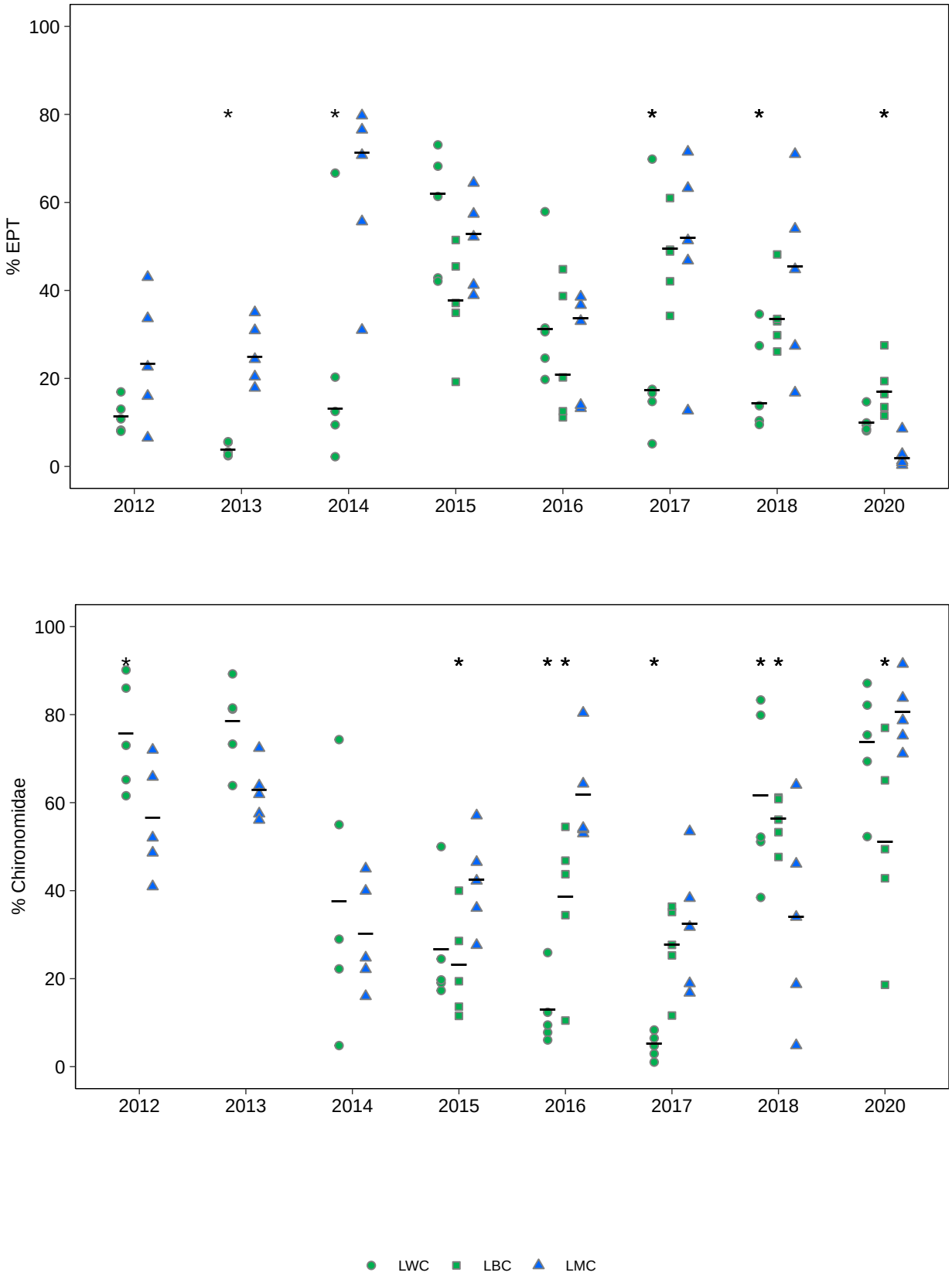


Figure 6.3: Benthic Invertebrate Community Supporting Endpoints at Lower Minto Creek and Reference Areas, 2012 to 2020

Notes: LWC = lower Wolverine Creek (Reference). LBC = lower Big Creek (Reference). LMC = lower Minto Creek (Exposed). Black horizontal bars indicate the Measure of Central Tendency (MCT). The MCT is the mean for non-transformed data, geometric mean for $\log_{10}$ transformed data and median for rank transformed data. An * indicates the reference station was significantly different from the exposed station for that year.

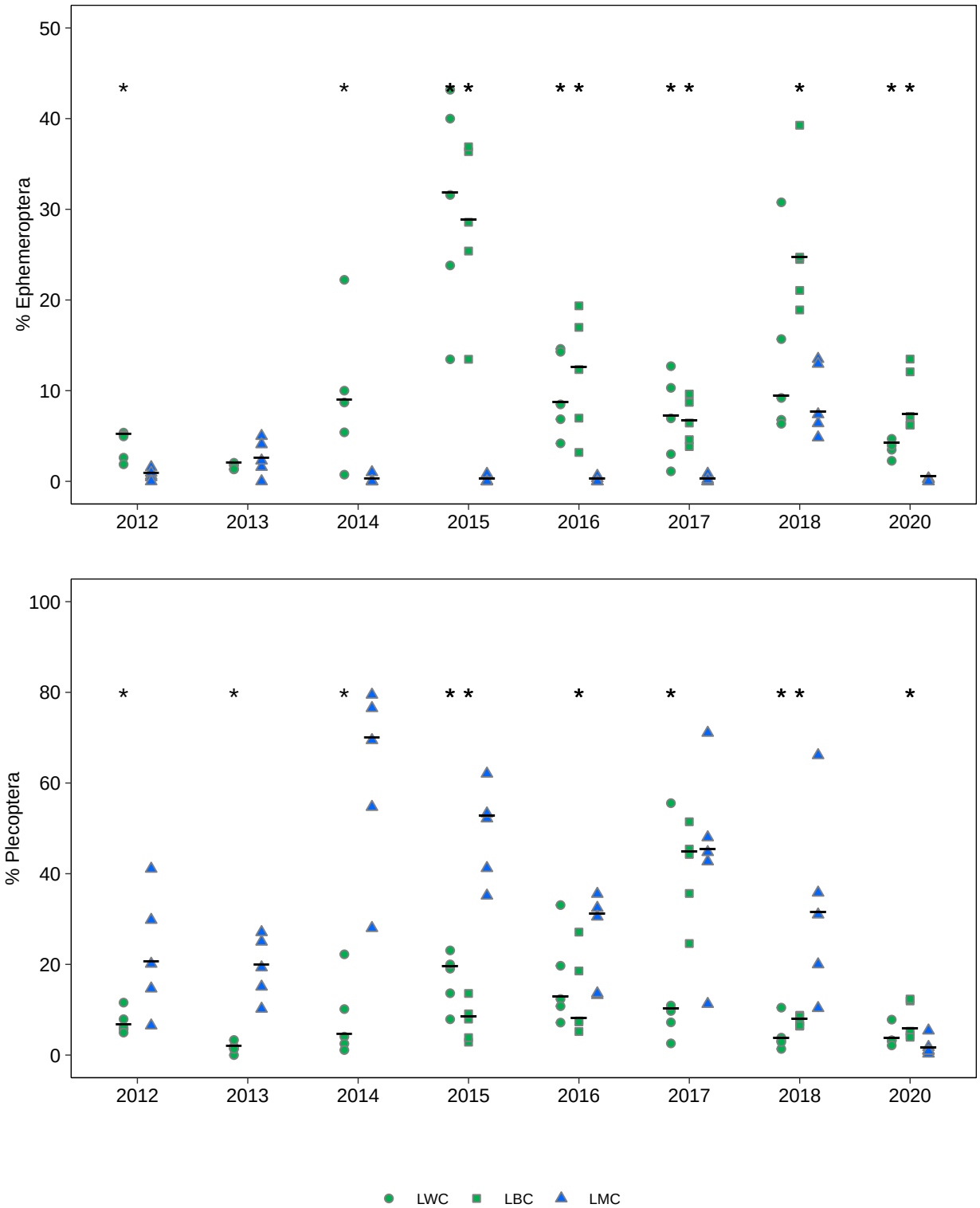


Figure 6.3: Benthic Invertebrate Community Supporting Endpoints at Lower Minto Creek and Reference Areas, 2012 to 2020

Notes: LWC = lower Wolverine Creek (Reference). LBC = lower Big Creek (Reference). LMC = lower Minto Creek (Exposed). Black horizontal bars indicate the Measure of Central Tendency (MCT). The MCT is the mean for non-transformed data, geometric mean for $\log_{10}$ transformed data and median for rank transformed data. An * indicates the reference station was significantly different from the exposed station for that year.

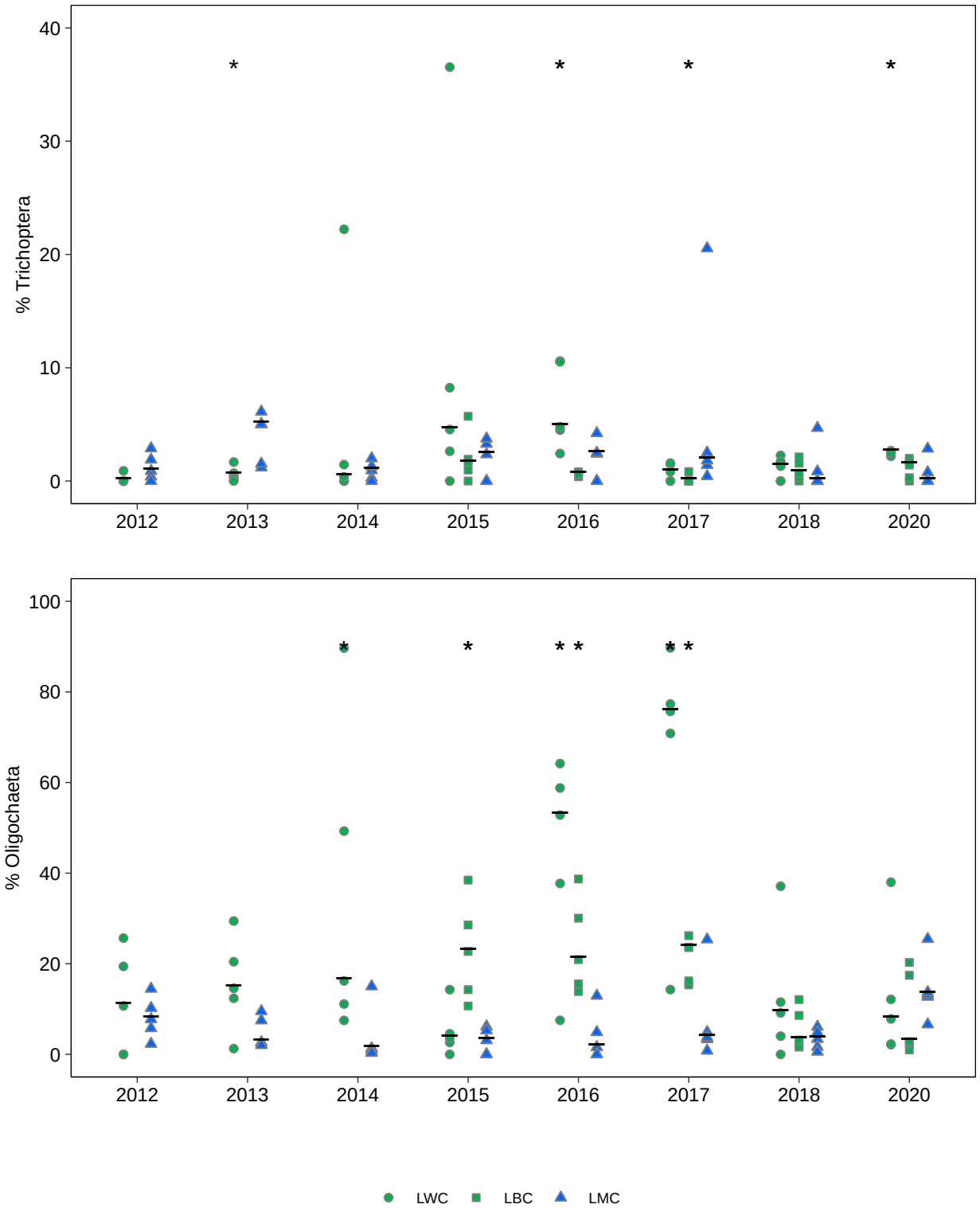


Figure 6.3: Benthic Invertebrate Community Supporting Endpoints at Lower Minto Creek and Reference Areas, 2012 to 2020

Notes: LWC = lower Wolverine Creek (Reference). LBC = lower Big Creek (Reference). LMC = lower Minto Creek (Exposed). Black horizontal bars indicate the Measure of Central Tendency (MCT). The MCT is the mean for non-transformed data, geometric mean for $\log_{10}$ transformed data and median for rank transformed data. An * indicates the reference station was significantly different from the exposed station for that year.

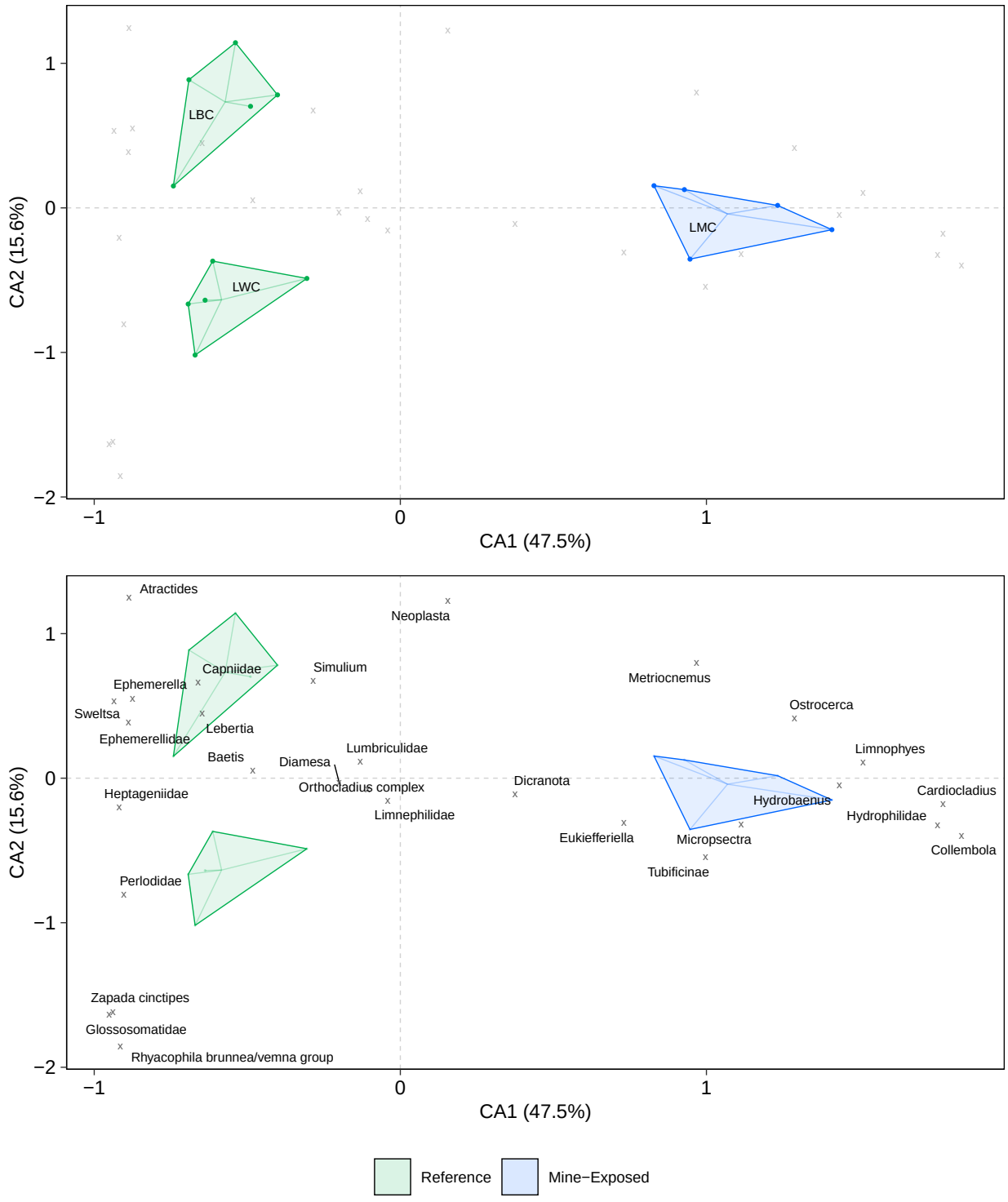


Figure 6.4: Correspondence Analysis (CA) Scatterplot for Benthic Invertebrate Relative Densities at Lower Minto Creek and Associated Reference Areas, Minto Mine, 2020

Notes: Taxa densities were ln(x+1)−transformed before CA calculations. Taxa present at two or fewer samples or accounted for less than 15% of the total abundance at any area were removed from the analysis. LMC = lower Minto Creek. LBC = lower Big Creek. LWC = lower Wolverine Creek.

dominated by Glossosomatidae (caddisfly), *Zapada cinctipes* (stonefly), *Sweltsa* (stonefly), and Heptageniidae (mayfly; Figure 6.4, Appendix Tables E.4 and E.5). The reference areas were separated on CA Axis-2 (which explained 15.6% of the total variation) and lower Minto Creek had significantly lower CA Axis-2 scores compared to lower Big Creek and significantly higher CA Axis-2 scores compared to lower Wolverine Creek (Appendix Table E.3). CA Axis-1 shows that lower Minto Creek and the reference areas are separated by different taxa: largely Collembola and chironomids for lower Minto and several taxa belonging to the orders Trichoptera, Plecoptera, and Ephemeroptera for the reference areas. The former are generally more tolerant than the latter (Mandaville 2002) and the CA results generally re-capitulate what was seen with the relative proportions of chironomids and EPT taxa.

6.2 Correlation Analysis

Correlation analysis between 11 benthic invertebrate community indices and seven supporting physical and chemical measurements (those for which significant differences among areas were observed) resulted in ten significant correlations at a p-level of 0.05 and an r-value of >0.6 (Table 6.3). It is important to consider that illustration of a significant or suggestive degree of correlation between two variables does not necessarily imply a cause-and-effect relationship, although it is a basis for further investigation and to consider known biological responses to environmental differences.

Of the ten significant correlations, six were associated with the proportion of substrate cobble and gravel (Table 6.3). These indicated a positive relationship between percent cobble and the proportion of EPT taxa, Ephemeroptera, and Acari and associated negative relationships with percent gravel (Appendix Figure E.2). These relationships are generally consistent with preference of EPT taxa for cobble substrate. A positive relationship was observed between density and the depth to which substrate was cleaned and a negative relationship between % Ephemeroptera and the depth to which substrate was cleaned (Table 6.3; Appendix Figure E.2). The former was leveraged by one data point and the latter showed some anomalies, consistent with lower p-values supporting these relationships (Table 6.3; Appendix Figure E.2). Furthermore, there is no clear mechanistic explanation for these relationships. Lastly, two relationships with water quality were observed: there was a positive relationship between % Acari and water temperature and a positive relationship between Simpson's diversity and water pH (Table 6.3; Appendix Figure E.2). The positive relationship between % Acari and water temperature was highly leveraged, while the positive relationship between Simpson's diversity and water pH showed a better distribution of data points that suggested a common influence on diversity and pH (Appendix Figure E.2), perhaps associated

Table 6.3: Spearman Rank Correlations between Benthic Community Endpoints and Physiochemical Parameters, Minto Mine, 2020

Endpoints	Statistic	Average Depth (cm) Sampler Pushed into Substrate	Average Depth (cm) Substrate Sampled/ Cleaned	% Cobble	% Gravel	Temperature (°C)	Specific Conductance (µS/cm)	pH
Density (Organisms/m^2)	r_s	0.516	0.604	-0.531	0.531	-0.512	0.087	0.063
	p-value	0.049	0.017	0.042	0.042	0.051	0.759	0.824
LPL Richness	r_s	-0.268	-0.347	0.418	-0.418	0.346	0.149	0.173
	p-value	0.334	0.205	0.121	0.121	0.207	0.596	0.538
LPL Simpson's Diversity	r_s	-0.269	-0.071	0.042	-0.042	-0.216	0.468	0.662
	p-value	0.331	0.801	0.883	0.883	0.438	0.078	0.007
Ephemeroptera (%)	r_s	-0.560	-0.633	0.809	-0.809	0.598	-0.216	-0.135
	p-value	0.030	0.011	0.000259	0.000259	0.019	0.440	0.631
Plecoptera (%)	r_s	-0.425	-0.505	0.527	-0.527	0.315	0.052	-0.181
	p-value	0.114	0.055	0.043	0.043	0.253	0.853	0.519
Trichoptera (%)	r_s	0.350	0.177	0.128	-0.128	0.220	-0.252	-0.585
	p-value	0.200	0.527	0.649	0.649	0.430	0.365	0.022
EPT (%)	r_s	-0.471	-0.574	0.687	-0.687	0.508	-0.092	-0.175
	p-value	0.077	0.025	0.005	0.005	0.053	0.745	0.532
Chironomidae (%)	r_s	0.315	0.432	-0.516	0.516	-0.274	0.245	-0.317
	p-value	0.253	0.108	0.049	0.049	0.324	0.379	0.250
Acari (%)	r_s	-0.446	-0.562	0.847	-0.847	0.643	-0.115	0.017
	p-value	0.095	0.029	<0.0001	<0.0001	0.010	0.684	0.952
CA1 (47.5%)	r_s	0.171	0.294	-0.600	0.600	-0.445	0.350	0.462
	p-value	0.543	0.288	0.018	0.018	0.096	0.202	0.083
CA2 (15.6%)	rs	-0.402	-0.387	0.224	-0.224	-0.125	0.557	0.569
	p-value	0.137	0.154	0.422	0.422	0.657	0.031	0.027

P-Value < 0.05
P-Value < 0.05 / 77 = 0.000649 (Bonferroni Corrected for 77 independent tests)
abs(r_s) > 0.6

Note: Correlations only conducted with endpoints and physiochemical parameters that were signficantly different among areas.

with the mine. Overall, relationships suggestive of plausible cause were limited to differences in substrate among creeks.

6.3 Temporal Comparisons

Temporal comparisons of benthic invertebrate community condition of lower Minto Creek were made in order to augment data interpretation, but their power was tempered by temporal changes in sampling location, sampling methodology, level of replication, and analytical processing techniques. Baseline data (1994) were collected near the mouth of Minto Creek as three single grab samples, 2006 data were collected at Station W2 in the same manner, 2008 and 2010 data were collected at Station W2 as three-grab composites whereas 2011 to 2018 data were collected as five replicate three-grab samples from a large area upstream of Station W2. Only in the later years (2011 to 2018, and 2020) do data represent an area (i.e., lower Minto Creek) rather than a station. In addition, data collected in 2013 to 2018 and 2020 were sieved using 500 µm mesh as recommended for federal EEM (Environment Canada 2012), whereas all years prior to 2011 used 250 µm (both mesh sizes were used in 2012 to assist in transition). This was expected to result in lower densities from 2013 and later.

Mean benthic invertebrate density at lower Minto Creek increased between 2017 and 2018. The 2020 density was the highest it has been in the 2012 to 2020 period but was not significantly higher than in 2018 (Figure 6.1; Table 6.1). Mean density also increased at lower Wolverine from 2018 to 2020, while lower Big Creek remained similar. There was no significant difference between density at lower Minto Creek compared to lower Wolverine Creek. Lower Minto Creek had significantly higher 2020 densities than lower Big Creek (Figure 6.1; Table 6.1).

Mean LPL richness, and LPL Simpson's Evenness at lower Minto Creek have not changed significantly over the 2012 to 2020 period. LPL richness was not significantly different between lower Minto Creek and either reference area (lower Wolverine Creek and lower Big Creek) over the 2012 to 2020 period, with the exception of 2012 (LWC) and 2016 (LBC; Figure 6.1; Table 6.1). LPL Simpson's Evenness at lower Minto Creek has only been significantly different from both reference areas for one year (2017) and was not significant relative to either reference area in 2020 (Figure 6.1; Table 6.1).

The mean density proportions of EPT (mayflies, stoneflies, and caddisflies) which are considered to be sensitive taxa (e.g., Lenat 1988, Herman and Nejadhashemi 2015) were significantly lower at lower Minto Creek in 2020 compared to previous years. EPT proportion at lower Minto Creek was not significantly different from that at lower Wolverine Creek but was significantly lower than lower Big Creek (MOD = 3.4%; Table 6.1). Similar to lower Minto Creek, lower Wolverine Creek had lower EPT proportion than in previous years while the proportion at lower Big Creek did not

change significantly over the years. Historically, lower Minto Creek has not been significantly different from lower Big Creek but has occasionally had a statistically higher EPT proportion when compared to lower Wolverine Creek (Figure 6.3; Table 6.1).

The mean density proportion of chironomids, considered to be a tolerant taxonomic group, was significantly higher at lower Minto Creek in 2020 compared to previous years but was comparable to historic values in 2012, 2013, and 2016 (Figure 6.3; Table 6.1). Chironomid proportion at lower Minto Creek was not significantly different from that at lower Wolverine Creek but was significantly lower than lower Big Creek (1.3%; Table 6.1). Both lower Wolverine and lower Big creeks had chironomid proportions comparable to those in 2018, which were higher than prior years. (Figure 6.3; Table 6.1)

6.4 Summary

The erosional benthic invertebrate community of lower Minto Creek differed from both reference (lower Wolverine Creek and lower Big Creek) communities for Bray-Curtis index and percent Ephemeroptera only. The benthic community differed from one of the two reference areas in percent EPT (LBC only), Trichoptera (LWC only), and Chironomids (LBC only). A potential decrease in number of taxa from 2012 to 2014 identified in previous reporting (Minnow 2015) appears to have been natural variability since number of taxa increased from 2014 to 2017, decreased in 2018, and increased again in 2020 (Minnow 2015, 2016, 2017, Minnow 2019a). Bray-Curtis index indicated that lower Minto Creek had a different community composition than the reference areas, and examination of taxon composition and CA results indicated that this difference was largely due to a higher proportion of chironomids and lower proportion of EPT taxa. Although this difference is indicative of a potential influence on the benthic invertebrate community, it may not be mine related as the mine was not discharging for more than a year prior to sampling; rather it is likely at least partly related to creek drying in 2019.

High temporal variability in benthic invertebrate community density, richness, and composition has been observed at the exposure and reference areas, presumably due to inter-annual variability in environmental conditions (e.g., flow, ice scour, water levels). Densities in 2020 were the highest they have been over the 2012 to 2020 period. None of the primary community endpoints at lower Minto Creek differed significantly compared to both reference stations. There was a statistically significant upwards trend in chironomid proportion and downwards trend in EPT proportion at lower Minto Creek. This community shift could possibly be attributed to the dry conditions at lower Minto Creek in 2019. Since chironomids are more tolerant and EPT taxa are more sensitive, it would make sense to see more chironomids and fewer EPT taxa following a dry year (i.e., environmental stress).

Overall, benthic invertebrate community metrics show that lower Minto Creek is generally similar to reference, but subtle differences in proportions of chironomids and EPT taxa were present, likely due to a combination of subtle habitat differences, dry conditions in 2019, and potential mine influence[3].

[3] Although a potential mine influence may exist, the absence of discharge in 2019 and 2020 indicates that the potential is not effluent related. A low level of influence to water quality of upper Minto Creek appears to occur in the absence of effluent discharge.

7 TISSUE CHEMISTRY

7.1 Overview

As indicated in Section 2.7, tissue chemistry data are provided here simply to report the ancillary data collected along with the selenium data reported separately. Data interpretation was therefore limited to basic comparisons of metal concentrations in tissue collected at the exposure area (lower Minto Creek) to those collected at reference creeks (lower Wolverine and lower Big creeks).

7.2 Periphyton Tissue

The quality of periphyton tissue data, assessed prior to data analysis and interpretation, was assessed as good based on good analyte detectability, precision, and accuracy (Appendix A). Concentrations of eleven analytes in periphyton tissue were significantly greater at lower Minto Creek than at both reference areas (Table 7.1, Appendix Table C.2). Analytes of concern such as copper and selenium were significantly greater in periphyton tissue from lower Minto Creek than in tissue from both reference areas (Table 7.1). No significant differences were observed between areas for selenium in 2013 (Figure 7.1), whereas from 2014 to 2018 and 2020, periphyton selenium concentrations were significantly greater at lower Minto Creek than at the reference areas (only between lower Big Creek in 2017; Figure 7.1). Significantly higher concentrations of selenium at lower Minto Creek compared to reference areas over the last three years suggest an influence of the mine on Minto Creek.

7.3 Benthic Invertebrate Tissue

Benthic invertebrate tissue data quality, assessed prior to data analysis and interpretation, were judged to be of good quality based on good analyte detectability, precision, and accuracy (Appendix A). Concentrations of one analyte in benthic invertebrate tissue, boron, was greater at lower Minto Creek compared to both reference areas (Table 7.1, Appendix Table C.3). Arsenic, copper, mercury, phosphorus, rubidium, and uranium concentrations were significantly lower at Minto Creek than lower Big Creek, while antimony, arsenic, lead, and tin were significantly higher at Minto Creek than lower Wolverine (Table 7.1, Appendix Table C.3). Selenium concentrations did not differ among areas in 2020 (Table 7.1).

Selenium in benthic invertebrate tissue in 2020 was not significantly different at lower Minto Creek compared to reference areas. Selenium concentrations at the reference areas were higher than those in 2018 (Figure 7.2, Appendix Table C.3) but significant changes in selenium concentrations at lower Minto Creek have not been observed since 2014 (Table 7.1, Figure 7.2). Historically, selenium concentrations at lower Minto Creek have been significantly higher than lower Big Creek, with the exception of 2014. Since 2013, concentrations of selenium in benthic



Table 7.1: Statistical Comparison of Benthic Invertebrate and Periphyton Tissue Chemistry Results, Minto Mine, 2020

Endpoint	Periphyton								Benthic Invertebrates							
	Data Transformation	Test	MCT[a]			Area P-Value	MOD (%)[b]		Data Transformation	Test	MCT[a]			Area P-Value	MOD (%)[b]	
			LWC (Reference)	LBC (Reference)	LMC (Exposed)		LMC vs. LWC	LMC vs. LBC			LWC (Reference)	LBC (Reference)	LMC (Exposed)		LMC vs. LWC	LMC vs. LBC
Moisture (%)	none	ANOVA	76.9	75.6	72.1	0.695	ns	ns	rank	K-W	82.1	85.7	83.4	0.482	ns	ns
Aluminum (mg/kg)	none	ANOVA	13,560	11,244	7,402	0.011	-45	ns	none	ANOVA	1,900	2,253	2,950	0.156	ns	ns
Antimony (mg/kg)	none	ANOVA	0.113	0.328	0.201	0.054	ns	ns	none	ANOVA	0.0522	0.144	0.105	<0.001	101	ns
Arsenic (mg/kg)	none	ANOVA	4.32	11.5	11.0	0.007	155	ns	none	ANOVA	1.61	4.38	3.20	<0.001	99	-27
Barium (mg/kg)	rank	K-W	157	190	646	0.008	311	240	none	ANOVA	66.9	61.9	89.3	0.429	ns	ns
Beryllium (mg/kg)	none	ANOVA	0.513	0.381	0.283	<0.001	-45	ns	none	ANOVA	0.106	0.109	0.0948	0.840	ns	ns
Bismuth (mg/kg)	log10	ANOVA	0.0623	0.435	0.0631	<0.001	ns	-86	rank	K-W	0.0110	0.0780	0.0200	0.003	ns	ns
Boron (mg/kg)	none	ANOVA	8.80	4.34	16.3	0.009	ns	276	rank	K-W	1.00	1.10	2.00	0.022	100	82
Cadmium (mg/kg)	log10	ANOVA	0.139	0.138	0.413	<0.001	197	199	none	ANOVA	0.950	1.81	1.10	0.232	ns	ns
Calcium (mg/kg)	rank	K-W	6,500	6,480	12,200	0.009	88	88	none	ANOVA	2,836	3,138	3,268	0.754	ns	ns
Cesium (mg/kg)	none	ANOVA	1.48	1.74	0.580	<0.001	-61	-67	none	ANOVA	0.190	0.380	0.303	0.101	ns	ns
Chromium (mg/kg)	log10	ANOVA	42.2	31.6	95.8	0.014	ns	203	none	ANOVA	6.00	5.83	6.42	0.913	ns	ns
Cobalt (mg/kg)	log10	ANOVA	9.33	6.77	17.4	0.002	86	157	none	ANOVA	2.39	2.90	2.40	0.644	ns	ns
Copper (mg/kg)	none	ANOVA	18.1	18.1	44.0	<0.001	144	143	none	ANOVA	26.6	46.8	25.0	0.035	ns	-47
Iron (mg/kg)	none	ANOVA	21,180	19,080	15,840	0.049	-25	ns	none	ANOVA	3,300	3,744	5,140	0.141	ns	ns
Lead (mg/kg)	none	ANOVA	4.30	6.38	3.39	0.002	ns	-47	log10	ANOVA	0.694	1.62	1.26	0.006	82	ns
Lithium (mg/kg)	none	ANOVA	9.04	7.44	5.72	0.063	ns	ns	none	ANOVA	1.38	1.59	2.24	0.108	ns	ns
Magnesium (mg/kg)	none	ANOVA	7,550	5,768	4,724	0.002	-37	ns	none	ANOVA	2,362	2,390	2,160	0.733	ns	ns
Manganese (mg/kg)	log10	ANOVA	665	397	7,708	<0.001	1,059	1,841	none	ANOVA	318	334	558	0.066	ns	ns
Mercury (mg/kg)	none	ANOVA	0.0555	0.0478	0.0394	0.451	ns	ns	none	ANOVA	0.0454	0.0536	0.0344	0.020	ns	-36
Molybdenum (mg/kg)	log10	ANOVA	0.466	0.742	2.28	<0.001	389	208	none	ANOVA	0.592	0.810	0.840	0.097	ns	ns
Nickel (mg/kg)	none	ANOVA	26.3	20.5	27.5	0.032	ns	34	none	ANOVA	4.92	5.94	6.38	0.553	ns	ns
Phosphorus (mg/kg)	none	ANOVA	1,592	1,358	2,686	0.016	ns	98	none	ANOVA	8,956	9,026	7,672	0.033	ns	-15
Potassium (mg/kg)	none	ANOVA	2,034	2,202	4,730	0.009	133	115	none	ANOVA	8,604	8,450	8,788	0.946	ns	ns
Rubidium (mg/kg)	none	ANOVA	12.3	12.0	7.89	0.056	ns	ns	none	ANOVA	5.38	8.00	4.05	0.002	ns	-49
Selenium (mg/kg)	none	ANOVA	0.894	0.460	1.72	<0.001	92	274	none	ANOVA	3.62	2.85	3.08	0.589	ns	ns
Sodium (mg/kg)	none	ANOVA	456	479	363	0.306	ns	ns	none	ANOVA	3,006	3,306	3,550	0.348	ns	ns
Strontium (mg/kg)	none	ANOVA	70.1	66.3	142	<0.001	103	114	rank	K-W	22.6	34.4	26.8	0.151	ns	ns
Tellurium (mg/kg)	rank	K-W	0.0200	0.0300	0.0280	0.032	40	ns	-	-	-	-	-	-	-	-
Thallium (mg/kg)	none	ANOVA	0.0758	0.0912	0.0599	0.098	ns	ns	rank	K-W	0.0180	0.0515	0.0254	0.071	ns	ns
Tin (mg/kg)	none	ANOVA	0.856	0.764	1.18	0.359	ns	ns	rank	K-W	0.100	0.100	0.110	0.087	10	ns
Uranium (mg/kg)	none	ANOVA	0.793	1.01	0.905	0.232	ns	ns	none	ANOVA	0.363	0.750	0.383	0.006	ns	-49
Vanadium (mg/kg)	none	ANOVA	51.0	50.1	39.4	0.011	-23	-21	none	ANOVA	8.10	9.22	11.7	0.275	ns	ns
Zinc (mg/kg)	none	ANOVA	46.5	45.2	66.3	0.013	43	47	none	ANOVA	168	174	126	0.098	ns	ns
Zirconium (mg/kg)	none	ANOVA	8.20	5.89	5.42	0.025	-34	ns	none	ANOVA	1.84	2.07	2.29	0.579	ns	ns

P-value < 0.05
MOD > 0
MOD < 0

Notes: "-" indicates analysis was not completed because all data was below the LRL. ns = not significant. ANOVA = analysis of variance. K-W = Kruskal-Wallis test. All values are expressed in mg/kg dry weight.

[a] Measure of Central Tendency is the mean for parameters where statistics were conducted on the raw scale, the geometric mean when statistics were log $_{10}$ transformed to meet the assumtions of normality, and the median when rank tranformed.

[b] Magnitude of difference (MOD) = $(MCT_{EXP}-MCT_{REF})/MCT_{REF}$ *100

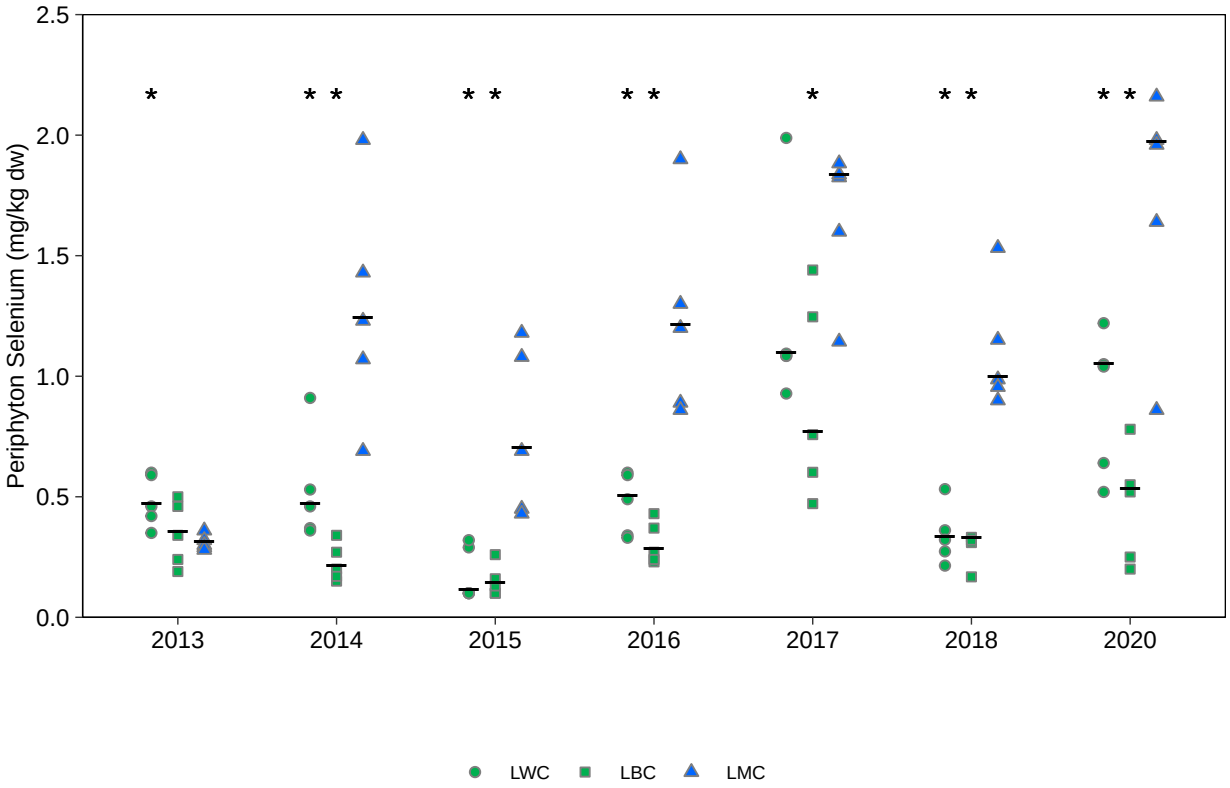


Figure 7.1: Periphyton Tissue Selenium Concentration Over Time, 2013 to 2020[a]

Notes: dw = dry weight. LWC = Lower Wolverine Creek (reference). LBC = Lower Big Creek (reference). LMC = Lower Minto Creek (exposed). Black horizontal bars indicate the Measure of Central Tendency (MCT). The MCT is the mean for non-transformed data, geometric mean for $\log_{10}$ transformed data and median for rank transformed data. An * indicates the reference station was significantly different from the exposed station for that year.
[a] Due to dry conditions at lower Minto Creek in 2019, sampling was not conducted.

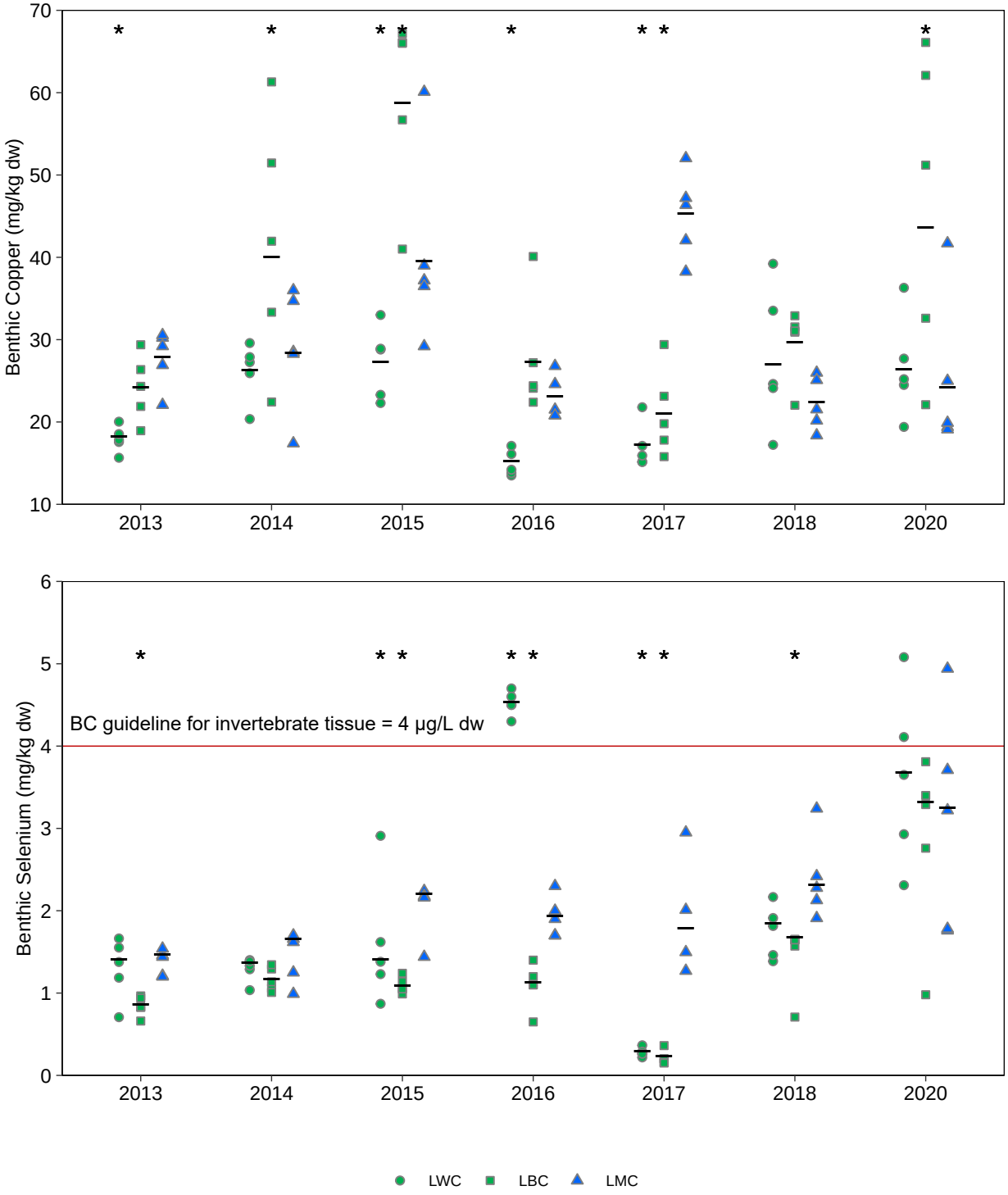


Figure 7.2: Benthic Tissue Metal Concentration, 2013 to 2020[a]

Notes: dw = dry weight. LWC = Lower Wolverine Creek (reference). LBC = Lower Big Creek (reference). LMC = Lower Minto Creek (exposed). British Columbia (BC) Benthic Invertebrate Tissue Guideline for Selenium is shown with a red line. Black horizontal bars indicate the Measure of Central Tendency (MCT). The MCT is the mean for non−transformed data, geometric mean for $\log_{10}$ transformed data and median for rank transformed data. An * indicates the reference station was significantly different from the exposed station for that year.

[a] Due to dry conditions at lower Minto Creek in 2019, sampling was not conducted.

invertebrate tissue from lower Minto Creek have only been statistically different than in lower Wolverine Creek from 2015 to 2017 (Table 7.2; Figure 7.2). With the exception of three samples (LWC-1, LWC-4, and LMC-5), selenium concentrations were below the interim guideline, suggesting limited mine influence.

In 2020, the mean copper concentration in benthic invertebrate tissue from lower Minto Creek was not significantly different from that at lower Wolverine Creek and was significantly lower when compared to lower Big Creek (Table 7.1, Figure 7.2). Since 2013, there has been no significant trend in mean copper concentrations in benthic invertebrate tissue. Values in 2020 were comparable to all years except for higher results observed in 2015 and 2017. Variability in concentrations of copper in benthic invertebrate tissue has been high over the years. In 2013, 2016, and 2017, copper was significantly higher in benthic invertebrates from lower Minto Creek compared to lower Wolverine Creek, but in 2014 and 2018 copper was not significantly different between areas (Figure 7.2). In 2015, copper was significantly lower at lower Minto Creek compared to lower Big Creek (Figure 7.2). This lack of consistency suggests observed differences likely represent natural variability.

Table 7.2: Statistical Comparison on Periphyton and Benthic Tissue Metal Concentrations, Minto Mine, 2012 to 2020

Endpoint	ANOVA Model				Year	Do Endpoints Differ Between Years?[a]			Do Endpoints Differ Between Areas?	
	Transformation	Area	Year	Area x Year		LWC (Reference)	LBC (Reference)	LMC (Exposed)	MOD (%)[b]	
									LMC vs. LWC	LMC vs. LBC
Periphyton Selenium (mg/kg dw)	rank	<0.001	<0.001	<0.001	2013	BC	BC	C	-35	ns
					2014	BC	BC	AB	167	515
					2015	D	C	B	590	431
					2016	BC	BC	AB	145	344
					2017	A	A	A	ns	141
					2018	CD	BC	AB	206	213
					2020	AB	B	A	88	277
Benthic Copper (mg/kg dw)	log10	<0.001	<0.001	<0.001	2013	ABC	D	BC	55	ns
					2014	AB	ABC	BC	ns	-29
					2015	A	A	AB	45	-33
					2016	C	CD	C	53	ns
					2017	BC	D	A	167	117
					2018	A	BCD	C	ns	ns
					2020	AB	AB	C	ns	-45
Benthic Selenium (mg/kg dw)	rank	<0.001	<0.001	<0.001	2013	B	CD	B	ns	73
					2014	B	BC	B	ns	ns
					2015	B	BCD	AB	57	105
					2016	A	BCD	AB	-58	73
					2017	C	D	AB	567	780
					2018	B	AB	A	ns	38
					2020	A	A	A	ns	ns

P-value < 0.05
Magnitude of Difference (MOD) > 0
Magnitude of Difference (MOD) < 0

Notes: ANOVA = analysis of variance. "ns" indicates a non-significant contrast.

[a] Years that do not share a letter were significantly different in a Tukey's Honestly Significant Difference post-hoc test ($\alpha = 0.05$).

[b] MOD = $(MCT_{LMC}-MCT_{LWC})/MCT_{LWC}$ *100; where the measures of central tendency (MCT) were medians for rank-transformed and geometric means for $\log_{10}$ transformed data.

8 CONCLUSIONS AND RECOMMENDATIONS

8.1 Conclusions

The Sediment, Periphyton, and Benthic Assessment component of the Minto Mine AEMP evaluated potential mine related effects to Minto Creek. Water quality (field measures and chemistry), sediment quality (chemistry and toxicity testing), periphyton (community and tissue quality), and benthic invertebrates (community and tissue quality) of Minto Creek were evaluated relative to reference creeks and previous data.

Supporting field measures collected in September 2020 indicated relatively good Minto Creek water quality. Higher conductance and pH values were observed in Minto Creek compared reference areas, suggesting a possible influence from the Minto Mine. All water quality measures met WUL objectives and CWQG guidelines for the protection of aquatic life except for total copper. Total copper exceeded the CWQG short-term guideline for both upper and lower exposed areas (upper Minto Creek and lower Minto Creek) and two of three reference areas (upper McGinty Creek and lower Wolverine Creek, but not lower Big Creek). Concentrations of total copper at upper Minto Creek were higher than concentrations at the upper McGinity Creek reference while total copper concentrations at lower Minto Creek were higher than concentrations at the lower Big Creek reference but lower than concentrations at the lower Wolverine Creek reference. Moving downstream, copper concentrations at lower Minto Creek were lower than those at upper Minto Creek but were still greater than the CWQG. Concentrations of dissolved copper remained below the SSWQO in all samples. In 2020, trophic status was oligotrophic in lower Minto Creek and mesotrophic in lower Wolverine Creek on the basis of chlorophyll-a concentrations (Dodds et al. 1998). This differed from 2018 (both classified as mesotrophic) and 2017 (lower Minto and lower Wolverine creeks classified as mesotrophic and oligotrophic, respectively).

Concentrations of metals in upper Minto Creek sediments were generally higher than those in McGinty Creek but lower than sediment quality guidelines. Exceptions were arsenic (which exceeded ISQG) and copper (which exceeded ISQG and PEL). Metal concentrations in lower Minto Creek sediments were generally similar to those in lower Wolverine Creek with the exception of arsenic, copper, and manganese (of which arsenic and copper were greater than ISQG but lower than PEL and arsenic has not been identified as elevated in water). Copper concentrations at both upper Minto and lower Minto Creek have been statistically higher than their respective reference areas since 2011 and 2013, respectively. Although concentrations of arsenic and copper in both upper and lower Minto Creek exceeded sediment quality guidelines, temporal analyses of copper concentrations since 2011 indicate that there has not been a significant increase in copper over the years at either upper or lower



Minto Creek. Sediment toxicity testing indicated an effect of lower Minto Creek sediment on *H. azteca* survival, but not on *H. azteca* growth or the survival and growth of *C. dilutus*. However, survival of *H. azteca* was spatially variable, with ≥60% mortality at two lower Minto Creek stations and no mortality at the remaining three stations.

Periphyton community evaluated on the basis of density (cells/m^2) and biomass (µg/cm^2) indicated significant differences in density (lower) and community structure compared to lower Wolverine Creek. Substantial temporal variability has been observed in periphyton community composition in both creeks, and the observed differences were within natural temporal variability and do not provide resolution of potential mine influence.

The erosional benthic invertebrate community of lower Minto Creek differed from both reference communities on the basis of Bray-Curtis index and percent Ephemeroptera only, indicating only subtle differences in community composition. Bray-Curtis index indicated that lower Minto Creek had a different community composition than the reference areas, and examination of taxon composition and CA results indicated that this difference was largely due to a higher proportion of chironomids and a lower proportion of EPT taxa. Although this difference is indicative of a potential influence on the benthic invertebrate community, it is likely related to creek drying in 2019. As the mine had not discharged since 2018 prior to sampling and water quality was correspondingly good in 2019 and 2020, it is unlikely that this difference is due to mine activities.

High temporal variability in benthic invertebrate community density, richness, and composition has been observed at the exposure and reference areas, presumably due to inter-annual variability in environmental conditions (e.g., flow, ice scour, water levels). Benthic invertebrate densities in 2020 were the highest they have been over the 2012 to 2020 period. There was a statistically significant upwards trend in chironomid proportion and downwards trend in EPT proportion at lower Minto Creek. This community shift could be due to the dry conditions at lower Minto Creek in 2019.

Concentrations of copper and selenium in periphyton tissue collected at lower Minto Creek were significantly higher than at both reference areas. There were no similar differences in copper or selenium concentrations in benthic invertebrate tissue. Furthermore, selenium concentrations in benthic invertebrate tissue were lower than the guideline for the protection of aquatic life indicating that no associated effects would be expected.

8.2 Recommendations

Based on the results and conclusions of the 2020 Minto Mine Sediment, Periphyton, and Benthic Assessment, it is recommended that the program is repeated in 2021. Given the continued

elevated copper concentrations in surface water and sediment in Minto Creek in 2020 (no discharge prior to sampling), the following recommendations are provided:

- Continue to monitor for potential adverse effects on the aquatic ecosystem (through sediment toxicity testing and benthic invertebrate community monitoring).
- Continue to monitor flow conditions in the open water season at lower Minto Creek prior to fall field work such that program adjustment can be made and communicated as early as possible if drying is observed (as in 2019).
- Continue to sample both lower Wolverine Creek and lower Big Creek as reference areas for the sediment toxicity and benthic invertebrate community assessment to provide perspective on whether any of the observed differences are due to mine influence or natural differences among creeks.

The above information is recommended for AEMP optimization as well as to optimize the connection between the AEMP data and the adaptive management plan.

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APPENDIX A

DATA QUALITY REVIEW

APPENDIX A DATA QUALITY REVIEW

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A1 INTRODUCTION

This Data Quality Review (DQR) provides an evaluation of data collected as part of the 2020 AEMP Minto Creek Sediment, Periphyton, and Benthic Invertebrate Community Assessment Report. The objective of the DQR is to define the overall quality of the data presented in the report, and, by extension, the confidence with which the data can be used to derive conclusions.

A1.1 Background

A variety of factors can influence the chemical and biological measurements made in an environmental study and thus affect the accuracy and/or precision of the data. Inconsistencies in sampling or laboratory methods, use of instruments that are inadequately calibrated or which cannot measure to the desired level of accuracy or precision, and contamination of samples in the field or laboratory are just some of the potential factors that can lead to the reporting of data that do not accurately reflect actual environmental conditions. Depending on the magnitude of the problem, inaccuracy or imprecision have the potential to affect the reliability of any conclusions made from the data. Therefore, it is important to ensure that monitoring programs incorporate appropriate steps to control the non-natural sources of data variability (i.e., minimize the variability that does not reflect natural spatial and temporal variability in the environment) and thus assure the quality of the data.

Data quality as a concept is meaningful only when it relates to the intended use of the data. That is, one must know the context in which the data will be interpreted in order to establish a relevant basis for judging whether or not the data set is adequate. The DQR involves comparison of actual field and laboratory measurement performance to data quality objectives (DQOs) established for a particular study, such as evaluation of laboratory reporting limits (LRL), blank sample data, data precision (based on laboratory duplicate samples), and data accuracy (based on matrix spike recoveries and/or analysis of standards or certified reference materials). Trusted analytical laboratories certified by Canadian Association for Laboratory Accreditation (CALA) with rigorous internal quality assurance programs were selected to ensure the highest possible quality.

DQOs were established either at the outset of the field program or by the laboratories and reflect reasonable and achievable performance expectations. The LRLs were set at the outset of the field program for water, sediment, and tissue quality. Only results that were below the LRL were evaluated against target detection limits. Target detection limits should be at least as low as applicable guidelines, ideally ≤ 1/10th guideline values. Programs involving a large number of samples and analytes usually result in some analytes that exceed the DQOs. This is

particularly so for multi-element scans (e.g., ICP scans for metals) since the analytical conditions are not necessarily optimal for every element included in the scan. Generally, scan results may be considered acceptable if no more than 25% of the parameters fail to meet the DQOs. Overall, the intent of comparing data to DQOs was not to reject any measurement that did not meet the DQO, but to ensure that any questionable data received more scrutiny to determine what effect, if any, this had on interpretation of results within the context of this project.

A1.2 Types of Quality Control Samples

Several types of quality control (QC) samples were assessed based on samples collected (or prepared) in the field and laboratory. These samples included the following:

- **Blanks** are samples of de-ionized water and/or appropriate reagent(s) that are handled and analyzed the same way as regular samples. These samples will reflect any contamination that occurred in the field (in the case of field or travel blanks) or the laboratory (in the case of laboratory or method blanks). Analyte concentrations should be non-detectable although a DQO of twice the LRL allows for slight "noise" around the LRL.
- **Laboratory Duplicates** are sub-sample pairs created in the laboratory from randomly selected field samples which are sub-sampled and then analyzed independently using identical analytical methods. The laboratory duplicate sample results reflect any variability introduced during laboratory sample handling and analysis and thus provide a measure of laboratory precision.
- **Spike Recovery Samples** are created in the laboratory by adding a known amount/concentration of a given analyte (or mixture of analytes) to a randomly selected test sample previously divided to create two sub-samples. The spiked and regular sub-samples are then analyzed in an identical manner. The spike recovery represents the difference between the measured spike amount (total amount in spiked sample minus amount in original sample) relative to the known spike amount (as a percentage). Two types of spike recovery samples are commonly analyzed. Spiked blanks (or blank spikes) are created using laboratory control materials whereas matrix spikes are created using field-collected samples. The analysis of spiked samples provides an indication of the accuracy of analytical results.
- **Internal Reference Materials** are samples containing known chemical concentrations that are processed and analyzed along with batches of environmental samples. The sample results are then compared to target results to provide a measure of

analytical accuracy. The results are reported as the percent of the known amount that was recovered in the analysis.

A2 WATER SAMPLES

A2.1 Laboratory Reporting Limits

All 2020 laboratory reporting limits were within target limits (≤ 1/10th guideline or water use license objectives), except for total cadmium (Table A.1). Only one cadmium sample out of five exceeded the target. Laboratory reporting limits for total cadmium were still good (i.e., below the guidelines), and therefore results were considered appropriate for the program evaluation.

A2.2 Laboratory Blank Sample Analysis

The laboratory blank analysis detected one sample of total manganese (0.00011 mg/L; Appendix B) but no other analytes were detectable. Only 1.03% of the laboratory blanks failed the DQO, therefore the samples were associated with minimal inadvertent contamination of samples within the laboratory during analysis.

A2.3 Data Precision

Due to internal laboratory practices, laboratory duplicate results were not performed on samples from this project, except forone laboratory duplicate sample, ammonia at Lower Wolverine Creek (Appendix B). Agreement was achieved between all laboratory duplicate samples (Appendix B). This indicates that samples were associated with good analytical precision.

A2.4 Laboratory Data Accuracy

Analyte recoveries for spiked blanks all met the DQO indicating excellent analytical accuracy for the water sample analyses (Appendix B).

Analyte recoveries for matrix spiked samples met DQOs for all analytes. The matrix spiked samples indicate good analytical accuracy for parameters of interest in the water sample analyses (Appendix B).

Table A.1: Laboratory Reporting Limits (LRLs) Relative to Targets and Water Quality Guidelines, Minto Mine, 2020[a]

Analyte		Units	Laboratory Reporting Limit		Water Use Licence Objectives	CCME Water Quality Guidelines[b]	
			Target	Achieved		Long-term	Short-term
Physical Tests	Total Suspended Solids	mg/L	-	3.0	-	-	-
	alkalinity, phenolphthalein (as $CaCO_3$)	mg/L	-	1.0	-	-	-
	alkalinity, hydroxide (as $CaCO_3$)	mg/L	-	1.0	-	-	-
	alkalinity, carbonate (as $CaCO_3$)	mg/L	-	1.0	-	-	-
Anions and Nutrients	Total Ammonia (as N)	mg/L	0.127	0.0050	0.25	1.27 - 6.02[c]	-
	Nitrate (as N)	mg/L	0.30	0.005	-	3	124
	Nitrite (as N)	mg/L	0.0060	0.0010	0.060	0.060	-
Total Metals	Total Antimony (Sb)	mg/L	-	0.00010	-	-	-
	Total Beryllium (Be)	mg/L	-	0.000020	-	-	-
	Total Bismuth (Bi)	mg/L	-	0.000050	-	-	-
	Total Boron (B)	mg/L	0.15	0.010	-	1.5	29
	Total Cadmium (Cd)	mg/L	0.00000953	0.0000050 - 0.000010	-	0.0000953 - 0.000346[d]	0.00113 - 0.00545[e]
	Total Cobalt (Co)	mg/L	-	0.00010	-	-	-
	Total Lead (Pb)	mg/L	0.00010	0.000050	-	0.0010 - 0.0070[f]	-
	Total Lithium (Li)	mg/L	-	0.0010	-	-	-
	Total Phosphorus (P)	mg/L	-	0.050	-	-	-
	Total Silver (Ag)	mg/L	0.000025	0.000010	-	0.00025	-
	Total Thallium (Tl)	mg/L	0.000080	0.000010	-	0.00080	-
	Total Tin (Sn)	mg/L	-	0.00010	-	-	-
	Total Titanium (Ti)	mg/L	-	0.00030 - 0.00240	-	-	-
	Total Vanadium (V)	mg/L	-	0.00050	-	-	-
	Total Zinc (Zn)	mg/L	-	0.0030	-	-	-
	Total Zirconium (Zr)	mg/L	-	0.00020	-	-	-
Dissolved Metals	Dissolved Antimony (Sb)	mg/L	-	0.00010	-	-	-
	Dissolved Beryllium (Be)	mg/L	-	0.00010	-	-	-
	Dissolved Bismuth (Bi)	mg/L	-	0.000050	-	-	-
	Dissolved Boron (B)	mg/L	-	0.010	-	-	-
	Dissolved Cadmium (Cd)	mg/L	0.000013	0.0000050	0.000135 - 0.422[g]	-	-
	Dissolved Lead (Pb)	mg/L	0.00040	0.000050	0.0040	-	-
	Dissolved Lithium (Li)	mg/L	-	0.0010	-	-	-
	Dissolved Phosphorus (P)	mg/L	-	0.050	-	-	-
	Dissolved Silver (Ag)	mg/L	0.000010	0.000010	0.00010	-	-
	Dissolved Thallium (Tl)	mg/L	-	0.000010	-	-	-
	Dissolved Tin (Sn)	mg/L	-	0.00010	-	-	-
	Dissolved Titanium (Ti)	mg/L	-	0.00030 - 0.00090	-	-	-
	Dissolved Vanadium (V)	mg/L	-	0.00050	-	-	-
	Dissolved Zinc (Zn)	mg/L	0.00294	0.0010	0.030	0.0294 - 0.125[h]	0.0933 - 0.298[i]
	Dissolved Zirconium (Zr)	mg/L	-	-	-	-	-

Value greater than target i.e., ≤ 1/10th guideline values

Notes: "-" = no guideline, target, or objective applicable. For range of guideline values, see Appendix Table B.5.

[a] Only analytes with reported values less than LRL were presented.

[b] CCME (Canadian Council of Ministers of the Environment). 1999. Canadian Environmental Quality Guidelines. 1999 (plus updates), Canadian Council of Ministers of the Environment, Winnipeg.

[c] Based on guideline using field temperature and pH.

[d] Total cadmium long-term guideline is based on hardness (as $CaCO_3$). At hardness ≥ 17 to ≤ 280 mg/L, the equation is CWQG (µg/L) = $10^{\{0.83(\log[\text{hardness}]) - 2.46\}}$.

[e] Total cadmium short-term guideline is based on hardness at hardness (as $CaCO_3$). At hardness ≥ 5.3 to ≤ 360 mg/ the equation is CWQG (µg/L) = $10^{\{1.016(\log[\text{hardness}]) - 1.71\}}$.

[f] Total lead guideline is based on hardness (as $CaCO_3$). At hardness 0 to ≤ 60 mg/L, the CWQG is 1 µg/L. At hardness ≥60 to ≤ 180 mg/L the equation is CWQG (µg/L)= $e^{[(1.273\{\ln[\text{hardness}]\}-}$

[g] Dissolved cadmium (µg/L) objective is based on the following formula using the lowest hardness: $e^{(0.736(\ln(\text{hardness}))-4.943)}$.

[h] Dissolved zinc long-term guideline is based on hardness, pH, and DOC. For hardness 23.4 and 399 mg/L, pH 6.5 to 8.13, and DOC 0.3 to 22.9 mg/L, the equation is CWQG (µg/L) = $e^{(0.947[\ln(\text{hardness mg/L})] - 0.815[\text{pH}] + 0.398[\ln(\text{DOC mg/L})] + 4.625}$

[i] Dissolved zinc short-term benchmark is based on hardness and DOC. For hardness 13.8 to 250.5 mg/L and DOC 0.3 and 17.3 mg/L, the equation is CWQG (µg/L)= $e^{(0.833[\ln(\text{hardness mg/L})] + 0.240[\ln(\text{DOC mg/L})] + 0.526)}$.

A3 SEDIMENT SAMPLES

A3.1 Laboratory Reporting Limits

Results for eight analytes were reported as less than LRL but only mercury had an associated guideline (Table A.2). Mercury LRLs were below the Canadian Sediment Quality Guideline (CSQG; CCME 1999) but did not meet the target (≤ 1/10th guideline; Table A.2). Analytes with guidelines were all detectable indicating that the data can be reliably interpreted.

A3.2 Laboratory Blank Sample Analysis

All blank samples contained non-detectable analyte concentrations indicating no inadvertent contamination of samples within the laboratory during analysis (Appendix C).

A3.3 Data Precision

Agreement was achieved between all laboratory duplicate samples except for one sample, total Kjeldahl nitrogen (Appendix C). This indicates good analytical precision.

A3.4 Laboratory Data Accuracy

Analyte recoveries for spiked blanks all met the DQO indicating excellent analytical accuracy for the sediment sample analyses (Appendix C).

Recoveries of all analytes in certified reference materials met the DQO (Appendix C). These data indicated excellent analytical accuracy associated with the analysis of sediment samples.

Table A.2: Laboratory Reporting Limits (LRLs) Relative to Targets and Sediment Guidelines, Minto Mine, 2020[a]

Analyte		Units	Laboratory Reporting Limit (LRL)		CSQG[b]	
			Target	Achieved	ISQG	PEL
Particle Size	Gravel (> 2 mm)	%	-	1.0	-	-
	Sand (2.0mm - 0.063mm)	%	-	1.0	-	-
	Silt (0.063mm - 0.004mm)	%	-	1.0	-	-
	Clay (<0.004mm)	%	-	1.0	-	-
Total Metals	Bismuth (Bi)	mg/kg	-	0.20	-	-
	Boron	mg/kg	-	5.0		
	Mercury (Hg)	mg/kg	0.017	0.050	0.17	0.49
	Silver (Ag)	mg/kg	-	0.10	-	-
	Sulfur (S)	mg/kg	-	1,000	-	-
	Thallium (Tl)	mg/kg	-	0.050	-	-
	Tin (Sn)	mg/kg	-	2.0	-	-
	Tungsten (W)	mg/kg	-	0.50	-	-

Value greater than target i.e., ≤ 1/10th guideline values.

Note: "-" = no applicable target or applicable guideline.

[a] Only analytes with reported values less than LRL were presented.

[b] CSQG = Canadian Sediment Quality Guidelines; ISQG = interim sediment quality guideline; PEL = probable effect level.

A4 SEDIMENT TOXICITY TESTING

The 10-day *Chironomus dilutus* test was within all control acceptability criteria and water quality parameters (Appendix C – Nautilus Environmental Report). Results of the 10-day *C. dilutus* test were compared to the historical range (mean ± two standard deviation) and were slightly outside of the lower end of the range (Appendix C – Nautilus Environmental Report). This did not appear to affect test results and were thought to be due to variability. The 14-day *Hyalella azteca* test was within the acceptability range for organism performance of mean and two standard deviations (Appendix C – Nautilus Environmental Report). Water quality parameters remained within the acceptability criteria throughout testing, with one exception. For the 14-day *H. azteca* test, pH was outside of the acceptable range for several days (Appendix C – Nautilus Environmental Report). When pH is outside the acceptable range water renewals should be conducted but were not in this case. Despite this reference sediment preformed similarly to control sediment and appears this did not affect test results. Furthermore, despite being outside of standard test protocol range, the higher pH values observed in the tests were similar to those observed *in situ*.

A5 PERIPHYTON COMMUNITY

Close agreement was achieved between laboratory duplicate samples for both density (cells/cm^2; Table A.3) and biomass (µg/cm^2; Table A.4). This indicates that data can be reliably interpreted.

Table A.3: Laboratory Duplicate Results for Analysis of Periphyton Group Density (cells/cm^2)

Algal Density (cells/cm^2)	Common Name	LWC-2	LWC-2R	RPD (%)
Cyanobacteria	Blue Green Algae	51,392	45,650	11.8
Rhodophytes	Red Algae	4,881	5,455	11.1
Bacillariophycae	Diatoms	72,639	69,767	4.03
	Total	128,912	120,873	6.44

> 30% Relative Percent Difference (RPD).

Table A.4: Laboratory Duplicate Results for Analysis of Periphyton Group Biomass (µg/cm^2)

Algal Biomass (µg/cm^2)	Common Name	LWC-2	LWC-2R	RPD (%)
Cyanobacteria	Blue Green Algae	37.4	42.5	12.7
Rhodophytes	Red Algae	1.28	1.43	11.1
Bacillariophycae	Diatoms	18.8	18.3	2.7
	Total	57.5	62.2	7.90

> 30% Relative Percent Difference (RPD).

A6 BENTHIC INVERTEBRATE COMMUNITY

Two re-sorted samples met the objective for percent organism recovery; both of which had a percent recovery of 100% (Table A.5). Of 15 benthic invertebrate community samples analyzed, five samples were analyzed whole. The remaining ten samples were subsampled at percentages ranging from 25% to 75% (Table A.6), and sub-sampling variability was required. Sub-sampling of LWC-2 met the DQO of 20% (Table A.7). This indicates that the data can be reliably interpreted.

Table A.5: Percent Sorting Efficiency of Benthic Invertebrates, Minto Mine, 2020

Station	Initial Sort	Re-sort	Percent Sorting Efficiency [a]
LWC-5	329	0	100%
LBC-3	335	0	100%

Sorting efficiency < 90%.

[a] Percent sorting efficiency = (1-(# in QA/AC re-sort / (# sorted originally + # in QA/QC re-sort)))* 100.

Table A.6: Percent of Benthic Invertebrate Sample Analyzed for Each Station, Minto Mine, 2020

Area	Station				
	1	2	3	4	5
LWC	38%	50%	25%	100%	38%
LBC	100%	100%	100%	100%	50%
LMC	31%	25%	75%	31%	25%

Note: LWC = Lower Wolverine Creek (reference), LBC = Lower Big Creek (reference), LMC = Lower Minto Creek (exposed).

Table A.7: Percent Subsampling Error for Benthic Invertebrate Samples, Minto Mine, 2020

Sample	Number of Organisms in Fraction 1 (50%)	Number of Organisms in Fraction 2 (50%)	Actual Density	Precision (RPD %)[a]	Accuracy (%)[b]
LWC-2	310	250	560	19.4	10.7

Value exceeded the < 20% data quality objective.

[a] Relative percent difference (RPD) among subsamples.

[b] Range of deviation of abundance estimates derived from sub-samples compared to analysis of entire sample (expressed as % of total organisms present).

A7 TISSUE SAMPLES

A7.1 Laboratory Reporting Limits

All chlorophyll-a periphyton samples were detectable and interpretable (Appendix B).

One periphyton tissue analyte, total tellurium, was below the LRL and did not meet target detection limits (Table A.8). Five out of 15 samples exceeded target concentrations. Target concentrations are not based on guidelines; rather represent detection limits quoted by the laboratory.

Four benthic invertebrate tissue analytes were below LRLs and did not meet targets: total bismuth (three of 15 samples), boron (eight of 15 samples), tellurium (all 15 samples), and tin (14 of 15 samples; Table A.9). Target concentrations are not guidelines but represent detection limits quoted by the laboratory. Data for this project can be reliably interpreted.

A7.2 Laboratory Blank Sample Analysis

Periphyton (chlorophyll-a [Appendix B], tissue [Appendix C]) and benthic invertebrate tissue (Appendix C) blank samples contained non-detectable analyte concentrations indicating no inadvertent contamination of samples within the laboratory during analysis.

A7.3 Data Precision

Laboratory duplicate periphyton tissue samples showed good agreement among all duplicate analyte concentrations (Appendix C). Periphyton samples were associated with good analytical precision.

A7.4 Data Accuracy

Analyte recoveries for spiked blanks all met the DQO indicating excellent analytical accuracy for periphyton (chlorophyll-a [Appendix B], tissue [Appendix C]) and benthic invertebrate tissue (Appendix C).

Certified reference material met the DQO for periphyton and benthic invertebrate tissue indicating excellent analytical accuracy (Appendix C).

Table A.8: Laboratory Reporting Limits (LRL) for Periphyton Tissue Samples Relative to Targets, Minto Mine, 2020[a]

Analyte	Units	Laboratory Reporting Limit (LRL)	
		Target	Achieved
Total Tellurium (Te)	mg/kg wwt	0.0040	0.0040 - 0.0065[b]

Target LRL was exceeded.

Notes: wwt = wet weight, mg/kg = milligrams per kilogram.

[a] Only analytes with reported values less than LRL were presented.

[b] Only one sample (LMC-5) had a detection limit higher than the target value.

Table A.9: Laboratory Reporting Limits (LRL) for Benthic Invertebrate Tissue Samples Relative to Targets, Minto Mine, 2020[a]

Analyte	Units	Laboratory Reporting Limit (LRL)	
		Target	Achieved
Bismuth (Bi)	mg/kg wwt	0.0020	0.0020
Boron (B)	mg/kg wwt	0.20	0.20 - 0.24[b]
Tellurium (Te)	mg/kg wwt	0.0040	0.0040
Tin (Sn)	mg/kg wwt	0.020	0.020

Target LRL was exceeded.

Notes: wwt = wet weight, mg/kg = milligrams per kilogram.

[a] Only analytes with reported values less than LRL were presented.

[b] Only one sample (LMC-5) had a detection limit higher than the target value.

A8 DATA QUALITY STATEMENT

Water chemistry results were considered appropriate for this program as they met the DQO for all samples, except for one sample of total cadmium (target limits exceeded guidelines) and one laboratory blank was detectable. Sediment chemistry data quality was considered good as all samples met the DQO, except for mercury reporting limits. However, all applicable guidelines could be met with the 2020 laboratory limits. The sediment toxicity test showed some pH results above 8.0 (the standard upper target range for testing), but pH values were consistent with *in situ* conditions and the reference results (i.e., the samples in which the slightly elevated pH results were observed) did not differ from the laboratory control. Accordingly, the laboratory deemed the tests to be acceptable and we agree that these data are of good quality.

All data quality objectives for periphyton community and benthic invertebrate community were met. Chlorophyll-a met all data quality objectives and was deemed acceptable. For periphyton and benthic tissue chemistry, the LRL target values were met for all analytes except for tellurium in one periphyton tissue sample and bismuth, boron, tellurium, and tin in four benthic invertebrate tissue samples. However, all applicable guidelines could be met with the 2020 laboratory limits.

Laboratory accuracy and precision was considered excellent across all components. Where applicable, method blanks, duplicates, matrix spikes, and laboratory control samples met the laboratory data quality objectives.

The overall quality of data for this project was considered good and can serve to meet the project objectives.

A9 REFERENCE

CCME (Canadian Council of Ministers of the Environment). 1999 (plus updates). Canadian Environmental Quality Guidelines. CCME, Winnipeg.

APPENDIX B

SUPPORTING INFORMATION AND DATA

Figures and Tables

Laboratory Reports

APPENDIX B

SUPPORTING INFORMATION AND DATA

Figures and Tables

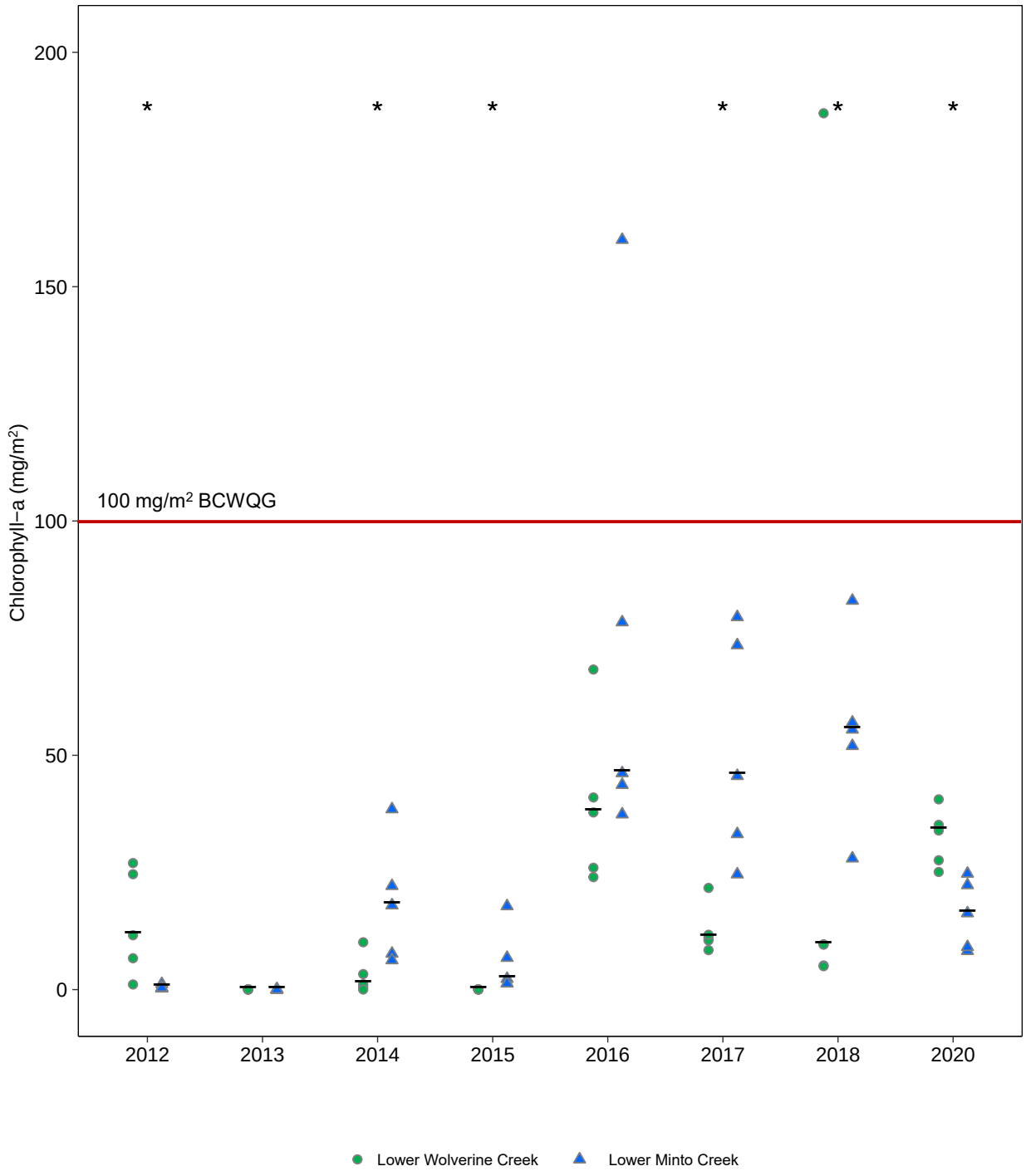


Figure B.1: Concentrations of Chlorophyll-a in Periphyton Measured in Lower Wolverine (Reference) and Lower Minto (Exposed) Creeks, 2012 to 2020[a]

Notes: Black horizontal bars indicate the Measure of Central Tendency (MCT). The MCT is the mean for non−transformed data, geometric mean for log−10 transformed data and median for rank transformed data. An * indicates stations were significantly different for that year.
[a] Sampling was not completed in 2019 due to dry conditions at Lower Minto Creek.

Table B.1: Habitat Characteristics for Benthic Invertebrate Areas, Minto Mine AEMP, September 2020

Characteristics		Lower Wolverine Creek (Reference)	Lower Big Creek (Reference)	Lower Minto Creek (Exposed)
UTM (NAD83, Zone 8V)	Easting	382477	396667	392260
	Northing	6954829	6942353	6948065
Approximate Length of Reach Assessed (m)		-	50	15
Gradient (%)		3	3.5	4.0
Velocity (m/s)	Mean (min-max)	0.24 (0.21 - 0.25)	0.24 (0.22 - 0.26)	0.24 (0.22 - 0.27)
Depth (cm)	Mean	42	14	12
	Maximum	65	67	43
Width (m)	Wetted	11	20	2.00
	Bankfull	26	50	2.9
General Morphology	% pool	0	0	10
	% riffle	30	20	60
	% run	70	80	30
Bank Condition		Moderate	Moderate	Moderate
Substrate Coverage	% bedrock	0	0	0
	% boulder	0	0	0
	% cobble	90	90	90
	% gravel	10	10	10
	% sand and finer	0	0	0
Instream Cover (% total surface)	undercut banks	5	0	5
	boulder	0	0	0
	woody debris	5	20	10
	deep pool	0	0	5
	macrophytes	0	0	0
	other	0	0	0
Overhead Canopy (% surface)	Dense	0	0	75
	Partially Open	20	20	25
	Open	80	80	0
Aquatic Vegetation (% areal coverage)	Emergent	0	0	0
	Submergent	0	0	0
	Floating	0	0	0
	Attached Algae	30	40	50
Riparian vegetation		willow, alder, aspen, spruce	alder, willow, aspen, spruce	alder, aspen
Surrounding Land Use		forested	forested	forested
Evidence of Anthropogenic Disturbance		none	none	mine upstream

Table B.2: Supporting Information for Erosional Benthic Invertebrate Surber Sample Collections, Minto Mine AEMP, September 2020

Characteristics		Lower Wolverine Creek (Reference)				
		LWC-1	LWC-2	LWC-3	LWC-4	LWC-5
Date		13-Sep-20	12-Sep-20	12-Sep-20	12-Sep-20	12-Sep-20
Time		8:20	16:30	14:25	12:40	10:10
UTM (NAD83, Zone 8V)	Easting	382426	382419	382477	382554	382561
	Northing	6954613	6954733	6954829	6955043	6955122
Sampling Device		Surber	Surber	Surber	Surber	Surber
Sampler Size (m^2)		0.093	0.093	0.093	0.093	0.093
Mesh Size (µm)		500	500	500	500	500
Grabs in Composite		3	3	3	3	3
Water Velocity (m/s)		0.40	0.34	0.36	0.38	0.39
Depth (m)		0.100	0.117	0.100	0.103	0.093
Number of Jars		1	1	2	1	1
Average Depth (cm) (Sampler pushed into substrate)		5	4	5	5	5
Average Depth (cm) (Substrate is sampled/cleaned)		6	6	7	6	7
Average Sampling Time per Grab (min)		8	8	8	8	8
Macrophytes (in sample)		none	none	none	none	none
Algae (in sample)		sparse (periphyton)	sparse (periphyton)	moderate (periphyton)	sparse (periphyton)	sparse (periphyton)
Sample Texture	% cobble	80	90	90	70	80
	% gravel	20	10	10	30	20
	% sand and finer	0	0	0	0	0
	% organic	0	0	0	0	0

Table B.2: Supporting Information for Erosional Benthic Invertebrate Surber Sample Collections, Minto Mine AEMP, September 2020

Characteristics		Lower Big Creek (Reference)				
		LBC-1	LBC-2	LBC-3	LBC-4	LBC-5
Date		16-Sep-20	16-Sep-20	16-Sep-20	16-Sep-20	16-Sep-20
Time		16:15	14:45	12:30	10:10	8:30
UTM (NAD83, Zone 8V)	Easting	396501	396602	396667	396627	396485
	Northing	6942187	6942247	6942353	6942546	6942705
Sampling Device		Surber	Surber	Surber	Surber	Surber
Sampler Size (m^2)		0.093	0.093	0.093	0.093	0.093
Mesh Size (µm)		500	500	500	500	500
Grabs in Composite		3	3	3	3	3
Water Velocity (m/s)		0.38	0.39	0.35	0.39	0.37
Depth (m)		0.110	0.103	0.103	0.097	0.097
Number of Jars		1	1	1	1	1
Average Depth (cm) (Sampler pushed into substrate)		2	3	2	2	5
Average Depth (cm) (Substrate is sampled/cleaned)		5	5	5	6	6
Average Sampling Time per Grab (min)		8	8	8	8	8
Macrophytes (in sample)		none	none	none	none	none
Algae (in sample)		moderate	moderate (periphyton)	sparse	sparse	sparse (periphyton)
Sample Texture	% cobble	90	90	90	90	90
	% gravel	10	10	10	10	10
	% sand and finer	0	0	0	0	10
	% organic	0	0	0	0	0

Table B.2: Supporting Information for Erosional Benthic Invertebrate Surber Sample Collections, Minto Mine AEMP, September 2020

Characteristics		Lower Minto Creek (Exposed)				
		LMC-1	LMC-2	LMC-3	LMC-4	LMC-5
Date		14-Sep-20	14-Sep-20	11-Sep-20	11-Sep-20	11-Sep-20
Time		17:00	15:00	16:15	13:00	-
UTM (NAD83, Zone 8V)	Easting	392129	392233	392260	392351	392381
	Northing	6948035	6948025	6948065	6948134	6948181
Sampling Device		Surber	Surber	Surber	Surber	Surber
Sampler Size (m^2)		0.093	0.093	0.093	0.093	0.093
Mesh Size (µm)		500	500	500	500	500
Grabs in Composite		3	3	3	3	3
Water Velocity (m/s)		0.38	0.41	0.40	0.35	0.40
Depth (m)		0.087	0.100	0.097	0.093	0.103
Number of Jars		1	2	1	1	2
Average Depth (cm) (Sampler pushed into substrate)		4	5	6	4	5
Average Depth (cm) (Substrate is sampled/cleaned)		5	7	7	7	8
Average Sampling Time per Grab (min)		8	8	8	8	7
Macrophytes (in sample)		none	none	none	none	none
Algae (in sample)		sparse (periphyton)	sparse (periphyton)	sparse (periphyton)	sparse (periphyton)	sparse (periphyton)
Sample Texture	% cobble	80	60	60	60	50
	% gravel	20	40	40	40	50
	% sand and finer	0	0	0	0	0
	% organic	0	0	0	0	0

Table B.3: *In Situ* Water Quality Measures at Sediment Sampling Stations, Minto Mine AEMP, September 2020

Area	Variable	Temperature	Specific Conductance	Dissolved Oxygen	Dissolved Oxygen	pH
	Unit	°C	µS/cm	mg/L	%	pH units
	CCME Water Quality Guidelines	-	-	6.5 - 9.5	54	6.5 - 9.0[a]
Upper McGinty Creek (Reference)	URC-1	2.1	89.9	11.01	79.7	7.48
	URC-2	2.1	90.6	10.45	75.9	7.42
	URC-3	0.6	96.0	11.17	77.9	7.24
	URC-4	0.6	97.0	10.78	96.1	7.49
	URC-5	0.7	107.0	11.09	77.3	7.63
	Mean	1.2	96.1	10.90	81.4	7.45
	Standard Deviation	0.80	6.9	0.29	8.3	0.141
Upper Minto Creek (Exposed)	UMC-1	1.0	523.0	10.30	72.5	7.36
	UMC-2	0.8	523.0	10.15	71.2	7.33
	UMC-3	3.4	500.0	10.40	78.2	7.39
	UMC-4	3.2	500.0	9.62	72.0	7.39
	UMC-5	3.1	496.0	9.77	72.9	7.30
	Mean	2.3	508.4	10.05	73.4	7.35
	Standard Deviation	1.28	13.4	0.34	2.8	0.039
Lower Wolverine Creek (Reference)	LWC-1	4.3	170.0	10.38	79.9	7.42
	LWC-2	5.7	170.0	3.96	32.6	7.19
	LWC-3	5.6	168.0	3.97	31.3	7.38
	LWC-4	6.4	157.0	6.72	54.5	7.46
	LWC-5	5.5	166.0	3.49	27.6	7.61
	Mean	5.5	166.2	5.70	45.2	7.41
	Standard Deviation	0.76	5	2.91	22.1	0.152
Lower Minto Creek (Exposed)	LMC-1	2.8	306.0	10.49	77.4	7.87
	LMC-2	2.5	294.0	10.96	80.4	7.90
	LMC-3	2.1	305.7	10.80	78.4	7.90
	LMC-4	1.9	306.0	11.22	80.9	7.94
	LMC-5	1.7	306.0	11.34	81.4	7.97
	Mean	2.2	303.5	10.96	79.7	7.92
	Standard Deviation	0.45	5.3	0.34	1.7	0.039

Value does not meet the water quality guideline.

[a] Range for the Water Use Licence is 6.0 to 9.0.

Table B.4: *In Situ* Water Quality Measures at Benthic Invertebrate Sampling Stations, Minto Mine AEMP, September 2020

Area	Parameter	Temperature	Specific Conductance	Dissolved Oxygen	Dissolved Oxygen	pH	Mean Depth	Mean Velocity
	Units	°C	µS/cm	mg/L	%	pH units	m	m/s
	CCME Water Quality Guidelines	-	-	6.5 - 9.5	54	6.5 - 9.0[a]	-	-
Lower Wolverine Creek (Reference)	LWC-1	3.3	170.0	11.25	84.4	7.70	0.100	0.40
	LWC-2	4.5	168.0	11.38	87.5	7.71	0.117	0.34
	LWC-3	4.5	168.0	11.40	88.1	7.72	0.100	0.36
	LWC-4	3.8	168.0	11.15	84.7	7.74	0.103	0.38
	LWC-5	3.5	164.0	11.18	94.2	7.78	0.093	0.39
	Mean	3.9	167.6	11.27	87.8	7.73	0.103	0.38
	Standard Deviation	0.56	2.2	0.11	3.9	0.03	0.009	0.024
Lower Big Creek (Reference)	LBC-1	5.1	196.0	11.28	88.7	7.83	0.110	0.38
	LBC-2	4.4	196.0	11.86	91.1	7.79	0.103	0.39
	LBC-3	3.4	197.0	11.46	86.2	7.74	0.103	0.35
	LBC-4	3.2	197.0	11.00	82.1	7.84	0.097	0.39
	LBC-5	3.3	196.0	10.97	82.2	7.99	0.097	0.37
	Mean	3.9	196.4	11.31	86.1	7.84	0.102	0.38
	Standard Deviation	0.83	0.55	0.37	4.0	0.094	0.006	0.015
Lower Minto Creek (Exposed)	LMC-1	1.7	165.5	11.74	84.3	7.97	0.087	0.38
	LMC-2	1.6	300.0	11.81	84.6	7.83	0.100	0.41
	LMC-3	2.9	285.0	11.30	83.9	7.89	0.097	0.40
	LMC-4	2.6	286.0	11.14	82.0	7.79	0.093	0.35
	LMC-5	2.2	285.0	11.51	83.7	7.88	0.103	0.40
	Mean	2.2	264.3	11.50	83.7	7.87	0.096	0.39
	Standard Deviation	0.56	55.6	0.28	1.0	0.07	0.006	0.025

Value does not meet the water quality guideline.

Note: CCME = Canadian Council of Ministers of the Environment (1999). "-" = no applicable guideline.

[a] Range for the Water Use Licence is 6.0 to 9.0.

Table B.5: Explanatory Notes for Selected Water Quality Guidelines, Minto Mine AEMP, 2020

				Area	Upper McGinty Creek	Upper Minto Creek	Lower Wolverine Creek	Lower Big Creek	Lower Minto Creek
				Station ID	URC-5	UMC-1	LWC-4	LBC-3	LMC-1
				Exposure Type	Reference	Exposed	Reference	Reference	Exposed
Modifying Parameters				Field Temperature (^{o}C)	0.700	0.900	3.80	2.90	2.80
				Hardness (mg/L $CaCO_3$)	54.2	256	151	89.9	83.8
				Field pH (pH units)	7.63	7.36	7.74	7.93	7.87
				Dissolved Organic Carbon (DOC; mg/L)	23.0	10.8	13.2	11.1	19.5
Analyte		**Guideline Type**	**Equation**		**Guideline Values**				
Nutrients	Total Ammonia	CWQG long-term guideline	Long-term guideline is calculated using CCME look-up table. Table values are for ammonia ion; convert to Ammonia (as N) by multiplying by 0.8224.		1.92	6.02	1.27	1.27	1.27
Total Metals	Aluminum	CWQG long-term guideline	pH < 6.5 = 5 µg/L and if pH ≥ 6 = 100 µg/L		0.100				
	Cadmium	CWQG long-term guideline	At hardness ≥ 17 to ≤ 280 mg/L $CaCO_3$, the equation is CWQG (µg/L) = $10^{\{0.83(\log[\text{hardness}]) - 2.46\}}$		0.0000953	0.000346	0.000223	0.000145	0.000137
		CWQG short-term guideline	At hardness ≥ 5.3 to ≤ 360 mg/L $CaCO_3$ the equation is CWQG (µg/L) = $10^{\{1.016(\log[\text{hardness}]) - 1.71\}}$		0.00113	0.00545	0.00319	0.00188	0.00175
	Copper	CWQG long-term guideline	CWQG (µg/L) = 0.2 x $e^{\{0.8545[\ln(\text{hardness})]-1.465\}}$		0.00200	0.00400	0.00336	0.00216	0.00203
	Lead	CWQG long-term guideline[a]	At hardness 0 to ≤ 60 mg/L $CaCO_3$, the CWQG is 1 µg/L. At hardness ≥ 60 to ≤ 180 mg/L the equation is CWQG (µg/L)= $e^{[(1.273\{\ln[\text{hardness}]\}-4.705)]}$. At hardness >180 mg/L $CaCO_3$, the CWQG is 7 µg/L		0.00100	0.00700	0.00538	0.00278	0.00254
	Nickel	CWQG long-term guideline[b]	At hardness 0 to ≤ 60 mg/L $CaCO_3$ the CWQG is 25 µg/L. At hardness > 60 to ≤ 180 mg/L $CaCO_3$ the CWQG is calculated using the equation CWQG (µg/L) = $e^{\{0.76[\ln(\text{hardness})]+1.06\}}$. At hardness >180 mg/L $CaCO_3$, the CWQG is 150 µg/L.		0.0250	0.150	0.131	0.0881	0.0836
Dissolved Metals	Cadmium	WUL Objective	WUL objective =$e^{(0.736(\ln(\text{hardness}))-4.943).}$		0.135	0.422	0.286	0.196	0.186
	Copper	WUL Objective	DOC is > 10 mg/L, objective is 0.02 mg/L Cu. If DOC ≤ 10 mg/L, objective is 0.013 mg/L Cu		all DOC values >10 mg/L. Guideline value = 0.020 mg/L				
	Manganese	CWQG long-term guideline	Long-term guideline is calculated using CCME benchmark calculator or look-up table. Values dependent on hardness and field pH		0.390	0.640	0.400	0.350	0.350
		CWQG short-term guideline	CWQG (µg/L) = $e^{(0.878[\ln(\text{hardness})] + 4.76)}$		3.89	15.2	9.56	6.06	5.70
	Zinc	CWQG long-term guideline[c]	For hardness 23.4 and 399 mg/L $CaCO_3$, pH 6.5 to 8.13, and DOC 0.3 to 22.9 mg/L, the equation is CWQG (µg/L) = $e^{(0.947[\ln(\text{hardness mg/L})] - 0.815[\text{pH}] + 0.398[\ln(\text{DOC mg/L})] + 4.625)}$		0.0310	0.125	0.0601	0.0294	0.0361
		CWQG short-term guideline[d]	For hardness 13.8 to 250.5 mg/L $CaCO_3$ and DOC 0.3 and 17.3 mg/L, the equation is CWQG (µg/L) = $e^{(0.833[\ln(\text{hardness mg/L})] + 0.240[\ln(\text{DOC mg/L})] + 0.526)}$		0.0933	0.298	0.205	0.128	0.134

Notes: CWQG = Canadian Water Quality Guideline. CCME = Canadian Council of Ministers of the Environment. WUL = water use licence.

[a] Hardness at upper McGinty Creek was outside of the validity range for calculation of total lead long-term guideline. As such, the maximum value for the guideline equation were applied (i.e., hardness of 60 mg/L $CaCO_3$).

[b] Hardness at upper McGinty Creek was outside of the validity range for calculation of total nickel long-term guideline. As such, the maximum value for the guideline equation were applied (i.e., hardness of 60 mg/L $CaCO_3$).

[c] DOC at upper Minto McGinty Creek and pH at upper Minto Creek were outside of the validity range for calculation of dissolved zinc long-term guideline. As such, the maximum values for the guideline equation were applied (i.e., DOC of 22.9 mg/L $CaCO_3$ and pH of 8.13).

[d] Hardness at upper McGinty Creek and DOC at upper and lower Minto Creek were outside of the validity range for calculation of dissolved zinc long-term guideline. As such, the maximum values for the guideline equation were applied (Hardness of 250.5 mg/L $CaCO_3$ and DOC of 17.3 mg/L).

Table B.6: Comparison of Water Quality Results at Reference and Exposed Areas in 2018 to 2020, Minto Mine AEMP

Analyte		Units	CCME Water Quality Guidelines[a]		WUL Objectives at W2	2018					2019[b]		2020				
			Long-term	Short-term		Upper McGinty Creek (Reference)	Upper Minto Creek (Exposed)	Lower Wolverine Creek (Reference)	Lower Big Creek (Reference)	Lower Minto Creek (Exposed)	Upper McGinty Creek (Reference)	Upper Minto Creek (Exposed)	Upper McGinty Creek (Reference)	Upper Minto Creek (Exposed)	Lower Wolverine Creek (Reference)	Lower Big Creek (Reference)	Lower Minto Creek (Exposed)
Physical Tests	Total Suspended Solids	mg/L	-	-	-	8.80	3.30	<3	<3	3.70	<3	<3	<3	<3	<3	5.10	<3
Total Metals	Total Aluminum (Al)	mg/L	0.10[c]	-	-	0.0282	0.0100	0.0761	0.0622	0.00880	0.00980	0.0765	0.0913	0.00960	0.0458	0.142	0.0818
	Total Antimony (Sb)	mg/L	-	-	-	<0.0001	<0.0001	0.000100	0.000150	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.000180	0.000110
	Total Arsenic (As)	mg/L	0.005	-	-	0.000410	0.000260	0.000470	0.000860	0.000490	0.000350	0.000290	0.000550	0.000360	0.000630	0.000960	0.000540
	Total Barium (Ba)	mg/L	-	-	-	0.0285	0.0635	0.0337	0.0624	0.0589	0.0393	0.0713	0.0337	0.0616	0.0612	0.0660	0.0345
	Total Beryllium (Be)	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00002	<0.00002	<0.00002	<0.00002	0.0000260
	Total Bismuth (Bi)	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
	Total Boron (B)	mg/L	1.5	29	-	<0.01	0.0230	<0.01	<0.01	<0.01	<0.01	0.0250	<0.01	0.0210	<0.01	<0.01	<0.01
	Total Cadmium (Cd)	mg/L	0.0000953 - 0.000346[d]	0.00113 - 0.00545[e]	-	<0.000005	<0.000005	<0.000005	0.00000620	<0.000005	<0.000005	<0.000015	0.00000770	<0.00001	<0.000005	0.0000142	0.00000540
	Total Calcium (Ca)	mg/L	-	-	-	18.3	57.5	17.9	21.9	42.8	33.7	63.6	15.3	60.7	40.2	22.8	19.6
	Total Cesium (Cs)	mg/L	-	-	-	<0.00001	<0.00001	<0.00001	0.0000150	<0.00001	<0.00001	<0.00001	-	-	-	-	-
	Total Chromium (Cr)	mg/L	0.0010[f]	-	-	0.000390	0.000190	0.000580	0.000440	0.000310	0.000200	0.000240	0.000710	0.000320	0.000500	0.000670	0.000850
	Total Cobalt (Co)	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.000110	<0.0001	<0.0001	<0.0001	0.000140	0.000110
	Total Copper (Cu)	mg/L	0.0020 - 0.0040[g]	-	-	0.00143	0.00405	0.00234	0.00215	0.00177	<0.0005	0.00388	0.00317	0.00444	0.00266	0.00290	0.00261
	Total Iron (Fe)	mg/L	0.30	-	-	0.226	0.0190	0.214	0.0860	0.0590	0.146	0.132	0.263	0.0310	0.135	0.220	0.225
	Total Lead (Pb)	mg/L	0.0010 - 0.0070[h]	-	-	<0.00005	<0.00005	<0.00005	0.0000560	<0.00005	<0.00005	0.0000540	<0.00005	<0.00005	<0.00005	0.0000930	<0.00005
	Total Lithium (Li)	mg/L	-	-	-	<0.001	0.00300	0.00150	0.00140	0.00160	<0.001	0.00350	<0.001	0.00300	0.00170	0.00160	0.00170
	Total Magnesium (Mg)	mg/L	-	-	-	5.85	30.5	10.2	9.04	16.6	9.54	29.9	4.44	27.4	13.8	9.40	9.86
	Total Manganese (Mn)	mg/L	-	-	-	0.0130	0.0402	0.00711	0.00931	0.00221	0.0314	0.0567	0.00934	0.0580	0.00733	0.0147	0.00858
	Total Mercury (Hg)	mg/L	0.000026	-	-	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	-	-	-	-	-
	Total Molybdenum (Mo)	mg/L	0.073	-	-	0.000911	0.00459	0.000420	0.00118	0.00163	0.00250	0.00587	0.000618	0.00518	0.00141	0.00124	0.000459
	Total Nickel (Ni)	mg/L	0.025 - 0.15[i]	-	-	0.000960	0.000990	0.00177	0.00111	0.000900	<0.0005	0.00100	0.00145	0.00154	0.00120	0.00150	0.00201
	Total Phosphorus (P)	mg/L	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	0.0100	0.00520	<0.05	<0.05	<0.05	<0.05	<0.05
	Total Potassium (K)	mg/L	-	-	-	0.413	2.38	0.576	0.779	1.52	0.806	2.38	0.302	2.32	1.18	0.742	0.533
	Total Rubidium (Rb)	mg/L	-	-	-	<0.0002	0.000320	0.000440	0.000750	0.000520	<0.0002	0.000340	-	-	-	-	-
	Total Selenium (Se)	mg/L	0.0010	-	-	0.000261	0.000169	0.000133	0.0000670	0.000152	0.000734	0.000308	0.000261	0.000312	0.000143	0.0000980	0.000161
	Total Silicon (Si)	mg/L	-	-	-	5.80	3.76	5.33	5.76	5.61	6.08	6.90	7.16	6.56	6.77	7.18	5.92
	Total Silver (Ag)	mg/L	0.00025	-	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Total Sodium (Na)	mg/L	-	-	-	3.89	19.1	6.47	6.64	10.1	6.16	20.6	3.75	17.4	9.29	7.16	6.64
	Total Strontium (Sr)	mg/L	-	-	-	0.128	0.707	0.161	0.230	0.431	0.237	0.843	0.104	0.784	0.412	0.264	0.191
	Total Sulfur (S)	mg/L	-	-	-	3.04	11.1	4.40	4.23	6.82	7.52	20.7	3.17	18.4	7.22	4.59	4.45
	Total Tellurium (Te)	mg/L	-	-	-	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	-	-	-	-	-
	Total Thallium (Tl)	mg/L	0.00080	-	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Total Thorium (Th)	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	-	-	-	-
	Total Tin (Sn)	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.000120	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Total Titanium (Ti)	mg/L	-	-	-	<0.0009	0.000340	<0.0027	0.00174	<0.0006	0.000450	<0.006	0.00296	0.000480	<0.0024	0.00599	0.00231
	Total Tungsten (W)	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	-	-	-	-
	Total Uranium (U)	mg/L	0.015	0.033	-	0.000354	0.00278	0.000522	0.00233	0.00198	0.00108	0.00302	0.000199	0.00245	0.00136	0.00222	0.000682
	Total Vanadium (V)	mg/L	-	-	-	0.000550	<0.0005	0.00110	0.000840	0.000750	0.000690	0.000830	0.00104	0.000640	0.00113	0.00172	0.00152
	Total Zinc (Zn)	mg/L	-	-	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Total Zirconium (Zr)	mg/L	-	-	-	0.000409	0.000113	0.000548	0.000241	0.000149	<0.0002	<0.0002	0.000730	<0.0002	0.000230	0.000410	0.000580

Water quality guideline not met.

Water use licence objectives not met.

Notes: "-" = no applicable guidelines / no data available. Guidelines for 2018 and 2019 results can be found in Minnow 2019a and Minnow 2020.

[a] CCME (Canadian Council of Ministers of the Environment). 1999. Canadian Environmental Quality Guidelines. 1999 (plus updates), Canadian Council of Ministers of the Environment, Winnipeg. See Appendix Table B.5 for values and explanatory notes on selected water quality guidelines.

[b] Due to dry conditions at lower Minto Creek, only upper sites were sampled. at each area.

[c] Guideline based on field pH at each area. If pH < 6.5 = 5 µg/L and if pH ≥ 6 = 100 µg/L.

[d] Total cadmium long-term guideline is based on hardness (as $CaCO_3$). At hardness ≥ 17 to ≤ 280 mg/L, the equation is CWQG (µg/L) = $10^{\{0.83(\log[\text{hardness}]) - 2.46\}}$.

[e] Total cadmium short-term guideline is based on hardness at hardness (as $CaCO_3$). At hardness ≥ 5.3 to ≤ 360 mg/ the equation is CWQG (µg/L) = $10^{\{1.016(\log[\text{hardness}]) - 1.71\}}$.

[f] Total chromium guideline is for hexavalent chromium, Cr(VI).

[g] Total copper guideline is based on hardness and is calculated using the equation CWQG (µg/L) = 0.2 x $e^{\{0.8545[\ln(\text{hardness})]-1.465\}}$.

[h] Total lead guideline is based on hardness (as $CaCO_3$). At hardness 0 to ≤ 60 mg/L, the CWQG is 1 µg/L. At hardness >60 to ≤ 180 mg/L the equation is CWQG (µg/L)= $e^{\{(1.273[\ln[\text{hardness}]]-4.705)\}}$. At hardness >180 mg/L, the CWQG is 7 µg/L.

[i] Total nickel guideline is based on hardness (as $CaCO_3$). At hardness 0 to ≤ 60 mg/L, the CWQG is 25 µg/L. At hardness >60 to ≤ 180 mg/L the CWQG is calculated using the equation CWQG (µg/L) = $e^{\{0.76[\ln(\text{hardness})]+1.06\}}$. At hardness >180 mg/L, the CWQG is 150 µg/L.

[j] Dissolved cadmium (µg/L) objective is based on the following formula using hardness as mg/L $CaCO_3$: $e^{(0.736(\ln(\text{hardness}))-4.943)}$.

[k] Dissolved copper objective is based on dissolved organic carbon (DOC). If DOC is > 10 mg/L, objective is 0.02 mg/L Cu. If DOC ≤ 10 mg/L, objective is 0.013 mg/L Cu.

[l] Dissolved manganese long-term guideline is calculated using CCME benchmark calculator or look-up table. Values dependent on hardness and pH.

[m] Dissolved manganese short-term guideline is based on hardness and is calculated using the equation CWQG (µg/L) = $e^{(0.878[\ln(\text{hardness})] + 4.76)}$.

[n] Dissolved zinc long-term guideline is based on hardness and DOC. For hardness 13.8 to 250.5 mg/L and DOC 0.3 and 17.3 mg/L, the equation is CWQG (µg/L)= $e^{(0.833[\ln(\text{hardness mg/L})] + 0.240[\ln(\text{DOC mg/L})] + 0.526)}$.

[o] Dissolved zinc short-term benchmark is based on hardness, pH, and DOC. For pH between 6.5 and 8.13, DOC between 0.3 to 22.9 mg/L, and hardness between 23.4 and 399 mg/L, the equation is CWQG (µg/L) = $e^{(0.833[\ln(\text{hardness mg/L})] + 0.240[\ln(\text{DOC mg/L})] + 0.526)}$.

Table B.6: Comparison of Water Quality Results at Reference and Exposed Areas in 2018 to 2020, Minto Mine AEMP

Analyte		Units	CCME Water Quality Guidelines[a]		WUL Objectives at W2	2018					2019[b]		2020				
			Long-term	Short-term		Upper McGinty Creek (Reference)	Upper Minto Creek (Exposed)	Lower Wolverine Creek (Reference)	Lower Big Creek (Reference)	Lower Minto Creek (Exposed)	Upper McGinty Creek (Reference)	Upper Minto Creek (Exposed)	Upper McGinty Creek (Reference)	Upper Minto Creek (Exposed)	Lower Wolverine Creek (Reference)	Lower Big Creek (Reference)	Lower Minto Creek (Exposed)
Dissolved Metals	Dissolved Aluminum (Al)	mg/L	-	-	0.10	0.0249	<0.0020	0.0294	0.0156	<0.004	0.00450	0.00110	0.0693	0.00450	0.00810	0.0326	0.0401
	Dissolved Antimony (Sb)	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	0.000140	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.000140	<0.0001
	Dissolved Arsenic (As)	mg/L	-	-	0.0050	0.000390	0.000250	0.000430	0.000740	0.000450	0.000280	0.000210	0.000410	0.000270	0.000510	0.000730	0.000420
	Dissolved Barium (Ba)	mg/L	-	-	-	0.0281	0.0675	0.0300	0.0603	0.0585	0.0378	0.0668	0.0292	0.0577	0.0565	0.0586	0.0322
	Dissolved Beryllium (Be)	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00002	<0.00002	<0.00002	<0.00002	0.0000300
	Dissolved Bismuth (Bi)	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
	Dissolved Boron (B)	mg/L	-	-	-	<0.01	0.0220	<0.01	<0.01	<0.01	<0.01	0.0230	<0.01	0.0260	<0.01	<0.01	<0.01
	Dissolved Cadmium (Cd)	mg/L	-	-	0.000135 - 0.422[j]	<0.000005	0.00000620	0.00000520	0.00000640	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	0.00000610	<0.000005
	Dissolved Calcium (Ca)	mg/L	-	-	-	18.2	55.4	17.2	22.1	44.1	32.2	62.1	14.3	57.4	37.7	21.3	18.1
	Dissolved Cesium (Cs)	mg/L	-	-	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	-	-	-	-	-
	Dissolved Chromium (Cr)	mg/L	-	-	0.0010	0.000380	<0.0001	0.000480	0.000190	0.000190	0.000200	0.000110	0.000580	0.000230	0.000280	0.000380	0.000620
	Dissolved Cobalt (Co)	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Dissolved Copper (Cu)	mg/L	-	-	0.020[k]	0.00136	0.00279	0.00204	0.00190	0.00164	0.000440	0.00231	0.00276	0.00384	0.00215	0.00226	0.00222
	Dissolved Iron (Fe)	mg/L	-	-	1.1	0.185	0.0140	0.136	0.0320	0.0400	0.0930	<0.01	0.194	0.0230	0.0740	0.0640	0.148
	Dissolved Lead (Pb)	mg/L	-	-	0.0040	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.0000690	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
	Dissolved Lithium (Li)	mg/L	-	-	-	<0.001	0.00290	0.00140	0.00130	0.00150	<0.001	0.00310	<0.001	0.00270	0.00140	0.00130	0.00150
	Dissolved Magnesium (Mg)	mg/L	-	-	-	5.52	28.6	9.54	9.67	16.8	9.59	29.5	4.46	27.3	13.7	8.93	9.39
	Dissolved Manganese (Mn)	mg/L	0.35 - 0.64[l]	3.89 - 15.2[m]	-	0.0116	0.0372	0.00446	0.00669	0.000870	0.0287	0.0317	0.00874	0.0528	0.00620	0.00949	0.00592
	Dissolved Mercury (Hg)	mg/L	-	-	-	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	-	-	-	-	-
	Dissolved Molybdenum (Mo	mg/L	-	-	0.073	0.000883	0.00499	0.000445	0.00123	0.00167	0.00241	0.00562	0.000544	0.00486	0.00129	0.00111	0.000432
	Dissolved Nickel (Ni)	mg/L	-	-	0.11	0.000940	0.000920	0.00162	0.000880	0.000840	<0.0005	0.000920	0.00130	0.00140	0.00111	0.00118	0.00177
	Dissolved Phosphorus (P)	mg/L	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	0.00810	0.00430	<0.05	<0.05	<0.05	<0.05	<0.05
	Dissolved Potassium (K)	mg/L	-	-	-	0.407	2.25	0.547	0.776	1.49	0.793	2.42	0.297	2.32	1.22	0.717	0.527
	Dissolved Rubidium (Rb)	mg/L	-	-	-	<0.0002	0.000280	0.000330	0.000630	0.000500	<0.0002	0.000250	-	-	-	-	-
	Dissolved Selenium (Se)	mg/L	-	-	0.0020	0.000281	0.000326	0.0000770	0.0000710	0.000155	0.000640	0.000293	0.000202	0.000258	0.000147	0.0000730	0.000117
	Dissolved Silicon (Si)	mg/L	-	-	-	5.68	5.82	5.00	5.90	5.86	5.50	6.05	6.46	6.32	6.16	6.41	5.45
	Dissolved Silver (Ag)	mg/L	-	-	0.00010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Dissolved Sodium (Na)	mg/L	-	-	-	3.70	17.5	6.07	6.70	9.81	6.24	18.7	3.55	16.7	9.15	6.70	6.29
	Dissolved Strontium (Sr)	mg/L	-	-	-	0.124	0.770	0.155	0.250	0.457	0.248	0.858	0.0934	0.706	0.374	0.238	0.176
	Dissolved Sulfur (S)	mg/L	-	-	-	3.00	19.3	4.17	4.84	7.88	6.74	17.6	2.66	17.3	6.42	4.24	4.18
	Dissolved Tellurium (Te)	mg/L	-	-	-	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	-	-	-	-	-
	Dissolved Thallium (Tl)	mg/L	-	-	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Dissolved Thorium (Th)	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	-	-	-	-
	Dissolved Tin (Sn)	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Dissolved Titanium (Ti)	mg/L	-	-	-	0.000610	<0.0003	<0.0009	<0.0003	<0.0003	<0.0003	<0.0003	0.00128	<0.0003	0.000390	0.000610	0.000820
	Dissolved Tungsten (W)	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	-	-	-	-
	Dissolved Uranium (U)	mg/L	-	-	-	0.000348	0.00270	0.000483	0.00221	0.00192	0.00111	0.00299	0.000178	0.00214	0.00119	0.00194	0.000623
	Dissolved Vanadium (V)	mg/L	-	-	-	<0.0005	<0.0005	0.000880	0.000700	0.000590	<0.0005	<0.0005	0.000560	<0.0005	0.000640	0.000930	0.000980
	Dissolved Zinc (Zn)	mg/L	0.0294 - 0.125[n]	0.0933 - 0.298[o]	0.030	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Dissolved Zirconium (Zr)	mg/L	-	-	-	0.000396	0.0000900	0.000493	0.000241	0.000146	<0.0002	<0.0002	0.000710	<0.0002	0.000220	0.000400	0.000570

Water quality guideline not met.

Water use licence objectives not met.

Notes: "-" = no applicable guidelines / no data available. Guidelines for 2018 and 2019 results can be found in Minnow 2019a and Minnow 2020.

[a] CCME (Canadian Council of Ministers of the Environment). 1999. Canadian Environmental Quality Guidelines. 1999 (plus updates), Canadian Council of Ministers of the Environment, Winnipeg. See Appendix Table B.5 for values and explanatory notes on selected water quality guidelines.

[b] Due to dry conditions at lower Minto Creek, only upper sites were sampled. at each area.

[c] Guideline based on field pH at each area. If pH < 6.5 = 5 µg/L and if pH ≥ 6 = 100 µg/L.

[d] Total cadmium long-term guideline is based on hardness (as $CaCO_3$). At hardness ≥ 17 to ≤ 280 mg/L, the equation is CWQG (µg/L) = $10^{\{0.83(\log[\text{hardness}]) - 2.46\}}$.

[e] Total cadmium short-term guideline is based on hardness at hardness (as $CaCO_3$). At hardness ≥ 5.3 to ≤ 360 mg/ the equation is CWQG (µg/L) = $10^{\{1.016(\log[\text{hardness}]) - 1.71\}}$.

[f] Total chromium guideline is for hexavalent chromium, Cr(VI).

[g] Total copper guideline is based on hardness and is calculated using the equation CWQG (µg/L) = 0.2 x $e^{\{0.8545[\ln(\text{hardness})]-1.465\}}$.

[h] Total lead guideline is based on hardness (as $CaCO_3$). At hardness 0 to ≤ 60 mg/L, the CWQG is 1 µg/L. At hardness >60 to ≤ 180 mg/L the equation is CWQG (µg/L)= $e^{\{(1.273[\ln[\text{hardness}]]-4.705)\}}$. At hardness >180 mg/L, the CWQG is 7 µg/L.

[i] Total nickel guideline is based on hardness (as $CaCO_3$). At hardness 0 to ≤ 60 mg/L, the CWQG is 25 µg/L. At hardness >60 to ≤ 180 mg/L the CWQG is calculated using the equation CWQG (µg/L) = $e^{\{0.76[\ln(\text{hardness})]+1.06\}}$. At hardness >180 mg/L, the CWQG is 150 µg/L.

[j] Dissolved cadmium (µg/L) objective is based on the following formula using hardness as mg/L $CaCO_3$: $e^{\{0.736(\ln(\text{hardness}))-4.943\}}$.

[k] Dissolved copper objective is based on dissolved organic carbon (DOC). If DOC is > 10 mg/L, objective is 0.02 mg/L Cu. If DOC ≤ 10 mg/L, objective is 0.013 mg/L Cu.

[l] Dissolved manganese long-term guideline is calculated using CCME benchmark calculator or look-up table. Values dependent on hardness and pH.

[m] Dissolved manganese short-term guideline is based on hardness and is calculated using the equation CWQG (µg/L) = $e^{(0.878[\ln(\text{hardness})] + 4.76)}$.

[n] Dissolved zinc long-term guideline is based on hardness and DOC. For hardness 13.8 to 250.5 mg/L and DOC 0.3 and 17.3 mg/L, the equation is CWQG (µg/L)= $e^{(0.833[\ln(\text{hardness mg/L})] + 0.240[\ln(\text{DOC mg/L})] + 0.526)}$.

[o] Dissolved zinc short-term benchmark is based on hardness, pH, and DOC. For pH between 6.5 and 8.13, DOC between 0.3 to 22.9 mg/L, and hardness between 23.4 and 399 mg/L, the equation is CWQG (µg/L) = $e^{(0.833[\ln(\text{hardness mg/L})] + 0.240[\ln(\text{DOC mg/L})] + 0.526)}$.

Table B.7: Concentration of Chlorophyll-a Measured at Five Benthic Stations in Lower Wolverine and Lower Minto Creeks, Minto Mine AEMP, 2020

Lower Wolverine Creek (Reference)		Lower Minto Creek (Exposed)	
Station	mg/m^2	Station	mg/m^2
LWC-1	25.1	LMC-1	8.25
LWC-2	40.6	LMC-2	9.10
LWC-3	35.2	LMC-3	16.3
LWC-4	27.6	LMC-4	24.8
LWC-5	34.0	LMC-5	22.3
Mean	32.5	Mean	16.1
Standard Deviation	6.19	Standard Deviation	7.48
Standard Error	2.77	Standard Error	3.35

Chlorophyll-a exceeded the BCWQG of 100 mg/m^2.

Table B.8: Statistical Comparison on Chlorophyll-a, Minto Mine, 2012 to 2020[a]

Endpoint	ANOVA Model				Year	Do Endpoints Differ Between Years for Each Area?[b]		Do Endpoints Differ Between Areas?
	Transformation	Area	Year	Area x Year		LWC (Reference)	LMC (Exposed)	MOD (%)[c]
Chlorophyll-a	rank	<0.001	<0.001	<0.001	2012	CD	CD	-97
					2013	E	D	ns
					2014	DE	B	1,473
					2015	E	BC	8,352
					2016	A	A	ns
					2017	C	A	311
					2018	BC	A	478
					2020	AB	B	-52

P-value < 0.1.

Magnitude of Difference (MOD) < 0.

Magnitude of Difference (MOD) > 0.

Notes: "-" indicates no data for comparison, "ns" indicates a non-significant contrast. LWC = lower Wolverine Creek, LMC = lower Minto Creek.

[a] Sampling was not completed in 2019 due to dry conditions.

[b] Years that do not share a letter were significantly different from each other in a Tukey's Honestly Significant Difference post-hoc test (α = 0.1).

[c] MOD = $(MCT_{LMC}-MCT_{LWC})/MCT_{LWC}*100$; where the measures of central tendency (MCT) were medians because data were rank-transformed.

Table B.9: Stage Height and Total Discharge at Station W1 on Minto Creek, 2019 and 2020

Year	Date	Time	Total Discharge (m^3/s)	Staff Gauge/Stage (m)
2019	16-Apr-19	10:00	0.0265	0
	23-Apr-19	14:00	0.0388	0
	30-Apr-19	08:00	0.0244	0
	07-May-19	10:00	0.0412	0.200
	07-May-19	10:30	0.0340	0.200
	14-May-19	09:30	0.0472	0.230
	21-May-19	07:30	0.0481	0.250
	21-May-19	08:00	0.0435	0.250
	28-May-19	08:00	0.0171	0.230
	04-Jun-19	09:30	0.129	0.330
	11-Jun-19	08:00	0.00583	0.220
	18-Jun-19	07:30	0.00910	0.220
	18-Jun-19	07:30	0.00807	0.220
	22-Jun-19	17:00	0.00128	0.180
	25-Jun-19	09:00	0	0
	02-Jul-19	08:30	0	0
	16-Jul-19	07:30	0	0
2020	26-Apr-20	09:00	0.101	0.270
	03-May-20	10:00	0.519	0.475
	07-May-20	10:30	0.442	0.440
	12-May-20	17:00	0.167	0.275
	18-May-20	09:30	0.0219	0.155
	25-May-20	08:30	0.0224	0.150
	25-May-20	09:00	0.0226	0.150
	01-Jun-20	08:30	0.0257	0.160
	08-Jun-20	16:00	0.0295	0.160
	08-Jun-20	16:00	0.0296	0.160
	15-Jun-20	08:00	0.0117	0.140
	15-Jun-20	08:00	0.0122	0.140
	24-Jun-20	10:00	0.0123	0.140
	14-Sep-20	11:00	0.0245	0.165
	14-Sep-20	11:30	0.0274	0.165
	21-Sep-20	08:00	0.0208	0.159
	21-Sep-20	08:30	0.0241	0.159
	28-Sep-20	09:30	0.0206	0.160
	07-Oct-20	11:30	0.0583	0.193
	09-Oct-20	10:30	0.0133	0.190
	13-Oct-20	11:00	0.0335	0.165

Table B.10a: Monthly Temperature at Minto Mine Compared to Climate Normals

Month	Daily Average Temperature (°C)																	
	Canada Climate Normals	2012		2013		2014		2015		2016		2017		2018		2019		2020	
		Minto Mine	Difference from Normals	Minto Mine	Difference from Normals	Minto Mine	Difference from Normals	Minto Mine	Difference from Normals	Minto Mine	Difference from Normals	Minto Mine	Difference from Normals	Minto Mine	Difference from Normals	Minto Mine	Difference from Normals	Minto Mine	Difference from Normals
January	-24.9	-21.3	3.58	-16.9	8.05	-9.28	15.6	-15.8	9.10	-9.39	15.5	-17.8	7.10	-15.1	9.81	-17.0	7.89	-23.8	1.13
February	-19.5	-7.64	11.9	-10.2	9.28	-17.3	2.22	-13.7	5.79	-7.99	11.5	-11.5	8.02	-17.8	1.67	-17.2	2.34	-16.1	3.39
March	-10.6	-8.84	1.76	-9.63	0.974	-8.13	2.47	-6.34	4.26	-1.75	8.85	-13.5	-2.88	-7.47	3.13	-1.21	9.39	-11.5	-0.916
April	0.700	3.16	2.46	-5.18	-5.88	0.889	0.189	2.03	1.33	4.68	3.98	2.24	1.54	-0.576	-1.28	1.79	1.09	0.241	-0.459
May	8.30	6.51	-1.79	7.17	-1.13	9.60	1.30	13.1	4.84	10.1	1.82	8.26	-0.038	8.49	0.193	11.0	2.68	9.38	1.08
June	13.9	12.8	-1.12	15.8	1.88	12.1	-1.83	13.5	-0.405	14.1	0.204	13.0	-0.879	12.9	-0.955	14.8	0.933	11.6	-2.26
July	15.8	13.6	-2.23	15.4	-0.447	14.8	-1.02	14.2	-1.59	14.8	-1.03	15.8	0.00675	16.4	0.583	16.9	1.05	13.2	-2.62
August	12.8	12.8	0.0386	14.5	1.74	12.5	-0.284	10.8	-2.02	13.5	0.722	13.9	1.10	11.8	-0.973	11.8	-1.03	11.4	-1.44
September	6.50	7.18	0.676	6.73	0.233	5.94	-0.561	5.10	-1.40	7.32	0.825	8.57	2.07	6.17	-0.331	9.02	2.52	6.97	0.470
October	-2.50	-5.50	-3.00	1.35	3.85	-1.79	0.713	0.0920	2.59	-4.86	-2.36	-1.23	1.27	1.06	3.56	-1.35	1.15	-4.29	-1.79
November	-16.3	-19.0	-2.73	-14.3	1.99	-13.2	3.06	-11.5	4.80	-10.2	6.12	-18.3	-1.98	-10.5	5.80	-12.5	3.80	-14.5	1.81
December	-21.9	-23.4	-1.51	-21.0	0.934	-12.2	9.69	-14.4	7.52	-18.7	3.22	-11.2	10.7	-12.4	9.50	-	-	-12.7	9.22

Notes: Canada Climate Normals from 1981 to 2010 (Government of Canada 2021). Climate normals are from the Pelly Ranch weather station.

Table B10.b: Monthly Precipitation at Minto Mine Compared to Canada Climate Normals

Month	Total Precipitation (mm)																		
	Canada Climate Normals	2012		2013		2014		2015		2016		2017		2018		2019		2020	
		Minto Mine	Difference from Normals	Minto Mine	Difference from Normals	Minto Mine	Difference from Normals	Minto Mine	Difference from Normals	Minto Mine	Difference from Normals	Minto Mine	Difference from Normals	Minto Mine	Difference from Normals	Minto Mine	Difference from Normals	Minto Mine	Difference from Normals
January	19.7	9.05	-10.7	4.38	-15.3	16.9	-2.77	9.05	-10.7	9.05	-10.6	1.31	-18.4	7.01	-12.7	7.15	-12.5	8.18	-11.5
February	14.9	9.92	-4.98	73.8	58.9	49.2	34.3	6.86	-8.04	6.86	-8.04	0	-14.9	8.61	-6.29	7.74	-7.17	14.9	0
March	10.6	34.9	24.3	7.44	-3.16	0	-10.6	3.06	-7.54	2.63	-7.97	3.80	-6.80	14.6	4.00	1.17	-9.43	7.30	-3.30
April	8.90	0	-8.90	0	-8.90	3.79	-5.11	3.80	-5.11	14.7	5.84	7.01	-1.89	4.96	-3.94	4.96	-3.94	16.4	7.50
May	27.2	0.146	-27.1	7.88	-19.3	15.0	-12.2	6.28	-20.9	39.3	12.1	22.0	-5.17	6.86	-20.3	17.2	-10.0	12.1	-15.1
June	38.5	31.1	-7.42	21.0	-17.5	12.0	-26.5	18.7	-19.8	30.2	-8.29	40.0	1.48	38.5	0.0200	26.0	-12.5	25.7	-12.8
July	58.0	44.8	-13.2	114	55.5	50.5	-7.52	35.3	-22.7	74.7	16.7	42.3	-15.7	20.7	-37.3	27.0	-31.0	85.9	27.9
August	41.4	20.6	-20.8	46.8	5.44	13.4	-28.0	79.7	38.3	46.0	4.57	20.4	-21.0	76.8	35.4	23.1	-18.3	50.5	9.10
September	31.6	26.1	-5.49	59.7	28.1	30.5	-1.10	19.0	-12.6	18.5	-13.1	37.4	5.75	22.9	-8.69	18.0	-13.7	19.0	-12.6
October	24.5	16.5	-8.01	13.6	-10.9	22.0	-2.47	14.7	-9.76	6.71	-17.8	4.67	-19.8	8.47	-16.0	13.6	-10.9	20.3	-4.20
November	25.8	17.1	-8.73	36.6	10.8	2.92	-22.9	33.0	7.17	24.2	-1.57	7.88	-17.9	8.61	-17.2	12.1	-13.7	11.8	-14.0
December	19.4	18.4	-1.01	37.9	18.5	19.4	0.0120	9.49	-9.91	7.45	-12.0	4.67	-14.7	6.71	-12.7	-	-	20.3	-
Annual Total:	320.5	228.5		422.7		235.7		238.9		280.4		191.5		224.7		157.9		272.1	

Notes: Canada Climate Normals from 1981 to 2010 (Government of Canada 2021). Climate normals are from the Pelly Ranch weather station.

APPENDIX B

SUPPORTING INFORMATION AND DATA

Laboratory Reports

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000877**	Page	: 1 of 6
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 15-Sep-2020 14:20
PO	: 232817 (WUL)	Date Analysis Commenced	: 18-Sep-2020
C-O-C number	: 2020-09-15 F	Issue Date	: 24-Sep-2020 16:55
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 5		
No. of samples analysed	: 5		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Bruna Botti	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Clarie Tejano		Metals, Burnaby, British Columbia
Cristina Alexandre	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Qualifiers

Qualifier	*Description*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LWC	URC	UMC	LBC	LMC
					Client sampling date / time	13-Sep-2020 12:30	14-Sep-2020 08:00	14-Sep-2020 11:00	14-Sep-2020 12:20	14-Sep-2020 12:50
						WR2000877-001	WR2000877-002	WR2000877-003	WR2000877-004	WR2000877-005
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		166	42.0	234	86.7	75.4
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		166	42.0	234	86.7	75.4
conductivity	----	E100	2.0	µS/cm		1370	106	524	194	172
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		151	54.2	256	89.9	83.8
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		157	56.6	264	95.7	89.6
pH	----	E108	0.10	pH units		8.14	7.58	8.22	8.07	7.98
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		210	96.4	326	131	126
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	<3.0	5.1	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0059	<0.0050	<0.0050	<0.0050	0.0063
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		1.39	0.13	4.49	0.43	0.20
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.0096	0.0225	0.0437	0.0465	<0.0050
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		17.0	7.50	49.4	11.9	11.7
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		13.2	23.0	10.8	11.1	19.5
Ion Balance										
anion sum	----	EC101	0.10	meq/L		3.72	1.00	5.84	2.00	1.76
cation sum	----	EC101	0.10	meq/L		3.45	1.26	5.90	2.11	1.97
ion balance (cation-anion difference)	----	EC101	0.010	%		3.76	11.5	0.511	2.68	5.63
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.0458	0.0913	0.0096	0.142	0.0818
antimony, total	7440-36-0	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00018	0.00011
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00063	0.00055	0.00036	0.00096	0.00054
barium, total	7440-39-3	E420	0.00010	mg/L		0.0612	0.0337	0.0616	0.0660	0.0345
beryllium, total	7440-41-7	E420	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	0.000026
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LWC	URC	UMC	LBC	LMC
					Client sampling date / time	13-Sep-2020 12:30	14-Sep-2020 08:00	14-Sep-2020 11:00	14-Sep-2020 12:20	14-Sep-2020 12:50
						WR2000877-001	WR2000877-002	WR2000877-003	WR2000877-004	WR2000877-005
						Result	Result	Result	Result	Result
Total Metals										
boron, total	7440-42-8	E420	0.010	mg/L		<0.010	<0.010	0.021	<0.010	<0.010
cadmium, total	7440-43-9	E420	0.0000050	mg/L		<0.0000050	0.0000077	<0.0000100 DLM	0.0000142	0.0000054
calcium, total	7440-70-2	E420	0.050	mg/L		40.2	15.3	60.7	22.8	19.6
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00050	0.00071	0.00032	0.00067	0.00085
cobalt, total	7440-48-4	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00014	0.00011
copper, total	7440-50-8	E420	0.00050	mg/L		0.00266	0.00317	0.00444	0.00290	0.00261
iron, total	7439-89-6	E420	0.010	mg/L		0.135	0.263	0.031	0.220	0.225
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	0.000093	<0.000050
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0017	<0.0010	0.0030	0.0016	0.0017
magnesium, total	7439-95-4	E420	0.100	mg/L		13.8	4.44	27.4	9.40	9.86
manganese, total	7439-96-5	E420	0.00010	mg/L		0.00733	0.00934	0.0580	0.0147	0.00858
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.00141	0.000618	0.00518	0.00124	0.000459
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00120	0.00145	0.00154	0.00150	0.00201
phosphorus, total	7723-14-0	E420	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, total	7440-09-7	E420	0.100	mg/L		1.18	0.302	2.32	0.742	0.533
selenium, total	7782-49-2	E420	0.000050	mg/L		0.000143	0.000261	0.000312	0.000098	0.000161
silicon, total	7440-21-3	E420	0.10	mg/L		6.77	7.16	6.56	7.18	5.92
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, total	7440-23-5	E420	0.050	mg/L		9.29	3.75	17.4	7.16	6.64
strontium, total	7440-24-6	E420	0.00020	mg/L		0.412	0.104	0.784	0.264	0.191
sulfur, total	7704-34-9	E420	0.50	mg/L		7.22	3.17	18.4	4.59	4.45
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, total	7440-32-6	E420	0.00030	mg/L		<0.00240 DLM	0.00296	0.00048	0.00599	0.00231
uranium, total	7440-61-1	E420	0.000010	mg/L		0.00136	0.000199	0.00245	0.00222	0.000682
vanadium, total	7440-62-2	E420	0.00050	mg/L		0.00113	0.00104	0.00064	0.00172	0.00152
zinc, total	7440-66-6	E420	0.0030	mg/L		<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
zirconium, total	7440-67-7	E420	0.00020	mg/L		0.00023	0.00073	<0.00020	0.00041	0.00058
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0081	0.0693	0.0045	0.0326	0.0401
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00014	<0.00010

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LWC	URC	UMC	LBC	LMC
					Client sampling date / time	13-Sep-2020 12:30	14-Sep-2020 08:00	14-Sep-2020 11:00	14-Sep-2020 12:20	14-Sep-2020 12:50
						WR2000877-001	WR2000877-002	WR2000877-003	WR2000877-004	WR2000877-005
						Result	Result	Result	Result	Result
Dissolved Metals										
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00051	0.00041	0.00027	0.00073	0.00042
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0565	0.0292	0.0577	0.0586	0.0322
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	0.000030
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		<0.010	<0.010	0.026	<0.010	<0.010
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	0.0000061	<0.0000050
calcium, dissolved	7440-70-2	E421	0.050	mg/L		37.7	14.3	57.4	21.3	18.1
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00028	0.00058	0.00023	0.00038	0.00062
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00215	0.00276	0.00384	0.00226	0.00222
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.074	0.194	0.023	0.064	0.148
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0014	<0.0010	0.0027	0.0013	0.0015
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		13.7	4.46	27.3	8.93	9.39
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.00620	0.00874	0.0528	0.00949	0.00592
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00129	0.000544	0.00486	0.00111	0.000432
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00111	0.00130	0.00140	0.00118	0.00177
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		1.22	0.297	2.32	0.717	0.527
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000147	0.000202	0.000258	0.000073	0.000117
silicon, dissolved	7440-21-3	E421	0.050	mg/L		6.16	6.46	6.32	6.41	5.45
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		9.15	3.55	16.7	6.70	6.29
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.374	0.0934	0.706	0.238	0.176
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		6.42	2.66	17.3	4.24	4.18
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		0.00039	0.00128	<0.00030	0.00061	0.00082
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00119	0.000178	0.00214	0.00194	0.000623
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00064	0.00056	<0.00050	0.00093	0.00098
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LWC	URC	UMC	LBC	LMC
					Client sampling date / time	13-Sep-2020 12:30	14-Sep-2020 08:00	14-Sep-2020 11:00	14-Sep-2020 12:20	14-Sep-2020 12:50
						WR2000877-001	WR2000877-002	WR2000877-003	WR2000877-004	WR2000877-005
						Result	Result	Result	Result	Result
Dissolved Metals										
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		0.00022	0.00071	<0.00020	0.00040	0.00057
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WR2000877**	Page	: 1 of 17
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 15-Sep-2020 14:20
PO	: 232817 (WUL)	Issue Date	: 24-Sep-2020 16:56
C-O-C number	: 2020-09-15 F		
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 5		
No. of samples analysed	: 5		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- Method Blank value outliers occur - please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **Water**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Method Blank (MB) Values								
Total Metals	QC-MRG2-8928200 1	----	manganese, total	7439-96-5	E420	0.00011 B mg/L	0.0001 mg/L	Blank result exceeds permitted value

Result Qualifiers

Qualifier	Description
B	*Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.*

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) LMC	E298	14-Sep-2020	----	----	----		20-Sep-2020	28 days	5 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (lab preserved) LBC	E298	14-Sep-2020	----	----	----		21-Sep-2020	3 days	6 days	× EHT
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (lab preserved) UMC	E298	14-Sep-2020	----	----	----		21-Sep-2020	3 days	6 days	× EHT
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (lab preserved) LWC	E298	13-Sep-2020	----	----	----		21-Sep-2020	3 days	7 days	× EHTL
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (lab preserved) URC	E298	14-Sep-2020	----	----	----		21-Sep-2020	3 days	7 days	× EHT
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE LWC	E235.Cl-L	13-Sep-2020	----	----	----		19-Sep-2020	28 days	5 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE LBC	E235.Cl-L	14-Sep-2020	----	----	----		20-Sep-2020	28 days	6 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE LMC	E235.Cl-L	14-Sep-2020	----	----	----		20-Sep-2020	28 days	6 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE UMC	E235.Cl-L	14-Sep-2020	----	----	----		20-Sep-2020	28 days	6 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE URC	E235.Cl-L	14-Sep-2020	----	----	----		20-Sep-2020	28 days	6 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE LWC	E235.NO3-L	13-Sep-2020	----	----	----		19-Sep-2020	3 days	5 days	× EHTL
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE LBC	E235.NO3-L	14-Sep-2020	----	----	----		20-Sep-2020	3 days	6 days	× EHT
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE LMC	E235.NO3-L	14-Sep-2020	----	----	----		20-Sep-2020	3 days	6 days	× EHT
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE UMC	E235.NO3-L	14-Sep-2020	----	----	----		20-Sep-2020	3 days	6 days	× EHT
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE URC	E235.NO3-L	14-Sep-2020	----	----	----		20-Sep-2020	3 days	6 days	× EHT
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE LWC	E235.NO2-L	13-Sep-2020	----	----	----		19-Sep-2020	3 days	5 days	× EHTL

Matrix: **Water**

Evaluation: ✖ = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE LBC	E235.NO2-L	14-Sep-2020	----	----	----		20-Sep-2020	3 days	6 days	✖ EHT
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE LMC	E235.NO2-L	14-Sep-2020	----	----	----		20-Sep-2020	3 days	6 days	✖ EHT
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE UMC	E235.NO2-L	14-Sep-2020	----	----	----		20-Sep-2020	3 days	6 days	✖ EHT
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE URC	E235.NO2-L	14-Sep-2020	----	----	----		20-Sep-2020	3 days	6 days	✖ EHT
Anions and Nutrients : Sulfate in Water by IC										
HDPE LWC	E235.SO4	13-Sep-2020	----	----	----		19-Sep-2020	28 days	5 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE LBC	E235.SO4	14-Sep-2020	----	----	----		20-Sep-2020	28 days	6 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE LMC	E235.SO4	14-Sep-2020	----	----	----		20-Sep-2020	28 days	6 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE UMC	E235.SO4	14-Sep-2020	----	----	----		20-Sep-2020	28 days	6 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE URC	E235.SO4	14-Sep-2020	----	----	----		20-Sep-2020	28 days	6 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) LBC	E421.Cr-L	14-Sep-2020	21-Sep-2020	180 days	6 days	✓	21-Sep-2020	173 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) LMC	E421.Cr-L	14-Sep-2020	21-Sep-2020	180 days	6 days	✓	21-Sep-2020	173 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) LWC	E421.Cr-L	13-Sep-2020	21-Sep-2020	180 days	7 days	✓	21-Sep-2020	172 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) UMC	E421.Cr-L	14-Sep-2020	21-Sep-2020	180 days	7 days	✓	21-Sep-2020	172 days	0 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) URC	E421.Cr-L	14-Sep-2020	21-Sep-2020	180 days	7 days	✓	21-Sep-2020	172 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) LBC	E421	14-Sep-2020	21-Sep-2020	180 days	6 days	✓	21-Sep-2020	173 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) LMC	E421	14-Sep-2020	21-Sep-2020	180 days	6 days	✓	21-Sep-2020	173 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) LWC	E421	13-Sep-2020	21-Sep-2020	180 days	7 days	✓	21-Sep-2020	172 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) UMC	E421	14-Sep-2020	21-Sep-2020	180 days	7 days	✓	21-Sep-2020	172 days	0 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) URC	E421	14-Sep-2020	21-Sep-2020	180 days	7 days	✓	21-Sep-2020	172 days	0 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) LMC	E358-L	14-Sep-2020	----	----	----		20-Sep-2020	28 days	5 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) LBC	E358-L	14-Sep-2020	----	----	----		20-Sep-2020	3 days	5 days	× EHT
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) UMC	E358-L	14-Sep-2020	----	----	----		20-Sep-2020	3 days	5 days	× EHT
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) LWC	E358-L	13-Sep-2020	----	----	----		20-Sep-2020	3 days	6 days	× EHTL
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved) URC	E358-L	14-Sep-2020	----	----	----		20-Sep-2020	3 days	6 days	× EHT
Physical Tests : Alkalinity Species by Titration										
HDPE LBC	E290	14-Sep-2020	----	----	----		18-Sep-2020	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE LMC	E290	14-Sep-2020	----	----	----		18-Sep-2020	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE UMC	E290	14-Sep-2020	----	----	----		18-Sep-2020	14 days	4 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE URC	E290	14-Sep-2020	----	----	----		18-Sep-2020	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE LWC	E290	13-Sep-2020	----	----	----		19-Sep-2020	14 days	5 days	✓
Physical Tests : Conductivity in Water										
HDPE LBC	E100	14-Sep-2020	----	----	----		18-Sep-2020	28 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE LMC	E100	14-Sep-2020	----	----	----		18-Sep-2020	28 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE UMC	E100	14-Sep-2020	----	----	----		18-Sep-2020	28 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE URC	E100	14-Sep-2020	----	----	----		18-Sep-2020	28 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE LWC	E100	13-Sep-2020	----	----	----		19-Sep-2020	28 days	5 days	✓
Physical Tests : pH by Meter										
HDPE LBC	E108	14-Sep-2020	----	----	----		18-Sep-2020	0.25 hrs	100 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE LMC	E108	14-Sep-2020	----	----	----		18-Sep-2020	0.25 hrs	100 hrs	× EHTR-FM

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : pH by Meter										
HDPE UMC	E108	14-Sep-2020	----	----	----		18-Sep-2020	0.25 hrs	102 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE URC	E108	14-Sep-2020	----	----	----		18-Sep-2020	0.25 hrs	105 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE LWC	E108	13-Sep-2020	----	----	----		19-Sep-2020	0.25 hrs	139 hrs	× EHTR-FM
Physical Tests : TSS by Gravimetry										
HDPE LBC	E160-H	14-Sep-2020	----	----	----		18-Sep-2020	7 days	4 days	✓
Physical Tests : TSS by Gravimetry										
HDPE LWC	E160-H	13-Sep-2020	----	----	----		18-Sep-2020	7 days	4 days	✓
Physical Tests : TSS by Gravimetry										
HDPE UMC	E160-H	14-Sep-2020	----	----	----		18-Sep-2020	7 days	4 days	✓
Physical Tests : TSS by Gravimetry										
HDPE URC	E160-H	14-Sep-2020	----	----	----		18-Sep-2020	7 days	4 days	✓
Physical Tests : TSS by Gravimetry										
HDPE LMC	E160-H	14-Sep-2020	----	----	----		20-Sep-2020	7 days	5 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) LMC	E420.Cr-L	14-Sep-2020	----	----	----		23-Sep-2020	180 days	8 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) LBC	E420.Cr-L	14-Sep-2020	----	----	----		23-Sep-2020	180 days	9 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) LWC	E420.Cr-L	13-Sep-2020	----	----	----		23-Sep-2020	180 days	9 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) UMC	E420.Cr-L	14-Sep-2020	----	----	----		23-Sep-2020	180 days	9 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) URC	E420.Cr-L	14-Sep-2020	----	----	----		23-Sep-2020	180 days	9 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) LMC	E420	14-Sep-2020	----	----	----		23-Sep-2020	180 days	8 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) LBC	E420	14-Sep-2020	----	----	----		23-Sep-2020	180 days	9 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) LWC	E420	13-Sep-2020	----	----	----		23-Sep-2020	180 days	9 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) UMC	E420	14-Sep-2020	----	----	----		23-Sep-2020	180 days	9 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) URC	E420	14-Sep-2020	----	----	----		23-Sep-2020	180 days	9 days	✓

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	88013	2	12	16.6	5.0	✓
Ammonia by Fluorescence	E298	88540	2	8	25.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	88001	2	7	28.5	5.0	✓
Conductivity in Water	E100	88012	2	12	16.6	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	89094	1	14	7.1	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	89093	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	88536	1	8	12.5	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	88000	2	25	8.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	87997	2	17	11.7	5.0	✓
pH by Meter	E108	88014	2	15	13.3	5.0	✓
Sulfate in Water by IC	E235.SO4	87995	2	21	9.5	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	89283	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	89282	2	19	10.5	5.0	✓
TSS by Gravimetry	E160-H	88008	4	76	5.2	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	88013	2	12	16.6	5.0	✓
Ammonia by Fluorescence	E298	88540	2	8	25.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	88001	2	7	28.5	5.0	✓
Conductivity in Water	E100	88012	2	12	16.6	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	89094	1	14	7.1	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	89093	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	88536	1	8	12.5	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	88000	2	25	8.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	87997	2	17	11.7	5.0	✓
pH by Meter	E108	88014	2	15	13.3	5.0	✓
Sulfate in Water by IC	E235.SO4	87995	2	21	9.5	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	89283	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	89282	1	19	5.2	5.0	✓
TSS by Gravimetry	E160-H	88008	4	76	5.2	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	88013	2	12	16.6	5.0	✓
Ammonia by Fluorescence	E298	88540	2	8	25.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	88001	2	7	28.5	5.0	✓
Conductivity in Water	E100	88012	2	12	16.6	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	89094	1	14	7.1	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	89093	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	88536	1	8	12.5	5.0	✓

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Method Blanks (MB) - Continued							
Nitrate in Water by IC (Low Level)	E235.NO3-L	88000	2	25	8.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	87997	2	17	11.7	5.0	✓
Sulfate in Water by IC	E235.SO4	87995	2	21	9.5	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	89283	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	89282	1	19	5.2	5.0	✓
TSS by Gravimetry	E160-H	88008	4	76	5.2	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	88540	2	8	25.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	88001	2	7	28.5	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	89094	1	14	7.1	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	89093	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	88536	1	8	12.5	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	88000	2	25	8.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	87997	2	17	11.7	5.0	✓
Sulfate in Water by IC	E235.SO4	87995	2	21	9.5	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	89283	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	89282	1	19	5.2	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
TSS by Gravimetry	E160-H Vancouver - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
Chloride in Water by IC (Low Level)	E235.Cl-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Vancouver - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Metals in Water by CRC ICPMS	E420 Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Vancouver - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	“Hardness (as CaCO3), dissolved” is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. “Total Hardness” refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Hardness (Calculated) from Total Ca/Mg	EC100A Vancouver - Environmental	Water	APHA 2340B	“Hardness (as CaCO3), from total Ca/Mg” is calculated from the sum of total Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. “Total Hardness” refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations. Hardness from total Ca/Mg is normally comparable to Dissolved Hardness in non-turbid waters.
Ion Balance using Dissolved Metals	EC101 Vancouver - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
TDS in Water (Calculation)	EC103 Vancouver - Environmental	Water	APHA 1030E (mod)	Total Dissolved Solids is calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.

QUALITY CONTROL REPORT

Work Order	: **WR2000877**	Page	: 1 of 17
Client	: Minto Explorations Ltd.	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 15-Sep-2020 14:20
PO	: 232817 (WUL)	Date Analysis Commenced	: 18-Sep-2020
C-O-C number	: 2020-09-15 F	Issue Date	: 24-Sep-2020 16:55
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 5		
No. of samples analysed	: 5		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Bruna Botti	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Clarie Tejano		Metals, Burnaby, British Columbia
Cristina Alexandre	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 88008)											
VA20B5182-001	Anonymous	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	35.3	41.5	16.1%	20%	----
Physical Tests (QC Lot: 88012)											
WR2000876-002	Anonymous	conductivity	----	E100	2.0	µS/cm	245	244	0.409%	10%	----
Physical Tests (QC Lot: 88013)											
WR2000876-002	Anonymous	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	123	125	1.61%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	123	125	1.61%	20%	----
Physical Tests (QC Lot: 88014)											
WR2000876-002	Anonymous	pH	----	E108	0.10	pH units	8.10	8.09	0.124%	4%	----
Physical Tests (QC Lot: 88093)											
VA20B5593-003	Anonymous	pH	----	E108	0.10	pH units	7.96	7.95	0.126%	4%	----
Physical Tests (QC Lot: 88094)											
VA20B5593-003	Anonymous	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	128	129	0.934%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	2.0	mg/L	128	129	0.934%	20%	----
Physical Tests (QC Lot: 88095)											
VA20B5593-003	Anonymous	conductivity	----	E100	2.0	µS/cm	367	368	0.272%	10%	----
Physical Tests (QC Lot: 88223)											
VA20B5300-002	Anonymous	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	154	147	4.79%	20%	----
Physical Tests (QC Lot: 88354)											
VA20B5431-013	Anonymous	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	<3.0	4.9	1.9	Diff <2x LOR	----
Physical Tests (QC Lot: 88796)											
VA20B5434-002	Anonymous	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	4.6	<3.0	1.6	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 87995)											
VA20B5493-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	8.72	8.72	0.00937%	20%	----
Anions and Nutrients (QC Lot: 87997)											

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Anions and Nutrients (QC Lot: 87997) - continued											
VA20B5493-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 88000)											
WR2000876-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.0248	0.0255	0.0007	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 88001)											
WR2000876-002	Anonymous	chloride	16887-00-6	E235.Cl-L	0.10	mg/L	0.29	0.29	0.003	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 88087)											
VA20B5593-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 88088)											
VA20B5593-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	36.8	36.8	0.188%	20%	----
Anions and Nutrients (QC Lot: 88089)											
VA20B5593-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 88092)											
WR2000873-001	Anonymous	chloride	16887-00-6	E235.Cl-L	0.50	mg/L	1.66	1.69	0.03	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 88540)											
VA20B5587-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 88659)											
WR2000877-001	LWC	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0059	<0.0050	0.0009	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 88536)											
VA20B5587-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	0.94	0.78	0.17	Diff <2x LOR	----
Total Metals (QC Lot: 89282)											
WR2000875-001	Anonymous	silver, total	7440-22-4	E420	0.000010	mg/L	0.000052	0.000038	0.000014	Diff <2x LOR	----
WR2000875-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.130	0.131	0.608%	20%	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	0.00036	0.00032	0.00005	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00436	0.00451	3.30%	20%	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.0194	0.0203	4.70%	20%	----
		beryllium, total	7440-41-7	E420	0.000020	mg/L	0.000065	0.000073	0.000008	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.010	mg/L	0.147	0.154	4.99%	20%	----
		cadmium, total	7440-43-9	E420	0.0000050	mg/L	0.0000413	0.0000457	0.0000044	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.050	mg/L	135	139	3.24%	20%	----
		cobalt, total	7440-48-4	E420	0.00010	mg/L	0.00025	0.00026	0.000005	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00050	mg/L	0.0579	0.0623	7.31%	20%	----
		iron, total	7439-89-6	E420	0.010	mg/L	1.88	1.93	2.62%	20%	----
		lead, total	7439-92-1	E420	0.000050	mg/L	0.000840	0.000869	3.40%	20%	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0184	0.0192	4.19%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Total Metals (QC Lot: 89282) - continued											
WR2000875-001	Anonymous	magnesium, total	7439-95-4	E420	0.100	mg/L	43.2	44.6	3.16%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.0480	0.0487	1.60%	20%	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00252	0.00260	3.10%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.00054	0.00055	0.000010	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E420	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.100	mg/L	3.40	3.53	3.56%	20%	----
		selenium, total	7782-49-2	E420	0.000050	mg/L	0.000070	0.000055	0.000015	Diff <2x LOR	----
		silicon, total	7440-21-3	E420	0.10	mg/L	8.07	8.49	5.02%	20%	----
		sodium, total	7440-23-5	E420	0.050	mg/L	90.2	92.4	2.40%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	7.23	7.51	3.81%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	97.4	101	3.92%	20%	----
		thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	0.00010	0.0000002	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	0.0100	0.00973	3.02%	20%	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.00785	0.00819	4.24%	20%	----
		vanadium, total	7440-62-2	E420	0.00050	mg/L	0.00082	0.00084	0.00003	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	0.0150	0.0156	0.0006	Diff <2x LOR	----
		zirconium, total	7440-67-7	E420	0.00020	mg/L	0.00025	0.00026	0.000010	Diff <2x LOR	----
Total Metals (QC Lot: 89283)											
WR2000875-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00069	0.00069	0.000002	Diff <2x LOR	----
Dissolved Metals (QC Lot: 89093)											
VA20B5354-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0102	0.0101	0.866%	20%	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00474	0.00467	1.46%	20%	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.0298	0.0294	1.11%	20%	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0380	0.0378	0.502%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	0.0000298	0.0000282	0.0000016	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	46.2	46.2	0.00423%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	0.00013	0.00013	0.000005	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00171	0.00170	0.00002	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	0.015	0.016	0.0009	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	0.000058	0.000008	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0159	0.0157	1.27%	20%	----
		magnesium, dissolved	7439-95-4	E421	0.100	mg/L	13.4	13.3	0.962%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 89093) - continued											
VA20B5354-001	Anonymous	manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00946	0.00934	1.30%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00184	0.00187	1.20%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00144	0.00146	0.00002	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.100	mg/L	3.17	3.11	1.99%	20%	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.000462	0.000448	0.000014	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	3.46	3.47	0.231%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	7440-23-5	E421	0.050	mg/L	3.66	3.58	2.33%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.230	0.229	0.460%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	25.8	25.9	0.130%	20%	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00334	0.00337	0.988%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 89094)											
VA20B5354-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 88008)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Physical Tests (QCLot: 88012)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 88013)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	1.3	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	1.3	----
Physical Tests (QCLot: 88094)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 88095)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 88223)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Physical Tests (QCLot: 88354)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Physical Tests (QCLot: 88796)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Anions and Nutrients (QCLot: 87995)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 87997)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 88000)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 88001)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 88087)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Anions and Nutrients (QCLot: 88088)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 88089)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 88092)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 88540)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 88659)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Organic / Inorganic Carbon (QCLot: 88536)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 89282)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	# 0.00011	B
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	7440-23-5	E420	0.05	mg/L	<0.050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 89282) - continued						
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	<0.00020	----
Total Metals (QCLot: 89283)						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 89093)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 89093) - continued						
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----
Dissolved Metals (QCLot: 89094)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----

Qualifiers

Qualifier	Description
B	*Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.*

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 88008)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	90.5	85.0	115	----
Physical Tests (QCLot: 88012)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	101	90.0	110	----
Physical Tests (QCLot: 88013)									
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	229 mg/L	99.6	75.0	125	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	99.3	85.0	115	----
Physical Tests (QCLot: 88014)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 88093)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 88094)									
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	229 mg/L	106	75.0	125	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	97.7	85.0	115	----
Physical Tests (QCLot: 88095)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	99.1	90.0	110	----
Physical Tests (QCLot: 88223)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	92.5	85.0	115	----
Physical Tests (QCLot: 88354)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	93.2	85.0	115	----
Physical Tests (QCLot: 88796)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	102	85.0	115	----
Anions and Nutrients (QCLot: 87995)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 87997)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	98.2	90.0	110	----
Anions and Nutrients (QCLot: 88000)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	99.5	90.0	110	----
Anions and Nutrients (QCLot: 88001)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	99.7	90.0	110	----
Anions and Nutrients (QCLot: 88087)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 88088)									

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Anions and Nutrients (QCLot: 88088) - continued									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 88089)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 88092)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 88540)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.12 mg/L	99.6	85.0	115	----
Anions and Nutrients (QCLot: 88659)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.12 mg/L	96.4	85.0	115	----
Organic / Inorganic Carbon (QCLot: 88536)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	104	80.0	120	----
Total Metals (QCLot: 89282)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	103	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	108	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	100	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	94.4	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	102	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	97.4	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	104	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	99.3	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	103	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	104	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	100	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	98.8	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	95.1	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	98.2	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	100	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	102	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	113	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	104	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	104	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	102	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	105	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 89282) - continued									
sodium, total	7440-23-5	E420	0.05	mg/L	50 mg/L	109	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	107	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	96.4	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	101	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	103	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	97.9	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	99.1	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	105	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	102	80.0	120	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.1 mg/L	99.0	80.0	120	----
Total Metals (QCLot: 89283)									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
Dissolved Metals (QCLot: 89093)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	104	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	101	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	103	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	105	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	98.6	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	102	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	120	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	105	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	101	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	101	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	102	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	103	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	98.8	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	108	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	105	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	103	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	101	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	105	70.0	130	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	104	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	102	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	100	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	98.9	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 89093) - continued									
sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	108	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	109	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	102	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	102	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	99.5	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	99.6	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	102	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	103	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	101	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	100.0	80.0	120	----
Dissolved Metals (QCLot: 89094)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	105	80.0	120	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 87995)										
VA20B5565-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	503 mg/L	500 mg/L	101	75.0	125	----
Anions and Nutrients (QCLot: 87997)										
VA20B5565-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	2.47 mg/L	2.5 mg/L	98.7	75.0	125	----
Anions and Nutrients (QCLot: 88000)										
WR2000877-002	URC	nitrate (as N)	14797-55-8	E235.NO3-L	2.53 mg/L	2.5 mg/L	101	75.0	125	----
Anions and Nutrients (QCLot: 88001)										
WR2000877-002	URC	chloride	16887-00-6	E235.Cl-L	101 mg/L	100 mg/L	101	75.0	125	----
Anions and Nutrients (QCLot: 88087)										
VA20B5593-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.65 mg/L	2.5 mg/L	106	75.0	125	----
Anions and Nutrients (QCLot: 88088)										
VA20B5593-002	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	104 mg/L	100 mg/L	104	75.0	125	----
Anions and Nutrients (QCLot: 88089)										
VA20B5593-002	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.516 mg/L	0.5 mg/L	103	75.0	125	----
Anions and Nutrients (QCLot: 88092)										
WR2000877-001	LWC	chloride	16887-00-6	E235.Cl-L	97.9 mg/L	100 mg/L	97.9	75.0	125	----
Anions and Nutrients (QCLot: 88540)										
VA20B5589-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.198 mg/L	0.2 mg/L	99.2	75.0	125	----
Anions and Nutrients (QCLot: 88659)										
WR2000877-002	URC	ammonia, total (as N)	7664-41-7	E298	0.211 mg/L	0.2 mg/L	106	75.0	125	----
Organic / Inorganic Carbon (QCLot: 88536)										
VA20B5589-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	10.1 mg/L	10 mg/L	101	70.0	130	----
Total Metals (QCLot: 89282)										
WR2000875-002	Anonymous	aluminum, total	7429-90-5	E420	0.208 mg/L	0.2 mg/L	104	70.0	130	----
		antimony, total	7440-36-0	E420	0.0222 mg/L	0.02 mg/L	111	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0208 mg/L	0.02 mg/L	104	70.0	130	----
		barium, total	7440-39-3	E420	0.0207 mg/L	0.02 mg/L	103	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0371 mg/L	0.04 mg/L	92.7	70.0	130	----
		bismuth, total	7440-69-9	E420	0.00946 mg/L	0.01 mg/L	94.6	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 89282) - continued										
WR2000875-002	Anonymous	boron, total	7440-42-8	E420	ND mg/L	0.1 mg/L	ND	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00411 mg/L	0.004 mg/L	103	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0203 mg/L	0.02 mg/L	102	70.0	130	----
		copper, total	7440-50-8	E420	0.0196 mg/L	0.02 mg/L	97.9	70.0	130	----
		iron, total	7439-89-6	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		lead, total	7439-92-1	E420	0.0189 mg/L	0.02 mg/L	94.4	70.0	130	----
		lithium, total	7439-93-2	E420	0.0957 mg/L	0.1 mg/L	95.7	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0212 mg/L	0.02 mg/L	106	70.0	130	----
		nickel, total	7440-02-0	E420	0.0394 mg/L	0.04 mg/L	98.6	70.0	130	----
		phosphorus, total	7723-14-0	E420	11.4 mg/L	10 mg/L	114	70.0	130	----
		potassium, total	7440-09-7	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		selenium, total	7782-49-2	E420	0.0450 mg/L	0.04 mg/L	112	70.0	130	----
		silicon, total	7440-21-3	E420	8.30 mg/L	10 mg/L	83.0	70.0	130	----
		silver, total	7440-22-4	E420	0.00421 mg/L	0.004 mg/L	105	70.0	130	----
		sodium, total	7440-23-5	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	ND mg/L	20 mg/L	ND	70.0	130	----
		thallium, total	7440-28-0	E420	0.00394 mg/L	0.004 mg/L	98.5	70.0	130	----
		tin, total	7440-31-5	E420	0.0219 mg/L	0.02 mg/L	110	70.0	130	----
		titanium, total	7440-32-6	E420	0.0441 mg/L	0.04 mg/L	110	70.0	130	----
		uranium, total	7440-61-1	E420	ND mg/L	0.004 mg/L	ND	70.0	130	----
		vanadium, total	7440-62-2	E420	0.108 mg/L	0.1 mg/L	108	70.0	130	----
		zinc, total	7440-66-6	E420	0.394 mg/L	0.4 mg/L	98.6	70.0	130	----
		zirconium, total	7440-67-7	E420	0.0434 mg/L	0.04 mg/L	108	70.0	130	----
Total Metals (QCLot: 89283)										
WR2000875-002	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.0414 mg/L	0.04 mg/L	103	70.0	130	----
Dissolved Metals (QCLot: 89093)										
VA20B5376-001	Anonymous	aluminum, dissolved	7429-90-5	E421	2.30 mg/L	2 mg/L	115	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.205 mg/L	0.2 mg/L	102	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.202 mg/L	0.2 mg/L	101	70.0	130	----
		barium, dissolved	7440-39-3	E421	0.205 mg/L	0.2 mg/L	103	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.0879 mg/L	0.1 mg/L	87.9	70.0	130	----
		boron, dissolved	7440-42-8	E421	ND mg/L	1 mg/L	ND	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 89093) - continued										
VA20B5376-001	Anonymous	cadmium, dissolved	7440-43-9	E421	0.0384 mg/L	0.04 mg/L	95.9	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	40 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.187 mg/L	0.2 mg/L	93.4	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.174 mg/L	0.2 mg/L	86.9	70.0	130	----
		iron, dissolved	7439-89-6	E421	19.2 mg/L	20 mg/L	96.0	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.187 mg/L	0.2 mg/L	93.6	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	10 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	0.203 mg/L	0.2 mg/L	102	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.204 mg/L	0.2 mg/L	102	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.354 mg/L	0.4 mg/L	88.6	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	121 mg/L	100 mg/L	121	70.0	130	----
		potassium, dissolved	7440-09-7	E421	ND mg/L	40 mg/L	ND	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.392 mg/L	0.4 mg/L	98.0	70.0	130	----
		silicon, dissolved	7440-21-3	E421	96.4 mg/L	100 mg/L	96.4	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.0387 mg/L	0.04 mg/L	96.8	70.0	130	----
		sodium, dissolved	7440-23-5	E421	ND mg/L	20 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.2 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	ND mg/L	200 mg/L	ND	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.0368 mg/L	0.04 mg/L	91.9	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.201 mg/L	0.2 mg/L	100	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.418 mg/L	0.4 mg/L	104	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.0389 mg/L	0.04 mg/L	97.3	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	1.04 mg/L	1 mg/L	104	70.0	130	----
		zinc, dissolved	7440-66-6	E421	3.80 mg/L	4 mg/L	94.9	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.425 mg/L	0.4 mg/L	106	70.0	130	----
Dissolved Metals (QCLot: 89094)										
VA20B5376-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.396 mg/L	0.4 mg/L	99.0	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number: 2020-09-15 F

Page 1 of 1

Environmental Division Whitehorse
Work Order Reference
WR2000877

Telephone : +1 867 668 6689

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Michelle Olesh

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: mintoenvironment@mintomine.com
Email 2: pstecko@minnow.ca
Email 3:

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: ap@mintomine.com
Email 2:

Select Service Level Below - Please confirm all E&P TA

Regular [R] ☑ Standard TAT if r

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐ | EMERGENCY

Date and Time Required for all E&P TATs

For tests that can not be performed according to the se

Analy

Project Information

ALS Account # / Quote #:
Job #:
PO / AFE: 232817 (WUL)
LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: | PO#
Major/Minor Code: | Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only):
ALS Contact: Shane Stack | Sampler:

Indicate Filtered (F), Preserved (P) or Filt

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	pH / Conductivity / Alkalinity / Anions	Total Suspended Solids (TSS)	Total Disolved Solids (TDS)	Total Metals (TM), Hardness	Dissolved Metals (DM)(filtered and preserve	Total Mercury, Hardness	Dissolved Mercury [1] (Filtered + preserved)	Total Nutrients (Ammonia)	Dissolved Organic Carbon (DOC)	Number of Containers
					P	F/P		P	F/P					
	LWC ✓	13-Sep-20	12:30	Water	R	R	R	R	R			R	R	5
	URC ✓	14-Sep-20	8:00	Water	R	R	R	R	R			R	R	5
	UMC	14-Sep-20	11:00	Water	R	R	R	R	R			R	R	
	LBC	14-Sep-20	12:20	Water	R	R	R	R	R			R	R	
	LMC	14-Sep-20	12:50	Water	R	R	R	R	R			R	R	

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO
Are samples for human drinking water use? ☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ | SIF Observations Yes ☐ No ☐
Ice Packs ☐ | Ice Cubes ☐ | Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
7	4	4	8	9	5	3	7

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
				Sept 15/20	14:20			

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

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1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number: 2020-09-15 F

Page 1 of 1

Environmental Division Whitehorse
Work Order Reference
WR2000877

Telephone : +1 867 668 5669

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Michelle Olesh

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: mintoenvironment@mintomine.com
Email 2: pstecko@minnow.ca
Email 3:

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: ap@mintomine.com
Email 2:

Project Information

ALS Account # / Quote #:
Job #:
PO / AFE: 232817 (WUL)
LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#:
Major/Minor Code: Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only)

ALS Contact: Shane Stack **Sampler:**

Select Service Level Below - Please confirm all E&P TA
Regular [R] ☑ Standard TAT if r
PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐ — EMERGENCY
Date and Time Required for all E&P TATs
For tests that can not be performed according to the se
Analy
Indicate Filtered (F), Preserved (P) or Filt

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	pH / Conductivity / Alkalinity / Anions	Total Suspended Solids (TSS)	Total Dissolved Solids (TDS)	Total Metals (TM), Hardness	Dissolved Metals (DM)(filtered and preserve	Total Mercury, Hardness	Dissolved Mercury [1] (Filtered + preserved)	Total Nutrients (Ammonia)	Dissolved Organic Carbon (DOC)	Number of Containers
	LWC ✓	13-Sep-20	12:30	Water	R	R	R	R	R			R	R	5
	URC ✓	14-Sep-20	8:00	Water	R	R	R	R	R			R	R	5
	UMC	14-Sep-20	11:00	Water	R	R	R	R	R			R	R	
	LBC	14-Sep-20	12:20	Water	R	R	R	R	R			R	R	
	LMC	14-Sep-20	12:50	Water	R	R	R	R	R			R	R	

Drinking Water (DW) Samples[1] (client use)

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Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C						FINAL COOLER TEMPERATURES °C					
7	1	4	1	8	1	9	5	1	3	7	1	8

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by: JC 7°C ice pack	Date: SEP 16 2020	Time: 2pm

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

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ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number: 2020-09-15 F

Page 1 of 1

Environmental Division
Whitehorse
Work Order Reference
WR2000877

Telephone : +1 867 668 6669

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Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
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City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Michelle Olesh

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Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
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Email 2: pstecko@minnow.ca
Email 3:

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: ap@mintomine.com
Email 2:

Project Information

ALS Account # / Quote #:
Job #:
PO / AFE: 232817 (WUL)
LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#
Major/Minor Code: Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only):

ALS Contact: Shane Stack Sampler:

Select Service Level Below - Please confirm all E&P TA

Regular [R] ☑ Standard TAT if r

PRIORITY (Business Days): 4 day [P4] ☐ / 3 day [P3] ☐ / 2 day [P2] ☐ — EMERGENCY

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the se

Analy

Indicate Filtered (F), Preserved (P) or Filt

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	pH / Conductivity / Alkalinity / Anions	Total Suspended Solids (TSS)	Total Dissolved Solids (TDS)	Total Metals (TM), Hardness	Dissolved Metals (DM)(filtered and preserve	Total Mercury, Hardness	Dissolved Mercury [1] (Filtered + preserved)	Total Nutrients (Ammonia)	Dissolved Organic Carbon (DOC)	Number of Containers
								P	F/P	P	F/P			
	LWC ✓	13-Sep-20	12:30	Water	R	R	R	R	R			R	R	5
	URC ✓	14-Sep-20	8:00	Water	R	R	R	R	R			R	R	5
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	LBC	14-Sep-20	12:20	Water	R	R	R	R	R			R	R	
	LMC	14-Sep-20	12:50	Water	R	R	R	R	R			R	R	

Drinking Water (DW) Samples[1] (client use)

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Are samples for human drinking water use? ☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
7	14	4	8	9	5	3	7

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
				Sept 15/20	14:20	JC 7°C ice pack	SEP 16 2020	2pm

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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OCTOBER 2015 FRONT

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1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000901**	Page	: 1 of 3
Client	: **Minnow Environmental Inc.**	Laboratory	: Whitehorse - Environmental
Contact	: Lisa Bowron	Account Manager	: Heather McKenzie
Address	: 204 – 1006 Fort Street Victoria BC Canada V8V 3K4	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: 250 595 1627	Telephone	: +1 867 668 6689
Project	: Minnow Project 20-70	Date Samples Received	: 18-Sep-2020 11:45
PO	: ----	Date Analysis Commenced	: 25-Oct-2020
C-O-C number	:	Issue Date	: 03-Nov-2020 14:32
Sampler	: Pierre Stecko		
Site	: ----		
Quote number	: Q75875		
No. of samples received	: 10		
No. of samples analysed	: 10		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Caitlin Macey	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
µg	micrograms

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Analytical Results

Sub-Matrix: **Tissue**
(Matrix: **Biota**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LWC-1	LWC-2	LWC-3	LWC-4	LWC-5
					Client sampling date / time	13-Sep-2020	12-Sep-2020	12-Sep-2020	12-Sep-2020	12-Sep-2020
						WR2000901-001	WR2000901-002	WR2000901-003	WR2000901-004	WR2000901-005
						Result	Result	Result	Result	Result
Plant Pigments										
chlorophyll a	479-61-8	E870	0.010	µg		50.2	81.2	70.3	55.2	67.9

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Tissue**
(Matrix: **Biota**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LMC-1	LMC-2	LMC-3	LMC-4	LMC-5
					Client sampling date / time	14-Sep-2020	14-Sep-2020	11-Sep-2020	11-Sep-2020	11-Sep-2020
						WR2000901-006	WR2000901-007	WR2000901-008	WR2000901-009	WR2000901-010
						Result	Result	Result	Result	Result
Plant Pigments										
chlorophyll a	479-61-8	E870	0.010	µg		16.5	18.2	32.6	49.5	44.6

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WR2000901**	Page	: 1 of 6
Client	: **Minnow Environmental Inc.**	Laboratory	: Whitehorse - Environmental
Contact	: Lisa Bowron	Account Manager	: Heather McKenzie
Address	: 204 – 1006 Fort Street Victoria BC Canada V8V 3K4	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: 250 595 1627	Telephone	: +1 867 668 6689
Project	: Minnow Project 20-70	Date Samples Received	: 18-Sep-2020 11:45
PO	: ----	Issue Date	: 03-Nov-2020 14:32
C-O-C number	:		
Sampler	: Pierre Stecko		
Site	: ----		
Quote number	: Q75875		
No. of samples received	: 10		
No. of samples analysed	: 10		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Plant Pigments : Chlorophyll-a by Fluorometry										
Opaque HDPE tube LMC-1	E870	14-Sep-2020	25-Oct-2020	28 days	40 days	× EHT	25-Oct-2020	28 days	0 days	✓
Plant Pigments : Chlorophyll-a by Fluorometry										
Opaque HDPE tube LMC-2	E870	14-Sep-2020	25-Oct-2020	28 days	40 days	× EHT	25-Oct-2020	28 days	0 days	✓
Plant Pigments : Chlorophyll-a by Fluorometry										
Opaque HDPE tube LWC-1	E870	13-Sep-2020	25-Oct-2020	28 days	41 days	× EHT	25-Oct-2020	28 days	0 days	✓
Plant Pigments : Chlorophyll-a by Fluorometry										
Opaque HDPE tube LWC-2	E870	12-Sep-2020	25-Oct-2020	28 days	42 days	× EHT	25-Oct-2020	28 days	0 days	✓
Plant Pigments : Chlorophyll-a by Fluorometry										
Opaque HDPE tube LWC-3	E870	12-Sep-2020	25-Oct-2020	28 days	42 days	× EHT	25-Oct-2020	28 days	0 days	✓
Plant Pigments : Chlorophyll-a by Fluorometry										
Opaque HDPE tube LWC-4	E870	12-Sep-2020	25-Oct-2020	28 days	42 days	× EHT	25-Oct-2020	28 days	0 days	✓
Plant Pigments : Chlorophyll-a by Fluorometry										
Opaque HDPE tube LWC-5	E870	12-Sep-2020	25-Oct-2020	28 days	42 days	× EHT	25-Oct-2020	28 days	0 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Plant Pigments : Chlorophyll-a by Fluorometry										
Opaque HDPE tube LMC-3	E870	11-Sep-2020	25-Oct-2020	28 days	43 days	× EHT	25-Oct-2020	28 days	0 days	✓
Plant Pigments : Chlorophyll-a by Fluorometry										
Opaque HDPE tube LMC-4	E870	11-Sep-2020	25-Oct-2020	28 days	43 days	× EHT	25-Oct-2020	28 days	0 days	✓
Plant Pigments : Chlorophyll-a by Fluorometry										
Opaque HDPE tube LMC-5	E870	11-Sep-2020	25-Oct-2020	28 days	43 days	× EHT	25-Oct-2020	28 days	0 days	✓

Legend & Qualifier Definitions

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Biota**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Control Samples (LCS)							
Chlorophyll-a by Fluorometry	E870	95123	1	10	10.0	5.0	✓
Method Blanks (MB)							
Chlorophyll-a by Fluorometry	E870	95123	1	10	10.0	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Chlorophyll-a by Fluorometry	E870 Vancouver - Environmental	Biota	EPA 445.0 (mod)	Chlorophyll-a is determined by a routine acetone/ethanol extraction followed with analysis by fluorometry using the non-acidification procedure.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Chlorophyll-a Extraction	EP870 Vancouver - Environmental	Biota	EPA 445.0 (mod)	Chlorophyll-a is determined by a routine acetone/ethanol extraction followed with analysis by fluorometry using the non-acidification procedure.

QUALITY CONTROL REPORT

Work Order	: **WR2000901**	Page	: 1 of 2
Client	: Minnow Environmental Inc.	Laboratory	: Whitehorse - Environmental
Contact	: Lisa Bowron	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: 250 595 1627	Telephone	: +1 867 668 6689
Project	: Minnow Project 20-70	Date Samples Received	: 18-Sep-2020 11:45
PO	: ----	Date Analysis Commenced	: 25-Oct-2020
C-O-C number	:	Issue Date	: 03-Nov-2020 14:32
Sampler	: Pierre Stecko		
Site	: ----		
Quote number	: Q75875		
No. of samples received	: 10		
No. of samples analysed	: 10		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Caitlin Macey	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Biota**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Plant Pigments (QCLot: 95123)						
chlorophyll a	479-61-8	E870	0.01	µg	<0.010	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Biota**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Plant Pigments (QCLot: 95123)									
chlorophyll a	479-61-8	E870	0.01	µg	1 µg	110	80.0	120	----

ALS Environmental

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

COC # _____

Page 1 of 1

Report To		Report Format / Distribution				Service Requested (Rush for routine analysis subject to availability)
Company:	Minnow Environmental Inc.	☑ Standard	☐ Other			◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Pierre Stecko	☑ PDF	☑ Excel	☐ Digital	☐ Fax	○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	204-1006 Fort Street	Email 1:	pstecko@minnow.ca			○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Victoria, BC	Email 2:	slatimer@minnow.ca			○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	(250)595-1627 x24 Fax: (250) 595-1625	Email 3:				
Invoice To	Same as Report ? ☐ Yes ☑ No	Client / Project Information				
Hardcopy of Invoice with Report?	☑ Yes ☐ No	Job #:	Minnow Project 20-70			
Company:	Minto Explorations Ltd	PO / AFE:				
Contact:	Todd Swenson	LSD:				
Address:	61 Wasson Place, Whitehorse, Yukon Y1A 0H7					
Phone:	604-759-4659 Fax:	Quote #:				
Lab Work Order # (lab use only)		ALS Contact:	Can Dang	Sampler:	Pierre Stecko ~~Lisa Bowron~~	

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Chlorophyll a	**See Complete Quote #054927	Number of Containers
1	LWC-1	13-Sep-20		Tissue	X		1
2	LWC-2	12-Sep-20		↓	X		1
3	LWC-3	12-Sep-20			X		1
4	LWC-4	12-Sep-20			X		1
5	LWC-5	12-Sep-20			X		1
6	LMC-1	14-Sep-20			X		1
7	LMC-2	14-Sep-20			X		1
8	LMC-3	11-Sep-20			X		1
9	LMC-4	11-Sep-20		↓	X		1
10	LMC-5	11-Sep-20		Tissue	X		1

Environmental Division
Whitehorse
Work Order Reference
WR2000901

Telephone : +1 867 668 6689

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Small samples. The critical analyte of interest is selenium; please ensure best possible MDLs. Periphyton samples.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)			SHIPMENT VERIFICATION (lab use only)			
Released by: S. Latimer	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
	18-Sep-20			Sept 10/20	11:45	4 °C	HA	9/9	2:10p	

5

APPENDIX C

SEDIMENT, PERIPHYTON, AND BENTHIC INVERTEBRATE QUALITY DATA

Tables

Laboratory Reports

APPENDIX C

SEDIMENT, PERIPHYTON AND BENTHIC INVERTEBRATE QUALITY DATA

Tables

Table C.1: Sediment Chemistry Data Collected at Reference and Exposed Areas, Minto Mine AEMP, 2020

Analyte		Units	CSQG[a]		Upper McGinty Creek (Reference)						Upper Minto Creek (Exposed)					
					URC-1	URC-2	URC-3	URC-4	URC-5	URC	UMC-1	UMC-2	UMC-3	UMC-4	UMC-5	UMC
			ISQG	PEL	13-Sep-20	13-Sep-20	13-Sep-20	14-Sep-20	14-Sep-20	14-Sep-20	14-Sep-20	14-Sep-20	10-Sep-20	10-Sep-20	10-Sep-20	14-Sep-20
Particle size, TKN, carbon analytes and pH	Loss on Ignition @ 550 °C	%	-	-	9.30	14.9	15.2	15.3	3.40	-	8.80	12.1	7.30	5.90	4.30	-
	pH (1:2 soil:water)	pH units	-	-	6.34	6.67	6.46	6.67	7.06	-	7.88	7.92	8.04	7.92	7.84	-
	Gravel (> 2 mm)	%	-	-	-	-	-	-	-	<1	-	-	-	-	-	1.20
	Sand (2.0mm - 0.063mm)	%	-	-	-	-	-	-	-	28.0	-	-	-	-	-	38.3
	Silt (0.063 mm - 4 µm)	%	-	-	-	-	-	-	-	63.8	-	-	-	-	-	51.8
	Clay (< 4 µm)	%	-	-	-	-	-	-	-	8.2	-	-	-	-	-	8.7
	Total Kjeldahl Nitrogen (TKN)	%	-	-	0.264	0.332	0.376	0.302	0.136	-	0.247	0.288	0.260	0.156	0.132	-
	Inorganic Carbon	%	-	-	0.111	0.150	0.156	0.141	0.0840	-	0.241	0.223	0.230	0.105	0.122	-
	Inorganic Carbon (as $CaCO_3$ Equivalent)	%	-	-	0.920	1.25	1.30	1.17	0.700	-	2.01	1.86	1.92	0.880	1.02	-
	Total Carbon by Combustion	%	-	-	4.98	6.54	7.26	5.89	2.75	-	4.54	4.98	4.25	2.54	2.84	-
	Total Organic Carbon	%	-	-	4.87	6.39	7.10	5.75	2.67	-	4.30	4.76	4.02	2.44	2.72	-
Total Metals	Aluminum (Al)	mg/kg	-	-	14,400	14,400	16,200	12,100	7,140	-	15,800	16,200	11,800	12,300	11,000	-
	Antimony (Sb)	mg/kg	-	-	0.420	0.460	0.520	0.430	0.390	-	0.510	0.550	0.510	0.470	0.440	-
	Arsenic (As)	mg/kg	5.9	17	6.50	5.59	5.54	4.58	4.41	-	7.66	7.25	6.10	5.91	5.31	-
	Barium (Ba)	mg/kg	-	-	250	254	278	217	115	-	470	608	579	193	178	-
	Beryllium (Be)	mg/kg	-	-	0.360	0.380	0.480	0.330	0.230	-	0.530	0.520	0.410	0.420	0.420	-
	Bismuth (Bi)	mg/kg	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2	<0.2	<0.2	<0.2	<0.2	-
	Boron (B)	mg/kg	-	-	<5	<5	<5	<5	<5	-	<5	5.20	<5	<5	<5	-
	Cadmium (Cd)	mg/kg	0.60	3.5	0.171	0.178	0.215	0.182	0.106	-	0.318	0.467	0.457	0.187	0.157	-
	Calcium (Ca)	mg/kg	-	-	8,440	8,840	10,000	8,060	5,230	-	10,300	12,500	11,000	9,160	7,890	-
	Chromium (Cr)	mg/kg	37.3	90	26.4	27.2	30.3	24.4	16.3	-	28.8	29.4	25.2	29.0	27.2	-
	Cobalt (Co)	mg/kg	-	-	10.4	9.32	10.8	8.60	6.36	-	14.1	15.1	13.0	9.82	9.63	-
	Copper (Cu)	mg/kg	35.7	197	25.0	25.8	29.8	23.9	14.0	-	249	351	268	87.7	108	-
	Iron (Fe)	mg/kg	-	-	23,300	22,500	23,800	20,100	16,000	-	29,600	28,800	23,700	22,200	22,200	-
	Lead (Pb)	mg/kg	35	91.3	4.94	5.06	5.71	4.46	3.39	-	6.27	6.62	5.66	5.48	5.36	-
	Lithium (Li)	mg/kg	-	-	7.40	7.60	8.50	6.80	4.80	-	9.80	10.0	7.60	8.30	7.20	-
	Magnesium (Mg)	mg/kg	-	-	4,580	4,830	5,370	4,190	3,160	-	8,130	8,210	6,620	6,930	6,240	-
	Manganese (Mn)	mg/kg	-	-	874	487	352	376	390	-	6,010	12,100	11,400	837	1,260	-
	Mercury (Hg)	mg/kg	0.17	0.49	<0.05	0.0514	0.0584	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	-
	Molybdenum (Mo)	mg/kg	-	-	0.540	0.780	0.540	0.630	0.460	-	2.44	6.52	6.50	0.920	1.13	-
	Nickel (Ni)	mg/kg	-	-	18.5	18.9	21.7	17.7	13.7	-	32.8	35.2	32.6	29.6	26.5	-
	Phosphorus (P)	mg/kg	-	-	875	817	979.0	790	626	-	1,100	1,050	969.0	943.0	1,020	-
	Potassium (K)	mg/kg	-	-	740	770	810	700	480	-	1,770	1,720	1,280	1,160	1,180	-
	Selenium (Se)	mg/kg	2.0	-	0.410	0.720	0.580	0.570	0.300	-	0.860	1.29	1.04	0.430	0.450	-
	Silver (Ag)	mg/kg	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	-	0.150	0.200	0.140	<0.1	<0.1	-
	Sodium (Na)	mg/kg	-	-	207	226	243	208	133	-	337	324	286	301	319	-
	Strontium (Sr)	mg/kg	-	-	70.2	74.1	72.4	66.9	40.4	-	126	189	162	105	93.9	-
	Sulfur	mg/kg	-	-	<1,000	<1,000	<1,000	<1,000	<1,000	-	<1,000	<1,000	<1,000	<1,000	<1,000	-
	Thallium (Tl)	mg/kg	-	-	0.0740	0.0710	0.0810	0.0670	<0.05	-	0.109	0.115	0.0920	0.0900	0.0760	-
	Tin (Sn)	mg/kg	-	-	<2	<2	<2	<2	<2	-	<2	<2	<2	<2	<2	-
	Titanium (Ti)	mg/kg	-	-	688	724	776	662	464	-	758	679	572	607	678	-
	Tungsten (W)	mg/kg	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	-
	Uranium (U)	mg/kg	-	-	1.21	1.50	1.57	1.38	0.863	-	1.17	1.27	0.982	0.888	0.724	-
	Vanadium (V)	mg/kg	-	-	50.6	51.4	57.9	48.4	36.9	-	58.2	59.2	53.6	49.4	51.6	-
	Zinc (Zn)	mg/kg	123	315	47.8	48.2	54.8	43.8	32.1	-	78.3	84.7	70.8	56.6	55.5	-
	Zirconium (Zr)	mg/kg	-	-	1.80	2.40	3.40	2.40	2.00	-	2.70	2.30	1.80	3.20	2.70	-

Indicates sediment concentration exceeding CSQG ISQG.

Indicates sediment concentration exceeding CSQG PEL.

Notes: CSQG = Canadian Sediment Quality Guidelines; ISQG = interim sediment quality guideline; PEL = probable effect level; - = no guideline available or no data available.

[a] CSQG (CCME 1999 plus updates) and BC Sediment Quality Guideline for Selenium (BCMOE 2014).

Table C.1: Sediment Chemistry Data Collected at Reference and Exposed Areas, Minto Mine AEMP, 2020

Analyte		Units	CSQG[a]		Lower Wolverine Creek (Reference)					Lower Minto Creek (Exposed)				
					LWC-1	LWC-2	LWC-3	LWC-4	LWC-5	LMC-1	LMC-2	LMC-3	LMC-4	LMC-5
			ISQG	PEL	13-Sep-20	13-Sep-20	13-Sep-20	13-Sep-20	13-Sep-20	15-Sep-20	15-Sep-20	15-Sep-20	15-Sep-20	15-Sep-20
Particle size, TKN, carbon analytes and pH	Loss on Ignition @ 550 °C	%	-	-	12.8	4.80	8.40	12.0	14.0	9.60	13.1	8.30	9.10	5.20
	pH (1:2 soil:water)	pH units	-	-	7.54	7.11	6.97	6.86	6.56	8.01	8.00	7.98	7.83	7.88
	Gravel (> 2 mm)	%	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Sand (2.0mm - 0.063mm)	%	-	-	28.2	52.2	36.0	18.9	5.50	16.8	17.1	17.7	19.1	45.0
	Silt (0.063 mm - 4 µm)	%	-	-	66.1	43.3	58.6	73.4	87.4	70.9	72.7	72.3	70.7	48.0
	Clay (< 4 µm)	%	-	-	5.70	4.50	5.40	7.70	7.10	12.2	10.2	10.0	10.1	7.00
	Total Kjeldahl Nitrogen (TKN)	%	-	-	0.307	0.168	0.240	0.359	0.383	0.288	0.357	0.246	0.285	0.205
	Inorganic Carbon	%	-	-	0.168	0.102	0.128	0.154	0.162	0.181	0.200	0.157	0.179	0.138
	Inorganic Carbon (as $CaCO_3$ Equivalent)	%	-	-	1.40	0.850	1.06	1.28	1.35	1.50	1.67	1.31	1.49	1.15
	Total Carbon by Combustion	%	-	-	5.86	3.13	4.03	6.12	6.16	4.30	6.00	4.30	4.76	3.45
	Total Organic Carbon	%	-	-	5.69	3.03	3.90	5.97	6.00	4.12	5.80	4.14	4.58	3.31
Total Metals	Aluminum (Al)	mg/kg	-	-	16,500	13,900	16,000	17,400	18,400	16,500	17,900	13,900	13,000	10,600
	Antimony (Sb)	mg/kg	-	-	0.510	0.370	0.400	0.450	0.430	0.560	0.600	0.460	0.470	0.400
	Arsenic (As)	mg/kg	5.9	17	7.02	5.59	6.00	4.54	4.27	8.42	9.07	6.98	7.12	6.04
	Barium (Ba)	mg/kg	-	-	245	175	198	234	255	287	338	249	232	188
	Beryllium (Be)	mg/kg	-	-	0.850	0.590	0.660	0.710	0.790	0.480	0.580	0.440	0.430	0.380
	Bismuth (Bi)	mg/kg	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	Boron (B)	mg/kg	-	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
	Cadmium (Cd)	mg/kg	0.60	3.5	0.280	0.170	0.186	0.237	0.268	0.215	0.299	0.199	0.213	0.139
	Calcium (Ca)	mg/kg	-	-	12,100	7,570	8,330	9,600	9,320	10,600	13,200	9,680	9,180	7,070
	Chromium (Cr)	mg/kg	37.3	90	46.9	39.0	45.2	48.7	51.2	34.6	36.2	29.4	29.3	25.0
	Cobalt (Co)	mg/kg	-	-	14.2	12.1	13.1	12.8	13.5	11.4	12.6	10.5	9.99	9.02
	Copper (Cu)	mg/kg	35.7	197	30.2	20.3	23.0	32.0	31.8	61.8	71.8	48.3	47.3	38.1
	Iron (Fe)	mg/kg	-	-	28,400	25,100	26,600	27,400	32,500	28,000	29,600	24,300	26,000	23,200
	Lead (Pb)	mg/kg	35	91.3	6.31	4.99	5.68	6.42	6.98	6.46	6.86	5.50	5.27	4.69
	Lithium (Li)	mg/kg	-	-	10.3	8.80	10.2	11.0	11.6	11.4	11.7	9.60	9.30	7.90
	Magnesium (Mg)	mg/kg	-	-	9,840	8,670	9,680	9,980	10,200	7,870	8,440	7,120	6,540	5,580
	Manganese (Mn)	mg/kg	-	-	785	480	630	219	221	1,240	1,700	1,070	1,120	847
	Mercury (Hg)	mg/kg	0.17	0.49	<0.05	<0.05	<0.05	<0.05	0.0504	<0.05	<0.05	<0.05	<0.05	<0.05
	Molybdenum (Mo)	mg/kg	-	-	0.610	0.550	0.480	0.810	0.480	0.810	0.900	0.690	0.740	0.640
	Nickel (Ni)	mg/kg	-	-	39.0	32.7	36.2	38.2	39.3	30.1	34.4	27.6	26.0	21.9
	Phosphorus (P)	mg/kg	-	-	1,100	1,030	1,070	1,040	1,090	997.0	985.0	980.0	828	721
	Potassium (K)	mg/kg	-	-	1,080	940.0	1,040	1,140	1,080	1,340	1,420	1,300	1,190	1,020
	Selenium (Se)	mg/kg	2.0	-	0.440	0.240	0.260	0.310	0.370	0.650	0.790	0.470	0.520	0.430
	Silver (Ag)	mg/kg	-	-	0.100	<0.1	<0.1	<0.1	<0.1	0.100	0.120	<0.1	<0.1	<0.1
	Sodium (Na)	mg/kg	-	-	399	383	414	426	393	298	295	315	262	257
	Strontium (Sr)	mg/kg	-	-	138	78.8	85.7	95.3	92.3	108	144	97.4	95.1	74.7
	Sulfur	mg/kg	-	-	<1,000	<1,000	<1,000	2,400	1,700	<1,000	<1,000	<1,000	<1,000	<1,000
	Thallium (Tl)	mg/kg	-	-	0.0820	0.0560	0.0770	0.0880	0.0970	0.101	0.106	0.0880	0.0830	0.0710
	Tin (Sn)	mg/kg	-	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	Titanium (Ti)	mg/kg	-	-	830	819	837	912.0	739	706	649	703	672	617
	Tungsten (W)	mg/kg	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Uranium (U)	mg/kg	-	-	3.71	1.76	2.06	2.77	2.49	1.09	1.43	1.10	1.11	0.837
	Vanadium (V)	mg/kg	-	-	72.4	64.0	67.8	71.8	67.5	61.4	60.5	54.1	58.4	53.0
	Zinc (Zn)	mg/kg	123	315	62.3	55.4	61.2	68.9	73.8	64.5	69.1	58.3	56.0	49.3
	Zirconium (Zr)	mg/kg	-	-	4.70	3.60	3.60	5.10	4.70	3.00	3.80	2.80	2.30	2.20

Indicates sediment concentration exceeding CSQG ISQG.

Indicates sediment concentration exceeding CSQG PEL.

Notes: CSQG = Canadian Sediment Quality Guidelines; ISQG = interim sediment quality guideline; PEL = probable effect level; - = no guideline available or no data available.

[a] CSQG (CCME 1999 plus updates) and BC Sediment Quality Guideline for Selenium (BCMOE 2014).

Table C.2: Periphyton Tissue Quality Results at Reference and Exposure Areas, Minto Mine AEMP, 2020

Analyte		Units	Lower Wolverine Creek (Reference)							Lower Big Creek (Reference)							Lower Minto Creek (Exposed)						
			LWC-1	LWC-2	LWC-3	LWC-4	LWC-5	Mean	Standard Deviation	LBC-1	LBC-2	LBC-3	LBC-4	LBC-5	Mean	Standard Deviation	LMC-1	LMC-2	LMC-3	LMC-4	LMC-5	Mean	Standard Deviation
Physical Tests	Moisture	%	65.6	72.4	82.9	78.8	84.9	76.9	7.93	60.6	79.6	84.3	89.2	64.1	75.6	12.6	74.9	64.2	77.1	72.2	72.2	72.1	4.88
Total Metals	Total Aluminum (Al)	mg/kg dw	13,900	13,400	14,000	13,800	12,700	13,560	532	8,760	13,300	10,900	13,300	9,960	11,244	2,024	4,470	13,900	9,210	4,900	4,530	7,402	4,141
	Total Antimony (Sb)	mg/kg dw	0.0570	0.0850	0.163	0.119	0.143	0.113	0.0429	0.149	0.374	0.374	0.605	0.137	0.328	0.193	0.302	0.0680	0.221	0.210	0.206	0.201	0.0843
	Total Arsenic (As)	mg/kg dw	3.71	3.85	4.69	4.88	4.48	4.32	0.517	7.20	11.8	11.2	18.4	8.66	11.5	4.31	16.3	7.33	12.1	11.1	8.22	11.0	3.55
	Total Barium (Ba)	mg/kg dw	154	157	163	169	153	159	6.72	204	190	156	197	138	177	28.5	1,980	257	646	765	342	798	693
	Total Beryllium (Be)	mg/kg dw	0.505	0.496	0.541	0.546	0.479	0.513	0.0291	0.291	0.440	0.381	0.462	0.330	0.381	0.0720	0.240	0.419	0.327	0.203	0.224	0.283	0.0897
	Total Bismuth (Bi)	mg/kg dw	0.0600	0.0600	0.0630	0.0700	0.0590	0.0624	0.00451	0.476	0.526	0.396	0.644	0.245	0.457	0.149	0.0480	0.0920	0.0790	0.0530	0.0540	0.0652	0.0192
	Total Boron (B)	mg/kg dw	5.10	4.80	11.3	13.0	9.80	8.80	3.69	2.70	5.40	3.90	7.30	2.40	4.34	2.03	18.4	5.40	15.1	26.8	16.0	16.3	7.66
	Total Cadmium (Cd)	mg/kg dw	0.121	0.130	0.149	0.160	0.138	0.140	0.0154	0.0950	0.158	0.144	0.188	0.123	0.142	0.0352	0.719	0.227	0.451	0.494	0.330	0.444	0.186
	Total Calcium (Ca)	mg/kg dw	6,460	6,420	6,840	6,500	6,890	6,622	224	6,400	7,360	6,480	8,440	5,470	6,830	1,121	12,300	10,200	11,600	12,200	18,600	12,980	3,251
	Total Cesium (Cs)	mg/kg dw	1.50	1.45	1.51	1.56	1.37	1.48	0.0719	1.18	1.97	1.74	2.32	1.49	1.74	0.437	0.329	1.04	0.737	0.386	0.409	0.580	0.303
	Total Chromium (Cr)	mg/kg dw	37.8	34.6	36.2	36.4	78.0	44.6	18.7	32.4	32.1	34.3	36.0	24.4	31.8	4.45	132	45.0	145	37.6	249	122	86.3
	Total Cobalt (Co)	mg/kg dw	9.18	8.89	9.37	10.1	9.14	9.34	0.460	5.60	8.00	6.87	7.55	6.12	6.83	0.988	38.1	9.31	18.4	21.2	11.5	19.7	11.4
	Total Copper (Cu)	mg/kg dw	15.5	16.2	19.8	19.7	19.2	18.1	2.06	13.5	21.3	17.0	24.8	14.0	18.1	4.86	38.6	33.3	42.6	46.6	59.1	44.0	9.75
	Total Iron (Fe)	mg/kg dw	20,700	20,000	21,800	23,100	20,300	21,180	1,272	19,400	20,200	19,400	20,200	16,200	19,080	1,659	12,300	22,700	19,200	12,200	12,800	15,840	4,831
	Total Lead (Pb)	mg/kg dw	4.32	4.19	4.22	4.39	4.37	4.30	0.0893	4.88	7.83	5.91	7.99	5.31	6.38	1.44	2.63	4.86	4.05	2.62	2.78	3.39	1.02
	Total Lithium (Li)	mg/kg dw	9.40	9.20	9.17	9.38	8.04	9.04	0.567	6.00	8.78	7.41	8.14	6.87	7.44	1.08	3.29	10.8	6.98	3.72	3.82	5.72	3.20
	Total Magnesium (Mg)	mg/kg dw	7,580	7,200	7,600	7,910	7,460	7,550	257	4,500	6,990	5,520	6,680	5,150	5,768	1,046	3,910	6,610	5,580	3,770	3,750	4,724	1,305
	Total Manganese (Mn)	mg/kg dw	549	613	644	807	745	672	104	287	472	441	517	320	407	99.3	30,300	1,600	9,600	12,600	4,640	11,748	11,214
	Total Mercury (Hg)	mg/kg dw	0.0390	0.0614	0.0428	0.0854	0.0491	0.0555	0.0187	0.0188	0.0738	0.0780	0.0397	0.0288	0.0478	0.0267	0.0259	0.0421	0.0477	0.0453	0.0362	0.0394	0.00871
	Total Molybdenum (Mo)	mg/kg dw	0.373	0.357	0.462	0.471	0.761	0.485	0.163	0.555	0.754	0.770	1.19	0.585	0.771	0.254	3.71	0.764	2.47	2.76	3.20	2.58	1.12
	Total Nickel (Ni)	mg/kg dw	25.0	24.2	26.1	29.1	27.2	26.3	1.92	14.8	25.6	19.9	23.5	18.5	20.5	4.24	34.7	24.5	30.3	23.6	24.2	27.5	4.87
	Total Phosphorus (P)	mg/kg dw	1,170	1,250	2,210	1,620	1,710	1,592	416	1,490	1,410	1,290	1,650	949.0	1,358	263	3,380	1,090	2,930	2,390	3,640	2,686	1,011
	Total Potassium (K)	mg/kg dw	1,370	1,620	3,000	1,980	2,200	2,034	628	1,100	2,530	2,170	3,860	1,350	2,202	1,095	4,760	2,130	5,130	4,470	7,160	4,730	1,795
	Total Rubidium (Rb)	mg/kg dw	12.1	11.6	13.7	12.4	11.7	12.3	0.846	7.38	13.8	12.0	17.4	9.59	12.0	3.86	5.00	12.4	9.46	5.78	6.80	7.89	3.03
	Total Selenium (Se)	mg/kg dw	0.520	0.640	1.22	1.05	1.04	0.894	0.298	0.200	0.520	0.550	0.780	0.250	0.460	0.238	2.16	0.860	1.98	1.64	1.96	1.72	0.516
	Total Sodium (Na)	mg/kg dw	428	378	583	366	524	456	94.5	336	554	476	699	328	479	156	295	313	450	272	486	363	97.6
	Total Strontium (Sr)	mg/kg dw	66.5	68.3	73.4	69.9	72.5	70.1	2.87	49.1	77.9	63.1	89.8	51.8	66.3	17.3	196	102	139	153	121	142	35.7
	Total Tellurium (Te)	mg/kg dw	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-	<0.02	0.0300	0.0380	0.0420	0.0220	0.0304	0.00942	0.0410	0.0210	0.0290	0.0280	<0.02	0.0278	0.00845
	Total Thallium (Tl)	mg/kg dw	0.0724	0.0736	0.0776	0.0831	0.0722	0.0758	0.00463	0.0593	0.102	0.0922	0.124	0.0784	0.0912	0.0244	0.0397	0.0995	0.0735	0.0449	0.0419	0.0599	0.0260
	Total Tin (Sn)	mg/kg dw	1.07	0.650	0.840	0.910	0.810	0.856	0.153	0.610	0.700	0.760	1.27	0.480	0.764	0.302	0.910	0.680	2.08	0.410	1.84	1.18	0.735
	Total Uranium (U)	mg/kg dw	0.804	0.751	0.836	0.835	0.740	0.793	0.0456	0.838	1.03	1.20	1.15	0.854	1.01	0.166	0.741	0.932	0.936	0.576	1.34	0.905	0.286
	Total Vanadium (V)	mg/kg dw	51.9	50.0	52.0	54.2	46.8	51.0	2.77	58.6	52.1	51.1	46.0	42.9	50.1	6.04	39.0	49.0	42.9	35.5	30.5	39.4	7.05
	Total Zinc (Zn)	mg/kg dw	46.3	44.1	50.7	47.8	43.6	46.5	2.90	34.8	51.2	46.6	55.4	38.1	45.2	8.67	89.8	52.1	70.6	52.1	66.9	66.3	15.6
	Total Zirconium (Zr)	mg/kg dw	8.79	7.38	8.10	8.33	8.41	8.20	0.522	4.95	6.55	5.76	7.32	4.86	5.89	1.05	3.84	8.92	6.51	3.85	3.99	5.42	2.26

Indicates periphyton tissue concentration exceeding the higher reference mean by more than two times.

Notes: - = no data available. dw = dry weight.

Table C.3: Benthic Tissue Quality Results at Reference and Exposure Areas, Minto Mine AEMP, 2020

Analyte		Units	Lower Wolverine Creek (Reference)							Lower Big Creek (Reference)							Lower Minto Creek (Exposed)						
			LWC-1	LWC-2	LWC-3	LWC-4	LWC-5	Mean	Standard Deviation	LBC-1	LBC-2	LBC-3	LBC-4	LBC-5	Mean	Standard Deviation	LMC-1	LMC-2	LMC-3	LMC-4	LMC-5	Mean	Standard Deviation
Physical Tests	Moisture	%	82.1	81.3	83.7	85.2	80.7	82.6	1.84	82.8	85.7	87.7	87.2	76.1	83.9	4.76	83.0	83.6	85.7	74.9	83.4	82.1	4.17
Total Metals	Total Aluminum (Al)	mg/kg dw	1,340	3,080	1,060	1,340	2,680	1,900	912.9	2,620	2,580	2,330	2,820	916.0	2,253	768	3,120	2,480	2,010	3,930	3,210	2,950	735
	Total Antimony (Sb)	mg/kg dw	0.0480	0.0780	0.0430	0.0390	0.0530	0.0522	0.0154	0.158	0.164	0.153	0.153	0.0900	0.144	0.0303	0.134	0.0880	0.0790	0.133	0.0910	0.105	0.0264
	Total Arsenic (As)	mg/kg dw	1.42	2.37	1.00	1.10	2.14	1.61	0.618	3.90	4.35	3.97	4.65	5.02	4.38	0.470	4.55	2.90	2.78	3.42	2.35	3.20	0.846
	Total Barium (Ba)	mg/kg dw	44.5	120	45.3	33.1	91.8	66.9	37.3	68.9	66.5	55.8	68.9	49.6	61.9	8.77	98.8	66.9	55.4	164	61.2	89.3	45.0
	Total Beryllium (Be)	mg/kg dw	0.0700	0.163	0.0660	0.0680	0.164	0.106	0.0523	0.141	0.136	0.112	0.112	0.0460	0.109	0.0379	0.114	0.0760	0.0670	0.135	0.0820	0.0948	0.0286
	Total Bismuth (Bi)	mg/kg dw	0.0110	0.0180	<0.01	<0.01	0.0110	0.0120	0.00343	0.0780	0.0880	0.0710	0.0840	0.0290	0.0700	0.0238	0.0270	0.0200	0.0170	0.0340	0.0200	0.0236	0.00688
	Total Boron (B)	mg/kg dw	1.00	1.60	<1	<1	1.80	1.28	0.427	1.10	1.10	1.20	<1	<1	1.08	0.0490	1.70	1.40	2.00	3.50	3.20	2.36	0.934
	Total Cadmium (Cd)	mg/kg dw	1.21	0.692	0.863	1.40	0.585	0.950	0.345	3.10	2.25	1.44	1.98	0.278	1.81	1.05	2.47	0.822	0.544	0.369	1.27	1.10	0.841
	Total Calcium (Ca)	mg/kg dw	2,250	2,290	1,930	3,570	4,140	2,836	962	4,040	3,440	3,630	3,500	1,080	3,138	1,174	3,580	3,130	2,710	2,960	3,960	3,268	500
	Total Cesium (Cs)	mg/kg dw	0.152	0.333	0.121	0.159	0.184	0.190	0.0831	0.426	0.451	0.379	0.492	0.150	0.380	0.135	0.265	0.210	0.178	0.295	0.568	0.303	0.155
	Total Chromium (Cr)	mg/kg dw	4.24	9.43	3.48	3.86	9.01	6.00	2.95	6.09	7.16	6.35	6.90	2.64	5.83	1.83	7.08	5.38	4.68	8.98	5.96	6.42	1.68
	Total Cobalt (Co)	mg/kg dw	1.74	3.19	1.26	2.06	3.69	2.39	1.02	3.82	3.59	2.68	3.25	1.14	2.90	1.07	2.58	1.88	1.70	3.61	2.24	2.40	0.755
	Total Copper (Cu)	mg/kg dw	27.7	24.5	19.4	36.3	25.2	26.6	6.19	66.1	62.1	32.6	51.2	22.1	46.8	19.0	19.4	19.1	19.9	41.7	25.0	25.0	9.63
	Total Iron (Fe)	mg/kg dw	2,240	4,960	1,920	2,210	5,170	3,300	1,618	4,360	4,100	4,180	4,410	1,670	3,744	1,166	5,520	4,400	3,700	7,370	4,710	5,140	1,407
	Total Lead (Pb)	mg/kg dw	0.607	1.12	0.519	0.553	0.827	0.725	0.251	2.10	2.00	2.00	1.79	0.734	1.72	0.565	1.52	1.08	1.02	1.62	1.19	1.29	0.269
	Total Lithium (Li)	mg/kg dw	1.04	2.19	0.730	0.900	2.06	1.38	0.687	1.88	1.72	1.66	2.10	0.610	1.59	0.576	2.60	1.91	1.55	2.95	2.19	2.24	0.553
	Total Magnesium (Mg)	mg/kg dw	1,900	2,860	1,770	2,030	3,250	2,362	654	2,510	2,450	2,520	2,760	1,710	2,390	398	2,330	1,880	1,820	2,770	2,000	2,160	394
	Total Manganese (Mn)	mg/kg dw	243	369	201	290	488	318	114	467	403	249	351	199	334	110	584	464	456	941.0	343	558	231
	Total Mercury (Hg)	mg/kg dw	0.0440	0.0420	0.0500	0.0420	0.0490	0.0454	0.00385	0.0600	0.0520	0.0460	0.0640	0.0460	0.0536	0.00817	0.0400	0.0220	0.0220	0.0350	0.0530	0.0344	0.0131
	Total Molybdenum (Mo)	mg/kg dw	0.653	0.590	0.525	0.688	0.506	0.592	0.0788	0.880	0.768	0.658	0.673	1.07	0.810	0.170	0.718	0.748	1.22	0.930	0.582	0.840	0.246
	Total Nickel (Ni)	mg/kg dw	3.60	8.23	2.95	3.17	6.63	4.92	2.38	6.44	7.62	5.82	6.65	3.16	5.94	1.68	6.89	4.80	5.03	10.1	5.06	6.38	2.24
	Total Phosphorus (P)	mg/kg dw	9,180	7,780	8,970	9,590	9,260	8,956	694	8,850	9,510	9,730	9,850	7,190	9,026	1,097	8,400	7,250	7,780	7,590	7,340	7,672	457
	Total Potassium (K)	mg/kg dw	7,970	10,500	7,660	7,370	9,520	8,604	1,346	7,760	8,850	8,900	9,220	7,520	8,450	758	8,690	6,470	9,010	12,500	7,270	8,788	2,319
	Total Rubidium (Rb)	mg/kg dw	5.55	5.79	3.88	6.89	4.77	5.38	1.13	10.0	8.48	7.53	9.31	4.69	8.00	2.07	4.73	3.82	3.66	4.21	3.85	4.05	0.428
	Total Selenium (Se)	mg/kg dw	4.11	2.31	3.65	5.08	2.93	3.62	1.07	3.40	3.81	2.76	3.29	0.980	2.85	1.11	3.71	1.76	1.78	3.22	4.94	3.08	1.35
	Total Sodium (Na)	mg/kg dw	3,110	2,720	3,180	3,190	2,830	3,006	217	3,370	3,540	3,340	3,520	2,760	3,306	318	3,840	2,400	4,770	2,980	3,760	3,550	903
	Total Strontium (Sr)	mg/kg dw	20.5	25.2	22.2	22.6	31.2	24.3	4.19	35.7	33.5	37.4	34.4	11.8	30.6	10.6	33.1	26.8	25.0	27.1	21.0	26.6	4.37
	Total Tellurium (Te)	mg/kg dw	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-
	Total Thallium (Tl)	mg/kg dw	0.0176	0.0227	0.0128	0.0218	0.0180	0.0186	0.00394	0.0590	0.0515	0.0390	0.0534	0.0130	0.0432	0.0184	0.0292	0.0213	0.0180	0.0297	0.0254	0.0247	0.00505
	Total Tin (Sn)	mg/kg dw	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	0.100	<0.1	<0.1	0.110	<0.1	0.102	0.00566	0.120	<0.1	<0.1	0.120	0.110	0.110	0.00600
	Total Uranium (U)	mg/kg dw	0.283	0.574	0.278	0.217	0.464	0.363	0.150	1.03	0.863	0.768	0.611	0.476	0.750	0.216	0.451	0.267	0.320	0.600	0.275	0.383	0.142
	Total Vanadium (V)	mg/kg dw	5.56	11.7	5.02	5.11	13.1	8.10	3.96	10.4	10.1	10.5	10.8	4.29	9.22	2.77	12.0	8.88	8.11	16.8	12.7	11.7	3.46
	Total Zinc (Zn)	mg/kg dw	162	178	170	151	178	168	11.5	212	154	174	210	120	174	38.9	135	116	91.0	198	88.7	126	44.7
	Total Zirconium (Zr)	mg/kg dw	1.44	3.10	1.34	1.26	2.05	1.84	0.771	2.74	2.44	2.27	2.18	0.730	2.07	0.780	2.45	1.90	1.83	2.71	2.58	2.29	0.403

Indicates benthic tissue concentration exceeding the higher reference mean by more than two times.

Indicates benthic tissue concentration exceeding the BCMOE interim selenium guideline for invertebrate tissue (4 µg/g dw; BCMOE 2014).

Notes: - = no data available. dw = dry weight.

APPENDIX C

SEDIMENT, PERIPHYTON AND BENTHIC INVERTEBRATE QUALITY DATA

Laboratory Reports

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000904**	Page	: 1 of 16
Client	: **Minnow Environmental Inc.**	Laboratory	: Whitehorse - Environmental
Contact	: Pierre Stecko	Account Manager	: Heather McKenzie
Address	: 204 – 1006 Fort Street Victoria BC Canada V8V 3K4	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: 250 595 1627	Telephone	: +1 867 668 6689
Project	: Minnow Project 20-70	Date Samples Received	: 18-Sep-2020 11:45
PO	: ----	Date Analysis Commenced	: 22-Sep-2020
C-O-C number	:	Issue Date	: 13-Oct-2020 18:00
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 32		
No. of samples analysed	: 32		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Dwayne Bennett	Technical Specialist	Inorganics, Saskatoon, Saskatchewan
Hedy Lai	Team Leader - Inorganics	Inorganics, Saskatoon, Saskatchewan
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Nancy Cruse	Laboratory _ Supervisor	Inorganics, Saskatoon, Saskatchewan
Ophelia Chiu	Supervisor - Organics Instrumentation	Organics, Burnaby, British Columbia
Xihua Yao	Laboratory Analyst	Inorganics, Saskatoon, Saskatchewan

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
%	percent
mg/kg	milligrams per kilogram
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Qualifiers

Qualifier	*Description*
DLHC	*Detection Limit Raised: Dilution required due to high concentration of test analyte(s).*

Analytical Results

Sub-Matrix: **Sediment**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	UMC-1	UMC-2	UMC-3	UMC-4	UMC-5
					Client sampling date / time	14-Sep-2020	14-Sep-2020	10-Sep-2020	10-Sep-2020	10-Sep-2020
						WR2000904-001	WR2000904-002	WR2000904-003	WR2000904-004	WR2000904-005
						Result	Result	Result	Result	Result
Physical Tests										
loss on ignition @ 420°C	----	E205C	1.0	%		8.8	12.1	7.3	5.9	4.3
pH (1:2 soil:water)	----	E108	0.10	pH units		7.88	7.92	8.04	7.92	7.84
Organic / Inorganic Carbon										
carbon, total [TC]	----	E351	0.050	%		4.54	4.98	4.25	2.54	2.84
carbon, inorganic [IC]	----	E354	0.050	%		0.241	0.223	0.230	0.105	0.122
carbon, inorganic [IC], (as CaCO3 equivalent)	----	E354	0.40	%		2.01	1.86	1.92	0.88	1.02
carbon, total organic [TOC]	----	EC356	0.050	%		4.30	4.76	4.02	2.44	2.72
organic matter	----	EC356	0.10	%		7.41	8.20	6.93	4.20	4.68
Metals										
aluminum	7429-90-5	E440	50	mg/kg		15800	16200	11800	12300	11000
antimony	7440-36-0	E440	0.10	mg/kg		0.51	0.55	0.51	0.47	0.44
arsenic	7440-38-2	E440	0.10	mg/kg		7.66	7.25	6.10	5.91	5.31
barium	7440-39-3	E440	0.50	mg/kg		470	608	579	193	178
beryllium	7440-41-7	E440	0.10	mg/kg		0.53	0.52	0.41	0.42	0.42
bismuth	7440-69-9	E440	0.20	mg/kg		<0.20	<0.20	<0.20	<0.20	<0.20
boron	7440-42-8	E440	5.0	mg/kg		<5.0	5.2	<5.0	<5.0	<5.0
cadmium	7440-43-9	E440	0.020	mg/kg		0.318	0.467	0.457	0.187	0.157
calcium	7440-70-2	E440	50	mg/kg		10300	12500	11000	9160	7890
chromium	7440-47-3	E440	0.50	mg/kg		28.8	29.4	25.2	29.0	27.2
cobalt	7440-48-4	E440	0.10	mg/kg		14.1	15.1	13.0	9.82	9.63
copper	7440-50-8	E440	0.50	mg/kg		249	351	268	87.7	108
iron	7439-89-6	E440	50	mg/kg		29600	28800	23700	22200	22200
lead	7439-92-1	E440	0.50	mg/kg		6.27	6.62	5.66	5.48	5.36
lithium	7439-93-2	E440	2.0	mg/kg		9.8	10.0	7.6	8.3	7.2
magnesium	7439-95-4	E440	20	mg/kg		8130	8210	6620	6930	6240
manganese	7439-96-5	E440	1.0	mg/kg		6010	12100	11400	837	1260
mercury	7439-97-6	E510	0.0500	mg/kg		<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
molybdenum	7439-98-7	E440	0.10	mg/kg		2.44	6.52	6.50	0.92	1.13
nickel	7440-02-0	E440	0.50	mg/kg		32.8	35.2	32.6	29.6	26.5
phosphorus	7723-14-0	E440	50	mg/kg		1100	1050	969	943	1020

Analytical Results

Sub-Matrix: **Sediment**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	UMC-1	UMC-2	UMC-3	UMC-4	UMC-5
					Client sampling date / time	14-Sep-2020	14-Sep-2020	10-Sep-2020	10-Sep-2020	10-Sep-2020
						WR2000904-001	WR2000904-002	WR2000904-003	WR2000904-004	WR2000904-005
						Result	Result	Result	Result	Result
Metals										
potassium	7440-09-7	E440	100	mg/kg		1770	1720	1280	1160	1180
selenium	7782-49-2	E440	0.20	mg/kg		0.86	1.29	1.04	0.43	0.45
silver	7440-22-4	E440	0.10	mg/kg		0.15	0.20	0.14	<0.10	<0.10
sodium	7440-23-5	E440	50	mg/kg		337	324	286	301	319
strontium	7440-24-6	E440	0.50	mg/kg		126	189	162	105	93.9
sulfur	7704-34-9	E440	1000	mg/kg		<1000	<1000	<1000	<1000	<1000
thallium	7440-28-0	E440	0.050	mg/kg		0.109	0.115	0.092	0.090	0.076
tin	7440-31-5	E440	2.0	mg/kg		<2.0	<2.0	<2.0	<2.0	<2.0
titanium	7440-32-6	E440	1.0	mg/kg		758	679	572	607	678
tungsten	7440-33-7	E440	0.50	mg/kg		<0.50	<0.50	<0.50	<0.50	<0.50
uranium	7440-61-1	E440	0.050	mg/kg		1.17	1.27	0.982	0.888	0.724
vanadium	7440-62-2	E440	0.20	mg/kg		58.2	59.2	53.6	49.4	51.6
zinc	7440-66-6	E440	2.0	mg/kg		78.3	84.7	70.8	56.6	55.5
zirconium	7440-67-7	E440	1.0	mg/kg		2.7	2.3	1.8	3.2	2.7
Leachable Anions & Nutrients										
Kjeldahl nitrogen, total [TKN]	----	E319	0.020	%		0.247 DLHC	0.288 DLHC	0.260 DLHC	0.156	0.132

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Sediment**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	UMC	URC-1	URC-2	URC-3	URC-4
					Client sampling date / time	10-Sep-2020	13-Sep-2020	13-Sep-2020	13-Sep-2020	14-Sep-2020
						WR2000904-006	WR2000904-007	WR2000904-008	WR2000904-009	WR2000904-010
						Result	Result	Result	Result	Result
Physical Tests										
loss on ignition @ 420°C	----	E205C	1.0	%		----	9.3	14.9	15.2	15.3
pH (1:2 soil:water)	----	E108	0.10	pH units		----	6.34	6.67	6.46	6.67
Particle Size										
passing (0.075 mm)	----	E182	1.0	%		63.5	----	----	----	----
clay (<0.004mm)	----	EC184E	1.0	%		8.7	----	----	----	----
silt (0.063mm - 0.004mm)	----	EC184E	1.0	%		51.8	----	----	----	----
sand (2.0mm - 0.063mm)	----	EC184E	1.0	%		38.3	----	----	----	----
gravel (>2mm)	----	EC184E	1.0	%		1.2	----	----	----	----
sand (0.2mm - 0.063mm)	----	EC184E	1.0	%		23.3	----	----	----	----
sand (2.0mm - 0.2mm)	----	EC184E	1.0	%		15.0	----	----	----	----
Organic / Inorganic Carbon										
carbon, total [TC]	----	E351	0.050	%		----	4.98	6.54	7.26	5.89
carbon, inorganic [IC]	----	E354	0.050	%		----	0.111	0.150	0.156	0.141
carbon, inorganic [IC], (as CaCO3 equivalent)	----	E354	0.40	%		----	0.92	1.25	1.30	1.17
carbon, total organic [TOC]	----	EC356	0.050	%		----	4.87	6.39	7.10	5.75
organic matter	----	EC356	0.10	%		----	8.39	11.0	12.2	9.91
Metals										
aluminum	7429-90-5	E440	50	mg/kg		----	14400	14400	16200	12100
antimony	7440-36-0	E440	0.10	mg/kg		----	0.42	0.46	0.52	0.43
arsenic	7440-38-2	E440	0.10	mg/kg		----	6.50	5.59	5.54	4.58
barium	7440-39-3	E440	0.50	mg/kg		----	250	254	278	217
beryllium	7440-41-7	E440	0.10	mg/kg		----	0.36	0.38	0.48	0.33
bismuth	7440-69-9	E440	0.20	mg/kg		----	<0.20	<0.20	<0.20	<0.20
boron	7440-42-8	E440	5.0	mg/kg		----	<5.0	<5.0	<5.0	<5.0
cadmium	7440-43-9	E440	0.020	mg/kg		----	0.171	0.178	0.215	0.182
calcium	7440-70-2	E440	50	mg/kg		----	8440	8840	10000	8060
chromium	7440-47-3	E440	0.50	mg/kg		----	26.4	27.2	30.3	24.4
cobalt	7440-48-4	E440	0.10	mg/kg		----	10.4	9.32	10.8	8.60
copper	7440-50-8	E440	0.50	mg/kg		----	25.0	25.8	29.8	23.9
iron	7439-89-6	E440	50	mg/kg		----	23300	22500	23800	20100
lead	7439-92-1	E440	0.50	mg/kg		----	4.94	5.06	5.71	4.46

Analytical Results

Sub-Matrix: **Sediment**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	UMC	URC-1	URC-2	URC-3	URC-4
					Client sampling date / time	10-Sep-2020	13-Sep-2020	13-Sep-2020	13-Sep-2020	14-Sep-2020
						WR2000904-006	WR2000904-007	WR2000904-008	WR2000904-009	WR2000904-010
						Result	Result	Result	Result	Result
Metals										
lithium	7439-93-2	E440	2.0	mg/kg		----	7.4	7.6	8.5	6.8
magnesium	7439-95-4	E440	20	mg/kg		----	4580	4830	5370	4190
manganese	7439-96-5	E440	1.0	mg/kg		----	874	487	352	376
mercury	7439-97-6	E510	0.0500	mg/kg		----	<0.0500	0.0514	0.0584	<0.0500
molybdenum	7439-98-7	E440	0.10	mg/kg		----	0.54	0.78	0.54	0.63
nickel	7440-02-0	E440	0.50	mg/kg		----	18.5	18.9	21.7	17.7
phosphorus	7723-14-0	E440	50	mg/kg		----	875	817	979	790
potassium	7440-09-7	E440	100	mg/kg		----	740	770	810	700
selenium	7782-49-2	E440	0.20	mg/kg		----	0.41	0.72	0.58	0.57
silver	7440-22-4	E440	0.10	mg/kg		----	<0.10	<0.10	<0.10	<0.10
sodium	7440-23-5	E440	50	mg/kg		----	207	226	243	208
strontium	7440-24-6	E440	0.50	mg/kg		----	70.2	74.1	72.4	66.9
sulfur	7704-34-9	E440	1000	mg/kg		----	<1000	<1000	<1000	<1000
thallium	7440-28-0	E440	0.050	mg/kg		----	0.074	0.071	0.081	0.067
tin	7440-31-5	E440	2.0	mg/kg		----	<2.0	<2.0	<2.0	<2.0
titanium	7440-32-6	E440	1.0	mg/kg		----	688	724	776	662
tungsten	7440-33-7	E440	0.50	mg/kg		----	<0.50	<0.50	<0.50	<0.50
uranium	7440-61-1	E440	0.050	mg/kg		----	1.21	1.50	1.57	1.38
vanadium	7440-62-2	E440	0.20	mg/kg		----	50.6	51.4	57.9	48.4
zinc	7440-66-6	E440	2.0	mg/kg		----	47.8	48.2	54.8	43.8
zirconium	7440-67-7	E440	1.0	mg/kg		----	1.8	2.4	3.4	2.4
Leachable Anions & Nutrients										
Kjeldahl nitrogen, total [TKN]	----	E319	0.020	%		----	0.264 DLHC	0.332 DLHC	0.376 DLHC	0.302 DLHC

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Sediment**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	URC-5	URC	LMC-1	LMC-1	LMC-2
					Client sampling date / time	14-Sep-2020	03-Sep-2020	15-Sep-2020	15-Sep-2020	15-Sep-2020
						WR2000904-011	WR2000904-012	WR2000904-013	WR2000904-014	WR2000904-015
						Result	Result	Result	Result	Result
Physical Tests										
loss on ignition @ 420°C	----	E205C	1.0	%		3.4	----	9.6	----	13.1
pH (1:2 soil:water)	----	E108	0.10	pH units		7.06	----	8.01	----	8.00
Particle Size										
passing (0.075 mm)	----	E182	1.0	%		----	74.0	----	83.9	----
clay (<0.004mm)	----	EC184E	1.0	%		----	8.2	----	12.2	----
silt (0.063mm - 0.004mm)	----	EC184E	1.0	%		----	63.8	----	70.9	----
sand (2.0mm - 0.063mm)	----	EC184E	1.0	%		----	28.0	----	16.8	----
gravel (>2mm)	----	EC184E	1.0	%		----	<1.0	----	<1.0	----
sand (0.2mm - 0.063mm)	----	EC184E	1.0	%		----	15.9	----	6.9	----
sand (2.0mm - 0.2mm)	----	EC184E	1.0	%		----	12.1	----	9.9	----
Organic / Inorganic Carbon										
carbon, total [TC]	----	E351	0.050	%		2.75	----	4.30	----	6.00
carbon, inorganic [IC]	----	E354	0.050	%		0.084	----	0.181	----	0.200
carbon, inorganic [IC], (as CaCO3 equivalent)	----	E354	0.40	%		0.70	----	1.50	----	1.67
carbon, total organic [TOC]	----	EC356	0.050	%		2.67	----	4.12	----	5.80
organic matter	----	EC356	0.10	%		4.60	----	7.10	----	10.0
Metals										
aluminum	7429-90-5	E440	50	mg/kg		7140	----	16500	----	17900
antimony	7440-36-0	E440	0.10	mg/kg		0.39	----	0.56	----	0.60
arsenic	7440-38-2	E440	0.10	mg/kg		4.41	----	8.42	----	9.07
barium	7440-39-3	E440	0.50	mg/kg		115	----	287	----	338
beryllium	7440-41-7	E440	0.10	mg/kg		0.23	----	0.48	----	0.58
bismuth	7440-69-9	E440	0.20	mg/kg		<0.20	----	<0.20	----	<0.20
boron	7440-42-8	E440	5.0	mg/kg		<5.0	----	<5.0	----	<5.0
cadmium	7440-43-9	E440	0.020	mg/kg		0.106	----	0.215	----	0.299
calcium	7440-70-2	E440	50	mg/kg		5230	----	10600	----	13200
chromium	7440-47-3	E440	0.50	mg/kg		16.3	----	34.6	----	36.2
cobalt	7440-48-4	E440	0.10	mg/kg		6.36	----	11.4	----	12.6
copper	7440-50-8	E440	0.50	mg/kg		14.0	----	61.8	----	71.8
iron	7439-89-6	E440	50	mg/kg		16000	----	28000	----	29600
lead	7439-92-1	E440	0.50	mg/kg		3.39	----	6.46	----	6.86

Analytical Results

Sub-Matrix: **Sediment**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	URC-5	URC	LMC-1	LMC-1	LMC-2
					Client sampling date / time	14-Sep-2020	03-Sep-2020	15-Sep-2020	15-Sep-2020	15-Sep-2020
						WR2000904-011	WR2000904-012	WR2000904-013	WR2000904-014	WR2000904-015
						Result	Result	Result	Result	Result
Metals										
lithium	7439-93-2	E440	2.0	mg/kg		4.8	----	11.4	----	11.7
magnesium	7439-95-4	E440	20	mg/kg		3160	----	7870	----	8440
manganese	7439-96-5	E440	1.0	mg/kg		390	----	1240	----	1700
mercury	7439-97-6	E510	0.0500	mg/kg		<0.0500	----	<0.0500	----	<0.0500
molybdenum	7439-98-7	E440	0.10	mg/kg		0.46	----	0.81	----	0.90
nickel	7440-02-0	E440	0.50	mg/kg		13.7	----	30.1	----	34.4
phosphorus	7723-14-0	E440	50	mg/kg		626	----	997	----	985
potassium	7440-09-7	E440	100	mg/kg		480	----	1340	----	1420
selenium	7782-49-2	E440	0.20	mg/kg		0.30	----	0.65	----	0.79
silver	7440-22-4	E440	0.10	mg/kg		<0.10	----	0.10	----	0.12
sodium	7440-23-5	E440	50	mg/kg		133	----	298	----	295
strontium	7440-24-6	E440	0.50	mg/kg		40.4	----	108	----	144
sulfur	7704-34-9	E440	1000	mg/kg		<1000	----	<1000	----	<1000
thallium	7440-28-0	E440	0.050	mg/kg		<0.050	----	0.101	----	0.106
tin	7440-31-5	E440	2.0	mg/kg		<2.0	----	<2.0	----	<2.0
titanium	7440-32-6	E440	1.0	mg/kg		464	----	706	----	649
tungsten	7440-33-7	E440	0.50	mg/kg		<0.50	----	<0.50	----	<0.50
uranium	7440-61-1	E440	0.050	mg/kg		0.863	----	1.09	----	1.43
vanadium	7440-62-2	E440	0.20	mg/kg		36.9	----	61.4	----	60.5
zinc	7440-66-6	E440	2.0	mg/kg		32.1	----	64.5	----	69.1
zirconium	7440-67-7	E440	1.0	mg/kg		2.0	----	3.0	----	3.8
Leachable Anions & Nutrients										
Kjeldahl nitrogen, total [TKN]	----	E319	0.020	%		0.136	----	0.288 DLHC	----	0.357 DLHC

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Sediment**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LMC-2	LMC-3	LMC-3	LMC-4	LMC-4
					Client sampling date / time	15-Sep-2020	15-Sep-2020	15-Sep-2020	15-Sep-2020	15-Sep-2020
						WR2000904-016	WR2000904-017	WR2000904-018	WR2000904-019	WR2000904-020
						Result	Result	Result	Result	Result
Physical Tests										
loss on ignition @ 420°C	----	E205C	1.0	%		----	8.3	----	9.1	----
pH (1:2 soil:water)	----	E108	0.10	pH units		----	7.98	----	7.83	----
Particle Size										
passing (0.075 mm)	----	E182	1.0	%		84.3	----	84.1	----	82.5
clay (<0.004mm)	----	EC184E	1.0	%		10.2	----	10.0	----	10.1
silt (0.063mm - 0.004mm)	----	EC184E	1.0	%		72.7	----	72.3	----	70.7
sand (2.0mm - 0.063mm)	----	EC184E	1.0	%		17.1	----	17.7	----	19.1
gravel (>2mm)	----	EC184E	1.0	%		<1.0	----	<1.0	----	<1.0
sand (0.2mm - 0.063mm)	----	EC184E	1.0	%		11.0	----	13.2	----	12.0
sand (2.0mm - 0.2mm)	----	EC184E	1.0	%		6.1	----	4.5	----	7.1
Organic / Inorganic Carbon										
carbon, total [TC]	----	E351	0.050	%		----	4.30	----	4.76	----
carbon, inorganic [IC]	----	E354	0.050	%		----	0.157	----	0.179	----
carbon, inorganic [IC], (as CaCO3 equivalent)	----	E354	0.40	%		----	1.31	----	1.49	----
carbon, total organic [TOC]	----	EC356	0.050	%		----	4.14	----	4.58	----
organic matter	----	EC356	0.10	%		----	7.14	----	7.90	----
Metals										
aluminum	7429-90-5	E440	50	mg/kg		----	13900	----	13000	----
antimony	7440-36-0	E440	0.10	mg/kg		----	0.46	----	0.47	----
arsenic	7440-38-2	E440	0.10	mg/kg		----	6.98	----	7.12	----
barium	7440-39-3	E440	0.50	mg/kg		----	249	----	232	----
beryllium	7440-41-7	E440	0.10	mg/kg		----	0.44	----	0.43	----
bismuth	7440-69-9	E440	0.20	mg/kg		----	<0.20	----	<0.20	----
boron	7440-42-8	E440	5.0	mg/kg		----	<5.0	----	<5.0	----
cadmium	7440-43-9	E440	0.020	mg/kg		----	0.199	----	0.213	----
calcium	7440-70-2	E440	50	mg/kg		----	9680	----	9180	----
chromium	7440-47-3	E440	0.50	mg/kg		----	29.4	----	29.3	----
cobalt	7440-48-4	E440	0.10	mg/kg		----	10.5	----	9.99	----
copper	7440-50-8	E440	0.50	mg/kg		----	48.3	----	47.3	----
iron	7439-89-6	E440	50	mg/kg		----	24300	----	26000	----
lead	7439-92-1	E440	0.50	mg/kg		----	5.50	----	5.27	----

Analytical Results

Sub-Matrix: **Sediment**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LMC-2	LMC-3	LMC-3	LMC-4	LMC-4
					Client sampling date / time	15-Sep-2020	15-Sep-2020	15-Sep-2020	15-Sep-2020	15-Sep-2020
						WR2000904-016	WR2000904-017	WR2000904-018	WR2000904-019	WR2000904-020
						Result	Result	Result	Result	Result
Metals										
lithium	7439-93-2	E440	2.0	mg/kg		----	9.6	----	9.3	----
magnesium	7439-95-4	E440	20	mg/kg		----	7120	----	6540	----
manganese	7439-96-5	E440	1.0	mg/kg		----	1070	----	1120	----
mercury	7439-97-6	E510	0.0500	mg/kg		----	<0.0500	----	<0.0500	----
molybdenum	7439-98-7	E440	0.10	mg/kg		----	0.69	----	0.74	----
nickel	7440-02-0	E440	0.50	mg/kg		----	27.6	----	26.0	----
phosphorus	7723-14-0	E440	50	mg/kg		----	980	----	828	----
potassium	7440-09-7	E440	100	mg/kg		----	1300	----	1190	----
selenium	7782-49-2	E440	0.20	mg/kg		----	0.47	----	0.52	----
silver	7440-22-4	E440	0.10	mg/kg		----	<0.10	----	<0.10	----
sodium	7440-23-5	E440	50	mg/kg		----	315	----	262	----
strontium	7440-24-6	E440	0.50	mg/kg		----	97.4	----	95.1	----
sulfur	7704-34-9	E440	1000	mg/kg		----	<1000	----	<1000	----
thallium	7440-28-0	E440	0.050	mg/kg		----	0.088	----	0.083	----
tin	7440-31-5	E440	2.0	mg/kg		----	<2.0	----	<2.0	----
titanium	7440-32-6	E440	1.0	mg/kg		----	703	----	672	----
tungsten	7440-33-7	E440	0.50	mg/kg		----	<0.50	----	<0.50	----
uranium	7440-61-1	E440	0.050	mg/kg		----	1.10	----	1.11	----
vanadium	7440-62-2	E440	0.20	mg/kg		----	54.1	----	58.4	----
zinc	7440-66-6	E440	2.0	mg/kg		----	58.3	----	56.0	----
zirconium	7440-67-7	E440	1.0	mg/kg		----	2.8	----	2.3	----
Leachable Anions & Nutrients										
Kjeldahl nitrogen, total [TKN]	----	E319	0.020	%		----	0.246 DLHC	----	0.285 DLHC	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Sediment**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LMC-5	LMC-5	LWC-1	LWC-1	LWC-2
					Client sampling date / time	15-Sep-2020	15-Sep-2020	13-Sep-2020	13-Sep-2020	18-Sep-2020
						WR2000904-021	WR2000904-022	WR2000904-023	WR2000904-024	WR2000904-025
						Result	Result	Result	Result	Result
Physical Tests										
loss on ignition @ 420°C	----	E205C	1.0	%		5.2	----	12.8	----	4.8
pH (1:2 soil:water)	----	E108	0.10	pH units		7.88	----	7.54	----	7.11
Particle Size										
passing (0.075 mm)	----	E182	1.0	%		----	57.5	----	73.3	----
clay (<0.004mm)	----	EC184E	1.0	%		----	7.0	----	5.7	----
silt (0.063mm - 0.004mm)	----	EC184E	1.0	%		----	48.0	----	66.1	----
sand (2.0mm - 0.063mm)	----	EC184E	1.0	%		----	45.0	----	28.2	----
gravel (>2mm)	----	EC184E	1.0	%		----	<1.0	----	<1.0	----
sand (0.2mm - 0.063mm)	----	EC184E	1.0	%		----	22.4	----	15.5	----
sand (2.0mm - 0.2mm)	----	EC184E	1.0	%		----	22.6	----	12.6	----
Organic / Inorganic Carbon										
carbon, total [TC]	----	E351	0.050	%		3.45	----	5.86	----	3.13
carbon, inorganic [IC]	----	E354	0.050	%		0.138	----	0.168	----	0.102
carbon, inorganic [IC], (as CaCO3 equivalent)	----	E354	0.40	%		1.15	----	1.40	----	0.85
carbon, total organic [TOC]	----	EC356	0.050	%		3.31	----	5.69	----	3.03
organic matter	----	EC356	0.10	%		5.71	----	9.81	----	5.22
Metals										
aluminum	7429-90-5	E440	50	mg/kg		10600	----	16500	----	13900
antimony	7440-36-0	E440	0.10	mg/kg		0.40	----	0.51	----	0.37
arsenic	7440-38-2	E440	0.10	mg/kg		6.04	----	7.02	----	5.59
barium	7440-39-3	E440	0.50	mg/kg		188	----	245	----	175
beryllium	7440-41-7	E440	0.10	mg/kg		0.38	----	0.85	----	0.59
bismuth	7440-69-9	E440	0.20	mg/kg		<0.20	----	<0.20	----	<0.20
boron	7440-42-8	E440	5.0	mg/kg		<5.0	----	<5.0	----	<5.0
cadmium	7440-43-9	E440	0.020	mg/kg		0.139	----	0.280	----	0.170
calcium	7440-70-2	E440	50	mg/kg		7070	----	12100	----	7570
chromium	7440-47-3	E440	0.50	mg/kg		25.0	----	46.9	----	39.0
cobalt	7440-48-4	E440	0.10	mg/kg		9.02	----	14.2	----	12.1
copper	7440-50-8	E440	0.50	mg/kg		38.1	----	30.2	----	20.3
iron	7439-89-6	E440	50	mg/kg		23200	----	28400	----	25100
lead	7439-92-1	E440	0.50	mg/kg		4.69	----	6.31	----	4.99

Analytical Results

Sub-Matrix: **Sediment**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LMC-5	LMC-5	LWC-1	LWC-1	LWC-2
					Client sampling date / time	15-Sep-2020	15-Sep-2020	13-Sep-2020	13-Sep-2020	18-Sep-2020
						WR2000904-021	WR2000904-022	WR2000904-023	WR2000904-024	WR2000904-025
						Result	Result	Result	Result	Result
Metals										
lithium	7439-93-2	E440	2.0	mg/kg		7.9	----	10.3	----	8.8
magnesium	7439-95-4	E440	20	mg/kg		5580	----	9840	----	8670
manganese	7439-96-5	E440	1.0	mg/kg		847	----	785	----	480
mercury	7439-97-6	E510	0.0500	mg/kg		<0.0500	----	<0.0500	----	<0.0500
molybdenum	7439-98-7	E440	0.10	mg/kg		0.64	----	0.61	----	0.55
nickel	7440-02-0	E440	0.50	mg/kg		21.9	----	39.0	----	32.7
phosphorus	7723-14-0	E440	50	mg/kg		721	----	1100	----	1030
potassium	7440-09-7	E440	100	mg/kg		1020	----	1080	----	940
selenium	7782-49-2	E440	0.20	mg/kg		0.43	----	0.44	----	0.24
silver	7440-22-4	E440	0.10	mg/kg		<0.10	----	0.10	----	<0.10
sodium	7440-23-5	E440	50	mg/kg		257	----	399	----	383
strontium	7440-24-6	E440	0.50	mg/kg		74.7	----	138	----	78.8
sulfur	7704-34-9	E440	1000	mg/kg		<1000	----	<1000	----	<1000
thallium	7440-28-0	E440	0.050	mg/kg		0.071	----	0.082	----	0.056
tin	7440-31-5	E440	2.0	mg/kg		<2.0	----	<2.0	----	<2.0
titanium	7440-32-6	E440	1.0	mg/kg		617	----	830	----	819
tungsten	7440-33-7	E440	0.50	mg/kg		<0.50	----	<0.50	----	<0.50
uranium	7440-61-1	E440	0.050	mg/kg		0.837	----	3.71	----	1.76
vanadium	7440-62-2	E440	0.20	mg/kg		53.0	----	72.4	----	64.0
zinc	7440-66-6	E440	2.0	mg/kg		49.3	----	62.3	----	55.4
zirconium	7440-67-7	E440	1.0	mg/kg		2.2	----	4.7	----	3.6
Leachable Anions & Nutrients										
Kjeldahl nitrogen, total [TKN]	----	E319	0.020	%		0.205	----	0.307 DLHC	----	0.168

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Sediment**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LWC-2	LWC-3	LWC-3	LWC-4	LWC-4
					Client sampling date / time	18-Sep-2020	18-Sep-2020	18-Sep-2020	18-Sep-2020	18-Sep-2020
						WR2000904-026	WR2000904-027	WR2000904-028	WR2000904-029	WR2000904-030
						Result	Result	Result	Result	Result
Physical Tests										
loss on ignition @ 420°C	----	E205C	1.0	%		----	8.4	----	12.0	----
pH (1:2 soil:water)	----	E108	0.10	pH units		----	6.97	----	6.86	----
Particle Size										
passing (0.075 mm)	----	E182	1.0	%		50.2	----	67.0	----	82.5
clay (<0.004mm)	----	EC184E	1.0	%		4.5	----	5.4	----	7.7
silt (0.063mm - 0.004mm)	----	EC184E	1.0	%		43.3	----	58.6	----	73.4
sand (2.0mm - 0.063mm)	----	EC184E	1.0	%		52.2	----	36.0	----	18.9
gravel (>2mm)	----	EC184E	1.0	%		<1.0	----	<1.0	----	<1.0
sand (0.2mm - 0.063mm)	----	EC184E	1.0	%		30.3	----	27.6	----	12.3
sand (2.0mm - 0.2mm)	----	EC184E	1.0	%		21.9	----	8.4	----	6.6
Organic / Inorganic Carbon										
carbon, total [TC]	----	E351	0.050	%		----	4.03	----	6.12	----
carbon, inorganic [IC]	----	E354	0.050	%		----	0.128	----	0.154	----
carbon, inorganic [IC], (as CaCO3 equivalent)	----	E354	0.40	%		----	1.06	----	1.28	----
carbon, total organic [TOC]	----	EC356	0.050	%		----	3.90	----	5.97	----
organic matter	----	EC356	0.10	%		----	6.73	----	10.3	----
Metals										
aluminum	7429-90-5	E440	50	mg/kg		----	16000	----	17400	----
antimony	7440-36-0	E440	0.10	mg/kg		----	0.40	----	0.45	----
arsenic	7440-38-2	E440	0.10	mg/kg		----	6.00	----	4.54	----
barium	7440-39-3	E440	0.50	mg/kg		----	198	----	234	----
beryllium	7440-41-7	E440	0.10	mg/kg		----	0.66	----	0.71	----
bismuth	7440-69-9	E440	0.20	mg/kg		----	<0.20	----	<0.20	----
boron	7440-42-8	E440	5.0	mg/kg		----	<5.0	----	<5.0	----
cadmium	7440-43-9	E440	0.020	mg/kg		----	0.186	----	0.237	----
calcium	7440-70-2	E440	50	mg/kg		----	8330	----	9600	----
chromium	7440-47-3	E440	0.50	mg/kg		----	45.2	----	48.7	----
cobalt	7440-48-4	E440	0.10	mg/kg		----	13.1	----	12.8	----
copper	7440-50-8	E440	0.50	mg/kg		----	23.0	----	32.0	----
iron	7439-89-6	E440	50	mg/kg		----	26600	----	27400	----
lead	7439-92-1	E440	0.50	mg/kg		----	5.68	----	6.42	----

Analytical Results

Sub-Matrix: **Sediment**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LWC-2	LWC-3	LWC-3	LWC-4	LWC-4
					Client sampling date / time	18-Sep-2020	18-Sep-2020	18-Sep-2020	18-Sep-2020	18-Sep-2020
						WR2000904-026	WR2000904-027	WR2000904-028	WR2000904-029	WR2000904-030
						Result	Result	Result	Result	Result
Metals										
lithium	7439-93-2	E440	2.0	mg/kg		----	10.2	----	11.0	----
magnesium	7439-95-4	E440	20	mg/kg		----	9680	----	9980	----
manganese	7439-96-5	E440	1.0	mg/kg		----	630	----	219	----
mercury	7439-97-6	E510	0.0500	mg/kg		----	<0.0500	----	<0.0500	----
molybdenum	7439-98-7	E440	0.10	mg/kg		----	0.48	----	0.81	----
nickel	7440-02-0	E440	0.50	mg/kg		----	36.2	----	38.2	----
phosphorus	7723-14-0	E440	50	mg/kg		----	1070	----	1040	----
potassium	7440-09-7	E440	100	mg/kg		----	1040	----	1140	----
selenium	7782-49-2	E440	0.20	mg/kg		----	0.26	----	0.31	----
silver	7440-22-4	E440	0.10	mg/kg		----	<0.10	----	<0.10	----
sodium	7440-23-5	E440	50	mg/kg		----	414	----	426	----
strontium	7440-24-6	E440	0.50	mg/kg		----	85.7	----	95.3	----
sulfur	7704-34-9	E440	1000	mg/kg		----	<1000	----	2400	----
thallium	7440-28-0	E440	0.050	mg/kg		----	0.077	----	0.088	----
tin	7440-31-5	E440	2.0	mg/kg		----	<2.0	----	<2.0	----
titanium	7440-32-6	E440	1.0	mg/kg		----	837	----	912	----
tungsten	7440-33-7	E440	0.50	mg/kg		----	<0.50	----	<0.50	----
uranium	7440-61-1	E440	0.050	mg/kg		----	2.06	----	2.77	----
vanadium	7440-62-2	E440	0.20	mg/kg		----	67.8	----	71.8	----
zinc	7440-66-6	E440	2.0	mg/kg		----	61.2	----	68.9	----
zirconium	7440-67-7	E440	1.0	mg/kg		----	3.6	----	5.1	----
Leachable Anions & Nutrients										
Kjeldahl nitrogen, total [TKN]	----	E319	0.020	%		----	0.240	----	0.359 DLHC	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Sediment**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LWC-5	LWC-5	----	----	----
					Client sampling date / time	18-Sep-2020	18-Sep-2020	----	----	----
						WR2000904-031	WR2000904-032	--------	--------	--------
						Result	Result	----	----	----
Physical Tests										
loss on ignition @ 420°C	----	E205C	1.0	%		14.0	----	----	----	----
pH (1:2 soil:water)	----	E108	0.10	pH units		6.56	----	----	----	----
Particle Size										
passing (0.075 mm)	----	E182	1.0	%		----	95.1	----	----	----
clay (<0.004mm)	----	EC184E	1.0	%		----	7.1	----	----	----
silt (0.063mm - 0.004mm)	----	EC184E	1.0	%		----	87.4	----	----	----
sand (2.0mm - 0.063mm)	----	EC184E	1.0	%		----	5.5	----	----	----
gravel (>2mm)	----	EC184E	1.0	%		----	<1.0	----	----	----
sand (0.2mm - 0.063mm)	----	EC184E	1.0	%		----	4.1	----	----	----
sand (2.0mm - 0.2mm)	----	EC184E	1.0	%		----	1.4	----	----	----
Organic / Inorganic Carbon										
carbon, total [TC]	----	E351	0.050	%		6.16	----	----	----	----
carbon, inorganic [IC]	----	E354	0.050	%		0.162	----	----	----	----
carbon, inorganic [IC], (as CaCO3 equivalent)	----	E354	0.40	%		1.35	----	----	----	----
carbon, total organic [TOC]	----	EC356	0.050	%		6.00	----	----	----	----
organic matter	----	EC356	0.10	%		10.3	----	----	----	----
Metals										
aluminum	7429-90-5	E440	50	mg/kg		18400	----	----	----	----
antimony	7440-36-0	E440	0.10	mg/kg		0.43	----	----	----	----
arsenic	7440-38-2	E440	0.10	mg/kg		4.27	----	----	----	----
barium	7440-39-3	E440	0.50	mg/kg		255	----	----	----	----
beryllium	7440-41-7	E440	0.10	mg/kg		0.79	----	----	----	----
bismuth	7440-69-9	E440	0.20	mg/kg		<0.20	----	----	----	----
boron	7440-42-8	E440	5.0	mg/kg		<5.0	----	----	----	----
cadmium	7440-43-9	E440	0.020	mg/kg		0.268	----	----	----	----
calcium	7440-70-2	E440	50	mg/kg		9320	----	----	----	----
chromium	7440-47-3	E440	0.50	mg/kg		51.2	----	----	----	----
cobalt	7440-48-4	E440	0.10	mg/kg		13.5	----	----	----	----
copper	7440-50-8	E440	0.50	mg/kg		31.8	----	----	----	----
iron	7439-89-6	E440	50	mg/kg		32500	----	----	----	----
lead	7439-92-1	E440	0.50	mg/kg		6.98	----	----	----	----

Analytical Results

Sub-Matrix: **Sediment**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LWC-5	LWC-5	----	----	----
					Client sampling date / time	18-Sep-2020	18-Sep-2020	----	----	----
						WR2000904-031	WR2000904-032	--------	--------	--------
						Result	Result	----	----	----
Metals										
lithium	7439-93-2	E440	2.0	mg/kg		11.6	----	----	----	----
magnesium	7439-95-4	E440	20	mg/kg		10200	----	----	----	----
manganese	7439-96-5	E440	1.0	mg/kg		221	----	----	----	----
mercury	7439-97-6	E510	0.0500	mg/kg		0.0504	----	----	----	----
molybdenum	7439-98-7	E440	0.10	mg/kg		0.48	----	----	----	----
nickel	7440-02-0	E440	0.50	mg/kg		39.3	----	----	----	----
phosphorus	7723-14-0	E440	50	mg/kg		1090	----	----	----	----
potassium	7440-09-7	E440	100	mg/kg		1080	----	----	----	----
selenium	7782-49-2	E440	0.20	mg/kg		0.37	----	----	----	----
silver	7440-22-4	E440	0.10	mg/kg		<0.10	----	----	----	----
sodium	7440-23-5	E440	50	mg/kg		393	----	----	----	----
strontium	7440-24-6	E440	0.50	mg/kg		92.3	----	----	----	----
sulfur	7704-34-9	E440	1000	mg/kg		1700	----	----	----	----
thallium	7440-28-0	E440	0.050	mg/kg		0.097	----	----	----	----
tin	7440-31-5	E440	2.0	mg/kg		<2.0	----	----	----	----
titanium	7440-32-6	E440	1.0	mg/kg		739	----	----	----	----
tungsten	7440-33-7	E440	0.50	mg/kg		<0.50	----	----	----	----
uranium	7440-61-1	E440	0.050	mg/kg		2.49	----	----	----	----
vanadium	7440-62-2	E440	0.20	mg/kg		67.5	----	----	----	----
zinc	7440-66-6	E440	2.0	mg/kg		73.8	----	----	----	----
zirconium	7440-67-7	E440	1.0	mg/kg		4.7	----	----	----	----
Leachable Anions & Nutrients										
Kjeldahl nitrogen, total [TKN]	----	E319	0.020	%		0.383 DLHC	----	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WR2000904**	Page	: 1 of 23
Client	: **Minnow Environmental Inc.**	Laboratory	: Whitehorse - Environmental
Contact	: Pierre Stecko	Account Manager	: Heather McKenzie
Address	: 204 – 1006 Fort Street Victoria BC Canada V8V 3K4	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minnow Project 20-70	Date Samples Received	: 18-Sep-2020 11:45
PO	: ----	Issue Date	: 13-Oct-2020 18:00
C-O-C number	:		
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 32		
No. of samples analysed	: 32		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Leachable Anions & Nutrients : Total Kjeldahl Nitrogen by Colourimetry										
Glass soil jar/Teflon lined cap										
LWC-1	E319	13-Sep-2020	23-Sep-2020	365 days	10 days	✓	25-Sep-2020	354 days	1 days	✓
Leachable Anions & Nutrients : Total Kjeldahl Nitrogen by Colourimetry										
Glass soil jar/Teflon lined cap										
URC-1	E319	13-Sep-2020	23-Sep-2020	365 days	10 days	✓	25-Sep-2020	354 days	1 days	✓
Leachable Anions & Nutrients : Total Kjeldahl Nitrogen by Colourimetry										
Glass soil jar/Teflon lined cap										
URC-2	E319	13-Sep-2020	23-Sep-2020	365 days	10 days	✓	25-Sep-2020	354 days	1 days	✓
Leachable Anions & Nutrients : Total Kjeldahl Nitrogen by Colourimetry										
Glass soil jar/Teflon lined cap										
URC-3	E319	13-Sep-2020	23-Sep-2020	365 days	10 days	✓	25-Sep-2020	354 days	1 days	✓
Leachable Anions & Nutrients : Total Kjeldahl Nitrogen by Colourimetry										
Glass soil jar/Teflon lined cap										
UMC-3	E319	10-Sep-2020	23-Sep-2020	365 days	13 days	✓	25-Sep-2020	351 days	1 days	✓
Leachable Anions & Nutrients : Total Kjeldahl Nitrogen by Colourimetry										
Glass soil jar/Teflon lined cap										
UMC-4	E319	10-Sep-2020	23-Sep-2020	365 days	13 days	✓	25-Sep-2020	351 days	1 days	✓
Leachable Anions & Nutrients : Total Kjeldahl Nitrogen by Colourimetry										
Glass soil jar/Teflon lined cap										
UMC-5	E319	10-Sep-2020	23-Sep-2020	365 days	13 days	✓	25-Sep-2020	351 days	1 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Leachable Anions & Nutrients : Total Kjeldahl Nitrogen by Colourimetry										
Glass soil jar/Teflon lined cap LWC-2	E319	18-Sep-2020	23-Sep-2020	365 days	5 days	✓	25-Sep-2020	359 days	1 days	✓
Leachable Anions & Nutrients : Total Kjeldahl Nitrogen by Colourimetry										
Glass soil jar/Teflon lined cap LWC-3	E319	18-Sep-2020	23-Sep-2020	365 days	5 days	✓	25-Sep-2020	359 days	1 days	✓
Leachable Anions & Nutrients : Total Kjeldahl Nitrogen by Colourimetry										
Glass soil jar/Teflon lined cap LWC-4	E319	18-Sep-2020	23-Sep-2020	365 days	5 days	✓	25-Sep-2020	359 days	1 days	✓
Leachable Anions & Nutrients : Total Kjeldahl Nitrogen by Colourimetry										
Glass soil jar/Teflon lined cap LWC-5	E319	18-Sep-2020	23-Sep-2020	365 days	5 days	✓	25-Sep-2020	359 days	1 days	✓
Leachable Anions & Nutrients : Total Kjeldahl Nitrogen by Colourimetry										
Glass soil jar/Teflon lined cap LMC-1	E319	15-Sep-2020	23-Sep-2020	365 days	8 days	✓	25-Sep-2020	356 days	1 days	✓
Leachable Anions & Nutrients : Total Kjeldahl Nitrogen by Colourimetry										
Glass soil jar/Teflon lined cap LMC-2	E319	15-Sep-2020	23-Sep-2020	365 days	8 days	✓	25-Sep-2020	356 days	1 days	✓
Leachable Anions & Nutrients : Total Kjeldahl Nitrogen by Colourimetry										
Glass soil jar/Teflon lined cap LMC-3	E319	15-Sep-2020	23-Sep-2020	365 days	8 days	✓	25-Sep-2020	356 days	1 days	✓
Leachable Anions & Nutrients : Total Kjeldahl Nitrogen by Colourimetry										
Glass soil jar/Teflon lined cap LMC-4	E319	15-Sep-2020	23-Sep-2020	365 days	8 days	✓	25-Sep-2020	356 days	1 days	✓
Leachable Anions & Nutrients : Total Kjeldahl Nitrogen by Colourimetry										
Glass soil jar/Teflon lined cap LMC-5	E319	15-Sep-2020	23-Sep-2020	365 days	8 days	✓	25-Sep-2020	356 days	1 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Leachable Anions & Nutrients : Total Kjeldahl Nitrogen by Colourimetry										
Glass soil jar/Teflon lined cap										
UMC-1	E319	14-Sep-2020	23-Sep-2020	365 days	9 days	✓	25-Sep-2020	355 days	1 days	✓
Leachable Anions & Nutrients : Total Kjeldahl Nitrogen by Colourimetry										
Glass soil jar/Teflon lined cap										
UMC-2	E319	14-Sep-2020	23-Sep-2020	365 days	9 days	✓	25-Sep-2020	355 days	1 days	✓
Leachable Anions & Nutrients : Total Kjeldahl Nitrogen by Colourimetry										
Glass soil jar/Teflon lined cap										
URC-4	E319	14-Sep-2020	23-Sep-2020	365 days	9 days	✓	25-Sep-2020	355 days	1 days	✓
Leachable Anions & Nutrients : Total Kjeldahl Nitrogen by Colourimetry										
Glass soil jar/Teflon lined cap										
URC-5	E319	14-Sep-2020	23-Sep-2020	365 days	9 days	✓	25-Sep-2020	355 days	1 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
LMC-1	E510	15-Sep-2020	25-Sep-2020	28 days	10 days	✓	25-Sep-2020	17 days	0 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
LMC-2	E510	15-Sep-2020	25-Sep-2020	28 days	10 days	✓	25-Sep-2020	17 days	0 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
LMC-3	E510	15-Sep-2020	25-Sep-2020	28 days	10 days	✓	25-Sep-2020	17 days	0 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
LMC-4	E510	15-Sep-2020	25-Sep-2020	28 days	10 days	✓	25-Sep-2020	17 days	0 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
LMC-5	E510	15-Sep-2020	25-Sep-2020	28 days	10 days	✓	25-Sep-2020	17 days	0 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
UMC-1	E510	14-Sep-2020	25-Sep-2020	28 days	11 days	✓	25-Sep-2020	16 days	0 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
UMC-2	E510	14-Sep-2020	25-Sep-2020	28 days	11 days	✓	25-Sep-2020	16 days	0 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
URC-4	E510	14-Sep-2020	25-Sep-2020	28 days	11 days	✓	25-Sep-2020	16 days	0 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
URC-5	E510	14-Sep-2020	25-Sep-2020	28 days	11 days	✓	25-Sep-2020	16 days	0 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
LWC-1	E510	13-Sep-2020	25-Sep-2020	28 days	12 days	✓	25-Sep-2020	15 days	0 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
URC-1	E510	13-Sep-2020	25-Sep-2020	28 days	12 days	✓	25-Sep-2020	15 days	0 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
URC-2	E510	13-Sep-2020	25-Sep-2020	28 days	12 days	✓	25-Sep-2020	15 days	0 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
URC-3	E510	13-Sep-2020	25-Sep-2020	28 days	12 days	✓	25-Sep-2020	15 days	0 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
UMC-3	E510	10-Sep-2020	25-Sep-2020	28 days	15 days	✓	25-Sep-2020	12 days	0 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
UMC-4	E510	10-Sep-2020	25-Sep-2020	28 days	15 days	✓	25-Sep-2020	12 days	0 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
UMC-5	E510	10-Sep-2020	25-Sep-2020	28 days	15 days	✓	25-Sep-2020	12 days	0 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
LWC-2	E510	18-Sep-2020	25-Sep-2020	28 days	7 days	✓	25-Sep-2020	20 days	0 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
LWC-3	E510	18-Sep-2020	25-Sep-2020	28 days	7 days	✓	25-Sep-2020	20 days	0 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
LWC-4	E510	18-Sep-2020	25-Sep-2020	28 days	7 days	✓	25-Sep-2020	20 days	0 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
LWC-5	E510	18-Sep-2020	25-Sep-2020	28 days	7 days	✓	25-Sep-2020	20 days	0 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
LMC-1	E440	15-Sep-2020	25-Sep-2020	180 days	10 days	✓	25-Sep-2020	169 days	0 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
LMC-2	E440	15-Sep-2020	25-Sep-2020	180 days	10 days	✓	25-Sep-2020	169 days	0 days	✓
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LMC-3	E440	15-Sep-2020	25-Sep-2020	180 days	10 days	✓	25-Sep-2020	169 days	0 days	✓

Matrix: **Soil/Solid**

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Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
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Glass soil jar/Teflon lined cap										
LMC-4	E440	15-Sep-2020	25-Sep-2020	180 days	10 days	✓	25-Sep-2020	169 days	0 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
LMC-5	E440	15-Sep-2020	25-Sep-2020	180 days	10 days	✓	25-Sep-2020	169 days	0 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
UMC-1	E440	14-Sep-2020	25-Sep-2020	180 days	11 days	✓	25-Sep-2020	168 days	0 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
UMC-2	E440	14-Sep-2020	25-Sep-2020	180 days	11 days	✓	25-Sep-2020	168 days	0 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
URC-4	E440	14-Sep-2020	25-Sep-2020	180 days	11 days	✓	25-Sep-2020	168 days	0 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
URC-5	E440	14-Sep-2020	25-Sep-2020	180 days	11 days	✓	25-Sep-2020	168 days	0 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
LWC-1	E440	13-Sep-2020	25-Sep-2020	180 days	12 days	✓	25-Sep-2020	167 days	0 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
URC-1	E440	13-Sep-2020	25-Sep-2020	180 days	12 days	✓	25-Sep-2020	167 days	0 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
URC-2	E440	13-Sep-2020	25-Sep-2020	180 days	12 days	✓	25-Sep-2020	167 days	0 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
URC-3	E440	13-Sep-2020	25-Sep-2020	180 days	12 days	✓	25-Sep-2020	167 days	0 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
UMC-3	E440	10-Sep-2020	25-Sep-2020	180 days	15 days	✓	25-Sep-2020	164 days	0 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
UMC-4	E440	10-Sep-2020	25-Sep-2020	180 days	15 days	✓	25-Sep-2020	164 days	0 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
UMC-5	E440	10-Sep-2020	25-Sep-2020	180 days	15 days	✓	25-Sep-2020	164 days	0 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
LWC-2	E440	18-Sep-2020	25-Sep-2020	180 days	7 days	✓	25-Sep-2020	172 days	0 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
LWC-3	E440	18-Sep-2020	25-Sep-2020	180 days	7 days	✓	25-Sep-2020	172 days	0 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
LWC-4	E440	18-Sep-2020	25-Sep-2020	180 days	7 days	✓	25-Sep-2020	172 days	0 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
LWC-5	E440	18-Sep-2020	25-Sep-2020	180 days	7 days	✓	25-Sep-2020	172 days	0 days	✓
Organic / Inorganic Carbon : Total Carbon by Combustion										
Glass soil jar/Teflon lined cap										
LMC-1	E351	15-Sep-2020	----	----	----		23-Sep-2020	0 days	0 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Organic / Inorganic Carbon : Total Carbon by Combustion										
Glass soil jar/Teflon lined cap										
LMC-2	E351	15-Sep-2020	----	----	----		23-Sep-2020	0 days	0 days	✓
Organic / Inorganic Carbon : Total Carbon by Combustion										
Glass soil jar/Teflon lined cap										
LMC-3	E351	15-Sep-2020	----	----	----		23-Sep-2020	0 days	0 days	✓
Organic / Inorganic Carbon : Total Carbon by Combustion										
Glass soil jar/Teflon lined cap										
LMC-4	E351	15-Sep-2020	----	----	----		23-Sep-2020	0 days	0 days	✓
Organic / Inorganic Carbon : Total Carbon by Combustion										
Glass soil jar/Teflon lined cap										
LMC-5	E351	15-Sep-2020	----	----	----		23-Sep-2020	0 days	0 days	✓
Organic / Inorganic Carbon : Total Carbon by Combustion										
Glass soil jar/Teflon lined cap										
LWC-1	E351	13-Sep-2020	----	----	----		23-Sep-2020	0 days	0 days	✓
Organic / Inorganic Carbon : Total Carbon by Combustion										
Glass soil jar/Teflon lined cap										
LWC-2	E351	18-Sep-2020	----	----	----		23-Sep-2020	0 days	0 days	✓
Organic / Inorganic Carbon : Total Carbon by Combustion										
Glass soil jar/Teflon lined cap										
LWC-3	E351	18-Sep-2020	----	----	----		23-Sep-2020	0 days	0 days	✓
Organic / Inorganic Carbon : Total Carbon by Combustion										
Glass soil jar/Teflon lined cap										
LWC-4	E351	18-Sep-2020	----	----	----		23-Sep-2020	0 days	0 days	✓
Organic / Inorganic Carbon : Total Carbon by Combustion										
Glass soil jar/Teflon lined cap										
LWC-5	E351	18-Sep-2020	----	----	----		23-Sep-2020	0 days	0 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Organic / Inorganic Carbon : Total Carbon by Combustion										
Glass soil jar/Teflon lined cap										
UMC-1	E351	14-Sep-2020	----	----	----		23-Sep-2020	0 days	0 days	✓
Organic / Inorganic Carbon : Total Carbon by Combustion										
Glass soil jar/Teflon lined cap										
UMC-2	E351	14-Sep-2020	----	----	----		23-Sep-2020	0 days	0 days	✓
Organic / Inorganic Carbon : Total Carbon by Combustion										
Glass soil jar/Teflon lined cap										
UMC-3	E351	10-Sep-2020	----	----	----		23-Sep-2020	0 days	0 days	✓
Organic / Inorganic Carbon : Total Carbon by Combustion										
Glass soil jar/Teflon lined cap										
UMC-4	E351	10-Sep-2020	----	----	----		23-Sep-2020	0 days	0 days	✓
Organic / Inorganic Carbon : Total Carbon by Combustion										
Glass soil jar/Teflon lined cap										
UMC-5	E351	10-Sep-2020	----	----	----		23-Sep-2020	0 days	0 days	✓
Organic / Inorganic Carbon : Total Carbon by Combustion										
Glass soil jar/Teflon lined cap										
URC-1	E351	13-Sep-2020	----	----	----		23-Sep-2020	0 days	0 days	✓
Organic / Inorganic Carbon : Total Carbon by Combustion										
Glass soil jar/Teflon lined cap										
URC-2	E351	13-Sep-2020	----	----	----		23-Sep-2020	0 days	0 days	✓
Organic / Inorganic Carbon : Total Carbon by Combustion										
Glass soil jar/Teflon lined cap										
URC-3	E351	13-Sep-2020	----	----	----		23-Sep-2020	0 days	0 days	✓
Organic / Inorganic Carbon : Total Carbon by Combustion										
Glass soil jar/Teflon lined cap										
URC-4	E351	14-Sep-2020	----	----	----		23-Sep-2020	0 days	0 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Organic / Inorganic Carbon : Total Carbon by Combustion										
Glass soil jar/Teflon lined cap										
URC-5	E351	14-Sep-2020	----	----	----		23-Sep-2020	0 days	0 days	✓
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve										
Glass soil jar/Teflon lined cap										
LMC-1	E354	15-Sep-2020	----	----	----		22-Sep-2020	----	----	
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve										
Glass soil jar/Teflon lined cap										
LMC-2	E354	15-Sep-2020	----	----	----		22-Sep-2020	----	----	
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve										
Glass soil jar/Teflon lined cap										
LMC-3	E354	15-Sep-2020	----	----	----		22-Sep-2020	----	----	
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve										
Glass soil jar/Teflon lined cap										
LMC-4	E354	15-Sep-2020	----	----	----		22-Sep-2020	----	----	
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve										
Glass soil jar/Teflon lined cap										
LMC-5	E354	15-Sep-2020	----	----	----		22-Sep-2020	----	----	
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve										
Glass soil jar/Teflon lined cap										
LWC-1	E354	13-Sep-2020	----	----	----		22-Sep-2020	----	----	
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve										
Glass soil jar/Teflon lined cap										
LWC-2	E354	18-Sep-2020	----	----	----		22-Sep-2020	----	----	
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve										
Glass soil jar/Teflon lined cap										
LWC-3	E354	18-Sep-2020	----	----	----		22-Sep-2020	----	----	

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve										
Glass soil jar/Teflon lined cap										
LWC-4	E354	18-Sep-2020	----	----	----		22-Sep-2020	----	----	
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve										
Glass soil jar/Teflon lined cap										
LWC-5	E354	18-Sep-2020	----	----	----		22-Sep-2020	----	----	
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve										
Glass soil jar/Teflon lined cap										
UMC-1	E354	14-Sep-2020	----	----	----		22-Sep-2020	----	----	
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve										
Glass soil jar/Teflon lined cap										
UMC-2	E354	14-Sep-2020	----	----	----		22-Sep-2020	----	----	
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve										
Glass soil jar/Teflon lined cap										
UMC-3	E354	10-Sep-2020	----	----	----		22-Sep-2020	----	----	
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve										
Glass soil jar/Teflon lined cap										
UMC-4	E354	10-Sep-2020	----	----	----		22-Sep-2020	----	----	
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve										
Glass soil jar/Teflon lined cap										
UMC-5	E354	10-Sep-2020	----	----	----		22-Sep-2020	----	----	
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve										
Glass soil jar/Teflon lined cap										
URC-1	E354	13-Sep-2020	----	----	----		22-Sep-2020	----	----	
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve										
Glass soil jar/Teflon lined cap										
URC-2	E354	13-Sep-2020	----	----	----		22-Sep-2020	----	----	

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve										
Glass soil jar/Teflon lined cap										
URC-3	E354	13-Sep-2020	----	----	----		22-Sep-2020	----	----	
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve										
Glass soil jar/Teflon lined cap										
URC-4	E354	14-Sep-2020	----	----	----		22-Sep-2020	----	----	
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve										
Glass soil jar/Teflon lined cap										
URC-5	E354	14-Sep-2020	----	----	----		22-Sep-2020	----	----	
Particle Size : Particle Size Analysis - Sieve <2mm										
LDPE bag										
LMC-1	E182	15-Sep-2020	----	----	----		22-Sep-2020	0 days	0 days	✓
Particle Size : Particle Size Analysis - Sieve <2mm										
LDPE bag										
LMC-2	E182	15-Sep-2020	----	----	----		22-Sep-2020	0 days	0 days	✓
Particle Size : Particle Size Analysis - Sieve <2mm										
LDPE bag										
LMC-3	E182	15-Sep-2020	----	----	----		22-Sep-2020	0 days	0 days	✓
Particle Size : Particle Size Analysis - Sieve <2mm										
LDPE bag										
LMC-4	E182	15-Sep-2020	----	----	----		22-Sep-2020	0 days	0 days	✓
Particle Size : Particle Size Analysis - Sieve <2mm										
LDPE bag										
LMC-5	E182	15-Sep-2020	----	----	----		22-Sep-2020	0 days	0 days	✓
Particle Size : Particle Size Analysis - Sieve <2mm										
LDPE bag										
LWC-1	E182	13-Sep-2020	----	----	----		22-Sep-2020	0 days	0 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Particle Size : Particle Size Analysis - Sieve <2mm										
LDPE bag LWC-2	E182	18-Sep-2020	----	----	----		22-Sep-2020	0 days	0 days	✓
Particle Size : Particle Size Analysis - Sieve <2mm										
LDPE bag LWC-3	E182	18-Sep-2020	----	----	----		22-Sep-2020	0 days	0 days	✓
Particle Size : Particle Size Analysis - Sieve <2mm										
LDPE bag LWC-4	E182	18-Sep-2020	----	----	----		22-Sep-2020	0 days	0 days	✓
Particle Size : Particle Size Analysis - Sieve <2mm										
LDPE bag LWC-5	E182	18-Sep-2020	----	----	----		22-Sep-2020	0 days	0 days	✓
Particle Size : Particle Size Analysis - Sieve <2mm										
LDPE bag UMC	E182	10-Sep-2020	----	----	----		22-Sep-2020	0 days	0 days	✓
Particle Size : Particle Size Analysis - Sieve <2mm										
LDPE bag URC	E182	03-Sep-2020	----	----	----		22-Sep-2020	0 days	0 days	✓
Physical Tests : Loss On Ignition (420°C)										
Glass soil jar/Teflon lined cap UMC-1	E205C	14-Sep-2020	----	----	----		25-Sep-2020	365 days	10 days	✓
Physical Tests : Loss On Ignition (420°C)										
Glass soil jar/Teflon lined cap UMC-2	E205C	14-Sep-2020	----	----	----		25-Sep-2020	365 days	10 days	✓
Physical Tests : Loss On Ignition (420°C)										
Glass soil jar/Teflon lined cap URC-4	E205C	14-Sep-2020	----	----	----		25-Sep-2020	365 days	10 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Loss On Ignition (420°C)										
Glass soil jar/Teflon lined cap										
URC-5	E205C	14-Sep-2020	----	----	----		25-Sep-2020	365 days	10 days	✓
Physical Tests : Loss On Ignition (420°C)										
Glass soil jar/Teflon lined cap										
LWC-1	E205C	13-Sep-2020	----	----	----		25-Sep-2020	365 days	11 days	✓
Physical Tests : Loss On Ignition (420°C)										
Glass soil jar/Teflon lined cap										
URC-1	E205C	13-Sep-2020	----	----	----		25-Sep-2020	365 days	11 days	✓
Physical Tests : Loss On Ignition (420°C)										
Glass soil jar/Teflon lined cap										
URC-2	E205C	13-Sep-2020	----	----	----		25-Sep-2020	365 days	11 days	✓
Physical Tests : Loss On Ignition (420°C)										
Glass soil jar/Teflon lined cap										
URC-3	E205C	13-Sep-2020	----	----	----		25-Sep-2020	365 days	11 days	✓
Physical Tests : Loss On Ignition (420°C)										
Glass soil jar/Teflon lined cap										
UMC-3	E205C	10-Sep-2020	----	----	----		25-Sep-2020	365 days	14 days	✓
Physical Tests : Loss On Ignition (420°C)										
Glass soil jar/Teflon lined cap										
UMC-4	E205C	10-Sep-2020	----	----	----		25-Sep-2020	365 days	14 days	✓
Physical Tests : Loss On Ignition (420°C)										
Glass soil jar/Teflon lined cap										
UMC-5	E205C	10-Sep-2020	----	----	----		25-Sep-2020	365 days	14 days	✓
Physical Tests : Loss On Ignition (420°C)										
Glass soil jar/Teflon lined cap										
LWC-2	E205C	18-Sep-2020	----	----	----		25-Sep-2020	365 days	6 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Loss On Ignition (420°C)										
Glass soil jar/Teflon lined cap										
LWC-3	E205C	18-Sep-2020	----	----	----		25-Sep-2020	365 days	6 days	✓
Physical Tests : Loss On Ignition (420°C)										
Glass soil jar/Teflon lined cap										
LWC-4	E205C	18-Sep-2020	----	----	----		25-Sep-2020	365 days	6 days	✓
Physical Tests : Loss On Ignition (420°C)										
Glass soil jar/Teflon lined cap										
LWC-5	E205C	18-Sep-2020	----	----	----		25-Sep-2020	365 days	6 days	✓
Physical Tests : Loss On Ignition (420°C)										
Glass soil jar/Teflon lined cap										
LMC-1	E205C	15-Sep-2020	----	----	----		25-Sep-2020	365 days	9 days	✓
Physical Tests : Loss On Ignition (420°C)										
Glass soil jar/Teflon lined cap										
LMC-2	E205C	15-Sep-2020	----	----	----		25-Sep-2020	365 days	9 days	✓
Physical Tests : Loss On Ignition (420°C)										
Glass soil jar/Teflon lined cap										
LMC-3	E205C	15-Sep-2020	----	----	----		25-Sep-2020	365 days	9 days	✓
Physical Tests : Loss On Ignition (420°C)										
Glass soil jar/Teflon lined cap										
LMC-4	E205C	15-Sep-2020	----	----	----		25-Sep-2020	365 days	9 days	✓
Physical Tests : Loss On Ignition (420°C)										
Glass soil jar/Teflon lined cap										
LMC-5	E205C	15-Sep-2020	----	----	----		25-Sep-2020	365 days	9 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
LMC-1	E108	15-Sep-2020	25-Sep-2020	30 days	10 days	✓	25-Sep-2020	19 days	0 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
LMC-2	E108	15-Sep-2020	25-Sep-2020	30 days	10 days	✓	25-Sep-2020	19 days	0 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
LMC-3	E108	15-Sep-2020	25-Sep-2020	30 days	10 days	✓	25-Sep-2020	19 days	0 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
LMC-4	E108	15-Sep-2020	25-Sep-2020	30 days	10 days	✓	25-Sep-2020	19 days	0 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
LMC-5	E108	15-Sep-2020	25-Sep-2020	30 days	10 days	✓	25-Sep-2020	19 days	0 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
UMC-1	E108	14-Sep-2020	25-Sep-2020	30 days	11 days	✓	25-Sep-2020	18 days	0 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
UMC-2	E108	14-Sep-2020	25-Sep-2020	30 days	11 days	✓	25-Sep-2020	18 days	0 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
URC-4	E108	14-Sep-2020	25-Sep-2020	30 days	11 days	✓	25-Sep-2020	18 days	0 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
URC-5	E108	14-Sep-2020	25-Sep-2020	30 days	11 days	✓	25-Sep-2020	18 days	0 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
LWC-1	E108	13-Sep-2020	25-Sep-2020	30 days	12 days	✓	25-Sep-2020	17 days	0 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
URC-1	E108	13-Sep-2020	25-Sep-2020	30 days	12 days	✓	25-Sep-2020	17 days	0 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
URC-2	E108	13-Sep-2020	25-Sep-2020	30 days	12 days	✓	25-Sep-2020	17 days	0 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
URC-3	E108	13-Sep-2020	25-Sep-2020	30 days	12 days	✓	25-Sep-2020	17 days	0 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
UMC-3	E108	10-Sep-2020	25-Sep-2020	30 days	15 days	✓	25-Sep-2020	14 days	0 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
UMC-4	E108	10-Sep-2020	25-Sep-2020	30 days	15 days	✓	25-Sep-2020	14 days	0 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
UMC-5	E108	10-Sep-2020	25-Sep-2020	30 days	15 days	✓	25-Sep-2020	14 days	0 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
LWC-2	E108	18-Sep-2020	25-Sep-2020	30 days	7 days	✓	25-Sep-2020	22 days	0 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
LWC-3	E108	18-Sep-2020	25-Sep-2020	30 days	7 days	✓	25-Sep-2020	22 days	0 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
LWC-4	E108	18-Sep-2020	25-Sep-2020	30 days	7 days	✓	25-Sep-2020	22 days	0 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
LWC-5	E108	18-Sep-2020	25-Sep-2020	30 days	7 days	✓	25-Sep-2020	22 days	0 days	✓

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Soil/Solid**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Loss On Ignition (420°C)	E205C	91914	1	20	5.0	5.0	✓
Mercury in Soil/Solid by CVAAS	E510	91618	1	20	5.0	5.0	✓
Metals in Soil/Solid by CRC ICPMS	E440	91619	1	20	5.0	5.0	✓
Particle Size Analysis - Sieve <2mm	E182	89997	1	12	8.3	5.0	✓
pH by Meter (1:2 Soil:Water Extraction)	E108	91620	1	20	5.0	5.0	✓
Total Carbon by Combustion	E351	90606	1	20	5.0	5.0	✓
Total Inorganic Carbon by Acetic Acid pH Standard Curve	E354	89998	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Colourimetry	E319	90427	2	23	8.7	5.0	✓
Laboratory Control Samples (LCS)							
Loss On Ignition (420°C)	E205C	91914	1	20	5.0	5.0	✓
Mercury in Soil/Solid by CVAAS	E510	91618	2	20	10.0	10.0	✓
Metals in Soil/Solid by CRC ICPMS	E440	91619	2	20	10.0	10.0	✓
Particle Size Analysis - Sieve <2mm	E182	89997	1	12	8.3	5.0	✓
pH by Meter (1:2 Soil:Water Extraction)	E108	91620	1	20	5.0	5.0	✓
Total Carbon by Combustion	E351	90606	2	20	10.0	10.0	✓
Total Inorganic Carbon by Acetic Acid pH Standard Curve	E354	89998	2	20	10.0	10.0	✓
Total Kjeldahl Nitrogen by Colourimetry	E319	90427	4	23	17.3	10.0	✓
Method Blanks (MB)							
Loss On Ignition (420°C)	E205C	91914	1	20	5.0	5.0	✓
Mercury in Soil/Solid by CVAAS	E510	91618	1	20	5.0	5.0	✓
Metals in Soil/Solid by CRC ICPMS	E440	91619	1	20	5.0	5.0	✓
Total Carbon by Combustion	E351	90606	1	20	5.0	5.0	✓
Total Inorganic Carbon by Acetic Acid pH Standard Curve	E354	89998	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Colourimetry	E319	90427	2	23	8.7	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
pH by Meter (1:2 Soil:Water Extraction)	E108 Vancouver - Environmental	Soil/Solid	BC Lab Manual	pH is determined by potentiometric measurement with a pH electrode at ambient laboratory temperature (normally 20 ± 5°C), and is carried out in accordance with procedures described in the BC Lab Manual (prescriptive method). The procedure involves mixing the dried (at <60 ºC) and sieved (10mesh/2mm) sample with ultra pure water at a 1:2 ratio of sediment to water. The pH is then measured by a standard pH probe.
Particle Size Analysis - Sieve <2mm	E182 Saskatoon - Environmental	Soil/Solid	ASTM D6913-04	Soil samples are disaggregated and sieved through a 2mm sieve. Material passed through the sieve is then further disaggregated using calgon solution and passed through a series of sieves. The amount passing through the sieves is measured gravimetrically.
Loss On Ignition (420°C)	E205C Saskatoon - Environmental	Soil/Solid	CSSS (1978) 3.81 (mod)	Loss On Ignition (LOI) is determined by drying a portion of an air dried and ground sampld at 105°C, then igniting at 420°C for 2 hours. The weight loss after ignition is reported as % loss on ignition. LOI is reported on a dry weight basis. LOI at 420°C can be considered an estimation of Organic Matter Content according to Alberta Agriculture (1988).
Total Kjeldahl Nitrogen by Colourimetry	E319 Saskatoon - Environmental	Soil/Solid	CSSS (2008) 22.2.3	The soil is digested with sulfuric acid in the presence of $CuSO_4$ and K_2SO_4 catalysts. Ammonia in the soil extract is determined colrimetrically at 660 nm.
Total Carbon by Combustion	E351 Saskatoon - Environmental	Soil/Solid	CSSS (2008) 21.2 (mod)	Total Carbon is determined by the high temperature combustion method with measurement by an infrared detector.
Total Inorganic Carbon by Acetic Acid pH Standard Curve	E354 Saskatoon - Environmental	Soil/Solid	CSSS (2008) 20.2	Total Inorganic Carbon is determined by acetic acid pH standard curve, where a known quantity of acetic acid is consumed by reaction with carbonates in the soil. The pH of the resulting solution is measured and compared against a standard curve relating pH to weight of carbonate.
Metals in Soil/Solid by CRC ICPMS	E440 Vancouver - Environmental	Soil/Solid	EPA 6020B (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with HNO_3 and HCl. This method is intended to liberate metals that may be environmentally available. Silicate minerals are not solubilized. Dependent on sample matrix, some metals may be only partially recovered, including Al, Ba, Be, Cr, Sr, Ti, Tl, V, W, and Zr. Volatile forms of sulfur (including sulfide) may not be captured, as they may be lost during sampling, storage, or digestion. Analysis is by Collision/Reaction Cell ICPMS.
Mercury in Soil/Solid by CVAAS	E510 Vancouver - Environmental	Soil/Solid	EPA 200.2/1631 Appendix (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with HNO_3 and HCl, followed by CVAAS analysis.
Particle Size Analysis (Pipette) - MMER Classification	EC184E Saskatoon - Environmental	Soil/Solid	Metal Mining Technical Guidance for Environmental Effects Monitoring (2012)	The particle size determination is performed by various methods to generate a Grain Size curve. The data from the curve is then used to produce particle size ranges based on the Metal Mining Effluent Regulations (MMER) classification system for Environmental Effects Monitoring.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Total Organic Carbon (Calculated) in soil	EC356 Saskatoon - Environmental	Soil/Solid	CSSS (2008) 21.2	Total Organic Carbon (TOC) is calculated by the difference between total carbon (TC) and total inorganic carbon (TIC).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Leach 1:2 Soil:Water for pH	EP108 Vancouver - Environmental	Soil/Solid	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL	The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water.
Kjeldahl Digestion for soils	EP319 Saskatoon - Environmental	Soil/Solid	CSSS (2008) 22.2.3	The soil is digested with sulfuric acid in the presence of CuSO4 and K2SO4 catalysts.
Digestion for Metals and Mercury	EP440 Vancouver - Environmental	Soil/Solid	EPA 200.2 (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCl. This method is intended to liberate metals that may be environmentally available.
Dry and Grind	EPP442 Saskatoon - Environmental	Soil/Solid	Soil Sampling and Methods of Analysis, Carter 2008	After removal of any coarse fragments and reservation of wet subsamples a portion of homogenized sample is set in a tray and dried at less than 60 C until dry. The sample is then particle size reduced with an automated crusher or mortar and pestle, typically to <2 mm. Further size reduction may be needed for particular tests.

QUALITY CONTROL REPORT

Work Order	: **WR2000904**	Page	: 1 of 10
Client	: Minnow Environmental Inc.	Laboratory	: Whitehorse - Environmental
Contact	: Pierre Stecko	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minnow Project 20-70	Date Samples Received	: 18-Sep-2020 11:45
PO	: ----	Date Analysis Commenced	: 22-Sep-2020
C-O-C number	:	Issue Date	: 13-Oct-2020 18:00
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 32		
No. of samples analysed	: 32		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Dwayne Bennett	Technical Specialist	Inorganics, Saskatoon, Saskatchewan
Hedy Lai	Team Leader - Inorganics	Inorganics, Saskatoon, Saskatchewan
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Nancy Cruse	Laboratory _ Supervisor	Inorganics, Saskatoon, Saskatchewan
Ophelia Chiu	Supervisor - Organics Instrumentation	Organics, Burnaby, British Columbia
Xihua Yao	Laboratory Analyst	Inorganics, Saskatoon, Saskatchewan

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 91620)											
WR2000904-001	UMC-1	pH (1:2 soil:water)	----	E108	0.10	pH units	7.88	7.91	0.380%	5%	----
Physical Tests (QC Lot: 91914)											
WR2000904-001	UMC-1	loss on ignition @ 420°C	----	E205C	1.0	%	8.8	8.7	0.1	Diff <2x LOR	----
Particle Size (QC Lot: 89997)											
WR2000904-006	UMC	passing (0.075 mm)	----	E182	1.0	%	63.5	65.9	3.70%	20%	----
Organic / Inorganic Carbon (QC Lot: 89998)											
WR2000904-001	UMC-1	carbon, inorganic [IC]	----	E354	0.050	%	0.241	0.246	0.005	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 90606)											
WR2000904-001	UMC-1	carbon, total [TC]	----	E351	0.050	%	4.54	4.58	0.693%	20%	----
Metals (QC Lot: 91618)											
WR2000904-001	UMC-1	mercury	7439-97-6	E510	0.0500	mg/kg	<0.0500	<0.0500	0	Diff <2x LOR	----
Metals (QC Lot: 91619)											
WR2000904-001	UMC-1	aluminum	7429-90-5	E440	50	mg/kg	15800	16700	5.59%	40%	----
		antimony	7440-36-0	E440	0.10	mg/kg	0.51	0.68	0.17	Diff <2x LOR	----
		arsenic	7440-38-2	E440	0.10	mg/kg	7.66	8.06	5.05%	30%	----
		barium	7440-39-3	E440	0.50	mg/kg	470	492	4.58%	40%	----
		beryllium	7440-41-7	E440	0.10	mg/kg	0.53	0.55	0.03	Diff <2x LOR	----
		bismuth	7440-69-9	E440	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	----
		boron	7440-42-8	E440	5.0	mg/kg	<5.0	<5.0	0	Diff <2x LOR	----
		cadmium	7440-43-9	E440	0.020	mg/kg	0.318	0.321	0.814%	30%	----
		calcium	7440-70-2	E440	50	mg/kg	10300	10800	4.89%	30%	----
		chromium	7440-47-3	E440	0.50	mg/kg	28.8	30.5	5.88%	30%	----
		cobalt	7440-48-4	E440	0.10	mg/kg	14.1	14.8	4.96%	30%	----
		copper	7440-50-8	E440	0.50	mg/kg	249	270	8.06%	30%	----
		iron	7439-89-6	E440	50	mg/kg	29600	31100	4.94%	30%	----
		lead	7439-92-1	E440	0.50	mg/kg	6.27	6.39	1.84%	40%	----
		lithium	7439-93-2	E440	2.0	mg/kg	9.8	10.2	0.4	Diff <2x LOR	----
		magnesium	7439-95-4	E440	20	mg/kg	8130	8320	2.32%	30%	----
		manganese	7439-96-5	E440	1.0	mg/kg	6010	6470	7.41%	30%	----
		molybdenum	7439-98-7	E440	0.10	mg/kg	2.44	2.62	7.23%	40%	----
		nickel	7440-02-0	E440	0.50	mg/kg	32.8	34.9	6.31%	30%	----

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Metals (QC Lot: 91619) - continued											
WR2000904-001	UMC-1	phosphorus	7723-14-0	E440	50	mg/kg	1100	1140	3.17%	30%	----
		potassium	7440-09-7	E440	100	mg/kg	1770	1830	3.62%	40%	----
		selenium	7782-49-2	E440	0.20	mg/kg	0.86	0.88	0.03	Diff <2x LOR	----
		silver	7440-22-4	E440	0.10	mg/kg	0.15	0.15	0.006	Diff <2x LOR	----
		sodium	7440-23-5	E440	50	mg/kg	337	344	2.12%	40%	----
		strontium	7440-24-6	E440	0.50	mg/kg	126	137	8.06%	40%	----
		sulfur	7704-34-9	E440	1000	mg/kg	<1000	<1000	0	Diff <2x LOR	----
		thallium	7440-28-0	E440	0.050	mg/kg	0.109	0.108	0.001	Diff <2x LOR	----
		tin	7440-31-5	E440	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	----
		titanium	7440-32-6	E440	1.0	mg/kg	758	786	3.63%	40%	----
		tungsten	7440-33-7	E440	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	----
		uranium	7440-61-1	E440	0.050	mg/kg	1.17	1.21	2.88%	30%	----
		vanadium	7440-62-2	E440	0.20	mg/kg	58.2	60.8	4.40%	30%	----
		zinc	7440-66-6	E440	2.0	mg/kg	78.3	81.7	4.19%	30%	----
		zirconium	7440-67-7	E440	1.0	mg/kg	2.7	2.8	0.1	Diff <2x LOR	----
Leachable Anions & Nutrients (QC Lot: 90426)											
VA20B5375-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E319	0.05	mg/kg	0.329 %	3380	90	Diff <2x LOR	----
Leachable Anions & Nutrients (QC Lot: 90427)											
WR2000904-025	LWC-2	Kjeldahl nitrogen, total [TKN]	----	E319	0.02	mg/kg	0.168 %	1680	7	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Organic / Inorganic Carbon (QCLot: 89998)						
carbon, inorganic [IC]	----	E354	0.05	%	<0.050	----
Organic / Inorganic Carbon (QCLot: 90606)						
carbon, total [TC]	----	E351	0.05	%	<0.050	----
Metals (QCLot: 91618)						
mercury	7439-97-6	E510	0.005	mg/kg	<0.0050	----
Metals (QCLot: 91619)						
aluminum	7429-90-5	E440	50	mg/kg	<50	----
antimony	7440-36-0	E440	0.1	mg/kg	<0.10	----
arsenic	7440-38-2	E440	0.1	mg/kg	<0.10	----
barium	7440-39-3	E440	0.5	mg/kg	<0.50	----
beryllium	7440-41-7	E440	0.1	mg/kg	<0.10	----
bismuth	7440-69-9	E440	0.2	mg/kg	<0.20	----
boron	7440-42-8	E440	5	mg/kg	<5.0	----
cadmium	7440-43-9	E440	0.02	mg/kg	<0.020	----
calcium	7440-70-2	E440	50	mg/kg	<50	----
chromium	7440-47-3	E440	0.5	mg/kg	<0.50	----
cobalt	7440-48-4	E440	0.1	mg/kg	<0.10	----
copper	7440-50-8	E440	0.5	mg/kg	<0.50	----
iron	7439-89-6	E440	50	mg/kg	<50	----
lead	7439-92-1	E440	0.5	mg/kg	<0.50	----
lithium	7439-93-2	E440	2	mg/kg	<2.0	----
magnesium	7439-95-4	E440	20	mg/kg	<20	----
manganese	7439-96-5	E440	1	mg/kg	<1.0	----
molybdenum	7439-98-7	E440	0.1	mg/kg	<0.10	----
nickel	7440-02-0	E440	0.5	mg/kg	<0.50	----
phosphorus	7723-14-0	E440	50	mg/kg	<50	----
potassium	7440-09-7	E440	100	mg/kg	<100	----
selenium	7782-49-2	E440	0.2	mg/kg	<0.20	----
silver	7440-22-4	E440	0.1	mg/kg	<0.10	----
sodium	7440-23-5	E440	50	mg/kg	<50	----
strontium	7440-24-6	E440	0.5	mg/kg	<0.50	----
sulfur	7704-34-9	E440	1000	mg/kg	<1000	----
thallium	7440-28-0	E440	0.05	mg/kg	<0.050	----

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Metals (QCLot: 91619) - continued						
tin	7440-31-5	E440	2	mg/kg	<2.0	----
titanium	7440-32-6	E440	1	mg/kg	<1.0	----
tungsten	7440-33-7	E440	0.5	mg/kg	<0.50	----
uranium	7440-61-1	E440	0.05	mg/kg	<0.050	----
vanadium	7440-62-2	E440	0.2	mg/kg	<0.20	----
zinc	7440-66-6	E440	2	mg/kg	<2.0	----
zirconium	7440-67-7	E440	1	mg/kg	<1.0	----
Leachable Anions & Nutrients (QCLot: 90426)						
Kjeldahl nitrogen, total [TKN]	----	E319	200	mg/kg	<200	----
Leachable Anions & Nutrients (QCLot: 90427)						
Kjeldahl nitrogen, total [TKN]	----	E319	200	mg/kg	<200	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 91620)									
pH (1:2 soil:water)	----	E108	----	pH units	6 pH units	101	95.0	105	----
Organic / Inorganic Carbon (QCLot: 89998)									
carbon, inorganic [IC]	----	E354	0.05	%	0.5 %	96.4	90.0	110	----
Organic / Inorganic Carbon (QCLot: 90606)									
carbon, total [TC]	----	E351	0.05	%	48 %	99.4	80.0	120	----
Metals (QCLot: 91618)									
mercury	7439-97-6	E510	0.005	mg/kg	0.1 mg/kg	102	80.0	120	----
Metals (QCLot: 91619)									
aluminum	7429-90-5	E440	50	mg/kg	200 mg/kg	113	80.0	120	----
antimony	7440-36-0	E440	0.1	mg/kg	100 mg/kg	120	80.0	120	----
arsenic	7440-38-2	E440	0.1	mg/kg	100 mg/kg	103	80.0	120	----
barium	7440-39-3	E440	0.5	mg/kg	25 mg/kg	105	80.0	120	----
beryllium	7440-41-7	E440	0.1	mg/kg	10 mg/kg	99.0	80.0	120	----
bismuth	7440-69-9	E440	0.2	mg/kg	100 mg/kg	107	80.0	120	----
boron	7440-42-8	E440	5	mg/kg	100 mg/kg	93.7	80.0	120	----
cadmium	7440-43-9	E440	0.02	mg/kg	10 mg/kg	105	80.0	120	----
calcium	7440-70-2	E440	50	mg/kg	5000 mg/kg	103	80.0	120	----
chromium	7440-47-3	E440	0.5	mg/kg	25 mg/kg	106	80.0	120	----
cobalt	7440-48-4	E440	0.1	mg/kg	25 mg/kg	102	80.0	120	----
copper	7440-50-8	E440	0.5	mg/kg	25 mg/kg	104	80.0	120	----
iron	7439-89-6	E440	50	mg/kg	100 mg/kg	101	80.0	120	----
lead	7439-92-1	E440	0.5	mg/kg	50 mg/kg	107	80.0	120	----
lithium	7439-93-2	E440	2	mg/kg	25 mg/kg	97.2	80.0	120	----
magnesium	7439-95-4	E440	20	mg/kg	5000 mg/kg	108	80.0	120	----
manganese	7439-96-5	E440	1	mg/kg	25 mg/kg	104	80.0	120	----
molybdenum	7439-98-7	E440	0.1	mg/kg	25 mg/kg	104	80.0	120	----
nickel	7440-02-0	E440	0.5	mg/kg	50 mg/kg	103	80.0	120	----
phosphorus	7723-14-0	E440	50	mg/kg	1000 mg/kg	112	80.0	120	----
potassium	7440-09-7	E440	100	mg/kg	5000 mg/kg	104	80.0	120	----
selenium	7782-49-2	E440	0.2	mg/kg	100 mg/kg	102	80.0	120	----
silver	7440-22-4	E440	0.1	mg/kg	10 mg/kg	104	80.0	120	----
sodium	7440-23-5	E440	50	mg/kg	5000 mg/kg	115	80.0	120	----

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Metals (QCLot: 91619) - continued									
strontium	7440-24-6	E440	0.5	mg/kg	25 mg/kg	103	80.0	120	----
sulfur	7704-34-9	E440	1000	mg/kg	5000 mg/kg	99.7	80.0	120	----
thallium	7440-28-0	E440	0.05	mg/kg	100 mg/kg	110	80.0	120	----
tin	7440-31-5	E440	2	mg/kg	50 mg/kg	104	80.0	120	----
titanium	7440-32-6	E440	1	mg/kg	25 mg/kg	103	80.0	120	----
tungsten	7440-33-7	E440	0.5	mg/kg	10 mg/kg	104	80.0	120	----
uranium	7440-61-1	E440	0.05	mg/kg	0.5 mg/kg	102	80.0	120	----
vanadium	7440-62-2	E440	0.2	mg/kg	50 mg/kg	108	80.0	120	----
zinc	7440-66-6	E440	2	mg/kg	50 mg/kg	103	80.0	120	----
zirconium	7440-67-7	E440	1	mg/kg	10 mg/kg	102	80.0	120	----
Leachable Anions & Nutrients (QCLot: 90426)									
Kjeldahl nitrogen, total [TKN]	----	E319	200	mg/kg	1000 mg/kg	91.2	80.0	120	----
Leachable Anions & Nutrients (QCLot: 90427)									
Kjeldahl nitrogen, total [TKN]	----	E319	200	mg/kg	1000 mg/kg	95.8	80.0	120	----

Reference Material (RM) Report

A Reference Material (RM) is a homogenous material with known and well-established analyte concentrations. RMs are processed in an identical manner to test samples, and are used to monitor and control the accuracy and precision of a test method for a typical sample matrix. RM results are expressed as percent recovery of the target analyte concentration. RM targets may be certified target concentrations provided by the RM supplier, or may be ALS long-term mean values (for empirical test methods).

Sub-Matrix: **Soil/Solid**

					Reference Material (RM) Report				
					RM Target	Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Physical Tests (QCLot: 91914)									
QC-91914-002	RM	loss on ignition @ 420°C	----	E205C	5.3 %	95.4	80.0	120	----
Particle Size (QCLot: 89997)									
QC-89997-001	RM	passing (0.075 mm)	----	E182	56 %	102	80.0	120	----
Organic / Inorganic Carbon (QCLot: 89998)									
QC-89998-003	RM	carbon, inorganic [IC]	----	E354	0.383 %	95.8	80.0	120	----
Organic / Inorganic Carbon (QCLot: 90606)									
QC-90606-003	RM	carbon, total [TC]	----	E351	1.4 %	99.2	80.0	120	----
Metals (QCLot: 91618)									
QC-91618-003	SCP SS-2	mercury	7439-97-6	E510	0.059 mg/kg	101	70.0	130	----
Metals (QCLot: 91619)									
QC-91619-003	SCP SS-2	aluminum	7429-90-5	E440	9817 mg/kg	109	70.0	130	----
QC-91619-003	SCP SS-2	antimony	7440-36-0	E440	3.99 mg/kg	105	70.0	130	----
QC-91619-003	SCP SS-2	arsenic	7440-38-2	E440	3.73 mg/kg	96.7	70.0	130	----
QC-91619-003	SCP SS-2	barium	7440-39-3	E440	105 mg/kg	102	70.0	130	----
QC-91619-003	SCP SS-2	beryllium	7440-41-7	E440	0.349 mg/kg	108	70.0	130	----
QC-91619-003	SCP SS-2	boron	7440-42-8	E440	8.5 mg/kg	104	40.0	160	----
QC-91619-003	SCP SS-2	cadmium	7440-43-9	E440	0.91 mg/kg	100	70.0	130	----
QC-91619-003	SCP SS-2	calcium	7440-70-2	E440	31082 mg/kg	103	70.0	130	----
QC-91619-003	SCP SS-2	chromium	7440-47-3	E440	101 mg/kg	107	70.0	130	----
QC-91619-003	SCP SS-2	cobalt	7440-48-4	E440	6.9 mg/kg	105	70.0	130	----
QC-91619-003	SCP SS-2	copper	7440-50-8	E440	123 mg/kg	108	70.0	130	----
QC-91619-003	SCP SS-2	iron	7439-89-6	E440	23558 mg/kg	102	70.0	130	----
QC-91619-003	SCP SS-2	lead	7439-92-1	E440	267 mg/kg	109	70.0	130	----
QC-91619-003	SCP SS-2	lithium	7439-93-2	E440	9.5 mg/kg	106	70.0	130	----
QC-91619-003	SCP SS-2	magnesium	7439-95-4	E440	5509 mg/kg	105	70.0	130	----
QC-91619-003	SCP SS-2	manganese	7439-96-5	E440	269 mg/kg	105	70.0	130	----
QC-91619-003	SCP SS-2	molybdenum	7439-98-7	E440	1.03 mg/kg	105	70.0	130	----
QC-91619-003	SCP SS-2	nickel	7440-02-0	E440	26.7 mg/kg	104	70.0	130	----
QC-91619-003	SCP SS-2	phosphorus	7723-14-0	E440	752 mg/kg	109	70.0	130	----

Sub-Matrix: **Soil/Solid**

					Reference Material (RM) Report				
					RM Target	Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Metals (QCLot: 91619) - continued									
QC-91619-003	SCP SS-2	potassium	7440-09-7	E440	1587 mg/kg	105	70.0	130	----
QC-91619-003	SCP SS-2	sodium	7440-23-5	E440	797 mg/kg	103	70.0	130	----
QC-91619-003	SCP SS-2	strontium	7440-24-6	E440	86.1 mg/kg	109	70.0	130	----
QC-91619-003	SCP SS-2	thallium	7440-28-0	E440	0.0786 mg/kg	99.8	40.0	160	----
QC-91619-003	SCP SS-2	tin	7440-31-5	E440	10.6 mg/kg	106	70.0	130	----
QC-91619-003	SCP SS-2	titanium	7440-32-6	E440	839 mg/kg	109	70.0	130	----
QC-91619-003	SCP SS-2	uranium	7440-61-1	E440	0.52 mg/kg	106	70.0	130	----
QC-91619-003	SCP SS-2	vanadium	7440-62-2	E440	32.7 mg/kg	106	70.0	130	----
QC-91619-003	SCP SS-2	zinc	7440-66-6	E440	297 mg/kg	103	70.0	130	----
QC-91619-003	SCP SS-2	zirconium	7440-67-7	E440	5.73 mg/kg	93.0	70.0	130	----
Leachable Anions & Nutrients (QCLot: 90426)									
QC-90426-003	RM	Kjeldahl nitrogen, total [TKN]	----	E319	1040 mg/kg	91.6	80.0	120	----
Leachable Anions & Nutrients (QCLot: 90427)									
QC-90427-003	RM	Kjeldahl nitrogen, total [TKN]	----	E319	1040 mg/kg	98.2	80.0	120	----

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	Victoria, BC	Email 2:	slatimer@minnow.ca			○ Same Day or Weekend Emergen
Phone:	(250)595-1627 x24 Fax: (250) 595-1625	Email 3:				An
Invoice To	Same as Report ? ☐ Yes ☑ No	Client / Project Information				Please indicate below Filte
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Address:	61 Wasson Place, Whitehorse, Yukon Y1A 0H7					
Phone:	604 759 4659 Fax:	Quote #:				
Lab Work Order # (lab use only)		ALS Contact:	Can Dang	Sampler:		

Environmental Division
Whitehorse
Work Order Reference
WR2000904

Telephone : +1 867 668 6689

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Rescan Low Level Sediments	Inorganic Carbon	Total Carbon by combustion	Mercury by CVAFS	Loss on Ignition	pH in soil	Particle Size	Total Organic Carl	Total Kjeldahl Nitr	**See Complete Q			Number of Conta
	UMC-1	Sept14		Sediment	✓	✓	✓	✓	✓	✓		✓	✓				1
	UMC-2	Sept14		"	✓	✓	✓	✓	✓	✓		✓	✓				1
	UMC-3	Sept10			✓	✓	✓	✓	✓	✓		✓	✓				1
	UMC-4	Sept10			✓	✓	✓	✓	✓	✓		✓	✓				1
	UMC-5	Sept10			✓	✓	✓	✓	✓	✓		✓	✓				1
	UMC	Sept10									✓						1
	URC-1	Sept13			✓	✓	✓	✓	✓	✓		✓	✓				1
	URC-2	Sept13			✓	✓	✓	✓	✓	✓		✓	✓				1
	URC-3	Sept13			✓	-	✓	✓	✓	✓		✓	✓				1
	URC-4	Sept14			✓	✓	✓	✓	✓	✓		✓	✓				1
	URC-5	Sept14			✓	✓	✓	✓	✓	✓		✓	✓				1
	URC	Sept13									✓						1

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Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Pierre Stecko	8-Sep-20		D.	Sept 14/20	11:45	3/1 °C				

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	LMC-1 jar	Sept 15-20		Sediment	✓	✓	✓	✓	✓	✓		✓	✓				
	LMC-1 bag	11		11							✓						
	LMC-2 jar				✓	✓	✓	✓	✓	✓		✓	✓				
	LMC-2 bag										✓						
	LMC-3 jar				✓	✓	✓	✓	✓	✓		✓	✓				
	LMC-3 bag										✓						
	LMC-4 jar				✓	✓	✓	✓	✓	✓		✓	✓				
	LMC-4 bag										✓						
	LMC-5 jar				✓	✓	-	-	✓	✓		✓	✓				
	LMC-5 bag										✓						

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Pierre Stecko	18-Sep-20					°C				

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Address:	61 Wasson Place, Whitehorse, Yukon Y1A 0H7							
Phone:	604 759 4659	Fax:		Quote #:				
Lab Work Order # (lab use only)				ALS Contact:	Can Dang	Sampler:		

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Rescan Low Level Sediments	Inorganic Carbon	Total Carbon by combustion	Mercury by CVAFS	Loss on Ignition	pH in soil	Particle Size	Total Organic Carbon	Total Kjeldahl Nitrogen	**See Complete Quote #Q51327			Number of Containers
	LWC-1 jar	Sept 13-20		Sediment	✓	✓	✓	✓	✓	✓		✓	✓				
	LWC-1 bag	"		"							✓						
	LWC-2 jar				✓	✓	✓	✓	✓	✓		✓	✓				
	LWC-2 bag										✓						
	LWC-3 jar				✓	✓	✓	✓	✓	✓		✓	✓				
	LWC-3 bag										✓						
	LWC-4 jar				✓	✓	✓	✓	✓	✓		✓	✓				
	LWC-4 bag										✓						
	LWC-5 jar				✓	✓	✓	✓	✓	✓		✓	✓				
	LWC-5 bag										✓						
					✓												

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Small samples. The critical analyte of interest is selenium; please ensure best possible MDLs.

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Address:	61 Wasson Place, Whitehorse, Yukon Y1A 0H7			
Phone:	604 759 4659 Fax:	Quote #:		
Lab Work Order # (lab use only)		ALS Contact: Can Dang	Sampler:	

Environmental Division Whitehorse

Work Order Reference

WR2000904

Telephone : +1 867 668 6689

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Rescan Low Level Sediments	Inorganic Carbon	Total Carbon by combustion	Mercury by CVAFS	Loss on Ignition	pH in soil	Particle Size	Total Organic Car	Total Kjeldahl Nitr	**See Complete Q			Number of Conta
	UMC-1	Sept14		Sediment	✓	✓	✓	✓	✓	✓		✓	✓				1
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	UMC-4	Sept10			✓	✓	✓	✓	✓	✓		✓	✓				1
	UMC-5	Sept10			✓	✓	✓	✓	✓	✓		✓	✓				1
	UMC	Sept10									✓						1
	URC-1	Sept13			✓	✓	✓	✓	✓	✓		✓	✓				1
	URC-2	Sept13			✓	✓	✓	✓	✓	✓		✓	✓				1
	URC-3	Sept13			✓	-	✓	✓	✓	✓		✓	✓				1
	URC-4	Sept14			✓	✓	✓	✓	✓	✓		✓	✓				1
	URC-5	Sept14			✓	✓	✓	✓	✓	✓		✓	✓				1
	URC	Sept13									✓						1

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~~Dup~~ samples. The critical analyte of interest is selenium; please ensure best possible MDLs.

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Pierre Stecko	8-Sep-20			Sept18/20	11:45	3 / 1 °C	N/A	9/19	2:10p	

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	LMC-1	jar	Sept 15-20		Sediment	✓	✓	✓	✓	✓	✓		✓	✓				
	LMC-1	bag	"		"							✓						
	LMC-2	jar				✓	✓	✓	✓	✓	✓		✓	✓				
	LMC-2	bag										✓						
	LMC-3	jar				✓	✓	✓	✓	✓	✓		✓	✓				
	LMC-3	bag										✓						
	LMC-4	jar				✓	✓	✓	✓	✓	✓		✓	✓				
	LMC-4	bag										✓						
	LMC-5	jar				✓	✓	✓	✓	✓	✓		✓	✓				
	LMC-5	bag										✓						
									–	–								
										–								

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	LWC-1 jar	Sept 13-20		Sediment	✓	✓	✓	✓	✓	✓		✓	✓				
	LWC-1 bag	"		"							✓						
	LWC-2 jar				✓	✓	✓	✓	✓	✓		✓	✓				
	LWC-2 bag										✓						
	LWC-3 jar				✓	✓	✓	✓	✓	✓		✓	✓				
	LWC-3 bag										✓						
	LWC-4 jar				✓	✓	✓	✓	✓	✓		✓	✓				
	LWC-4 bag										✓						
	LWC-5 jar				✓	✓	✓	✓	✓	✓		✓	✓				
	LWC-5 bag										✓						
					✓												

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Pierre Stecko	18-Sep-20					°C				

Freshwater sediment toxicity testing using *H. azteca* and *C. dilutus*

September 2020 Sediment Samples

Final Report

November 12, 2020

Submitted to: **Minnow Environmental Inc.**
Victoria, BC

8664 Commerce Court, Burnaby, BC V5A 4N7

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APPENDIX C – Analytical Chemistry
APPENDIX D – Chain-of-Custody Forms

SIGNATURE PAGE

Report By:
Karen Lee, B. Sc.
Biologist – Project Manager

Reviewed By:
Armando Tang, R.P.Bio.
Senior Reviewer

This report has been prepared by Nautilus Environmental Company Inc. based on data and/or samples provided by our client and the results of this study are for their sole benefit. Any reliance on the data by a third party is at the sole and exclusive risk of that party. The results presented here relate only to the samples tested.

SUMMARY

Sample and Test Type Information

Sample ID	LWC and LMC
Sample collection date	September 13 and 15, 2020
Sample receipt date	September 22, 2020
Sample receipt temperature	8.5°C
Test types	14-d *Hyalella azteca* survival and growth 10-d *Chironomus dilutus* survival and growth

Results

Endpoint (mean + SD)	Sample ID		
	Control Sediment	**LWC**	**LMC**
H. azteca survival (%)	100 ± 0.0	100 ± 0.0	74.0 ± 35.8[*, α]
H. azteca growth (mg)	0.14 ± 0.02	0.14 ± 0.01	0.13 ± 0.01
C. dilutus survival (%)	90.0 ± 10.0	94.0 ± 13.4	76.0 ± 20.7[α]
C. dilutus growth (mg)	1.74 ± 0.18	2.40 ± 0.31	2.65 ± 0.27

SD = Standard Deviation

(*) Indicates a statistically significant effect relative to the control sediment

(α) Indicates a statistically significant effect relative to reference sediment LWC

1.0 INTRODUCTION

Nautilus Environmental Company Inc. conducted freshwater sediment toxicity tests for Minnow Environmental Inc. on samples identified as LWC and LMC. The samples were collected on September 13 and 15, 2020; each sample was transported in two Ziploc bags and delivered to laboratory in Burnaby, BC on September 22, 2020. The samples had a temperature of 8.5°C on receipt and were stored in the dark at 4 ± 2°C prior to testing. A 14-d *Hyalella azteca* and 10-d *Chironomus dilutus* survival and growth sediment toxicity test were conducted on the samples and the test results provided in this report. Copies of laboratory data sheets and printouts of statistical analyses for the tests are provided in Appendices A and B, analytical chemistry is provided in Appendix C and the chain-of-custody form is provided in Appendix D.

2.0 METHODS

Methods for the toxicity tests are summarized in Tables 1 and 2. Testing was conducted according to procedures described by Environment Canada (1997 and 2017). Statistical analyses for all tests were performed using CETIS (Tidepool Scientific Software, 2013).

Ammonia concentrations were measured in-house three times per week on reference sediment sample LWC to ensure that un-ionized ammonia was below 0.2 mg/L (Environment Canada, 2017). Samples of overlying water were also collected at test initiation and termination, and sent to ALS Environmental, Burnaby, BC for measurements of total ammonia concentration. Analytical results are provided in Appendix C.

Table 1. Summary of test conditions: *Hyalella azteca* survival and growth test.

Test species	*Hyalella azteca*
Organism source	Aquatic Research Organisms, Hampton, NH
Organism age	2- to 9-days old
Test type	Static
Test duration	14 days
Test vessel	375-mL glass container
Test volume	100 mL sediment; 175 mL overlying water
Test replicates	5 field replicates per sample
Number of organisms	10 per replicate
Control/dilution water	Reconstituted water
Test solution renewal	None
Test temperature	23 ± 1°C
Feeding	0.75 mL of YCT and 1.35 mg of Tetramin per replicate daily
Light intensity	500 to 1000 lux at water surface
Photoperiod	16 hours light/8 hours dark
Aeration	Continuous gentle aeration
Test measurements	Temperature, dissolved oxygen, pH and conductivity of overlying water measured daily; hardness, alkalinity and total ammonia of overlying water measured at test initiation and termination; unionized ammonia measured three times weekly in overlying water of reference sample
Test protocol	Environment Canada (2017), EPS 1/RM/33
Statistical software	CETIS Version 1.9.4
Test endpoints	Survival and dry weight
Test acceptability criteria for controls	≥80% survival and ≥0.1 mg/amphipod dry weight
Reference toxicant	Sodium chloride (NaCl)

Table 2. Summary of test conditions: *Chironomus dilutus* survival and growth test.

Test species	*Chironomus dilutus*
Organism source	Aquatic BioSystems, Fort Collins, CO
Organism age	Third instar
Test type	Static
Test duration	10 days
Test vessel	375-mL glass container
Test volume	100 mL sediment; 175 mL overlying water
Test replicates	5 field replicates per sample
Number of organisms	10 per replicate
Control/dilution water	Reconstituted water
Test solution renewal	None
Test temperature	23 ± 1°C
Feeding	6 mg of Tetramin per replicate daily
Light intensity	500 to 1000 lux at water surface
Photoperiod	16 hours light/8 hours dark
Aeration	Continuous gentle aeration
Test measurements	Temperature, dissolved oxygen, pH and conductivity of overlying water measured daily; hardness, alkalinity and total ammonia of overlying water measured at test initiation and termination
Test protocol	Environment Canada (1997), EPS 1/RM/32
Statistical software	CETIS Version 1.9.4
Test endpoints	Survival and dry weight
Test acceptability criteria for controls	≥70% survival and ≥0.6 mg/worm dry weight
Reference toxicant	Potassium chloride (KCl)

3.0 RESULTS

Adverse effects were observed on the survival of *H. azteca* in the exposure sediment (LMC) compared to both the control sediment and the reference sediment (LWC) (Table 3). The survival of *C. dilutus* was also significantly reduced in the exposure sediment compared to the reference sediment only (Table 4). No significant effects were observed on growth for either *H. azteca* or *C. dilutus*.

Measured total ammonia concentrations are summarized in Table 5. These concentrations were at levels that are not expected to cause adverse effects to the species. Un-ionized ammonia measurements on the reference sediment sample were below 0.2 mg/L throughout the *H. azteca* test; therefore, renewal of the overlying water was not required (Environment Canada, 2017).

Table 3. Results: *Hyalella azteca* survival and growth test.

Sample ID	Mean ± SD	
	Survival (%)	Average Dry Weight (mg/org)
Control Sediment	100 ± 0.0	0.14 ± 0.02
LWC	100 ± 0.0	0.14 ± 0.01
LMC	74.0 ± 35.8 *,α	0.13 ± 0.01

SD = Standard Deviation

(*) Indicates a statistically significant effect relative to control sediment

(α) Indicates a statistically significant effect relative to reference sediment LWC

Table 4. Results: *Chironomus dilutus* survival and growth test.

Sample ID	Mean ± SD	
	Survival (%)	Average Dry Weight (mg/org)
Control Sediment	90.0 ± 10.0	1.74 ± 0.18
LWC	94.0 ± 13.4	2.40 ± 0.31
LMC	76.0 ± 20.7 α	2.65 ± 0.27

SD = Standard Deviation

(α) Indicates a statistically significant effect relative to reference sediment LWC

Table 5. Summary of total overlying ammonia concentrations (mg/L N) measured in the toxicity tests.

Sample ID	*Hyalella azteca*		*Chironomus dilutus*	
	Day 0	Day 14	Day 0	Day 10
Control Sediment	0.228	0.292	0.228	1.13
LWC	0.050	0.087	0.050	0.295
LMC	0.188	0.080	0.188	0.289

4.0 QA/QC

The health history of the test organisms used in the exposures was acceptable and met the requirement of the Environment Canada protocol. The test met all control acceptability criteria and water quality parameters of the *C. dilutus* test remained within ranges specified in the protocol throughout the test. The pH measurements of the reference sediment in the *H. azteca* test were 8.1 and 8.2 on Days 8 to 14 of the test; water renewals were not conducted, which is required if the pH of the reference sediment is outside of the acceptable range of 6.0 to 8.0. This deviation did not appear to affect test results, as the reference sediment performed equally as well and was not significantly different compared to the control sediment. There were no other deviations from the test methodology. Uncertainty associated with the tests are best described by the standard deviations around the mean.

Results of the reference toxicant test conducted during the testing program are summarized in Table 6. Results for the *H. azteca* test fell within the acceptable range for organism performance of mean and two standard deviations, based on historical results obtained by the laboratory with this test. Thus, the sensitivity of the organisms used in the test was appropriate. Results for the *C. dilutus* test was slightly outside of two standard deviations, was likely due to variability and did not appear to affect test results.

Table 6. Reference toxicant test results.

Test Species	Endpoint	Historical Mean (2 SD Range)	CV (%)	Test Date
H. azteca	Survival (LC50): 4.5 g/L NaCl	5.7 (4.0 – 8.1)	18	September 25, 2020
C. dilutus	Survival (LC50): 4.3 g/L KCl	5.8 (4.4 – 7.8)	15	September 25, 2020

SD = Standard Deviation, CV = Coefficient of Variation, LC = Lethal Concentration

5.0 REFERENCES

Environment Canada. 2017. Biological test method: test for survival and growth in sediment and water using the freshwater amphipod, *Hyalella azteca*. EPS 1/RM/33, Second Edition, September 2017.

Environment Canada. 1997. Biological test method: test for survival and growth in sediment using the larvae of freshwater midges (*Chironomus tentans* and *Chrironomus riparius*). Environmental Protection Series EPS 1/RM/32. December 1997. Environment Canada, Method Development and Application Section, Environmental Technology Centre, Ottawa, ON. 131 pp.

Tidepool Scientific Software. 2013. CETIS comprehensive environmental toxicity information system, version 1.9.4 Tidepool Scientific Software, McKinleyville, CA. 275 pp.

APPENDIX A – *Hyalella azteca* Toxicity Test Data

Hyalella azteca Sediment Test Summary Sheet

Client: Minnow Environmental Inc.
Work Order No.: 201797

Start Date: Sept. 25/20
Set up by: RZS

Sample Information:

Sample ID: LMC & LWC
Sample Date: Sept. 15 & Sept. 13
Date Received: Sept. 22/20
Sample Volume: 2 bags per field rep

Test Organism Information:

Species: *Hyalella azteca*
Supplier: Aquatic Biosystems, CO
Date received: Sept. 23/20
Age or size (Day 0): ~~2nd instar~~ 7-9 d
% Mortality in 24 h prior to testing 0

NaCl Reference Toxicant Results:

Reference Toxicant ID: RZS ~~HA191~~ HA190
Stock Solution ID: n/a
Date Initiated: Sept. 25/20

96-h LC50 (95% CL): 4.5 (3.1-6.5) g/L NaCl

96-h LC50 Reference Toxicant Mean and Range: 5.7 (4.0-8.1) g/L NaCl CV (%): 18

Test Results:

Sample ID	Survival ± SD (%)	Average Dry Wt. ± SD (mg)
Control Sediment	100 ± 0.0	0.14 ± 0.02
LWC	100 ± 0.0	0.14 ± 0.01
LMC	74.0 ± 35.8 *,x	0.13 ± 0.01
	±	±
	±	±
	±	±
	±	±
	±	±

* significantly different compared to control sediment
x Significantly different compared to ~~control~~ sediment LWC

Reviewed by: JOH (RZS Reference)
Date reviewed: Oct. 29/20

Chronic *H. azteca* Sediment Toxicity Test Data Sheet

Freshwater Sediment Water Quality

Client: Minnow Environmental Inc.
Work Order No.: RES ~~201796~~ 201797

Start Date: Sept 25/20
Termination Date: Oct 9/20
CER #: 6
Test Organism: *Hyalella azteca*

Temperature (°C)

Sample ID	Day														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Control	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.5	22.5
LWC	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.5	22.5
LMC	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.5	22.5
Technician Initials	GJU	MW	CMP	GJU	GJU	RZS	GJU	RZS	JW	MW	RZS	GJU	RZS	RZS	RZS

Thermometer: 6

Conductivity (µS)

Sample ID	Day														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Control	416	463	501	515	515	521	523	528	541	546	543	555	556	561	571
LWC	407	437	444	448	457	468	493	519	567	606	650	680	687	691	697
LMC	496	561	596	642	682	720	770	775	805	836	857	871	859	835	826
Technician Initials	GJU	MW	CMP	GJU	GJU	RZS	GJU	RZS	JW	MW	RZS	GJU	RZS	RZS	RZS

Conductivity meter/probe: 3 / 3

Comments: Small black worm was found in LMC rep B and taken out

Reviewed by: JGU

Date Reviewed: Oct. 15/20

Chronic *H. azteca* Sediment Toxicity Test Data Sheet
Freshwater Sediment Water Quality

Client: Minnow Environmental Inc.
Work Order No.: 20797

Start Date: Sept 25/20
Termination Date: Oct 9/20
CER #: 6
Test Organism: *Hyalella azteca*

Dissolved oxygen (mg/L)

Sample ID	Day														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Control	8.2	8.2	8.3	8.1	8.1	8.0	8.3	8.3	8.5	8.3	8.0 ~~8.15~~	8.3	8.1	7.9	7.7
LWC	8.3	8.2	8.3	7.7	8.0	8.0	8.1	8.3	8.5	8.3	~~7.85~~	8.2	8.1	7.7	7.7
LMC	8.4	8.3	8.4	8.0	8.2	8.0	8.2	8.2	8.6	8.2	~~7.80~~ 8.1	8.0	8.0	7.7	7.7
Technician Initials	GJU	UW	CMP	RZS	GJU	RZS	GJU	RZS	JW	UW	RZS	GJU	RZS	RZS	RZS

DO meter/probe: 3 / 3

pH

Sample ID	Day														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Control	7.6	7.9	8.1	7.7	7.8	7.7	7.8	7.7	7.8	7.9	7.7	7.7	7.7	7.7	7.8
LWC	7.5	7.7	7.9	7.6	7.7	7.9	8.0	8.0	8.1	8.1	8.2	8.1	8.1	8.1	8.1
LMC	8.3	8.3	8.5	8.4	8.5	8.6	8.6	8.4	8.4	8.4	8.6	8.5	8.5	8.5	8.6
Technician Initials	GJU	UW	CMP	RZS	GJU	RZS	GJU	RZS	JW	UW	RZS	GJU	RZS	RZS	RZS

pH meter/probe: 3 / 3

Light meter: Lit-1

Light intensity (Lux): 450-880

Comments:

Reviewed by: JOH

Date Reviewed: Oct-15/20

H. azteca Sediment Toxicity Test Data Sheet

Freshwater Sediment 14-d Survival and Weight

Client: Minnow Environmental
Work Order No: ~~BZ.2019~~ 201797
Sample ID: LWC and LMC

Start Date: Sept 25/20
Termination Date: Oct 9/20
Test Organism: *Hyalella azteca*
Balance: 1

Sample ID	Pan No. (25 wire)	Rep	No. alive	No. dead	No. missing	Initials	Pan weight (mg)	Pan + organism (mg)	No. weighed	Initials
Control Sediment	1	A	10	0	0	KJL	997.37	998.93	10	RZS
	2	B	10	0	0		1001.71	1003.37	10	
	3	C	10	0	0		1006.94	1008.24	10	
	4	D	10	0	0		1003.23	1004.58	10	
	5	E	10	0	0		1001.52	1002.54	10	
LWC	6	A	10	0	0	KJL	1015.86	1017.33	10	
	7	B	10	0	0	JZL	1001.54	1002.71	10	
	8	C	10	0	0	JZL	994.23	995.68	10	
	9	D	10	0	0	RZS	1000.03	1001.44	RZS ~~10~~ 9 (2)	
	10	E	10	0	0	RZS	1003.26	1004.66	10	
LMC	11	A	10	0	0	JZL	1002.41	1003.78	10	
	12	B	10	0	0	JZL	1005.10	1006.37	10	
	13	C	4 (1)	0	6	JZL	1008.22	1008.77	4	
	14	D	10	0	0	RZS	1006.88	1008.09	10	
	15	E	3 (1)	0	7	RZS	1011.06	1011.41	3	
		A								
		B								
		C								
		D								
		E								

Comments:
(1) checked by KJL — 10% reweigh pan # 11: 1003.78 mg
(2) One Hyallela lost in transfer & pan #6: 1017.24 mg RZS

Reviewed by: JCh
Date Reviewed: Oct. 15/20

CETIS Summary Report

Hyalella 14-d Survival and Growth Sediment Test — **Nautilus Environmental**

Batch ID:	08-3515-3659	**Test Type:**	Growth-Survival (~~10d~~ 14) RZS	**Analyst:**	Rachel Sakurdeep
Start Date:	25 Sep-20	**Protocol:**	EC/EPS 1/RM/33	**Diluent:**	Reconstituted Water
Ending Date:	09 Oct-20	**Species:**	Hyalella azteca	**Brine:**	
Test Length:	14d 0h	**Taxon:**	Malacostraca	**Source:**	Aquatic Biosystems, CO **Age:** 7-9d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Control Sedimen	08-1153-5124	25 Sep-20	25 Sep-20	n/a	Minnow Environmental	
LWC	02-8948-8472	13 Sep-20	22 Sep-20 09:52	12d 0h (8.5 °C)		
LMC	16-3510-3273	15 Sep-20	22 Sep-20 09:52	10d 0h (8.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Control Sedimen	Sediment Sample	Minnow Environmental	Control Sediment	
LWC	Sediment Sample	Minnow Environmental	LWC	
LMC	Sediment Sample	Minnow Environmental	LMC	

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
12-3187-8564	10d Survival Rate (14 RZS)	Fisher Exact/Bonferroni-Holm Test	1.0000	LWC passed ~~10d~~ survival rate	1
12-3187-8564	10d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	Control Sedimen passed ~~10d~~ survival rate	1
12-3187-8564	10d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	LMC passed ~~10d~~ survival rate	1
17-2415-5152	10d Survival Rate	Fisher Exact Test	5.0E-05	Control Sedimen failed ~~10d~~ survival rate	1
17-2415-5152	10d Survival Rate	Fisher Exact Test	5.0E-05	LMC failed ~~10d~~ survival rate	1
17-2415-5152	10d Survival Rate	Fisher Exact Test	5.0E-05	LWC failed ~~10d~~ survival rate	1
12-3187-8564	10d Survival Rate	Fisher Exact/Bonferroni-Holm Test	5.0E-05	Control Sedimen failed ~~10d~~ survival rate	1
12-3187-8564	10d Survival Rate	Fisher Exact/Bonferroni-Holm Test	5.0E-05	LWC failed ~~10d~~ survival rate	1
12-3187-8564	10d Survival Rate	Fisher Exact/Bonferroni-Holm Test	5.0E-05	LMC failed ~~10d~~ survival rate	1
08-8838-2628	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	0.7740	LMC passed mean dry weight-mg	1
08-8838-2628	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	0.7740	LWC passed mean dry weight-mg	1
08-8838-2628	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	0.7740	Control Sedimen passed mean dry weight-	1
08-8838-2628	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	0.3024	Control Sedimen passed mean dry weight-	1
08-8838-2628	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	0.3024	LMC passed mean dry weight-mg	1
08-8838-2628	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	0.3024	LWC passed mean dry weight-mg	1
01-3211-1804	Mean Dry Weight-mg	Equal Variance t Two-Sample Test	0.0638	Control Sedimen passed mean dry weight-	1
01-3211-1804	Mean Dry Weight-mg	Equal Variance t Two-Sample Test	0.0638	LWC passed mean dry weight-mg	1
01-3211-1804	Mean Dry Weight-mg	Equal Variance t Two-Sample Test	0.0638	LMC passed mean dry weight-mg	1

(22) ~~10d~~ 14 **Survival Rate Summary**

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control Sedimen	N	5	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
LWC	RS	5	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	0.00%
LMC		5	0.7400	0.2958	1.0000	0.3000	1.0000	0.1600	0.3578	48.35%	26.00%

Mean Dry Weight-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control Sedimen	N	5	0.1378	0.1069	0.1687	0.102	0.166	0.01113	0.02488	18.06%	0.00%
LWC	RS	5	0.1411	0.1228	0.1595	0.117	0.1567	0.006611	0.01478	10.47%	-2.42%
LMC		5	0.1278	0.1162	0.1395	0.1167	0.1375	0.004184	0.009355	7.32%	7.23%

Hyalella 14-d Survival and Growth Sediment Test — **Nautilus Environmental**

RZS 14 ~~10~~d Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control Sedimen	N	1.0000	1.0000	1.0000	1.0000	1.0000
LWC	RS	1.0000	1.0000	1.0000	1.0000	1.0000
LMC		1.0000	1.0000	0.4000	1.0000	0.3000

Mean Dry Weight-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control Sedimen	N	0.156	0.166	0.13	0.135	0.102
LWC	RS	0.147	0.117	0.145	0.1567	0.14
LMC		0.137	0.127	0.1375	0.121	0.1167

RZS 14 ~~10~~d Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control Sedimen	N	10/10	10/10	10/10	10/10	10/10
LWC	RS	10/10	10/10	10/10	10/10	10/10
LMC		10/10	10/10	4/10	10/10	3/10

CETIS Analytical Report

Report Date: 14 Oct-20 14:17 (p 1 of 1)
Test Code/ID: 201797 / 14-0332-9587

Hyalella 14-d Survival and Growth Sediment Test — **Nautilus Environmental**

Analysis ID:	12-3187-8564	**Endpoint:**	14 ~~10~~d Survival Rate RZS	**CETIS Version:**	CETISv1.9.4
Analyzed:	14 Oct-20 14:14	**Analysis:**	STP 2xK Contingency Tables	**Status Level:**	1
Batch ID:	08-3515-3659	**Test Type:**	Growth-Survival (14 ~~10~~d) RZS	**Analyst:**	Rachel Sakurdeep
Start Date:	25 Sep-20	**Protocol:**	EC/EPS 1/RM/33	**Diluent:**	Reconstituted Water
Ending Date:	09 Oct-20	**Species:**	Hyalella azteca	**Brine:**	
Test Length:	14d 0h	**Taxon:**	Malacostraca	**Source:**	Aquatic Biosystems, CO **Age:** 7-9d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Control Sedimen	08-1153-5124	25 Sep-20	25 Sep-20	n/a	Minnow Environmental	
LWC	02-8948-8472	13 Sep-20	22 Oct-20 09:52	12d 0h (8.5 °C)		
LMC	16-3510-3273	15 Sep-20	22 Oct-20 09:52	10d 0h (8.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Control Sedimen	Sediment Sample	Minnow Environmental	Control Sediment	
LWC	Sediment Sample	Minnow Environmental	LWC	
LMC	Sediment Sample	Minnow Environmental	LMC	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Negative Control		LWC	1.0000	Exact	1.0000	Non-Significant Effect
		LMC*	0.0000	Exact	5.0E-05	Significant Effect

Data Summary

Conc-Sed	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Control Sedimen	N	50	0	50	1	0	0.0%
LWC		50	0	50	1	0	0.0%
LMC		37	13	50	0.74	0.26	26.0%

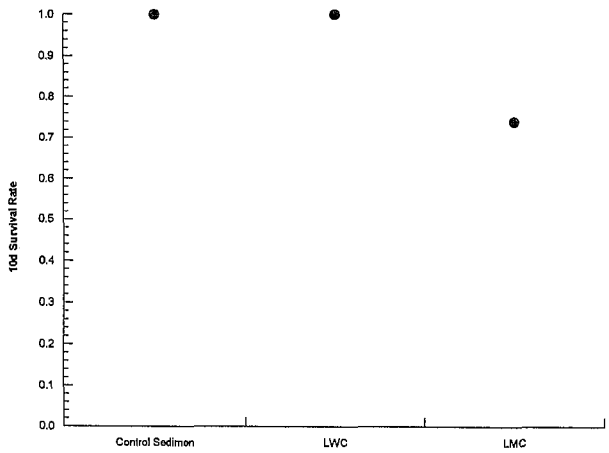
14 RZS **~~10~~d Survival Rate Detail**

Conc-Sed	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control Sedimen	N	1.0000	1.0000	1.0000	1.0000	1.0000
LWC		1.0000	1.0000	1.0000	1.0000	1.0000
LMC		1.0000	1.0000	0.4000	1.0000	0.3000

14 RZS **~~10~~d Survival Rate Binomials**

Conc-Sed	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control Sedimen	N	10/10	10/10	10/10	10/10	10/10
LWC		10/10	10/10	10/10	10/10	10/10
LMC		10/10	10/10	4/10	10/10	3/10

Graphics



Analyst: RZS QA: Oct. 15/20

CETIS Analytical Report

Hyalella 14-d Survival and Growth Sediment Test — **Nautilus Environmental**

Analysis ID:	08-8838-2628	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.9.4
Analyzed:	19 Oct-20 13:58	**Analysis:**	Parametric-Control vs Treatments	**Status Level:**	1
Batch ID:	08-3515-3659	**Test Type:**	Growth-Survival (~~10~~14d) RZS	**Analyst:**	Rachel Sakurdeep
Start Date:	25 Sep-20	**Protocol:**	EC/EPS 1/RM/33	**Diluent:**	Reconstituted Water
Ending Date:	09 Oct-20	**Species:**	Hyalella azteca	**Brine:**	
Test Length:	14d 0h	**Taxon:**	Malacostraca	**Source:**	Aquatic Biosystems, CO **Age:** 7-9d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Control Sedimen	08-1153-5124	25 Sep-20	25 Sep-20	n/a	Minnow Environmental	
LWC	02-8948-8472	13 Sep-20	22 Oct-20 09:52	12d 0h (8.5 °C)		
LMC	16-3510-3273	15 Sep-20	22 Oct-20 09:52	10d 0h (8.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Control Sedimen	Sediment Sample	Minnow Environmental	Control Sediment	
LWC	Sediment Sample	Minnow Environmental	LWC	
LMC	Sediment Sample	Minnow Environmental	LMC	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	LWC passed mean dry weight-mg	16.99%
		LMC passed mean dry weight-mg	16.99%

Dunnett Multiple Comparison Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Negative Control		LWC	-0.3002	2.108	0.023	8	CDF	0.7740	Non-Significant Effect
		LMC	0.897	2.108	0.023	8	CDF	0.3024	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0004787	0.0002393	2	0.776	0.4820	Non-Significant Effect
Error	0.0037011	0.0003084	12			
Total	0.0041798		14			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	3.266	9.21	0.1953	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9743	0.8328	0.9156	Normal Distribution

Mean Dry Weight-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Control Sedimen	N	5	0.1378	0.1069	0.1687	0.135	0.102	0.166	0.01113	18.06%	0.00%
LWC		5	0.1411	0.1228	0.1595	0.145	0.117	0.1567	0.006611	10.47%	-2.42%
LMC		5	0.1278	0.1162	0.1395	0.127	0.1167	0.1375	0.004184	7.32%	7.23%

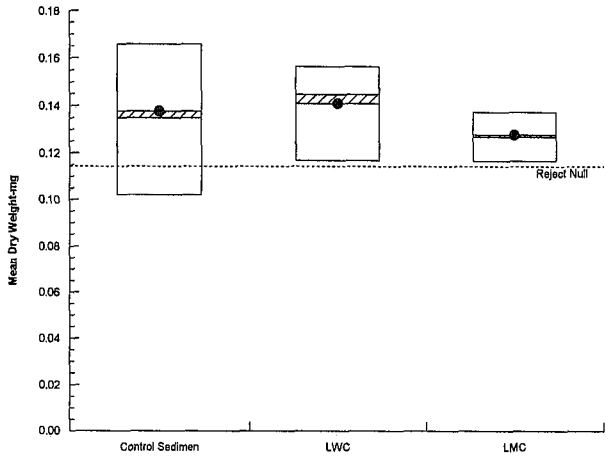
Mean Dry Weight-mg Detail

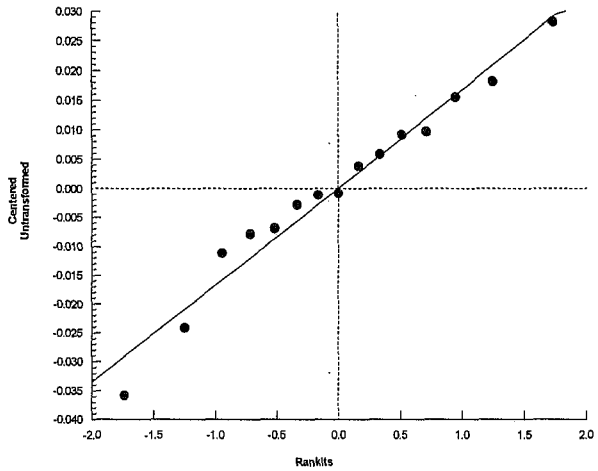
Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control Sedimen	N	0.156	0.166	0.13	0.135	0.102
LWC		0.147	0.117	0.145	0.1567	0.14
LMC		0.137	0.127	0.1375	0.121	0.1167

Hyalella 14-d Survival and Growth Sediment Test **Nautilus Environmental**

Analysis ID:	08-8838-2628	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.9.4
Analyzed:	19 Oct-20 13:58	**Analysis:**	Parametric-Control vs Treatments	**Status Level:**	1

Graphics





CETIS Analytical Report

Test Code/ID: 201797 / 14-0332-9587

Hyalella 14-d Survival and Growth Sediment Test — **Nautilus Environmental**

Analysis ID:	17-2415-5152	**Endpoint:**	~~10~~ 14d Survival Rate	**CETIS Version:**	CETISv1.9.4
Analyzed:	14 Oct-20 14:42	**Analysis:**	Single 2x2 Contingency Table	**Status Level:**	1
Batch ID:	08-3515-3659	**Test Type:**	Growth-Survival (~~10d~~ 14)	**Analyst:**	Rachel Sakurdeep
Start Date:	25 Sep-20	**Protocol:**	EC/EPS 1/RM/33	**Diluent:**	Reconstituted Water
Ending Date:	09 Oct-20	**Species:**	Hyalella azteca	**Brine:**	
Test Length:	14d 0h	**Taxon:**	Malacostraca	**Source:**	Aquatic Biosystems, CO **Age:** 7-9d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
LWC	02-8948-8472	13 Sep-20	22 Oct-20 09:52	12d 0h (8.5 °C)	Minnow Environmental	
LMC	16-3510-3273	15 Sep-20	22 Oct-20 09:52	10d 0h (8.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
LWC	Sediment Sample	Minnow Environmental	LWC	
LMC	Sediment Sample	Minnow Environmental	LMC	

Fisher Exact Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Reference Sed		LMC*	0.0000	Exact	5.0E-05	Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
LWC	RS	50	0	50	1	0	0.0%
LMC		37	13	50	0.74	0.26	26.0%

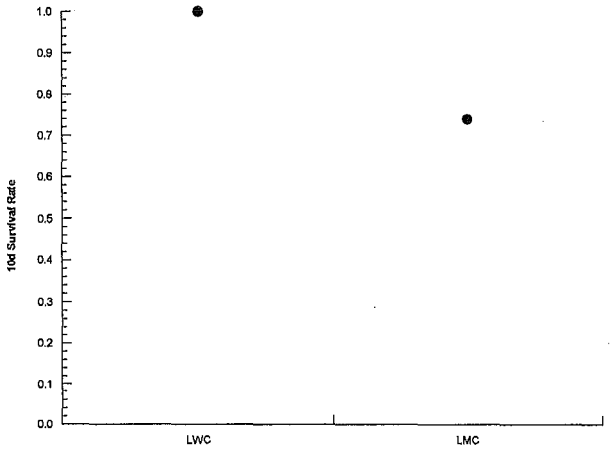
14 RZS **~~10~~d Survival Rate Detail**

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
LWC	RS	1.0000	1.0000	1.0000	1.0000	1.0000
LMC		1.0000	1.0000	0.4000	1.0000	0.3000

14 RZS **~~10~~d Survival Rate Binomials**

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
LWC	RS	10/10	10/10	10/10	10/10	10/10
LMC		10/10	10/10	4/10	10/10	3/10

Graphics



Analyst: RZS QA: JGu Oct 21/20

Hyalella 14-d Survival and Growth Sediment Test — **Nautilus Environmental**

Analysis ID:	01-3211-1804	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.9.4
Analyzed:	14 Oct-20 14:44	**Analysis:**	Parametric-Two Sample	**Status Level:**	1
Batch ID:	08-3515-3659	**Test Type:**	Growth-Survival (~~10d~~ 14) RZS	**Analyst:**	Rachel Sakurdeep
Start Date:	25 Sep-20	**Protocol:**	EC/EPS 1/RM/33	**Diluent:**	Reconstituted Water
Ending Date:	09 Oct-20	**Species:**	Hyalella azteca	**Brine:**	
Test Length:	14d 0h	**Taxon:**	Malacostraca	**Source:**	Aquatic Biosystems, CO **Age:** 7-9d

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
LWC	02-8948-8472	13 Sep-20	22 Oct-20 09:52	12d 0h (8.5 °C)	Minnow Environmental	
LMC	16-3510-3273	15 Sep-20	22 Oct-20 09:52	10d 0h (8.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
LWC	Sediment Sample	Minnow Environmental	LWC	
LMC	Sediment Sample	Minnow Environmental	LMC	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	*C > T*	*LMC passed mean dry weight-mg*	10.31%

Equal Variance t Two-Sample Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Reference Sed		LMC	1.7	1.86	0.015	8	CDF	0.0638	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0004421	0.0004421	1	2.889	0.1276	Non-Significant Effect
Error	0.0012242	0.0001530	8			
Total	0.0016662		9			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	2.497	23.15	0.3971	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9495	0.7411	0.6623	Normal Distribution

Mean Dry Weight-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
LWC	* RS	5	0.1411	0.1228	0.1595	0.145	0.117	0.1567	0.006611	10.47%	0.00%
LMC		5	0.1278	0.1162	0.1395	0.127	0.1167	0.1375	0.004184	7.32%	9.42%

Mean Dry Weight-mg Detail

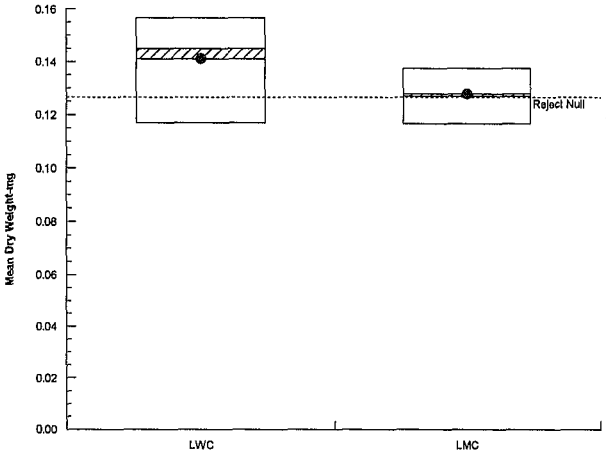
Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
LWC	RS	0.147	0.117	0.145	0.1567	0.14
LMC		0.137	0.127	0.1375	0.121	0.1167

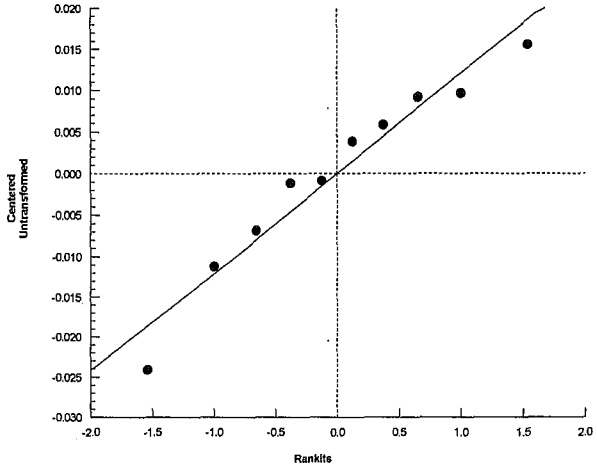
* RS = Reference Sediment

Hyalella 14-d Survival and Growth Sediment Test — **Nautilus Environmental**

Analysis ID:	01-3211-1804	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.9.4
Analyzed:	14 Oct-20 14:44	**Analysis:**	Parametric-Two Sample	**Status Level:**	1

Graphics





Client : Minnow Environmental
W.O.: 201797
Date see below

Table of PKa values

	TDS (mg/L)			Salinity (g/kg)		
Temperature (°C)	*0*	*250*	*2000*	*10*	*20*	*30*
12	9.662	9.699	9.754	9.788	9.819	9.837
15	9.564	9.601	9.655	9.688	9.719	9.737
18	9.465	9.502	9.557	9.588	9.619	9.636
20	9.401	9.438	9.492	9.523	9.554	9.571
22		9.391				
23	9.307	9.344	9.398	9.426	9.459	9.476
24		9.314				
25	9.246	9.283	9.337	9.366	9.397	9.414

Date	Sample ID	Temperature (C)	pH	Salinity (ppt)	Total Ammonia as N (mg/L)	pKa	Unionized Ammonia (mg/L N)
25-Sep-20	**LWC**	**22**	**7.5**		**0.04**	9.391	**0.000508**
28-Sep-20	**LWC**	**22**	**7.6**		**0.55**	9.391	**0.008758**
30-Sep-20	**LWC**	**22**	**7.9**		**0.90**	9.391	**0.028148**
2-Oct-20	**LWC**	**22**	**8**		**0.50**	9.391	**0.019528**
5-Oct-20	**LWC**	**22**	**8.2**		**0.10**	9.391	**0.006052**
7-Oct-20	**LWC**	**22**	**8.1**		**0.20**	9.391	**0.009735**

JCh
Oct. 21/20

Nautilus Environmental
Water Quality Data For Ammonia

Client: Minnow Environmental Inc. **Species:** H. azteca

Work Order No: 201797 **Sample Type:** overlying ammonia

Date Measured: See below

Date	Sample ID	Temperature (°C)	pH	Total Ammonia as N (mg/L)	Unionized Ammonia as N (mg/L)	Tech. Init.
Sept 25/20	LWC	22.0	7.5	0.04	0.0005	KJV
Sept 28	LWC	22.0	7.6	0.55	0.0088	RZS / GJU
Sept 30	LWC	22.0	7.9	RZS ~~0~~ 0.90	0.028	RZS / GJU
Oct 2	LWC	22.0	8.0	0.50	0.020	GJU / RZS
Oct 5	LWC	22.0	8.2	0.10	0.006	RZS / GJU
Oct 7	LWC	22.0	8.1	0.20	0.010	RZS / GJU

Ammonia Salicylate Lot #: A9338

Ammonia Cyanurate Lot #: A9295

Comments: _____

Reviewed by: _____ **Date Reviewed:** Oct. 21/20

Client: Minnow Environmental Inc.

W.O.#: 201796 - 201797

Hardness and Alkalinity Datasheet

	Alkalinity						Hardness			
Sample ID	Subsample Date	Date Measured	Sample Volume (mL)	(mL) 0.02N HCL/H_2SO_4 used to pH 4.5	(mL) of 0.02N HCL/H_2SO_4 used to pH 4.2	Total Alkalinity ($mg/LCaCO_3$)	Sample Volume (mL)	Volume of 0.01M EDTA Used (mL)	Total Hardness ($mg/L\ CaCO_3$)	Technician
Control (Day 0)	Sept 25/20	Sept 28/20	50.0	2.8	2.9	54	50.0	5.9	118	RZS / GJU
LWC (Day 0)	↓	↓	~~50.0~~	2.8	2.9	54	50.0	6.2	124	RZS / GJU
LMC (Day 0)	↓	↓	50.0	6.0	6.1	118	10.0 ①	~~5~~ 1.5	150	RZS / GJU
Control (Day 10)	Oct 5/20	Oct 5/20	50.0	3.3	3.4	64	50.0	6.8	136	RZS / GJU
LWC (Day 10)	↓	↓	50.0	JZL ~~2~~ 5.1	5.2	100	10.0 ①	2.0	200	RZS / GJU
LMC (Day 10)	↓	↓	50.0	15.9	16.8	300	10.0 ①	3.2	320	RZS / GJU
~~Con~~ RZS										
Control (Day 14)	Oct. 9/20	Oct. 12/20	50.0	RZS ~~2.4~~ 2.5	2.6	48	50.0	6.8	136	RZS
LWC (Day 14)	↓	↓	50.0	6.1	6.3	118	10.0 ①	2.0	200	RZS
LMC (Day 14)	↓	↓	50.0	16.4	17.1	314	10.0 ①	2.5	250	RZS

Notes: ① Sample was diluted to 100.0mL w/ DI

Reviewed by: JGu Date Reviewed: Oct. 21/20

Sediment Description Data Sheet

Client: Minnow Environmental Inc.
Work Order No.: 201796 - 201797

Date: Sept 24/20
Test Organism: *Hyalella azteca*, *Chironomus dilutus*

Sample ID	Grain Size	Colour	Odour	Debris	Other	Initials
Control Sediment	Sand	grey	—	—		
LWC-1	wet clay	brown	—	roots		RZS
LWC-2	wet clay	brown	—		lots of overlying water	GJV
LWC-3	wet clay	brown	—	twigs		RZS
LWC-4	wet clay	dark brown/black	—	roots		GJV
LWC-5	clay	dark brow	—	roots	overlying water	
LMC-1	clay (wet)	brown	—	roots	overlying water	RZS
LMC-2	clay (wet)	brown	—		overlying water	GJV
LMC-3	clay (wet)	brown	—	roots		
LMC-4	clay (wet)	brown	—		overlying water	
LMC-5	clay (wet)	brown	—	twigs, roots	overlying water	

Reviewed by: JGV

Date Reviewed: Oct. 15/20

APPENDIX B – *Chironomus dilutus* Toxicity Test Data

Chironomus dilutus Sediment Test Summary Sheet

Client: Minnow Environmental Inc
Work Order No.: 201796

Start Date: Sept. 25, 2020
Set up by: RZS / KJL

Sample Information:

Sample ID: LHC & LWC
Sample Date: Sept. 15 & Sept. 13
Date Received: Sept. 22/20
Sample Volume: 2 bags per field rep

Test Organism Information:

Species: *C. dilutus*
Supplier: Aquatic Biosystems, CO
Date received: Sept. 23/20
Age or size (Day 0): 3rd in-star

KCl Reference Toxicant Results:

Reference Toxicant ID: CT90
Stock Solution ID: n/a
Date Initiated: Sept. 25/20

96-h LC50 (95% CL): 4.3 (3.1 - 5.8) g/L KCl

96-h LC50 Reference Toxicant Mean and Range: 5.8 (4.4 - 7.8) g/L KCl CV (%): 15

Test Results:

Sample ID	Survival ± SD (%)	Average Dry Wt. ± SD (mg)
Control Sediment	90.0 ± 10.0	1.74 ± ~~0.08~~ RZS 0.18
LWC	94.0 ± 13.4	2.40 ± ~~0.14~~ RZS 0.31
LHC	76.0 ± 20.7 *	2.65 ± ~~0.12~~ RZS 0.27
	±	±
	±	±
	±	±
	±	±

* significantly different compared to Reference sediment LWC

Reviewed by: JM

Date reviewed: Oct. 29/20

10-d Chironomid Sediment Toxicity Test Data Sheet

Freshwater Sediment 10-d Water Quality

Client: Minnow Environmental Inc.
W.O #: 201796

Start Date: Sept 25/20
Termination Date: Oct 9/20
CER #: 6 5
Test Organism: *Chironomus dilutus*

Temperature (°C)

Sample ID	Day										
	0	1	2	3	4	5	6	7	8	9	10
Control	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
LWC	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
LMC	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Technician Initials	RZS	UW	CML	GJU	RZS	GJU	RZS	GJU	JW	UW	GJU

Thermometer: 6

Conductivity (µS)

Sample ID	Day										
	0	1	2	3	4	5	6	7	8	9	10
Control	416	423	441	450	461	479	492	500	508	523	526
LWC	407	424	429	448	473	511 RZS	554	588	625	646	662
LMC	496	539	571	626	664	694	724	725	750	772	790
Technician Initials	RZS	UW	CML	GJU	RZS	GJU	RZS	GJU	JW	UW	GJU

Conductivity meter/probe: 3 / 3

Comments:

Reviewed by: JOL

Date Reviewed: Oct - 15/20

10-d Chironomid Sediment Toxicity Test Data Sheet

Freshwater Sediment 10-d Water Quality

Client: Minnow Environmental Inc.
W.O. #: 201796

Start Date: Sept 25/20
Termination Date: Oct 5/20
CER #: 6
Test Organism: *Chironomus dilutus*

Dissolved oxygen (mg/L)

Sample ID	Day										
	0	1	2	3	4	5	6	7	8	9	10
Control	8.2	8.2	8.0	8.0	7.8	7.7	7.9	7.8	8.4	8.3	8.0
LWC	8.3	8.0	8.1	7.7	7.7	7.8	8.0	~~RZS~~ 7.7	8.3	8.2	7.9
LMC	8.4	8.2	8.1	7.9	7.8	7.9	7.9	7.8	8.4	8.1	8.0
Technician Initials	GJU	UW	CMP	RZS	RZS	GJU	RZS	GJU	JW	UW	GJU

DO meter/probe: 3 / 3

pH

Sample ID	Day										
	0	1	2	3	4	5	6	7	8	9	10
Control	7.6	8.0	7.9	7.8	7.7	7.9	7.9	7.7	7.9	8.0	7.8
LWC	7.5	7.8	7.8	7.9	8.0	8.1	8.2	8.0	8.1	8.1	8.0
LMC	8.3	8.3	8.4	8.3	8.5	8.5	8.5	8.3	8.4	8.5	8.4
Technician Initials	GJU	UW	CMP	RZS	RZS	GJU	RZS	GJU	JW	UW	GJU

pH meter/probe: 3 / 3

Light meter: Lit-1

Light intensity (Lux): 450 - 880

Comments:

Reviewed by: JOh

Date Reviewed: Oct. 15/20

10-d Chironomid Sediment Toxicity Test Data Sheet

Freshwater Sediment 10-d Survival and Weight

Client: Minnow Environmental Inc.
W.O. #: 201796
Sample ID: LWC & LMC

Start Date: Sept 25/20
Termination Date: Oct 5/20
Test Organism: *Chironomus dilutus*
Balance: 1

Sample ID	Pan No. (25 used)	Rep	No. alive	No. dead	No. missing	Initials	Pan weight (mg)	Pan + organism (mg)	No. weighed	Initials
Control Sediment	1	A	10	0	0	RZS	1002.41	1017.65	10	RZS
	2	B	10	0	0	GJU	1001.75	1017.68	10	RZS
	3	C	8	0	2	RZS	998.78	1013.98	8	RZS
	4	D	9	0	1	GJU	1005.46	1021.10	9	RZS
	5	E	8	0	2	GJU	1000.02	1015.56	8	RZS
~~Control~~ -		A								
		B								
		C								
		D								
		E								
LWC	6	A	7	0	3	RZS	1003.85	1023.30	7	RZS
	7	B	10 ①	0	0	GJU	998.24	1020.73	10	RZS
	8	C	10	0	0	RZS	1004.14	1026.15	10	RZS
	9	D	10	0	0	GJU	1003.10	1029.97	10	RZS
	10	E	11 ②	0	0	RZS	999.69	1022.77	~~10~~ GJU 11	GJU
LMC	11	A	9 ②	0	1	GJU	1011.91	1036.41	9	GJU
	12	B	4 ③	0	6	RZS	1008.50	1019.63	4	GJU
	13	C	8	0	2	GJU	998.70	1022.44	8	GJU
	14	D	9	0	1	RZS	1001.11	1021.37	9	GJU
	15	E	8 ①	0	2	GJU	998.86	1019.23	8	GJU

Comments:
① 1 of them is considerably smaller than others - 10% reweigh pan #6: 1023.15 mg
② 2 of them are considerably smaller than others & pan #13: 1022.32 mg RZS.
③ checked by KSL

Reviewed by: JGA

Date Reviewed: Oct-15/20

CETIS Summary Report

Chironomus 10-d Survival and Growth Sediment Test — **Nautilus Environmental**

Batch ID:	10-5748-4799	**Test Type:**	Growth-Survival (10d)	**Analyst:**	Rachel Sakurdeep
Start Date:	25 Sep-20	**Protocol:**	EC/EPS 1/RM/32	**Diluent:**	Reconstituted Water
Ending Date:	05 Oct-20	**Species:**	Chironomus dilutus	**Brine:**	
Test Length:	10d 0h	**Taxon:**		**Source:**	Aquatic Biosystems, CO **Age:** 3rd

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Control Sedimen	08-1153-5124	25 Sep-20	25 Sep-20	n/a	Minnow Environmental	
LWC	02-8948-8472	13 Sep-20	22 Sep-20 09:52	12d 0h (8.5 °C)		
LMC	16-3510-3273	15 Sep-20	22 Sep-20 09:52	10d 0h (8.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Control Sedimen	Sediment Sample	Minnow Environmental	Control Sediment	
LWC	Sediment Sample	Minnow Environmental	LWC	
LMC	Sediment Sample	Minnow Environmental	LMC	

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
08-6264-8062	10d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	LWC passed 10d survival rate	1
08-6264-8062	10d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	LMC passed 10d survival rate	1
08-6264-8062	10d Survival Rate	Fisher Exact/Bonferroni-Holm Test	1.0000	Control Sedimen passed 10d survival rate	1
20-6350-3921	10d Survival Rate	Fisher Exact Test	0.0102	LMC failed 10d survival rate	1
20-6350-3921	10d Survival Rate	Fisher Exact Test	0.0102	LWC failed 10d survival rate	1
20-6350-3921	10d Survival Rate	Fisher Exact Test	0.0102	Control Sedimen failed 10d survival rate	1
08-6264-8062	10d Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.0542	Control Sedimen passed 10d survival rate	1
08-6264-8062	10d Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.0542	LWC passed 10d survival rate	1
08-6264-8062	10d Survival Rate	Fisher Exact/Bonferroni-Holm Test	0.0542	LMC passed 10d survival rate	1
03-2418-0197	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	0.9999	LMC passed mean dry weight-mg	1
03-2418-0197	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	0.9999	LWC passed mean dry weight-mg	1
03-2418-0197	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	0.9999	Control Sedimen passed mean dry weight-	1
20-6771-4291	Mean Dry Weight-mg	Equal Variance t Two-Sample Test	0.9984	LWC passed mean dry weight-mg	1
20-6771-4291	Mean Dry Weight-mg	Equal Variance t Two-Sample Test	0.9984	Control Sedimen passed mean dry weight-	1
20-6771-4291	Mean Dry Weight-mg	Equal Variance t Two-Sample Test	0.9984	LMC passed mean dry weight-mg	1
03-2418-0197	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	1.0000	LWC passed mean dry weight-mg	1
03-2418-0197	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	1.0000	LMC passed mean dry weight-mg	1
03-2418-0197	Mean Dry Weight-mg	Dunnett Multiple Comparison Test	1.0000	Control Sedimen passed mean dry weight-	1
20-6771-4291	Mean Dry Weight-mg	Equal Variance t Two-Sample Test	0.9999	Control Sedimen passed mean dry weight-	1
20-6771-4291	Mean Dry Weight-mg	Equal Variance t Two-Sample Test	0.9999	LWC passed mean dry weight-mg	1
20-6771-4291	Mean Dry Weight-mg	Equal Variance t Two-Sample Test	0.9999	LMC passed mean dry weight-mg	1

10d Survival Rate Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control Sedimen	N	5	0.9000	0.7758	1.0000	0.8000	1.0000	0.0447	0.1000	11.11%	0.00%
LWC		5	0.9400	0.7734	1.0000	0.7000	1.0000	0.0600	0.1342	14.27%	-4.44%
LMC		5	0.7600	0.5025	1.0000	0.4000	0.9000	0.0927	0.2074	27.28%	15.56%

Mean Dry Weight-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
Control Sedimen	N	5	1.739	1.511	1.967	1.524	1.942	0.08212	0.1836	10.56%	0.00%
LWC		5	2.403	2.02	2.785	2.098	2.779	0.1377	0.3079	12.81%	-38.13%
LMC		5	2.654	2.318	2.99	2.251	2.967	0.1211	0.2708	10.20%	-52.57%

Chironomus 10-d Survival and Growth Sediment Test **Nautilus Environmental**

10d Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control Sedimen	N	1.0000	1.0000	0.8000	0.9000	0.8000
LWC		0.7000	1.0000	1.0000	1.0000	1.0000
LMC		0.9000	0.4000	0.8000	0.9000	0.8000

Mean Dry Weight-mg Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control Sedimen	N	1.524	1.593	1.9	1.738	1.942
LWC		2.779	2.249	2.201	2.687	2.098
LMC		2.722	2.783	2.967	2.251	2.546

10d Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control Sedimen	N	10/10	10/10	8/10	9/10	8/10
LWC		7/10	10/10	10/10	10/10	11/11
LMC		9/10	4/10	8/10	9/10	8/10

CETIS Analytical Report

Chironomus 10-d Survival and Growth Sediment Test — **Nautilus Environmental**

Analysis ID:	20-6350-3921	**Endpoint:**	10d Survival Rate	**CETIS Version:**	CETISv1.9.4
Analyzed:	08 Oct-20 16:49	**Analysis:**	Single 2x2 Contingency Table	**Status Level:**	1
Batch ID:	10-5748-4799	**Test Type:**	Growth-Survival (10d)	**Analyst:**	Rachel Sakurdeep
Start Date:	25 Sep-20	**Protocol:**	EC/EPS 1/RM/32	**Diluent:**	Reconstituted Water
Ending Date:	05 Oct-20	**Species:**	Chironomus dilutus	**Brine:**	
Test Length:	10d 0h	**Taxon:**		**Source:**	Aquatic Biosystems, CO **Age:** 3rd

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
LWC	02-8948-8472	13 Sep-20	22 Oct-20 09:52	12d 0h (8.5 °C)	Minnow Environmental	
LMC	16-3510-3273	15 Sep-20	22 Oct-20 09:52	10d 0h (8.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
LWC	Sediment Sample	Minnow Environmental	LWC	
LMC	Sediment Sample	Minnow Environmental	LMC	

Fisher Exact Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Reference Sed		LMC*	0.0102	Exact	0.0102	Significant Effect

Data Summary

Sample	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
LWC	RS	48	3	51	0.9412	0.05882	0.0%
LMC		38	12	50	0.76	0.24	19.25%

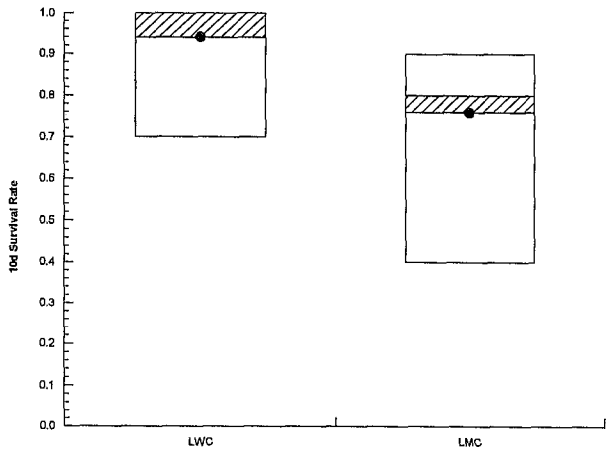
10d Survival Rate Detail

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
LWC	RS	0.7000	1.0000	1.0000	1.0000	1.0000
LMC		0.9000	0.4000	0.8000	0.9000	0.8000

10d Survival Rate Binomials

Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
LWC	RS	7/10	10/10	10/10	10/10	11/11
LMC		9/10	4/10	8/10	9/10	8/10

Graphics



Analyst: RZS QA: Oct. 15/20

CETIS Analytical Report

Test Code/ID: 201796 / 17-6767-8874

Chironomus 10-d Survival and Growth Sediment Test — **Nautilus Environmental**

Analysis ID:	11-8595-2390	**Endpoint:**	10d Survival Rate	**CETIS Version:**	CETISv1.9.4
Analyzed:	08 Oct-20 16:42	**Analysis:**	STP 2xK Contingency Tables	**Status Level:**	1
Batch ID:	10-5748-4799	**Test Type:**	Growth-Survival (10d)	**Analyst:**	Rachel Sakurdeep
Start Date:	25 Sep-20	**Protocol:**	EC/EPS 1/RM/32	**Diluent:**	Reconstituted Water
Ending Date:	05 Oct-20	**Species:**	Chironomus dilutus	**Brine:**	
Test Length:	10d 0h	**Taxon:**		**Source:**	Aquatic Biosystems, CO **Age:** 3rd

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Control Sedimen	08-1153-5124	25 Sep-20	25 Sep-20	n/a	Minnow Environmental	
LWC	02-8948-8472	13 Sep-20	22 Oct-20 09:52	12d 0h (8.5 °C)		
LMC	16-3510-3273	15 Sep-20	22 Oct-20 09:52	10d 0h (8.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Control Sedimen	Sediment Sample	Minnow Environmental	Control Sediment	
LWC	Sediment Sample	Minnow Environmental	LWC	
LMC	Sediment Sample	Minnow Environmental	LMC	

Fisher Exact/Bonferroni-Holm Test

Sample I	vs	Sample II	Test Stat	P-Type	P-Value	Decision(α:5%)
Negative Control		LWC	0.8719	Exact	1.0000	Non-Significant Effect
		LMC	0.0542	Exact	0.0542	Non-Significant Effect

Data Summary

Conc-Sed	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
Control Sedimen	N	45	5	50	0.9	0.1	4.38%
LWC		48	3	51	0.9412	0.05882	0.0%
LMC		38	12	50	0.76	0.24	19.25%

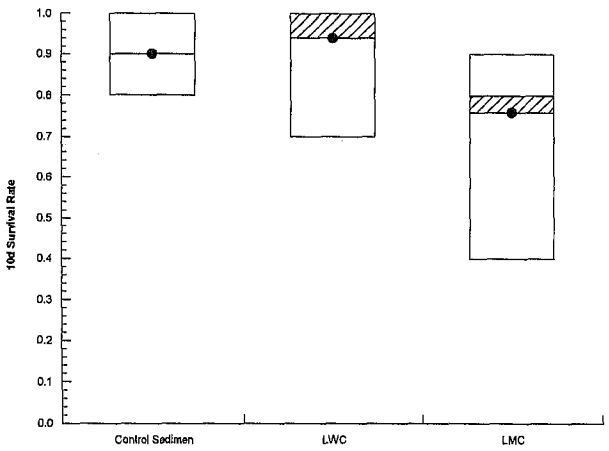
10d Survival Rate Detail

Conc-Sed	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control Sedimen	N	1.0000	1.0000	0.8000	0.9000	0.8000
LWC		0.7000	1.0000	1.0000	1.0000	1.0000
LMC		0.9000	0.4000	0.8000	0.9000	0.8000

10d Survival Rate Binomials

Conc-Sed	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control Sedimen	N	10/10	10/10	8/10	9/10	8/10
LWC		7/10	10/10	10/10	10/10	11/11
LMC		9/10	4/10	8/10	9/10	8/10

Graphics



Analyst: RZS QA: Oct-15/20

Chironomus 10-d Survival and Growth Sediment Test — **Nautilus Environmental**

Analysis ID:	03-2418-0197	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.9.4
Analyzed:	08 Oct-20 17:03	**Analysis:**	Parametric-Control vs Treatments	**Status Level:**	1
Batch ID:	10-5748-4799	**Test Type:**	Growth-Survival (10d)	**Analyst:**	Rachel Sakurdeep
Start Date:	25 Sep-20	**Protocol:**	EC/EPS 1/RM/32	**Diluent:**	Reconstituted Water
Ending Date:	05 Oct-20	**Species:**	Chironomus dilutus	**Brine:**	
Test Length:	10d 0h	**Taxon:**		**Source:**	Aquatic Biosystems, CO **Age:** 3rd

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
Control Sedimen	08-1153-5124	25 Sep-20	25 Sep-20	n/a	Minnow Environmental	
LWC	02-8948-8472	13 Sep-20	22 Oct-20 09:52	12d 0h (8.5 °C)		
LMC	16-3510-3273	15 Sep-20	22 Oct-20 09:52	10d 0h (8.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
Control Sedimen	Sediment Sample	Minnow Environmental	Control Sediment	
LWC	Sediment Sample	Minnow Environmental	LWC	
LMC	Sediment Sample	Minnow Environmental	LMC	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	LWC passed mean dry weight-mg	19.88%
		LMC passed mean dry weight-mg	19.88%

Dunnett Multiple Comparison Test

Sample I	vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Negative Control		LWC	-4.043	2.108	0.346	8	CDF	0.9999	Non-Significant Effect
		LMC	-5.574	2.108	0.346	8	CDF	1.0000	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2.23216	1.11608	2	16.59	3.5E-04	Significant Effect
Error	0.807391	0.0672826	12			
Total	3.03955		14			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	0.9429	9.21	0.6241	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9602	0.8328	0.6950	Normal Distribution

Mean Dry Weight-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
Control Sedimen	N	5	1.739	1.511	1.967	1.738	1.524	1.942	0.08212	10.56%	0.00%
LWC		5	2.403	2.02	2.785	2.249	2.098	2.779	0.1377	12.81%	-38.13%
LMC		5	2.654	2.318	2.99	2.722	2.251	2.967	0.1211	10.20%	-52.57%

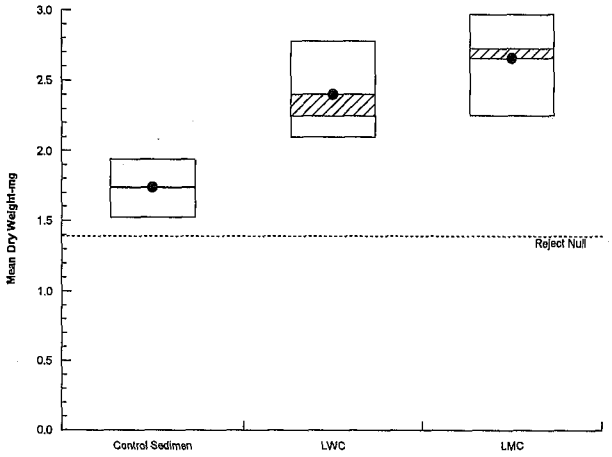
Mean Dry Weight-mg Detail

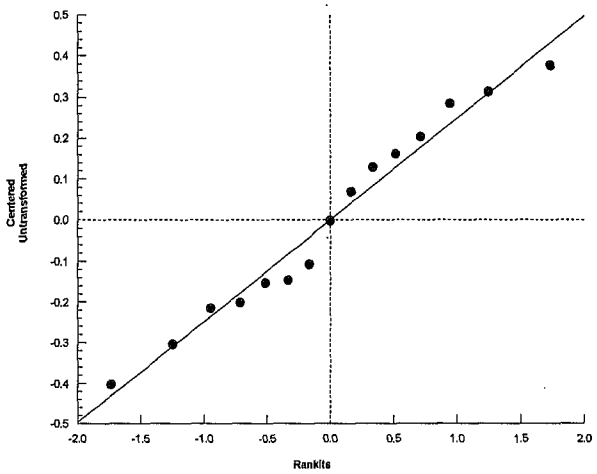
Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Control Sedimen	N	1.524	1.593	1.9	1.738	1.942
LWC		2.779	2.249	2.201	2.687	2.098
LMC		2.722	2.783	2.967	2.251	2.546

Chironomus 10-d Survival and Growth Sediment Test — **Nautilus Environmental**

Analysis ID:	03-2418-0197	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.9.4
Analyzed:	08 Oct-20 17:03	**Analysis:**	Parametric-Control vs Treatments	**Status Level:**	1

Graphics





CETIS Analytical Report

Test Code/ID: 201796 / 17-6767-8874

Chironomus 10-d Survival and Growth Sediment Test — **Nautilus Environmental**

Analysis ID:	20-7144-0098	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.9.4
Analyzed:	06 Nov-20 16:41	**Analysis:**	Parametric-Two Sample	**Status Level:**	1
Batch ID:	10-5748-4799	**Test Type:**	Growth-Survival (10d)	**Analyst:**	Rachel Sakurdeep
Start Date:	25 Sep-20	**Protocol:**	EC/EPS 1/RM/32	**Diluent:**	Reconstituted Water
Ending Date:	05 Oct-20	**Species:**	Chironomus dilutus	**Brine:**	
Test Length:	10d 0h	**Taxon:**		**Source:**	Aquatic Biosystems, CO **Age:** 3rd

Sample Code	Sample ID	Sample Date	Receipt Date	Sample Age	Client Name	Project
LWC	02-8948-8472	13 Sep-20	22 Sep-20 09:52	12d 0h (8.5 °C)	Minnow Environmental	
LMC	16-3510-3273	15 Sep-20	22 Sep-20 09:52	10d 0h (8.5 °C)		

Sample Code	Material Type	Sample Source	Station Location	Lat/Long
LWC	Sediment Sample	Minnow Environmental	LWC	
LMC	Sediment Sample	Minnow Environmental	LMC	

Data Transform	Alt Hyp	Comparison Result	PMSD
Untransformed	C > T	LMC passed mean dry weight-mg	14.19%

Equal Variance t Two-Sample Test

Sample I vs	Sample II	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Reference Sed	LMC	-1.37	1.86	0.341	8	CDF	0.8960	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.157712	0.157712	1	1.876	0.2080	Non-Significant Effect
Error	0.672522	0.0840652	8			
Total	0.830234		9			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	1.292	23.15	0.8097	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9421	0.7411	0.5761	Normal Distribution

Mean Dry Weight-mg Summary

Sample	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
LWC	RS	5	2.403	2.02	2.785	2.249	2.098	2.779	0.1377	12.81%	0.00%
LMC		5	2.654	2.318	2.99	2.722	2.251	2.967	0.1211	10.20%	-10.45%

Mean Dry Weight-mg Detail

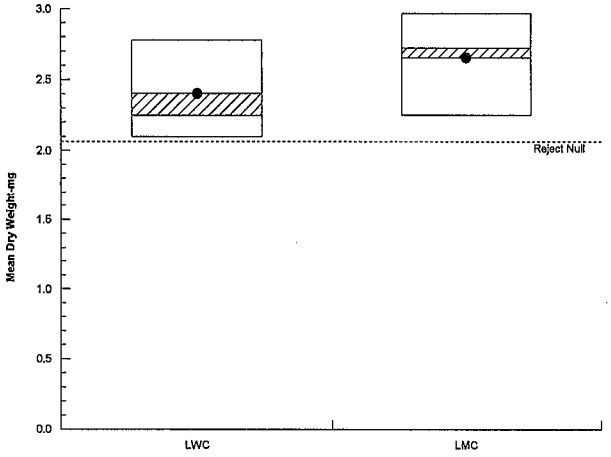
Sample	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
LWC	RS	2.779	2.249	2.201	2.687	2.098
LMC		2.722	2.783	2.967	2.251	2.546

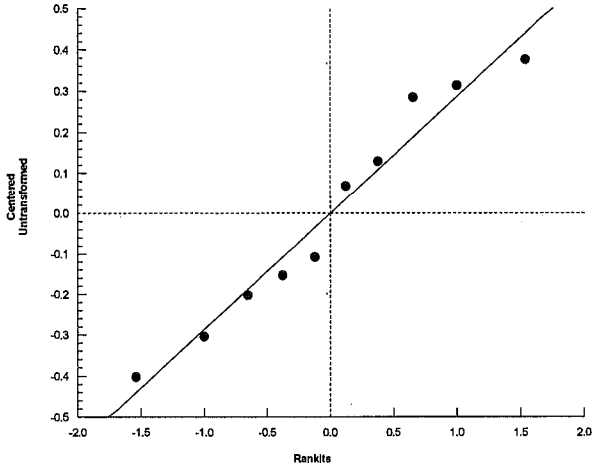
Analyst: RL QA: Nov 6/20

Chironomus 10-d Survival and Growth Sediment Test **Nautilus Environmental**

Analysis ID:	20-7144-0098	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.9.4
Analyzed:	06 Nov-20 16:41	**Analysis:**	Parametric-Two Sample	**Status Level:**	1

Graphics





APPENDIX C – Analytical Chemistry

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **VA20B6904**	Page	: 1 of 2
Client	: **Nautilus Environmental Company Inc.**	Laboratory	: Vancouver - Environmental
Contact	: Karen Lee	Account Manager	: Hilary Woods
Address	: 8664 Commerce Court Imperial Square Lake City Burnaby BC Canada V5A 4N7	Address	: 8081 Lougheed Highway Burnaby BC Canada V5A 1W9
Telephone	: 604 420 8773	Telephone	: +1 604 253 4188
Project	: ----	Date Samples Received	: 30-Sep-2020 17:30
PO	: ----	Date Analysis Commenced	: 08-Oct-2020
C-O-C number	: ----	Issue Date	: 15-Oct-2020 09:43
Sampler	: ----		
Site	: Tissue, Water and Sediment Testing		
Quote number	: Q69439		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Ruth Morrison		Inorganics, Calgary, Alberta

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
mg/L	milligrams per litre

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Analytical Results

Sub-Matrix: **Water** (Matrix: **Water**)				*Client sample ID*	**Control Sediment**	**LWC**	**LMC**	**----**	**----**
				Client sampling date / time	25-Sep-2020	25-Sep-2020	25-Sep-2020	----	----
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	**VA20B6904-001**	**VA20B6904-002**	**VA20B6904-003**	--------	--------
					Result	Result	Result	----	----
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.228	0.0498	0.188	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **VA20B6904**	Page	: 1 of 5
Client	: **Nautilus Environmental Company Inc.**	Laboratory	: Vancouver - Environmental
Contact	: Karen Lee	Account Manager	: Hilary Woods
Address	: 8664 Commerce Court Imperial Square Lake City Burnaby BC Canada V5A 4N7	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: 604 420 8773	Telephone	: +1 604 253 4188
Project	: ----	Date Samples Received	: 30-Sep-2020 17:30
PO	: ----	Issue Date	: 15-Oct-2020 09:43
C-O-C number	: ----		
Sampler	: ----		
Site	: Tissue, Water and Sediment Testing		
Quote number	: Q69439		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
Control Sediment	E298	25-Sep-2020	----	----	----		08-Oct-2020	28 days	12 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
LMC	E298	25-Sep-2020	----	----	----		08-Oct-2020	28 days	12 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
LWC	E298	25-Sep-2020	----	----	----		08-Oct-2020	28 days	12 days	✓

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Ammonia by Fluorescence	E298	99493	1	20	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Ammonia by Fluorescence	E298	99493	1	20	5.0	5.0	✓
Method Blanks (MB)							
Ammonia by Fluorescence	E298	99493	1	20	5.0	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	99493	1	20	5.0	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Ammonia by Fluorescence	E298 Calgary - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).

NAUTILUS ENVIRONMENTAL

TESTING LOCATION (Please Circle)

Burnaby
8664 Commerce Court
Burnaby, British Columbia, Canada
V5A 4N7
Phone 604.420.8773

Calgary
#4, 6125 12 Street SE
Calgary, Alberta, Canada
T2H 2K1
Phone 403.253.7121

Chain of Custody

Date_____Page__of__

Report to:		Invoice To:	
Company		Company	
Address		Address	
City/Prov/PC		City/Prov/PC	
Contact	Karen	Contact	Nair
Phone		Phone	
Email	Karen@nautilusenvironmental.ca	Email	Nair@nautilusenvironmental.ca
		PO No.	

Sample Collection By:

Sample Type: Grab ○ OR Composite ○

	SAMPLE ID	DATE (DD/MM/YY)	TIME	MATRIX	# OF CONTAINERS AND VOLUME (e.g. 1 x 20 L)	COMMENTS	ANALYSES REQUIRED: Ammonia	Receipt Temperature (°C)
1	Control Sediment	25/09/20			1X125mL	overlying ammonia	X	
2	LWC	↓			↓		X	
3	LMC						X	
4								
5								
6								
7								
8								
9								
10								

SPECIAL INSTRUCTIONS/COMMENTS (CLIENT)

Day 0 Hyalella and Chironomid test
preserved w/ sulfuric acid

SAMPLE RECEIPT DETAILS (LABORATORY)

1. Total No. of Containers		4. Ice Present in Cooler?	Y / N
2. Courier		5. Seal Present?	Y / N
3. Good Condition?	Y / N	6. Initials Present on Seal?	Y / N

SAMPLE DESC ... **RY)**

Environmental Division
Vancouver
Work Order Reference
VA20B6904

Telephone : +1 604 253 4188

RELINQUISHED BY (CLIENT)

Karen Lee (Printed Name) _____ (Signature)

Nautilus Environmental Sept 25/20 17:00 (Company) (Date DD/MM/YY and Time)

RECEIVED BY (LABORATORY)

MB 09/30 5:30PM (Printed Name) (Signature)

13.2 (Aug 3) (Company) (Date DD/MM/YY and Time)

Our liability is limite... ...ults only relate to the sample as received. No liability in whole or in part is assumed for the collection, handling, or transport of the sample, application or interpretation of the test data or results in part or in whole.

Additional costs may be required for sample disposal or storage. Payment net 30 unless otherwise contracted.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **VA20B7968**	Page	: 1 of 2
Client	: **Nautilus Environmental Company Inc.**	Laboratory	: Vancouver - Environmental
Contact	: Karen Lee	Account Manager	: Hilary Woods
Address	: 8664 Commerce Court Imperial Square Lake City Burnaby BC Canada V5A 4N7	Address	: 8081 Lougheed Highway Burnaby BC Canada V5A 1W9
Telephone	: 604 420 8773	Telephone	: +1 604 253 4188
Project	: ----	Date Samples Received	: 13-Oct-2020 13:00
PO	: ----	Date Analysis Commenced	: 22-Oct-2020
C-O-C number	: ----	Issue Date	: 23-Oct-2020 16:02
Sampler	: ----		
Site	: Tissue, Water and Sediment Testing		
Quote number	: Q69439		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Ruth Morrison		Inorganics, Calgary, Alberta

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
mg/L	milligrams per litre

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Qualifiers

Qualifier	*Description*
DLHC	*Detection Limit Raised: Dilution required due to high concentration of test analyte(s).*

Analytical Results

Sub-Matrix: **Water** (Matrix: **Water**)					*Client sample ID*	**Control**	**LWC**	**LMC**	**----**	**----**
					Client sampling date / time	05-Oct-2020	05-Oct-2020	05-Oct-2020	----	----
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*		**VA20B7968-001**	**VA20B7968-002**	**VA20B7968-003**	--------	--------
						Result	Result	Result	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		1.13 DLHC	0.295	0.289	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **VA20B7968**	Page	: 1 of 5
Client	: **Nautilus Environmental Company Inc.**	Laboratory	: Vancouver - Environmental
Contact	: Karen Lee	Account Manager	: Hilary Woods
Address	: 8664 Commerce Court Imperial Square Lake City Burnaby BC Canada V5A 4N7	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: 604 420 8773	Telephone	: +1 604 253 4188
Project	: ----	Date Samples Received	: 13-Oct-2020 13:00
PO	: ----	Issue Date	: 23-Oct-2020 16:02
C-O-C number	: ----		
Sampler	: ----		
Site	: Tissue, Water and Sediment Testing		
Quote number	: Q69439		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
Control	E298	05-Oct-2020	----	----	----		22-Oct-2020	28 days	16 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
LMC	E298	05-Oct-2020	----	----	----		22-Oct-2020	28 days	16 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
LWC	E298	05-Oct-2020	----	----	----		22-Oct-2020	28 days	16 days	✓

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Ammonia by Fluorescence	E298	106662	1	20	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Ammonia by Fluorescence	E298	106662	1	20	5.0	5.0	✓
Method Blanks (MB)							
Ammonia by Fluorescence	E298	106662	1	20	5.0	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	106662	1	20	5.0	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Ammonia by Fluorescence	E298 Calgary - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).

NAUTILUS ENVIRONMENTAL

TESTING LOCATION (Please Circle)

Burnaby
8664 Commerce Court
Burnaby, British Columbia, Canada
V5A 4N7
Phone 604.420.8773

Calgary
#4, 6125 12 Street SE
Calgary, Alberta, Canada
T2H 2K1
Phone 403.253.7121

Chain of Custody

Date_____ Page__of__

Report to:		**Invoice To:**	
Company	Nautilus Environmental	**Company**	Nautilus Environmental
Address		**Address**	
City/Prov/PC		**City/Prov/PC**	
Contact		**Contact**	
Phone		**Phone**	
Email	karen@nautilusenvironmental.ca	**Email**	nair@nautilusenvironmental.ca
		PO No.	

Sample Collection By: **Sample Type:** Grab ○ OR Composite ○

	SAMPLE ID	DATE (DD/MM/YY)	TIME	MATRIX	# OF CONTAINERS AND VOLUME (e.g. 1 x 20 L)	COMMENTS	ANALYSES REQUIRED: Ammonia	Receipt Temperature (°C)
1	Control	05/10/20			125 ~~250~~ml Bottle		✓	
2	LWC	"			"		✓	
3	LMC	"			"		✓	
4								
5								
6								
7								
8								
9								
10								

SPECIAL INSTRUCTIONS/COMMENTS (CLIENT)

Already preserved w/ sulfuric acid

SAMPLE RECEIPT DETAILS (LABORATORY)

1. Total No. of Containers		4. Ice Present in Cooler?	Y / N
2. Courier		5. Seal Present?	Y / N
3. Good Condition?	Y / N	6. Initials Present on Seal?	Y / N

RELINQUISHED BY (CLIENT)

Karen Lee (Printed Name) (Signature)

Nautilus Env. Oct 5/20 (Company) (Date DD/MM/YY and Time)

RECEIVED BY (LABORATORY)

(Printed Name) (Signature)

(Company) (Date DD/MM/YY and Time)

Environmental Division Vancouver
Work Order Reference
VA20B7968

Telephone : +1 604 253 4188

Our liability is limited to the cost of the test requested. The test results only relate to the sample as received. No liability in whole or in part is assumed for the collection, handling, or transport of the sample, application or interpretation of the test data or results in part or in whole.

Additional costs may be required for sample disposal or storage. Payment net 30 unless otherwise contracted.

Form 020; Version 1.2; Revised by CC 2016/10/06

13.3°C Oct 13/2020 JM, 1:00 pm

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **VA20B7969**	Page	: 1 of 2
Client	: **Nautilus Environmental Company Inc.**	Laboratory	: Vancouver - Environmental
Contact	: Karen Lee	Account Manager	: Hilary Woods
Address	: 8664 Commerce Court Imperial Square Lake City Burnaby BC Canada V5A 4N7	Address	: 8081 Lougheed Highway Burnaby BC Canada V5A 1W9
Telephone	: 604 420 8773	Telephone	: +1 604 253 4188
Project	: ----	Date Samples Received	: 13-Oct-2020 13:00
PO	: ----	Date Analysis Commenced	: 22-Oct-2020
C-O-C number	: ----	Issue Date	: 23-Oct-2020 16:02
Sampler	: ----		
Site	: Tissue, Water and Sediment Testing		
Quote number	: Q69439		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Ruth Morrison		Inorganics, Calgary, Alberta

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
mg/L	milligrams per litre

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

					Client sample ID	**Control Day 14**	**LWC**	**LMC**	**----**	**----**
					Client sampling date / time	09-Oct-2020	09-Oct-2020	09-Oct-2020	----	----
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*		**VA20B7969-001**	**VA20B7969-002**	**VA20B7969-003**	--------	--------
						Result	Result	Result	---	---
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.292	0.0866	0.0801	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **VA20B7969**	Page	: 1 of 5
Client	: **Nautilus Environmental Company Inc.**	Laboratory	: Vancouver - Environmental
Contact	: Karen Lee	Account Manager	: Hilary Woods
Address	: 8664 Commerce Court Imperial Square Lake City Burnaby BC Canada V5A 4N7	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: 604 420 8773	Telephone	: +1 604 253 4188
Project	: ----	Date Samples Received	: 13-Oct-2020 13:00
PO	: ----	Issue Date	: 23-Oct-2020 16:02
C-O-C number	: ----		
Sampler	: ----		
Site	: Tissue, Water and Sediment Testing		
Quote number	: Q69439		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
Control - Day 14	E298	09-Oct-2020	----	----	----		22-Oct-2020	28 days	12 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
LMC	E298	09-Oct-2020	----	----	----		22-Oct-2020	28 days	12 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
LWC	E298	09-Oct-2020	----	----	----		22-Oct-2020	28 days	12 days	✓

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Ammonia by Fluorescence	E298	106662	1	20	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Ammonia by Fluorescence	E298	106662	1	20	5.0	5.0	✓
Method Blanks (MB)							
Ammonia by Fluorescence	E298	106662	1	20	5.0	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	106662	1	20	5.0	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Ammonia by Fluorescence	E298 Calgary - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).

NAUTILUS ENVIRONMENTAL

TESTING LOCATION (Please Circle)

Burnaby
8664 Commerce Court
Burnaby, British Columbia, Canada
V5A 4N7
Phone 604.420.8773

Calgary
#4, 6125 12 Street SE
Calgary, Alberta, Canada
T2H 2K1
Phone 403.253.7121

Chain of Custody

Date Oct 9/20 Page 1 of 1

Report to:
Company: Nautilus Environmental
Address:
City/Prov/PC:
Contact:
Phone:
Email:

Invoice To:
Company:
Address:
City/Prov/PC:
Contact:
Phone:
Email:
PO No.:

Sample Collection By:

Sample Type: Grab ○ OR Composite ○

	SAMPLE ID	DATE (DD/MM/YY)	TIME	MATRIX	# OF CONTAINERS AND VOLUME (e.g. 1 x 20 L)	COMMENTS	ANALYSES REQUIRED: ammonia	Receipt Temperature (°C)
1	Control	Oct 9/20			1X125mL	Day 14	X	
2	LWC	↓			↓		X	
3	LMC	↓			↓		X	
4								
5								
6								
7								
8								
9								
10								

SPECIAL INSTRUCTIONS/COMMENTS (CLIENT)

overlying ammonia
Day 14 - Hyal test
Samples are preserved w/ sulphuric acid

SAMPLE RECEIPT DETAILS (LABORATORY)

1. Total No. of Containers		4. Ice Present in Cooler?	Y / N
2. Courier		5. Seal Present?	Y / N
3. Good Condition?	Y / N	6. Initials Present on Seal?	Y / N

RELINQUISHED BY (CLIENT)

Karen Lee (Printed Name) (Signature)

Nautilus Environmental (Company) Oct 9/20 17:00 (Date DD/MM/YY and Time)

RECEIVED BY (LABORATORY)

(Printed Name) (Signature)

(Company) (Date DD/MM/YY and Time)

Environmental Division
Vancouver
Work Order Reference
VA20B7969

Telephone : +1 604 253 4188

Our liability is limited to the cost of the test requested. The test results only relate to the sample as received. No liability in whole or in part is assumed for the collection, handling, or transport of the sample, application or interpretation of the test data or results in part or in whole.

Additional costs may be required for sample disposal or storage. Payment net 30 unless otherwise contracted.

Form 020; Version 1.2; Revised by CC 2016/10/06

13.3°C Oct 13/2020, JM, 1:00 PM

APPENDIX D – Chain-of-Custody Forms

Nautilus Environmental

8664 Commerce Crt.
Burnaby, BC V5A 4N7
Phone (604) 420-8773

Chain of Custody

Date Sept 17 Page 1 of 1

Sample Collection By:

Report to:

Company	Minnow Environmental Inc.
Address	204-1006 Fort Street
City/State/Zip	Victoria, BC, V8V 3K4
Contact	Pierre Stecko
Phone	250-595-1627 x24
Email	pstecko@minnow.ca
	slatimer@minnow.ca

Invoice To:

Company	Minto Explorations Ltd.
Address	61 Wasson Place
City/State/Zip	Whitehorse, YT, Y1A 0H7
Contact	Todd Swenson
Phone	604 759 4659
Email	todds@mintomine.com

	SAMPLE ID	DATE	TIME	MATRIX	CONTAINER TYPE	NO. OF CONTAINERS	COMMENTS	ANALYSES REQUIRED: 10 day Chironomus dilutus 201796	14 day Hyallela azteca 201797	Receipt Temperature (°C)
1	LMC-1	Sept15		Sediment	bags	2	Field reps for test area 1 = exposed	✓	✓	8.5
2	LMC-2	Sept15		"				✓	✓	
3	LMC-3	Sept15		"				✓	✓	
4	LMC-4	Sept15		"				✓	✓	
5	LMC-5	Sept15		"				✓	✓	
6	LWC-1	Sept13		Sed.	bags	2	Field reps for area 2 = reference	✓	✓	
7	LWC-2	Sept13						✓	✓	
8	LWC-3	Sept13						✓	✓	
9	LWC-4	Sept13						✓	✓	
10	LWC-5	Sept13						✓	✓	

PROJECT INFORMATION		SAMPLE RECEIPT	
Client:	Minnow Environmental Inc	Total No. of Containers	20
PO No.:	20-70	Received Good Condition?	Y
Shipped Via:	Manitoulin Ground	Matches Test Schedule?	Y

SPECIAL INSTRUCTIONS/COMMENTS:

Field Replicates
2 areas.

RELINQUISHED BY (CLIENT)

(Signature) (Time)

(Printed Name) Pierre Stecko (Date) Sept17'20

(Company) Minnow Environmental

RELINQUISHED BY (COURIER)

(Signature) (Time)

(Printed Name) (Date)

(Company)

RECEIVED BY (COURIER)

(Signature) (Time)

(Printed Name) (Date)

(Company)

RECEIVED BY (LABORATORY)

(Signature) TH (Time) 9:52

(Printed Name) Tym (Date) Sept 23/20

(Company) NAUTILUS

Additional costs may be required for sample disposal or storage. Payment net 30 unless otherwise contracted.

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END OF REPORT

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000902**	Page	: 1 of 11
Client	: **Minnow Environmental Inc.**	Laboratory	: Whitehorse - Environmental
Contact	: Lisa Bowron	Account Manager	: Heather McKenzie
Address	: 204 – 1006 Fort Street Victoria BC Canada V8V 3K4	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: 250 595 1627	Telephone	: +1 867 668 6689
Project	: Minnow Project 20-70	Date Samples Received	: 18-Sep-2020 11:45
PO	: ----	Date Analysis Commenced	: 23-Oct-2020
C-O-C number	: 1 of 2, 2 of 2	Issue Date	: 10-Nov-2020 18:14
Sampler	: Pierro Stecko		
Site	: ----		
Quote number	: Q75875		
No. of samples received	: 15		
No. of samples analysed	: 15		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Cristina Alexandre	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Evan Ben-Oliel	Metal Analyst	Metals, Burnaby, British Columbia
Kinny Wu	Lab Analyst	Metals, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
%	percent
mg/kg	milligrams per kilogram
mg/kg wwt	milligrams per kilogram wet weight

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Qualifiers

Qualifier	*Description*
DLA	*Detection Limit adjusted for required dilution.*

Analytical Results

Sub-Matrix: **Tissue**
(Matrix: **Biota**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LWC-1	LWC-2	LWC-3	LWC-4	LWC-5
					Client sampling date / time	13-Sep-2020	12-Sep-2020	12-Sep-2020	12-Sep-2020	12-Sep-2020
						WR2000902-001	WR2000902-002	WR2000902-003	WR2000902-004	WR2000902-005
						Result	Result	Result	Result	Result
Physical Tests										
moisture	----	E144-H	2.0	%		65.6	72.4	82.9	78.8	84.9
Metals										
aluminum	7429-90-5	E472	5.0	mg/kg		13900	13400	14000	13800	12700
antimony	7440-36-0	E472	0.010	mg/kg		0.057	0.085	0.163	0.119	0.143
arsenic	7440-38-2	E472	0.030	mg/kg		3.71	3.85	4.69	4.88	4.48
barium	7440-39-3	E472	0.050	mg/kg		154	157	163	169	153
beryllium	7440-41-7	E472	0.010	mg/kg		0.505	0.496	0.541	0.546	0.479
bismuth	7440-69-9	E472	0.010	mg/kg		0.060	0.060	0.063	0.070	0.059
boron	7440-42-8	E472	1.0	mg/kg		5.1	4.8	11.3	13.0	9.8
cadmium	7440-43-9	E472	0.010	mg/kg		0.121	0.130	0.149	0.160	0.138
calcium	7440-70-2	E472	20	mg/kg		6460	6420	6840	6500	6890
cesium	7440-46-2	E472	0.0050	mg/kg		1.50	1.45	1.51	1.56	1.37
chromium	7440-47-3	E472	0.20	mg/kg		37.8	34.6	36.2	36.4	78.0
cobalt	7440-48-4	E472	0.020	mg/kg		9.18	8.89	9.37	10.1	9.14
copper	7440-50-8	E472	0.20	mg/kg		15.5	16.2	19.8	19.7	19.2
iron	7439-89-6	E472	5.0	mg/kg		20700	20000	21800	23100	20300
lead	7439-92-1	E472	0.050	mg/kg		4.32	4.19	4.22	4.39	4.37
lithium	7439-93-2	E472	0.50	mg/kg		9.40	9.20	9.17	9.38	8.04
magnesium	7439-95-4	E472	2.0	mg/kg		7580	7200	7600	7910	7460
manganese	7439-96-5	E472	0.050	mg/kg		549	613	644	807	745
mercury	7439-97-6	E511	0.0050	mg/kg		0.0390	0.0614	0.0428	0.0854	0.0491
molybdenum	7439-98-7	E472	0.040	mg/kg		0.373	0.357	0.462	0.471	0.761
nickel	7440-02-0	E472	0.20	mg/kg		25.0	24.2	26.1	29.1	27.2
phosphorus	7723-14-0	E472	10	mg/kg		1170	1250	2210	1620	1710
potassium	7440-09-7	E472	20	mg/kg		1370	1620	3000	1980	2200
rubidium	7440-17-7	E472	0.050	mg/kg		12.1	11.6	13.7	12.4	11.7
selenium	7782-49-2	E472	0.10	mg/kg		0.52	0.64	1.22	1.05	1.04
sodium	7440-23-5	E472	20	mg/kg		428	378	583	366	524
strontium	7440-24-6	E472	0.10	mg/kg		66.5	68.3	73.4	69.9	72.5
tellurium	13494-80-9	E472	0.020	mg/kg		<0.020	<0.020	<0.020	<0.020	<0.020
thallium	7440-28-0	E472	0.0020	mg/kg		0.0724	0.0736	0.0776	0.0831	0.0722

Analytical Results

Sub-Matrix: **Tissue**
(Matrix: **Biota**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LWC-1	LWC-2	LWC-3	LWC-4	LWC-5
					Client sampling date / time	13-Sep-2020	12-Sep-2020	12-Sep-2020	12-Sep-2020	12-Sep-2020
						WR2000902-001	WR2000902-002	WR2000902-003	WR2000902-004	WR2000902-005
						Result	Result	Result	Result	Result
Metals										
tin	7440-31-5	E472	0.10	mg/kg		1.07	0.65	0.84	0.91	0.81
uranium	7440-61-1	E472	0.0020	mg/kg		0.804	0.751	0.836	0.835	0.740
vanadium	7440-62-2	E472	0.10	mg/kg		51.9	50.0	52.0	54.2	46.8
zinc	7440-66-6	E472	1.0	mg/kg		46.3	44.1	50.7	47.8	43.6
zirconium	7440-67-7	E472	0.20	mg/kg		8.79	7.38	8.10	8.33	8.41
aluminum	7429-90-5	E472A	1.0	mg/kg wwt		4800	3690	2400	2920	1910
antimony	7440-36-0	E472A	0.0020	mg/kg wwt		0.0196	0.0233	0.0280	0.0253	0.0216
arsenic	7440-38-2	E472A	0.0060	mg/kg wwt		1.28	1.06	0.804	1.04	0.675
barium	7440-39-3	E472A	0.010	mg/kg wwt		52.9	43.2	28.0	35.9	23.1
beryllium	7440-41-7	E472A	0.0020	mg/kg wwt		0.174	0.137	0.0927	0.116	0.0722
bismuth	7440-69-9	E472A	0.0020	mg/kg wwt		0.0207	0.0166	0.0108	0.0148	0.0090
boron	7440-42-8	E472A	0.20	mg/kg wwt		1.75	1.33	1.93	2.76	1.48
cadmium	7440-43-9	E472A	0.0020	mg/kg wwt		0.0416	0.0359	0.0255	0.0339	0.0208
calcium	7440-70-2	E472A	4.0	mg/kg wwt		2230	1770	1170	1380	1040
cesium	7440-46-2	E472A	0.0010	mg/kg wwt		0.516	0.399	0.260	0.331	0.207
chromium	7440-47-3	E472A	0.040	mg/kg wwt		13.0	9.53	6.20	7.71	11.8
cobalt	7440-48-4	E472A	0.0040	mg/kg wwt		3.16	2.45	1.60	2.15	1.38
copper	7440-50-8	E472A	0.040	mg/kg wwt		5.35	4.46	3.39	4.18	2.89
iron	7439-89-6	E472A	1.0	mg/kg wwt		7140	5520	3730	4910	3070
lead	7439-92-1	E472A	0.010	mg/kg wwt		1.49	1.15	0.722	0.932	0.659
lithium	7439-93-2	E472A	0.10	mg/kg wwt		3.24	2.53	1.57	1.99	1.21
magnesium	7439-95-4	E472A	0.40	mg/kg wwt		2610	1980	1300	1680	1120
manganese	7439-96-5	E472A	0.010	mg/kg wwt		189	169	110	171	112
mercury	7439-97-6	E511A	0.0010	mg/kg wwt		0.0134	0.0169	0.0073	0.0181	0.0074
molybdenum	7439-98-7	E472A	0.0080	mg/kg wwt		0.128	0.0984	0.0792	0.100	0.115
nickel	7440-02-0	E472A	0.040	mg/kg wwt		8.61	6.67	4.48	6.17	4.11
phosphorus	7723-14-0	E472A	2.0	mg/kg wwt		404	343	379	343	257
potassium	7440-09-7	E472A	4.0	mg/kg wwt		471	447	514	421	332
rubidium	7440-17-7	E472A	0.010	mg/kg wwt		4.16	3.21	2.34	2.63	1.76
selenium	7782-49-2	E472A	0.020	mg/kg wwt		0.178	0.177	0.209	0.223	0.158
sodium	7440-23-5	E472A	4.0	mg/kg wwt		148	104	99.9	77.6	79.0
strontium	7440-24-6	E472A	0.020	mg/kg wwt		22.9	18.8	12.6	14.8	10.9

Analytical Results

Sub-Matrix: **Tissue**
(Matrix: **Biota**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LWC-1	LWC-2	LWC-3	LWC-4	LWC-5
					Client sampling date / time	13-Sep-2020	12-Sep-2020	12-Sep-2020	12-Sep-2020	12-Sep-2020
						WR2000902-001	WR2000902-002	WR2000902-003	WR2000902-004	WR2000902-005
						Result	Result	Result	Result	Result
Metals										
tellurium	13494-80-9	E472A	0.0040	mg/kg wwt		0.0050	<0.0040	<0.0040	<0.0040	<0.0040
thallium	7440-28-0	E472A	0.00040	mg/kg wwt		0.0249	0.0203	0.0133	0.0176	0.0109
tin	7440-31-5	E472A	0.020	mg/kg wwt		0.370	0.178	0.144	0.194	0.123
uranium	7440-61-1	E472A	0.00040	mg/kg wwt		0.277	0.207	0.143	0.177	0.112
vanadium	7440-62-2	E472A	0.020	mg/kg wwt		17.9	13.8	8.92	11.5	7.06
zinc	7440-66-6	E472A	0.20	mg/kg wwt		15.9	12.2	8.68	10.1	6.58
zirconium	7440-67-7	E472A	0.040	mg/kg wwt		3.03	2.03	1.39	1.77	1.27

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Tissue**
(Matrix: **Biota**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LBC-1	LBC-2	LBC-3	LBC-4	LBC-5
					Client sampling date / time	16-Sep-2020	16-Sep-2020	16-Sep-2020	16-Sep-2020	16-Sep-2020
						WR2000902-006	WR2000902-007	WR2000902-008	WR2000902-009	WR2000902-010
						Result	Result	Result	Result	Result
Physical Tests										
moisture	----	E144-H	2.0	%		60.6	79.6	84.3	89.2	64.1
Metals										
aluminum	7429-90-5	E472	5.0	mg/kg		8760	13300	10900	13300	9960
antimony	7440-36-0	E472	0.010	mg/kg		0.149	0.374	0.374	0.605	0.137
arsenic	7440-38-2	E472	0.030	mg/kg		7.20	11.8	11.2	18.4	8.66
barium	7440-39-3	E472	0.050	mg/kg		204	190	156	197	138
beryllium	7440-41-7	E472	0.010	mg/kg		0.291	0.440	0.381	0.462	0.330
bismuth	7440-69-9	E472	0.010	mg/kg		0.476	0.526	0.396	0.644	0.245
boron	7440-42-8	E472	1.0	mg/kg		2.7	5.4	3.9	7.3	2.4
cadmium	7440-43-9	E472	0.010	mg/kg		0.095	0.158	0.144	0.188	0.123
calcium	7440-70-2	E472	20	mg/kg		6400	7360	6480	8440	5470
cesium	7440-46-2	E472	0.0050	mg/kg		1.18	1.97	1.74	2.32	1.49
chromium	7440-47-3	E472	0.20	mg/kg		32.4	32.1	34.3	36.0	24.4
cobalt	7440-48-4	E472	0.020	mg/kg		5.60	8.00	6.87	7.55	6.12
copper	7440-50-8	E472	0.20	mg/kg		13.5	21.3	17.0	24.8	14.0
iron	7439-89-6	E472	5.0	mg/kg		19400	20200	19400	20200	16200
lead	7439-92-1	E472	0.050	mg/kg		4.88	7.83	5.91	7.99	5.31
lithium	7439-93-2	E472	0.50	mg/kg		6.00	8.78	7.41	8.14	6.87
magnesium	7439-95-4	E472	2.0	mg/kg		4500	6990	5520	6680	5150
manganese	7439-96-5	E472	0.050	mg/kg		287	472	441	517	320
mercury	7439-97-6	E511	0.0050	mg/kg		0.0188	0.0738	0.0780	0.0397	0.0288
molybdenum	7439-98-7	E472	0.040	mg/kg		0.555	0.754	0.770	1.19	0.585
nickel	7440-02-0	E472	0.20	mg/kg		14.8	25.6	19.9	23.5	18.5
phosphorus	7723-14-0	E472	10	mg/kg		1490	1410	1290	1650	949
potassium	7440-09-7	E472	20	mg/kg		1100	2530	2170	3860	1350
rubidium	7440-17-7	E472	0.050	mg/kg		7.38	13.8	12.0	17.4	9.59
selenium	7782-49-2	E472	0.10	mg/kg		0.20	0.52	0.55	0.78	0.25
sodium	7440-23-5	E472	20	mg/kg		336	554	476	699	328
strontium	7440-24-6	E472	0.10	mg/kg		49.1	77.9	63.1	89.8	51.8
tellurium	13494-80-9	E472	0.020	mg/kg		<0.020	0.030	0.038	0.042	0.022
thallium	7440-28-0	E472	0.0020	mg/kg		0.0593	0.102	0.0922	0.124	0.0784
tin	7440-31-5	E472	0.10	mg/kg		0.61	0.70	0.76	1.27	0.48

Analytical Results

Sub-Matrix: **Tissue**
(Matrix: **Biota**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LBC-1	LBC-2	LBC-3	LBC-4	LBC-5
					Client sampling date / time	16-Sep-2020	16-Sep-2020	16-Sep-2020	16-Sep-2020	16-Sep-2020
						WR2000902-006	WR2000902-007	WR2000902-008	WR2000902-009	WR2000902-010
						Result	Result	Result	Result	Result
Metals										
uranium	7440-61-1	E472	0.0020	mg/kg		0.838	1.03	1.20	1.15	0.854
vanadium	7440-62-2	E472	0.10	mg/kg		58.6	52.1	51.1	46.0	42.9
zinc	7440-66-6	E472	1.0	mg/kg		34.8	51.2	46.6	55.4	38.1
zirconium	7440-67-7	E472	0.20	mg/kg		4.95	6.55	5.76	7.32	4.86
aluminum	7429-90-5	E472A	1.0	mg/kg wwt		3460	2720	1710	1440	3580
antimony	7440-36-0	E472A	0.0020	mg/kg wwt		0.0589	0.0761	0.0587	0.0653	0.0492
arsenic	7440-38-2	E472A	0.0060	mg/kg wwt		2.84	2.40	1.75	1.99	3.11
barium	7440-39-3	E472A	0.010	mg/kg wwt		80.6	38.6	24.5	21.3	49.7
beryllium	7440-41-7	E472A	0.0020	mg/kg wwt		0.114	0.0896	0.0597	0.0499	0.119
bismuth	7440-69-9	E472A	0.0020	mg/kg wwt		0.188	0.107	0.0622	0.0695	0.0881
boron	7440-42-8	E472A	0.20	mg/kg wwt		1.07	1.10	0.62	0.79	0.85
cadmium	7440-43-9	E472A	0.0020	mg/kg wwt		0.0375	0.0321	0.0227	0.0204	0.0441
calcium	7440-70-2	E472A	4.0	mg/kg wwt		2520	1500	1020	911	1970
cesium	7440-46-2	E472A	0.0010	mg/kg wwt		0.465	0.401	0.273	0.250	0.536
chromium	7440-47-3	E472A	0.040	mg/kg wwt		12.8	6.53	5.38	3.89	8.76
cobalt	7440-48-4	E472A	0.0040	mg/kg wwt		2.21	1.63	1.08	0.815	2.20
copper	7440-50-8	E472A	0.040	mg/kg wwt		5.33	4.33	2.67	2.68	5.04
iron	7439-89-6	E472A	1.0	mg/kg wwt		7660	4120	3040	2180	5840
lead	7439-92-1	E472A	0.010	mg/kg wwt		1.92	1.59	0.927	0.863	1.91
lithium	7439-93-2	E472A	0.10	mg/kg wwt		2.36	1.79	1.16	0.88	2.47
magnesium	7439-95-4	E472A	0.40	mg/kg wwt		1780	1420	866	721	1850
manganese	7439-96-5	E472A	0.010	mg/kg wwt		113	96.2	69.1	55.8	115
mercury	7439-97-6	E511A	0.0010	mg/kg wwt		0.0074	0.0150	0.0122	0.0043	0.0104
molybdenum	7439-98-7	E472A	0.0080	mg/kg wwt		0.219	0.154	0.121	0.128	0.210
nickel	7440-02-0	E472A	0.040	mg/kg wwt		5.84	5.22	3.12	2.54	6.64
phosphorus	7723-14-0	E472A	2.0	mg/kg wwt		588	287	202	178	341
potassium	7440-09-7	E472A	4.0	mg/kg wwt		432	515	340	416	485
rubidium	7440-17-7	E472A	0.010	mg/kg wwt		2.91	2.80	1.88	1.87	3.44
selenium	7782-49-2	E472A	0.020	mg/kg wwt		0.081	0.106	0.086	0.084	0.090
sodium	7440-23-5	E472A	4.0	mg/kg wwt		132	113	74.7	75.5	118
strontium	7440-24-6	E472A	0.020	mg/kg wwt		19.3	15.8	9.90	9.69	18.6
tellurium	13494-80-9	E472A	0.0040	mg/kg wwt		0.0066	0.0062	0.0060	0.0046	0.0079

Analytical Results

Sub-Matrix: **Tissue**
(Matrix: **Biota**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LBC-1	LBC-2	LBC-3	LBC-4	LBC-5
					Client sampling date / time	16-Sep-2020	16-Sep-2020	16-Sep-2020	16-Sep-2020	16-Sep-2020
						WR2000902-006	WR2000902-007	WR2000902-008	WR2000902-009	WR2000902-010
						Result	Result	Result	Result	Result
Metals										
thallium	7440-28-0	E472A	0.00040	mg/kg wwt		0.0234	0.0207	0.0145	0.0134	0.0282
tin	7440-31-5	E472A	0.020	mg/kg wwt		0.241	0.143	0.120	0.137	0.171
uranium	7440-61-1	E472A	0.00040	mg/kg wwt		0.330	0.210	0.188	0.124	0.307
vanadium	7440-62-2	E472A	0.020	mg/kg wwt		23.1	10.6	8.01	4.97	15.4
zinc	7440-66-6	E472A	0.20	mg/kg wwt		13.7	10.4	7.32	5.98	13.7
zirconium	7440-67-7	E472A	0.040	mg/kg wwt		1.95	1.33	0.903	0.790	1.75

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Tissue**
(Matrix: **Biota**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LMC-1	LMC-2	LMC-3	LMC-4	LMC-5
					Client sampling date / time	14-Sep-2020	14-Sep-2020	11-Sep-2020	11-Sep-2020	11-Sep-2020
						WR2000902-011	WR2000902-012	WR2000902-013	WR2000902-014	WR2000902-015
						Result	Result	Result	Result	Result
Physical Tests										
moisture	----	E144-H	2.0	%		74.9	64.2	77.1	72.2	72.2
Metals										
aluminum	7429-90-5	E472	5.0	mg/kg		4470	13900	9210	4900	4530
antimony	7440-36-0	E472	0.010	mg/kg		0.302	0.068	0.221	0.210	0.206
arsenic	7440-38-2	E472	0.030	mg/kg		16.3	7.33	12.1	11.1	8.22
barium	7440-39-3	E472	0.050	mg/kg		1980	257	646	765	342
beryllium	7440-41-7	E472	0.010	mg/kg		0.240	0.419	0.327	0.203	0.224
bismuth	7440-69-9	E472	0.010	mg/kg		0.048	0.092	0.079	0.053	0.054
boron	7440-42-8	E472	1.0	mg/kg		18.4	5.4	15.1	26.8	16.0
cadmium	7440-43-9	E472	0.010	mg/kg		0.719	0.227	0.451	0.494	0.330
calcium	7440-70-2	E472	20	mg/kg		12300	10200	11600	12200	18600
cesium	7440-46-2	E472	0.0050	mg/kg		0.329	1.04	0.737	0.386	0.409
chromium	7440-47-3	E472	0.20	mg/kg		132	45.0	145	37.6	249
cobalt	7440-48-4	E472	0.020	mg/kg		38.1	9.31	18.4	21.2	11.5
copper	7440-50-8	E472	0.20	mg/kg		38.6	33.3	42.6	46.6	59.1
iron	7439-89-6	E472	5.0	mg/kg		12300	22700	19200	12200	12800
lead	7439-92-1	E472	0.050	mg/kg		2.63	4.86	4.05	2.62	2.78
lithium	7439-93-2	E472	0.50	mg/kg		3.29	10.8	6.98	3.72	3.82
magnesium	7439-95-4	E472	2.0	mg/kg		3910	6610	5580	3770	3750
manganese	7439-96-5	E472	0.050	mg/kg		30300	1600	9600	12600	4640
mercury	7439-97-6	E511	0.0050	mg/kg		0.0259	0.0421	0.0477	0.0453	0.0362
molybdenum	7439-98-7	E472	0.040	mg/kg		3.71	0.764	2.47	2.76	3.20
nickel	7440-02-0	E472	0.20	mg/kg		34.7	24.5	30.3	23.6	24.2
phosphorus	7723-14-0	E472	10	mg/kg		3380	1090	2930	2390	3640
potassium	7440-09-7	E472	20	mg/kg		4760	2130	5130	4470	7160
rubidium	7440-17-7	E472	0.050	mg/kg		5.00	12.4	9.46	5.78	6.80
selenium	7782-49-2	E472	0.10	mg/kg		2.16	0.86	1.98	1.64	1.96
sodium	7440-23-5	E472	20	mg/kg		295	313	450	272	486
strontium	7440-24-6	E472	0.10	mg/kg		196	102	139	153	121
tellurium	13494-80-9	E472	0.020	mg/kg		0.041	0.021	0.029	0.028	<0.020
thallium	7440-28-0	E472	0.0020	mg/kg		0.0397	0.0995	0.0735	0.0449	0.0419
tin	7440-31-5	E472	0.10	mg/kg		0.91	0.68	2.08	0.41	1.84

Analytical Results

Sub-Matrix: **Tissue**
(Matrix: **Biota**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LMC-1	LMC-2	LMC-3	LMC-4	LMC-5
					Client sampling date / time	14-Sep-2020	14-Sep-2020	11-Sep-2020	11-Sep-2020	11-Sep-2020
						WR2000902-011	WR2000902-012	WR2000902-013	WR2000902-014	WR2000902-015
						Result	Result	Result	Result	Result
Metals										
uranium	7440-61-1	E472	0.0020	mg/kg		0.741	0.932	0.936	0.576	1.34
vanadium	7440-62-2	E472	0.10	mg/kg		39.0	49.0	42.9	35.5	30.5
zinc	7440-66-6	E472	1.0	mg/kg		89.8	52.1	70.6	52.1	66.9
zirconium	7440-67-7	E472	0.20	mg/kg		3.84	8.92	6.51	3.85	3.99
aluminum	7429-90-5	E472A	1.0	mg/kg wwt		1120	4980	2110	1360	1260
antimony	7440-36-0	E472A	0.0020	mg/kg wwt		0.0760	0.0244	0.0506	0.0584	0.0575
arsenic	7440-38-2	E472A	0.0060	mg/kg wwt		4.11	2.62	2.78	3.08	2.29
barium	7440-39-3	E472A	0.010	mg/kg wwt		497	92.1	148	212	95.1
beryllium	7440-41-7	E472A	0.0020	mg/kg wwt		0.0602	0.150	0.0749	0.0565	0.0624
bismuth	7440-69-9	E472A	0.0020	mg/kg wwt		0.0121	0.0331	0.0181	0.0147	0.0151
boron	7440-42-8	E472A	0.20	mg/kg wwt		4.62	1.92	3.46	7.46	4.47
cadmium	7440-43-9	E472A	0.0020	mg/kg wwt		0.181	0.0812	0.103	0.137	0.0918
calcium	7440-70-2	E472A	4.0	mg/kg wwt		3090	3660	2660	3380	5180
cesium	7440-46-2	E472A	0.0010	mg/kg wwt		0.0828	0.373	0.169	0.107	0.114
chromium	7440-47-3	E472A	0.040	mg/kg wwt		33.2	16.1	33.1	10.4	69.2
cobalt	7440-48-4	E472A	0.0040	mg/kg wwt		9.57	3.33	4.22	5.89	3.19
copper	7440-50-8	E472A	0.040	mg/kg wwt		9.70	11.9	9.75	12.9	16.4
iron	7439-89-6	E472A	1.0	mg/kg wwt		3090	8120	4400	3380	3550
lead	7439-92-1	E472A	0.010	mg/kg wwt		0.661	1.74	0.928	0.727	0.774
lithium	7439-93-2	E472A	0.10	mg/kg wwt		0.83	3.87	1.60	1.03	1.06
magnesium	7439-95-4	E472A	0.40	mg/kg wwt		983	2360	1280	1050	1040
manganese	7439-96-5	E472A	0.010	mg/kg wwt		7620	572	2200	3490	1290
mercury	7439-97-6	E511A	0.0010	mg/kg wwt		0.0065	0.0151	0.0109	0.0126	0.0101
molybdenum	7439-98-7	E472A	0.0080	mg/kg wwt		0.933	0.273	0.567	0.767	0.892
nickel	7440-02-0	E472A	0.040	mg/kg wwt		8.73	8.78	6.93	6.56	6.74
phosphorus	7723-14-0	E472A	2.0	mg/kg wwt		848	389	670	664	1010
potassium	7440-09-7	E472A	4.0	mg/kg wwt		1190	763	1180	1240	1990
rubidium	7440-17-7	E472A	0.010	mg/kg wwt		1.26	4.45	2.17	1.61	1.89
selenium	7782-49-2	E472A	0.020	mg/kg wwt		0.543	0.309	0.453	0.457	0.546
sodium	7440-23-5	E472A	4.0	mg/kg wwt		74.1	112	103	75.4	135
strontium	7440-24-6	E472A	0.020	mg/kg wwt		49.1	36.6	31.9	42.6	33.7
tellurium	13494-80-9	E472A	0.0040	mg/kg wwt		0.0102	0.0076	0.0067	0.0079	<0.0065 DLA

Analytical Results

Sub-Matrix: **Tissue**
(Matrix: **Biota**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LMC-1	LMC-2	LMC-3	LMC-4	LMC-5
					Client sampling date / time	14-Sep-2020	14-Sep-2020	11-Sep-2020	11-Sep-2020	11-Sep-2020
						WR2000902-011	WR2000902-012	WR2000902-013	WR2000902-014	WR2000902-015
						Result	Result	Result	Result	Result
Metals										
thallium	7440-28-0	E472A	0.00040	mg/kg wwt		0.00998	0.0356	0.0168	0.0124	0.0117
tin	7440-31-5	E472A	0.020	mg/kg wwt		0.228	0.245	0.477	0.114	0.513
uranium	7440-61-1	E472A	0.00040	mg/kg wwt		0.186	0.334	0.214	0.160	0.374
vanadium	7440-62-2	E472A	0.020	mg/kg wwt		9.81	17.5	9.83	9.86	8.48
zinc	7440-66-6	E472A	0.20	mg/kg wwt		22.6	18.6	16.2	14.5	18.6
zirconium	7440-67-7	E472A	0.040	mg/kg wwt		0.966	3.19	1.49	1.07	1.11

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WR2000902**	Page	: 1 of 13
Client	: **Minnow Environmental Inc.**	Laboratory	: Whitehorse - Environmental
Contact	: Lisa Bowron	Account Manager	: Heather McKenzie
Address	: 204 – 1006 Fort Street Victoria BC Canada V8V 3K4	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: 250 595 1627	Telephone	: +1 867 668 6689
Project	: Minnow Project 20-70	Date Samples Received	: 18-Sep-2020 11:45
PO	: ----	Issue Date	: 10-Nov-2020 18:14
C-O-C number	: 1 of 2, 2 of 2		
Sampler	: Pierro Stecko		
Site	: ----		
Quote number	: Q75875		
No. of samples received	: 15		
No. of samples analysed	: 15		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (DRY units, Micro)										
Compliant container LBC-2	E511	16-Sep-2020	02-Nov-2020	365 days	47 days	✓	04-Nov-2020	317 days	2 days	✓
Metals : Mercury in Biota by CVAAS (DRY units, Micro)										
Compliant container LBC-3	E511	16-Sep-2020	02-Nov-2020	365 days	47 days	✓	04-Nov-2020	317 days	2 days	✓
Metals : Mercury in Biota by CVAAS (DRY units, Micro)										
Compliant container LBC-4	E511	16-Sep-2020	02-Nov-2020	365 days	47 days	✓	04-Nov-2020	317 days	2 days	✓
Metals : Mercury in Biota by CVAAS (DRY units, Micro)										
Compliant container LBC-5	E511	16-Sep-2020	02-Nov-2020	365 days	47 days	✓	04-Nov-2020	317 days	2 days	✓
Metals : Mercury in Biota by CVAAS (DRY units, Micro)										
Compliant container LBC-1	E511	16-Sep-2020	02-Nov-2020	365 days	49 days	✓	04-Nov-2020	315 days	-1 days	✓
Metals : Mercury in Biota by CVAAS (DRY units, Micro)										
Compliant container LMC-1	E511	14-Sep-2020	02-Nov-2020	365 days	49 days	✓	04-Nov-2020	315 days	2 days	✓
Metals : Mercury in Biota by CVAAS (DRY units, Micro)										
Compliant container LMC-2	E511	14-Sep-2020	02-Nov-2020	365 days	49 days	✓	04-Nov-2020	315 days	2 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (DRY units, Micro)										
Compliant container LWC-1	E511	13-Sep-2020	02-Nov-2020	365 days	50 days	✓	04-Nov-2020	314 days	2 days	✓
Metals : Mercury in Biota by CVAAS (DRY units, Micro)										
Compliant container LWC-2	E511	12-Sep-2020	02-Nov-2020	365 days	51 days	✓	04-Nov-2020	313 days	2 days	✓
Metals : Mercury in Biota by CVAAS (DRY units, Micro)										
Compliant container LWC-3	E511	12-Sep-2020	02-Nov-2020	365 days	51 days	✓	04-Nov-2020	313 days	2 days	✓
Metals : Mercury in Biota by CVAAS (DRY units, Micro)										
Compliant container LWC-4	E511	12-Sep-2020	02-Nov-2020	365 days	51 days	✓	04-Nov-2020	313 days	2 days	✓
Metals : Mercury in Biota by CVAAS (DRY units, Micro)										
Compliant container LWC-5	E511	12-Sep-2020	02-Nov-2020	365 days	51 days	✓	04-Nov-2020	313 days	2 days	✓
Metals : Mercury in Biota by CVAAS (DRY units, Micro)										
Compliant container LMC-3	E511	11-Sep-2020	02-Nov-2020	365 days	52 days	✓	04-Nov-2020	312 days	2 days	✓
Metals : Mercury in Biota by CVAAS (DRY units, Micro)										
Compliant container LMC-4	E511	11-Sep-2020	02-Nov-2020	365 days	52 days	✓	04-Nov-2020	312 days	2 days	✓
Metals : Mercury in Biota by CVAAS (DRY units, Micro)										
Compliant container LMC-5	E511	11-Sep-2020	02-Nov-2020	365 days	52 days	✓	04-Nov-2020	312 days	2 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Micro)										
Compliant container LBC-1	E511A	16-Sep-2020	02-Nov-2020	365 days	47 days	✓	04-Nov-2020	317 days	2 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (WET units, Micro)										
Compliant container LBC-2	E511A	16-Sep-2020	02-Nov-2020	365 days	47 days	✓	04-Nov-2020	317 days	2 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Micro)										
Compliant container LBC-3	E511A	16-Sep-2020	02-Nov-2020	365 days	47 days	✓	04-Nov-2020	317 days	2 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Micro)										
Compliant container LBC-4	E511A	16-Sep-2020	02-Nov-2020	365 days	47 days	✓	04-Nov-2020	317 days	2 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Micro)										
Compliant container LBC-5	E511A	16-Sep-2020	02-Nov-2020	365 days	47 days	✓	04-Nov-2020	317 days	2 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Micro)										
Compliant container LMC-1	E511A	14-Sep-2020	02-Nov-2020	365 days	49 days	✓	04-Nov-2020	315 days	2 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Micro)										
Compliant container LMC-2	E511A	14-Sep-2020	02-Nov-2020	365 days	49 days	✓	04-Nov-2020	315 days	2 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Micro)										
Compliant container LWC-1	E511A	13-Sep-2020	02-Nov-2020	365 days	50 days	✓	04-Nov-2020	314 days	2 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Micro)										
Compliant container LWC-2	E511A	12-Sep-2020	02-Nov-2020	365 days	51 days	✓	04-Nov-2020	313 days	2 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Micro)										
Compliant container LWC-3	E511A	12-Sep-2020	02-Nov-2020	365 days	51 days	✓	04-Nov-2020	313 days	2 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (WET units, Micro)										
Compliant container LWC-4	E511A	12-Sep-2020	02-Nov-2020	365 days	51 days	✓	04-Nov-2020	313 days	2 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Micro)										
Compliant container LWC-5	E511A	12-Sep-2020	02-Nov-2020	365 days	51 days	✓	04-Nov-2020	313 days	2 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Micro)										
Compliant container LMC-3	E511A	11-Sep-2020	02-Nov-2020	365 days	52 days	✓	04-Nov-2020	312 days	2 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Micro)										
Compliant container LMC-4	E511A	11-Sep-2020	02-Nov-2020	365 days	52 days	✓	04-Nov-2020	312 days	2 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Micro)										
Compliant container LMC-5	E511A	11-Sep-2020	02-Nov-2020	365 days	52 days	✓	04-Nov-2020	312 days	2 days	✓
Metals : Metals in Biota by CRC ICPMS (DRY units, Micro)										
Compliant container LBC-1	E472	16-Sep-2020	02-Nov-2020	730 days	47 days	✓	03-Nov-2020	682 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (DRY units, Micro)										
Compliant container LBC-2	E472	16-Sep-2020	02-Nov-2020	730 days	47 days	✓	03-Nov-2020	682 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (DRY units, Micro)										
Compliant container LBC-3	E472	16-Sep-2020	02-Nov-2020	730 days	47 days	✓	03-Nov-2020	682 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (DRY units, Micro)										
Compliant container LBC-4	E472	16-Sep-2020	02-Nov-2020	730 days	47 days	✓	03-Nov-2020	682 days	1 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Metals in Biota by CRC ICPMS (DRY units, Micro)										
Compliant container LBC-5	E472	16-Sep-2020	02-Nov-2020	730 days	47 days	✓	03-Nov-2020	682 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (DRY units, Micro)										
Compliant container LMC-1	E472	14-Sep-2020	02-Nov-2020	730 days	49 days	✓	03-Nov-2020	680 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (DRY units, Micro)										
Compliant container LMC-2	E472	14-Sep-2020	02-Nov-2020	730 days	49 days	✓	03-Nov-2020	680 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (DRY units, Micro)										
Compliant container LWC-1	E472	13-Sep-2020	02-Nov-2020	730 days	50 days	✓	03-Nov-2020	679 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (DRY units, Micro)										
Compliant container LWC-2	E472	12-Sep-2020	02-Nov-2020	730 days	51 days	✓	03-Nov-2020	678 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (DRY units, Micro)										
Compliant container LWC-3	E472	12-Sep-2020	02-Nov-2020	730 days	51 days	✓	03-Nov-2020	678 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (DRY units, Micro)										
Compliant container LWC-4	E472	12-Sep-2020	02-Nov-2020	730 days	51 days	✓	03-Nov-2020	678 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (DRY units, Micro)										
Compliant container LWC-5	E472	12-Sep-2020	02-Nov-2020	730 days	51 days	✓	03-Nov-2020	678 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (DRY units, Micro)										
Compliant container LMC-3	E472	11-Sep-2020	02-Nov-2020	730 days	52 days	✓	03-Nov-2020	677 days	1 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Metals in Biota by CRC ICPMS (DRY units, Micro)										
Compliant container LMC-4	E472	11-Sep-2020	02-Nov-2020	730 days	52 days	✓	03-Nov-2020	677 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (DRY units, Micro)										
Compliant container LMC-5	E472	11-Sep-2020	02-Nov-2020	730 days	52 days	✓	03-Nov-2020	677 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Micro)										
Compliant container LBC-1	E472A	16-Sep-2020	02-Nov-2020	730 days	47 days	✓	03-Nov-2020	682 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Micro)										
Compliant container LBC-2	E472A	16-Sep-2020	02-Nov-2020	730 days	47 days	✓	03-Nov-2020	682 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Micro)										
Compliant container LBC-3	E472A	16-Sep-2020	02-Nov-2020	730 days	47 days	✓	03-Nov-2020	682 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Micro)										
Compliant container LBC-4	E472A	16-Sep-2020	02-Nov-2020	730 days	47 days	✓	03-Nov-2020	682 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Micro)										
Compliant container LBC-5	E472A	16-Sep-2020	02-Nov-2020	730 days	47 days	✓	03-Nov-2020	682 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Micro)										
Compliant container LMC-1	E472A	14-Sep-2020	02-Nov-2020	730 days	49 days	✓	03-Nov-2020	680 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Micro)										
Compliant container LMC-2	E472A	14-Sep-2020	02-Nov-2020	730 days	49 days	✓	03-Nov-2020	680 days	1 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Metals in Biota by CRC ICPMS (WET units, Micro)										
Compliant container LWC-1	E472A	13-Sep-2020	02-Nov-2020	730 days	50 days	✓	03-Nov-2020	679 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Micro)										
Compliant container LWC-2	E472A	12-Sep-2020	02-Nov-2020	730 days	51 days	✓	03-Nov-2020	678 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Micro)										
Compliant container LWC-3	E472A	12-Sep-2020	02-Nov-2020	730 days	51 days	✓	03-Nov-2020	678 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Micro)										
Compliant container LWC-4	E472A	12-Sep-2020	02-Nov-2020	730 days	51 days	✓	03-Nov-2020	678 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Micro)										
Compliant container LWC-5	E472A	12-Sep-2020	02-Nov-2020	730 days	51 days	✓	03-Nov-2020	678 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Micro)										
Compliant container LMC-3	E472A	11-Sep-2020	02-Nov-2020	730 days	52 days	✓	03-Nov-2020	677 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Micro)										
Compliant container LMC-4	E472A	11-Sep-2020	02-Nov-2020	730 days	52 days	✓	03-Nov-2020	677 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Micro)										
Compliant container LMC-5	E472A	11-Sep-2020	02-Nov-2020	730 days	52 days	✓	03-Nov-2020	677 days	1 days	✓
Physical Tests : Moisture Content by Gravimetry (Micro)										
Compliant container LBC-1	E144-H	16-Sep-2020	----	----	----		23-Oct-2020	----	----	

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Moisture Content by Gravimetry (Micro)										
Compliant container LBC-2	E144-H	16-Sep-2020	----	----	----		23-Oct-2020	----	----	
Physical Tests : Moisture Content by Gravimetry (Micro)										
Compliant container LBC-3	E144-H	16-Sep-2020	----	----	----		23-Oct-2020	----	----	
Physical Tests : Moisture Content by Gravimetry (Micro)										
Compliant container LBC-4	E144-H	16-Sep-2020	----	----	----		23-Oct-2020	----	----	
Physical Tests : Moisture Content by Gravimetry (Micro)										
Compliant container LBC-5	E144-H	16-Sep-2020	----	----	----		23-Oct-2020	----	----	
Physical Tests : Moisture Content by Gravimetry (Micro)										
Compliant container LMC-1	E144-H	14-Sep-2020	----	----	----		23-Oct-2020	----	----	
Physical Tests : Moisture Content by Gravimetry (Micro)										
Compliant container LMC-2	E144-H	14-Sep-2020	----	----	----		23-Oct-2020	----	----	
Physical Tests : Moisture Content by Gravimetry (Micro)										
Compliant container LMC-3	E144-H	11-Sep-2020	----	----	----		23-Oct-2020	----	----	
Physical Tests : Moisture Content by Gravimetry (Micro)										
Compliant container LMC-4	E144-H	11-Sep-2020	----	----	----		23-Oct-2020	----	----	
Physical Tests : Moisture Content by Gravimetry (Micro)										
Compliant container LMC-5	E144-H	11-Sep-2020	----	----	----		23-Oct-2020	----	----	

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Moisture Content by Gravimetry (Micro)										
Compliant container LWC-1	E144-H	13-Sep-2020	----	----	----		23-Oct-2020	----	----	
Physical Tests : Moisture Content by Gravimetry (Micro)										
Compliant container LWC-2	E144-H	12-Sep-2020	----	----	----		23-Oct-2020	----	----	
Physical Tests : Moisture Content by Gravimetry (Micro)										
Compliant container LWC-3	E144-H	12-Sep-2020	----	----	----		23-Oct-2020	----	----	
Physical Tests : Moisture Content by Gravimetry (Micro)										
Compliant container LWC-4	E144-H	12-Sep-2020	----	----	----		23-Oct-2020	----	----	
Physical Tests : Moisture Content by Gravimetry (Micro)										
Compliant container LWC-5	E144-H	12-Sep-2020	----	----	----		23-Oct-2020	----	----	

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Biota**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Mercury in Biota by CVAAS (DRY units, Micro)	E511	110393	1	15	6.6	5.0	✓
Mercury in Biota by CVAAS (WET units, Micro)	E511A	110396	1	15	6.6	5.0	✓
Metals in Biota by CRC ICPMS (DRY units, Micro)	E472	110395	1	15	6.6	5.0	✓
Metals in Biota by CRC ICPMS (WET units, Micro)	E472A	110394	1	15	6.6	5.0	✓
Moisture Content by Gravimetry (Micro)	E144-H	107441	1	15	6.6	5.0	✓
Laboratory Control Samples (LCS)							
Mercury in Biota by CVAAS (DRY units, Micro)	E511	110393	2	15	13.3	10.0	✓
Mercury in Biota by CVAAS (WET units, Micro)	E511A	110396	2	15	13.3	10.0	✓
Metals in Biota by CRC ICPMS (DRY units, Micro)	E472	110395	2	15	13.3	10.0	✓
Metals in Biota by CRC ICPMS (WET units, Micro)	E472A	110394	2	15	13.3	10.0	✓
Moisture Content by Gravimetry (Micro)	E144-H	107441	1	15	6.6	5.0	✓
Method Blanks (MB)							
Mercury in Biota by CVAAS (DRY units, Micro)	E511	110393	1	15	6.6	5.0	✓
Mercury in Biota by CVAAS (WET units, Micro)	E511A	110396	1	15	6.6	5.0	✓
Metals in Biota by CRC ICPMS (DRY units, Micro)	E472	110395	1	15	6.6	5.0	✓
Metals in Biota by CRC ICPMS (WET units, Micro)	E472A	110394	1	15	6.6	5.0	✓
Moisture Content by Gravimetry (Micro)	E144-H	107441	1	15	6.6	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Moisture Content by Gravimetry (Micro)	E144-H Vancouver - Environmental	Biota	Puget Sound Water Quality Authority/BC MOE Lab Manual	Moisture is measured gravimetrically by drying the sample at <60°C for a minimum of 3 days to constant weight. Moisture content is calculated as the weight loss (due to water) divided by the wet weight of soil, expressed as a percentage.
Metals in Biota by CRC ICPMS (DRY units, Micro)	E472 Vancouver - Environmental	Biota	EPA 200.3/6020B (mod)	Tissue samples are homogenized and sub-sampled prior to hotblock digestion with HNO3, HCl, and H2O2. Analysis is by Collision/Reaction Cell ICPMS. Method Limitation: This method employs a strong acid/peroxide digestion, and is intended to provide a conservative estimate of bio-available metals. Near complete recoveries are achieved for most toxicologically important metals, but elements associated with recalcitrant minerals may be only partially recovered.
Metals in Biota by CRC ICPMS (WET units, Micro)	E472A Vancouver - Environmental	Biota	EPA 200.3/6020B (mod)	Tissue samples are homogenized and sub-sampled prior to hotblock digestion with HNO3, HCl, and H2O2. Analysis is by Collision/Reaction Cell ICPMS. Method Limitation: This method employs a strong acid/peroxide digestion, and is intended to provide a conservative estimate of bio-available metals. Near complete recoveries are achieved for most toxicologically important metals, but elements associated with recalcitrant minerals may be only partially recovered.
Mercury in Biota by CVAAS (DRY units, Micro)	E511 Vancouver - Environmental	Biota	EPA 200.3/1631E (mod)	Samples are homogenized and sub-sampled prior to hotblock digestion with nitric acid, hydrochloric acid, and hydrogen peroxide. Analysis is by CVAAS.
Mercury in Biota by CVAAS (WET units, Micro)	E511A Vancouver - Environmental	Biota	EPA 200.3/1631E (mod)	Samples are homogenized and sub-sampled prior to hotblock digestion with nitric acid, hydrochloric acid, and hydrogen peroxide. Analysis is by CVAAS.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Metals and Mercury Biota Digestion (Micro)	EP472 Vancouver - Environmental	Biota	EPA 200.3	This method, designed for small sample amounts, uses a heated strong acid digestion with HNO3, HCl, and H2O2 and is intended to provide a conservative estimate of bio-available metals.

QUALITY CONTROL REPORT

Work Order	: **WR2000902**	Page	: 1 of 14
Client	: Minnow Environmental Inc.	Laboratory	: Whitehorse - Environmental
Contact	: Lisa Bowron	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: 250 595 1627	Telephone	: +1 867 668 6689
Project	: Minnow Project 20-70	Date Samples Received	: 18-Sep-2020 11:45
PO	: ----	Date Analysis Commenced	: 23-Oct-2020
C-O-C number	: 1 of 2, 2 of 2	Issue Date	: 10-Nov-2020 18:14
Sampler	: Pierro Stecko		
Site	: ----		
Quote number	: Q75875		
No. of samples received	: 15		
No. of samples analysed	: 15		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Cristina Alexandre	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Evan Ben-Oliel	Metal Analyst	Metals, Burnaby, British Columbia
Kinny Wu	Lab Analyst	Metals, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Biota**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Physical Tests (QC Lot: 107441)											
WR2000902-001	LWC-1	moisture	----	E144-H	2.0	%	65.6	68.3	4.10%	20%	----
Metals (QC Lot: 110393)											
WR2000902-001	LWC-1	mercury	7439-97-6	E511	0.0050	mg/kg	0.0390	0.0357	8.87%	40%	----
Metals (QC Lot: 110394)											
WR2000902-001	LWC-1	aluminum	7429-90-5	E472A	1.0	mg/kg wwt	4800	5140	6.84%	40%	----
		antimony	7440-36-0	E472A	0.0020	mg/kg wwt	0.0196	0.0177	10.1%	40%	----
		arsenic	7440-38-2	E472A	0.0060	mg/kg wwt	1.28	1.32	2.97%	40%	----
		barium	7440-39-3	E472A	0.010	mg/kg wwt	52.9	54.4	2.73%	40%	----
		beryllium	7440-41-7	E472A	0.0020	mg/kg wwt	0.174	0.186	7.00%	40%	----
		bismuth	7440-69-9	E472A	0.0020	mg/kg wwt	0.0207	0.0222	7.24%	40%	----
		boron	7440-42-8	E472A	0.20	mg/kg wwt	1.75	1.46	18.3%	40%	----
		cadmium	7440-43-9	E472A	0.0020	mg/kg wwt	0.0416	0.0420	0.954%	40%	----
		calcium	7440-70-2	E472A	4.0	mg/kg wwt	2230	2390	7.04%	60%	----
		cesium	7440-46-2	E472A	0.0010	mg/kg wwt	0.516	0.538	4.19%	40%	----
		chromium	7440-47-3	E472A	0.040	mg/kg wwt	13.0	13.9	6.46%	40%	----
		cobalt	7440-48-4	E472A	0.0040	mg/kg wwt	3.16	3.35	5.78%	40%	----
		copper	7440-50-8	E472A	0.040	mg/kg wwt	5.35	5.43	1.61%	40%	----
		iron	7439-89-6	E472A	1.0	mg/kg wwt	7140	7540	5.45%	40%	----
		lead	7439-92-1	E472A	0.010	mg/kg wwt	1.49	1.58	6.25%	40%	----
		lithium	7439-93-2	E472A	0.10	mg/kg wwt	3.24	3.47	6.91%	40%	----
		magnesium	7439-95-4	E472A	0.40	mg/kg wwt	2610	2790	6.53%	40%	----
		manganese	7439-96-5	E472A	0.010	mg/kg wwt	189	194	2.47%	40%	----
		molybdenum	7439-98-7	E472A	0.0080	mg/kg wwt	0.128	0.126	2.04%	40%	----
		nickel	7440-02-0	E472A	0.040	mg/kg wwt	8.61	9.09	5.46%	40%	----
		phosphorus	7723-14-0	E472A	2.0	mg/kg wwt	404	432	6.81%	40%	----
		potassium	7440-09-7	E472A	4.0	mg/kg wwt	471	493	4.63%	40%	----
		rubidium	7440-17-7	E472A	0.010	mg/kg wwt	4.16	4.26	2.48%	40%	----
		selenium	7782-49-2	E472A	0.020	mg/kg wwt	0.178	0.172	3.34%	40%	----
		sodium	7440-23-5	E472A	4.0	mg/kg wwt	148	148	0.116%	40%	----
		strontium	7440-24-6	E472A	0.020	mg/kg wwt	22.9	23.7	3.51%	60%	----
		tellurium	13494-80-9	E472A	0.0040	mg/kg wwt	0.0050	0.0051	0.00005	Diff <2x LOR	----
		thallium	7440-28-0	E472A	0.00040	mg/kg wwt	0.0249	0.0272	8.65%	40%	----

Sub-Matrix: **Biota**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Metals (QC Lot: 110394) - continued											
WR2000902-001	LWC-1	tin	7440-31-5	E472A	0.020	mg/kg wwt	0.370	0.282	27.0%	40%	----
		uranium	7440-61-1	E472A	0.00040	mg/kg wwt	0.277	0.293	5.65%	40%	----
		vanadium	7440-62-2	E472A	0.020	mg/kg wwt	17.9	18.6	3.98%	40%	----
		zinc	7440-66-6	E472A	0.20	mg/kg wwt	15.9	17.0	6.40%	40%	----
		zirconium	7440-67-7	E472A	0.040	mg/kg wwt	3.03	3.13	3.19%	40%	----
Metals (QC Lot: 110395)											
WR2000902-001	LWC-1	aluminum	7429-90-5	E472	5.0	mg/kg	13900	14900	6.84%	40%	----
		antimony	7440-36-0	E472	0.010	mg/kg	0.057	0.051	10.1%	40%	----
		arsenic	7440-38-2	E472	0.030	mg/kg	3.71	3.82	2.97%	40%	----
		barium	7440-39-3	E472	0.050	mg/kg	154	158	2.73%	40%	----
		beryllium	7440-41-7	E472	0.010	mg/kg	0.505	0.542	7.00%	40%	----
		bismuth	7440-69-9	E472	0.010	mg/kg	0.060	0.064	7.24%	40%	----
		boron	7440-42-8	E472	1.0	mg/kg	5.1	4.2	0.8	Diff <2x LOR	----
		cadmium	7440-43-9	E472	0.010	mg/kg	0.121	0.122	0.954%	40%	----
		calcium	7440-70-2	E472	20	mg/kg	6460	6940	7.04%	60%	----
		cesium	7440-46-2	E472	0.0050	mg/kg	1.50	1.56	4.19%	40%	----
		chromium	7440-47-3	E472	0.20	mg/kg	37.8	40.3	6.46%	40%	----
		cobalt	7440-48-4	E472	0.020	mg/kg	9.18	9.72	5.78%	40%	----
		copper	7440-50-8	E472	0.20	mg/kg	15.5	15.8	1.61%	40%	----
		iron	7439-89-6	E472	5.0	mg/kg	20700	21900	5.45%	40%	----
		lead	7439-92-1	E472	0.050	mg/kg	4.32	4.59	6.25%	40%	----
		lithium	7439-93-2	E472	0.50	mg/kg	9.40	10.1	6.91%	40%	----
		magnesium	7439-95-4	E472	2.0	mg/kg	7580	8090	6.53%	40%	----
		manganese	7439-96-5	E472	0.050	mg/kg	549	563	2.47%	40%	----
		molybdenum	7439-98-7	E472	0.040	mg/kg	0.373	0.365	2.04%	40%	----
		nickel	7440-02-0	E472	0.20	mg/kg	25.0	26.4	5.46%	40%	----
		phosphorus	7723-14-0	E472	10	mg/kg	1170	1260	6.81%	40%	----
		potassium	7440-09-7	E472	20	mg/kg	1370	1430	4.63%	40%	----
		rubidium	7440-17-7	E472	0.050	mg/kg	12.1	12.4	2.48%	40%	----
		selenium	7782-49-2	E472	0.10	mg/kg	0.52	0.50	3.34%	40%	----
		sodium	7440-23-5	E472	20	mg/kg	428	429	0.116%	40%	----
		strontium	7440-24-6	E472	0.10	mg/kg	66.5	68.9	3.51%	60%	----
		tellurium	13494-80-9	E472	0.020	mg/kg	<0.020	<0.020	0	Diff <2x LOR	----
		thallium	7440-28-0	E472	0.0020	mg/kg	0.0724	0.0789	8.65%	40%	----
		tin	7440-31-5	E472	0.10	mg/kg	1.07	0.82	27.0%	40%	----
		uranium	7440-61-1	E472	0.0020	mg/kg	0.804	0.851	5.65%	40%	----

Sub-Matrix: **Biota**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Metals (QC Lot: 110395) - continued											
WR2000902-001	LWC-1	vanadium	7440-62-2	E472	0.10	mg/kg	51.9	54.0	3.98%	40%	----
		zinc	7440-66-6	E472	1.0	mg/kg	46.3	49.3	6.40%	40%	----
		zirconium	7440-67-7	E472	0.20	mg/kg	8.79	9.08	3.19%	40%	----
Metals (QC Lot: 110396)											
WR2000902-001	LWC-1	mercury	7439-97-6	E511A	0.0010	mg/kg wwt	0.0134	0.0123	8.87%	40%	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Biota**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 107441)						
moisture	----	E144-H	2	%	<2.0	----
Metals (QCLot: 110393)						
mercury	7439-97-6	E511	0.005	mg/kg	<0.0050	----
Metals (QCLot: 110394)						
aluminum	7429-90-5	E472A	1	mg/kg wwt	<1.0	----
antimony	7440-36-0	E472A	0.002	mg/kg wwt	<0.0020	----
arsenic	7440-38-2	E472A	0.006	mg/kg wwt	<0.0060	----
barium	7440-39-3	E472A	0.01	mg/kg wwt	<0.010	----
beryllium	7440-41-7	E472A	0.002	mg/kg wwt	<0.0020	----
bismuth	7440-69-9	E472A	0.002	mg/kg wwt	<0.0020	----
boron	7440-42-8	E472A	0.2	mg/kg wwt	<0.20	----
cadmium	7440-43-9	E472A	0.002	mg/kg wwt	<0.0020	----
calcium	7440-70-2	E472A	4	mg/kg wwt	<4.0	----
cesium	7440-46-2	E472A	0.001	mg/kg wwt	<0.0010	----
chromium	7440-47-3	E472A	0.04	mg/kg wwt	<0.040	----
cobalt	7440-48-4	E472A	0.004	mg/kg wwt	<0.0040	----
copper	7440-50-8	E472A	0.04	mg/kg wwt	<0.040	----
iron	7439-89-6	E472A	1	mg/kg wwt	<1.0	----
lead	7439-92-1	E472A	0.01	mg/kg wwt	<0.010	----
lithium	7439-93-2	E472A	0.1	mg/kg wwt	<0.10	----
magnesium	7439-95-4	E472A	0.4	mg/kg wwt	<0.40	----
manganese	7439-96-5	E472A	0.01	mg/kg wwt	<0.010	----
molybdenum	7439-98-7	E472A	0.008	mg/kg wwt	<0.0080	----
nickel	7440-02-0	E472A	0.04	mg/kg wwt	<0.040	----
phosphorus	7723-14-0	E472A	2	mg/kg wwt	<2.0	----
potassium	7440-09-7	E472A	4	mg/kg wwt	<4.0	----
rubidium	7440-17-7	E472A	0.01	mg/kg wwt	<0.010	----
selenium	7782-49-2	E472A	0.02	mg/kg wwt	<0.020	----
sodium	7440-23-5	E472A	4	mg/kg wwt	<4.0	----
strontium	7440-24-6	E472A	0.02	mg/kg wwt	<0.020	----
tellurium	13494-80-9	E472A	0.004	mg/kg wwt	<0.0040	----
thallium	7440-28-0	E472A	0.0004	mg/kg wwt	<0.00040	----
tin	7440-31-5	E472A	0.02	mg/kg wwt	<0.020	----

Sub-Matrix: **Biota**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Metals (QCLot: 110394) - continued						
uranium	7440-61-1	E472A	0.0004	mg/kg wwt	<0.00040	----
vanadium	7440-62-2	E472A	0.02	mg/kg wwt	<0.020	----
zinc	7440-66-6	E472A	0.2	mg/kg wwt	<0.20	----
zirconium	7440-67-7	E472A	0.04	mg/kg wwt	<0.040	----
Metals (QCLot: 110395)						
aluminum	7429-90-5	E472	5	mg/kg	<5.0	----
antimony	7440-36-0	E472	0.01	mg/kg	<0.010	----
arsenic	7440-38-2	E472	0.03	mg/kg	<0.030	----
barium	7440-39-3	E472	0.05	mg/kg	<0.050	----
beryllium	7440-41-7	E472	0.01	mg/kg	<0.010	----
bismuth	7440-69-9	E472	0.01	mg/kg	<0.010	----
boron	7440-42-8	E472	1	mg/kg	<1.0	----
cadmium	7440-43-9	E472	0.01	mg/kg	<0.010	----
calcium	7440-70-2	E472	20	mg/kg	<20	----
cesium	7440-46-2	E472	0.005	mg/kg	<0.0050	----
chromium	7440-47-3	E472	0.2	mg/kg	<0.20	----
cobalt	7440-48-4	E472	0.02	mg/kg	<0.020	----
copper	7440-50-8	E472	0.2	mg/kg	<0.20	----
iron	7439-89-6	E472	5	mg/kg	<5.0	----
lead	7439-92-1	E472	0.05	mg/kg	<0.050	----
lithium	7439-93-2	E472	0.5	mg/kg	<0.50	----
magnesium	7439-95-4	E472	2	mg/kg	<2.0	----
manganese	7439-96-5	E472	0.05	mg/kg	<0.050	----
molybdenum	7439-98-7	E472	0.04	mg/kg	<0.040	----
nickel	7440-02-0	E472	0.2	mg/kg	<0.20	----
phosphorus	7723-14-0	E472	10	mg/kg	<10	----
potassium	7440-09-7	E472	20	mg/kg	<20	----
rubidium	7440-17-7	E472	0.05	mg/kg	<0.050	----
selenium	7782-49-2	E472	0.1	mg/kg	<0.10	----
sodium	7440-23-5	E472	20	mg/kg	<20	----
strontium	7440-24-6	E472	0.1	mg/kg	<0.10	----
tellurium	13494-80-9	E472	0.02	mg/kg	<0.020	----
thallium	7440-28-0	E472	0.002	mg/kg	<0.0020	----
tin	7440-31-5	E472	0.1	mg/kg	<0.10	----
uranium	7440-61-1	E472	0.002	mg/kg	<0.0020	----
vanadium	7440-62-2	E472	0.1	mg/kg	<0.10	----

Sub-Matrix: **Biota**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Metals (QCLot: 110395) - continued						
zinc	7440-66-6	E472	1	mg/kg	<1.0	----
zirconium	7440-67-7	E472	0.2	mg/kg	<0.20	----
Metals (QCLot: 110396)						
mercury	7439-97-6	E511A	0.001	mg/kg wwt	<0.0010	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Biota**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 107441)									
moisture	----	E144-H	2	%	100 %	100	90.0	110	----
Metals (QCLot: 110393)									
mercury	7439-97-6	E511	0.005	mg/kg	0.02 mg/kg	105	80.0	120	----
Metals (QCLot: 110394)									
aluminum	7429-90-5	E472A	1	mg/kg wwt	20 mg/kg wwt	90.7	80.0	120	----
antimony	7440-36-0	E472A	0.002	mg/kg wwt	10 mg/kg wwt	83.0	80.0	120	----
arsenic	7440-38-2	E472A	0.006	mg/kg wwt	10 mg/kg wwt	84.4	80.0	120	----
barium	7440-39-3	E472A	0.01	mg/kg wwt	2.5 mg/kg wwt	84.0	80.0	120	----
beryllium	7440-41-7	E472A	0.002	mg/kg wwt	1 mg/kg wwt	84.0	80.0	120	----
bismuth	7440-69-9	E472A	0.002	mg/kg wwt	10 mg/kg wwt	80.4	80.0	120	----
boron	7440-42-8	E472A	0.2	mg/kg wwt	10 mg/kg wwt	85.3	80.0	120	----
cadmium	7440-43-9	E472A	0.002	mg/kg wwt	1 mg/kg wwt	83.4	80.0	120	----
calcium	7440-70-2	E472A	4	mg/kg wwt	500 mg/kg wwt	84.9	80.0	120	----
cesium	7440-46-2	E472A	0.001	mg/kg wwt	0.5 mg/kg wwt	85.1	80.0	120	----
chromium	7440-47-3	E472A	0.04	mg/kg wwt	2.5 mg/kg wwt	86.4	80.0	120	----
cobalt	7440-48-4	E472A	0.004	mg/kg wwt	2.5 mg/kg wwt	85.3	80.0	120	----
copper	7440-50-8	E472A	0.04	mg/kg wwt	2.5 mg/kg wwt	83.5	80.0	120	----
iron	7439-89-6	E472A	1	mg/kg wwt	10 mg/kg wwt	88.7	80.0	120	----
lead	7439-92-1	E472A	0.01	mg/kg wwt	5 mg/kg wwt	81.2	80.0	120	----
lithium	7439-93-2	E472A	0.1	mg/kg wwt	2.5 mg/kg wwt	86.0	80.0	120	----
magnesium	7439-95-4	E472A	0.4	mg/kg wwt	500 mg/kg wwt	85.4	80.0	120	----
manganese	7439-96-5	E472A	0.01	mg/kg wwt	2.5 mg/kg wwt	87.1	80.0	120	----
molybdenum	7439-98-7	E472A	0.008	mg/kg wwt	2.5 mg/kg wwt	88.3	80.0	120	----
nickel	7440-02-0	E472A	0.04	mg/kg wwt	5 mg/kg wwt	83.2	80.0	120	----
phosphorus	7723-14-0	E472A	2	mg/kg wwt	100 mg/kg wwt	89.3	80.0	120	----
potassium	7440-09-7	E472A	4	mg/kg wwt	500 mg/kg wwt	84.5	80.0	120	----
rubidium	7440-17-7	E472A	0.01	mg/kg wwt	1 mg/kg wwt	89.3	80.0	120	----
selenium	7782-49-2	E472A	0.02	mg/kg wwt	10 mg/kg wwt	84.4	80.0	120	----
sodium	7440-23-5	E472A	4	mg/kg wwt	500 mg/kg wwt	86.4	80.0	120	----
strontium	7440-24-6	E472A	0.02	mg/kg wwt	2.5 mg/kg wwt	87.6	80.0	120	----
tellurium	13494-80-9	E472A	0.004	mg/kg wwt	1 mg/kg wwt	84.1	80.0	120	----
thallium	7440-28-0	E472A	0.0004	mg/kg wwt	10 mg/kg wwt	80.8	80.0	120	----
tin	7440-31-5	E472A	0.02	mg/kg wwt	5 mg/kg wwt	87.1	80.0	120	----

Sub-Matrix: **Biota**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Metals (QCLot: 110394) - continued									
uranium	7440-61-1	E472A	0.0004	mg/kg wwt	0.05 mg/kg wwt	84.2	80.0	120	----
vanadium	7440-62-2	E472A	0.02	mg/kg wwt	5 mg/kg wwt	88.0	80.0	120	----
zinc	7440-66-6	E472A	0.2	mg/kg wwt	5 mg/kg wwt	81.5	80.0	120	----
zirconium	7440-67-7	E472A	0.04	mg/kg wwt	1 mg/kg wwt	87.6	80.0	120	----
Metals (QCLot: 110395)									
aluminum	7429-90-5	E472	5	mg/kg	20 mg/kg	90.7	80.0	120	----
antimony	7440-36-0	E472	0.01	mg/kg	10 mg/kg	83.0	80.0	120	----
arsenic	7440-38-2	E472	0.03	mg/kg	10 mg/kg	84.4	80.0	120	----
barium	7440-39-3	E472	0.05	mg/kg	2.5 mg/kg	84.0	80.0	120	----
beryllium	7440-41-7	E472	0.01	mg/kg	1 mg/kg	84.0	80.0	120	----
bismuth	7440-69-9	E472	0.01	mg/kg	10 mg/kg	80.4	80.0	120	----
boron	7440-42-8	E472	1	mg/kg	10 mg/kg	85.3	80.0	120	----
cadmium	7440-43-9	E472	0.01	mg/kg	1 mg/kg	83.4	80.0	120	----
calcium	7440-70-2	E472	20	mg/kg	500 mg/kg	84.9	80.0	120	----
cesium	7440-46-2	E472	0.005	mg/kg	0.5 mg/kg	85.1	80.0	120	----
chromium	7440-47-3	E472	0.2	mg/kg	2.5 mg/kg	86.4	80.0	120	----
cobalt	7440-48-4	E472	0.02	mg/kg	2.5 mg/kg	85.3	80.0	120	----
copper	7440-50-8	E472	0.2	mg/kg	2.5 mg/kg	83.5	80.0	120	----
iron	7439-89-6	E472	5	mg/kg	10 mg/kg	88.7	80.0	120	----
lead	7439-92-1	E472	0.05	mg/kg	5 mg/kg	81.2	80.0	120	----
lithium	7439-93-2	E472	0.5	mg/kg	2.5 mg/kg	86.0	80.0	120	----
magnesium	7439-95-4	E472	2	mg/kg	500 mg/kg	85.4	80.0	120	----
manganese	7439-96-5	E472	0.05	mg/kg	2.5 mg/kg	87.1	80.0	120	----
molybdenum	7439-98-7	E472	0.04	mg/kg	2.5 mg/kg	88.3	80.0	120	----
nickel	7440-02-0	E472	0.2	mg/kg	5 mg/kg	83.2	80.0	120	----
phosphorus	7723-14-0	E472	10	mg/kg	100 mg/kg	89.3	80.0	120	----
potassium	7440-09-7	E472	20	mg/kg	500 mg/kg	84.5	80.0	120	----
rubidium	7440-17-7	E472	0.05	mg/kg	1 mg/kg	89.3	80.0	120	----
selenium	7782-49-2	E472	0.1	mg/kg	10 mg/kg	84.4	80.0	120	----
sodium	7440-23-5	E472	20	mg/kg	500 mg/kg	86.4	80.0	120	----
strontium	7440-24-6	E472	0.1	mg/kg	2.5 mg/kg	87.6	80.0	120	----
tellurium	13494-80-9	E472	0.02	mg/kg	1 mg/kg	84.1	80.0	120	----
thallium	7440-28-0	E472	0.002	mg/kg	10 mg/kg	80.8	80.0	120	----
tin	7440-31-5	E472	0.1	mg/kg	5 mg/kg	87.1	80.0	120	----
uranium	7440-61-1	E472	0.002	mg/kg	0.05 mg/kg	84.2	80.0	120	----
vanadium	7440-62-2	E472	0.1	mg/kg	5 mg/kg	88.0	80.0	120	----
zinc	7440-66-6	E472	1	mg/kg	5 mg/kg	81.5	80.0	120	----

Sub-Matrix: **Biota**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Metals (QCLot: 110395) - continued									
zirconium	7440-67-7	E472	0.2	mg/kg	1 mg/kg	87.6	80.0	120	----
Metals (QCLot: 110396)									
mercury	7439-97-6	E511A	0.001	mg/kg wwt	0.02 mg/kg wwt	105	80.0	120	----

Reference Material (RM) Report

A Reference Material (RM) is a homogenous material with known and well-established analyte concentrations. RMs are processed in an identical manner to test samples, and are used to monitor and control the accuracy and precision of a test method for a typical sample matrix. RM results are expressed as percent recovery of the target analyte concentration. RM targets may be certified target concentrations provided by the RM supplier, or may be ALS long-term mean values (for empirical test methods).

Sub-Matrix: **Biota**

					Reference Material (RM) Report				
					RM Target	Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Metals (QCLot: 110393)									
QC-110393-003	RM	mercury	7439-97-6	E511	0.322 mg/kg	129	70.0	130	----
Metals (QCLot: 110394)									
QC-110394-003	RM	aluminum	7429-90-5	E472A	1280 mg/kg wwt	109	70.0	130	----
QC-110394-003	RM	arsenic	7440-38-2	E472A	6.87 mg/kg wwt	96.0	70.0	130	----
QC-110394-003	RM	barium	7440-39-3	E472A	4.4 mg/kg wwt	101	70.0	130	----
QC-110394-003	RM	boron	7440-42-8	E472A	9.24 mg/kg wwt	95.1	70.0	130	----
QC-110394-003	RM	cadmium	7440-43-9	E472A	0.299 mg/kg wwt	96.8	70.0	130	----
QC-110394-003	RM	calcium	7440-70-2	E472A	2360 mg/kg wwt	104	70.0	130	----
QC-110394-003	RM	cesium	7440-46-2	E472A	0.078 mg/kg wwt	90.9	70.0	130	----
QC-110394-003	RM	chromium	7440-47-3	E472A	1.58 mg/kg wwt	101	70.0	130	----
QC-110394-003	RM	cobalt	7440-48-4	E472A	0.25 mg/kg wwt	95.8	70.0	130	----
QC-110394-003	RM	copper	7440-50-8	E472A	15.7 mg/kg wwt	92.5	70.0	130	----
QC-110394-003	RM	iron	7439-89-6	E472A	318 mg/kg wwt	101	70.0	130	----
QC-110394-003	RM	lead	7439-92-1	E472A	0.231 mg/kg wwt	94.9	70.0	130	----
QC-110394-003	RM	lithium	7439-93-2	E472A	1.21 mg/kg wwt	91.4	50.0	150	----
QC-110394-003	RM	magnesium	7439-95-4	E472A	910 mg/kg wwt	95.6	70.0	130	----
QC-110394-003	RM	manganese	7439-96-5	E472A	3.17 mg/kg wwt	95.2	70.0	130	----
QC-110394-003	RM	molybdenum	7439-98-7	E472A	0.29 mg/kg wwt	91.5	70.0	130	----
QC-110394-003	RM	nickel	7440-02-0	E472A	1.34 mg/kg wwt	88.1	70.0	130	----
QC-110394-003	RM	phosphorus	7723-14-0	E472A	8000 mg/kg wwt	98.9	70.0	130	----
QC-110394-003	RM	potassium	7440-09-7	E472A	12840 mg/kg wwt	97.4	70.0	130	----
QC-110394-003	RM	rubidium	7440-17-7	E472A	5.59 mg/kg wwt	102	70.0	130	----
QC-110394-003	RM	selenium	7782-49-2	E472A	3.45 mg/kg wwt	102	70.0	130	----
QC-110394-003	RM	sodium	7440-23-5	E472A	14000 mg/kg wwt	101	70.0	130	----
QC-110394-003	RM	strontium	7440-24-6	E472A	10.1 mg/kg wwt	93.5	70.0	130	----
QC-110394-003	RM	thallium	7440-28-0	E472A	0.0093 mg/kg wwt	93.6	70.0	130	----
QC-110394-003	RM	uranium	7440-61-1	E472A	0.0481 mg/kg wwt	87.2	70.0	130	----
QC-110394-003	RM	vanadium	7440-62-2	E472A	1.48 mg/kg wwt	100	70.0	130	----

Sub-Matrix: **Biota**

Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Reference Material (RM) Report: RM Target Concentration	Recovery (%): RM	Recovery Limits (%): Low	Recovery Limits (%): High	Qualifier
Metals (QCLot: 110394) - continued									
QC-110394-003	RM	zinc	7440-66-6	E472A	46.2 mg/kg wwt	104	70.0	130	----
QC-110394-003	RM	zirconium	7440-67-7	E472A	0.254 mg/kg wwt	88.8	70.0	130	----
Metals (QCLot: 110395)									
QC-110395-003	RM	aluminum	7429-90-5	E472	1280 mg/kg	109	70.0	130	----
QC-110395-003	RM	arsenic	7440-38-2	E472	6.87 mg/kg	96.0	70.0	130	----
QC-110395-003	RM	barium	7440-39-3	E472	4.4 mg/kg	101	70.0	130	----
QC-110395-003	RM	boron	7440-42-8	E472	9.24 mg/kg	95.1	70.0	130	----
QC-110395-003	RM	cadmium	7440-43-9	E472	0.299 mg/kg	96.8	70.0	130	----
QC-110395-003	RM	calcium	7440-70-2	E472	2360 mg/kg	104	70.0	130	----
QC-110395-003	RM	cesium	7440-46-2	E472	0.078 mg/kg	90.9	70.0	130	----
QC-110395-003	RM	chromium	7440-47-3	E472	1.58 mg/kg	101	70.0	130	----
QC-110395-003	RM	cobalt	7440-48-4	E472	0.25 mg/kg	95.8	70.0	130	----
QC-110395-003	RM	copper	7440-50-8	E472	15.7 mg/kg	92.5	70.0	130	----
QC-110395-003	RM	iron	7439-89-6	E472	318 mg/kg	101	70.0	130	----
QC-110395-003	RM	lead	7439-92-1	E472	0.231 mg/kg	94.9	70.0	130	----
QC-110395-003	RM	lithium	7439-93-2	E472	1.21 mg/kg	91.4	50.0	150	----
QC-110395-003	RM	magnesium	7439-95-4	E472	910 mg/kg	95.6	70.0	130	----
QC-110395-003	RM	manganese	7439-96-5	E472	3.17 mg/kg	95.2	70.0	130	----
QC-110395-003	RM	molybdenum	7439-98-7	E472	0.29 mg/kg	91.5	70.0	130	----
QC-110395-003	RM	nickel	7440-02-0	E472	1.34 mg/kg	88.1	70.0	130	----
QC-110395-003	RM	phosphorus	7723-14-0	E472	8000 mg/kg	98.9	70.0	130	----
QC-110395-003	RM	potassium	7440-09-7	E472	12840 mg/kg	97.4	70.0	130	----
QC-110395-003	RM	rubidium	7440-17-7	E472	5.59 mg/kg	102	70.0	130	----
QC-110395-003	RM	selenium	7782-49-2	E472	3.45 mg/kg	102	70.0	130	----
QC-110395-003	RM	sodium	7440-23-5	E472	14000 mg/kg	101	70.0	130	----
QC-110395-003	RM	strontium	7440-24-6	E472	10.1 mg/kg	93.5	70.0	130	----
QC-110395-003	RM	thallium	7440-28-0	E472	0.0093 mg/kg	93.6	70.0	130	----
QC-110395-003	RM	uranium	7440-61-1	E472	0.0481 mg/kg	87.2	70.0	130	----
QC-110395-003	RM	vanadium	7440-62-2	E472	1.48 mg/kg	100	70.0	130	----
QC-110395-003	RM	zinc	7440-66-6	E472	46.2 mg/kg	104	70.0	130	----
Metals (QCLot: 110396)									
QC-110396-003	RM	mercury	7439-97-6	E511A	0.322 mg/kg wwt	129	70.0	130	----

ALS Environmental

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COC #

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Peri
~~Benthic Invert~~. Tissue.

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Company:	Minnow Environmental Inc.	☑ Standard ☐ Other		◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Pierre Stecko	☑ PDF ☑ Excel ☐ Digital ☐ Fax		○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	204-1006 Fort Street	Email 1: pstecko@minnow.ca		○ Emergency (1-2 Bus. Days
	Victoria, BC	Email 2: slatimer@minnow.ca		○ Same Day or Weekend Em
Phone:	(250)595-1627 x24 Fax: (250) 595-1625	Email 3:		
Invoice To	Same as Report ? ☐ Yes ☑ No	Client / Project Information		Please indicate below
Hardcopy of Invoice with Report?	☑ Yes ☐ No	Job #: Minnow Project 20-70		
Company:	Minto Explorations Ltd	PO / AFE:		
Contact:	Todd Swenson	LSD:		
Address:	61 Wasson Place, Whitehorse, Yukon Y1A 0H7			
Phone:	604-759-4659 Fax:	Quote #:		
Lab Work Order # (lab use only)		ALS Contact: Can Dang	Sampler: Pierre Stecko ~~Lisa Bowen~~	

Environmental Division
Whitehorse
Work Order Reference
WR2000902

Telephone : +1 867 668 6689

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Moisture (%)	High Resolution ICP-MS scan	Mercury in Tissue by CVAFS	**See Comments	Number of Containers
1	LWC-1	13-Sep-20		Tissue	X	X	X		1
2	LWC-2	12-Sep-20		↓	X	X	X		1
3	LWC-3	12-Sep-20			X	X	X		1
4	LWC-4	12-Sep-20			X	X	X		1
5	LWC-5	12-Sep-20			X	X	X		1
6	LBC-1	16-Sep-20			X	X	X		1
7	LBC-2	16-Sep-20			X	X	X		1
8	LBC-3	16-Sep-20			X	X	X		1
9	LBC-4	16-Sep-20			X	X	X		1
10	LBC-5	16-Sep-20			X	X	X		1
11	LMC-1	14-Sep-20		↓	X	X	X		1
12	LMC-2	14-Sep-20		Tissue	X	X	X		1

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Small samples. The critical analyte of interest is selenium; please ensure best possible MDLs. Periphyton samples.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)			SHIPMENT VERIFICATION (lab use only)			
Released by: S. Latimer	Date (dd-mmm-yy)	Time (hh-mm)	Received by: D	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
	18-Sep-20			Sept 18/20	11:45	4 / °C	HA	9/19	2:10pm	

5

ALS Environmental

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

COC #

Peri ~~Benthic Invert.~~ Tissue.

Report To		Report Format / Distribution		Service Requested (Rush for routine analysis subject to availability)
Company:	Minnow Environmental Inc.	☑ Standard ☐ Other		◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Pierre Stecko	☑ PDF ☑ Excel ☐ Digital ☐ Fax		○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	204-1006 Fort Street	Email 1: pstecko@minnow.ca		○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Victoria, BC	Email 2: slatimer@minnow.ca		○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	(250)595-1627 x24 Fax: (250) 595-1625	Email 3:		
Invoice To	Same as Report ? ☐ Yes ☑ No	Client / Project Information		Analysis Request
Hardcopy of Invoice with Report?	☑ Yes ☐ No	Job #:	Minnow Project 20-70	Please indicate below Filtered, Preserved or both (F, P, F/P)
Company:	Minto Explorations Ltd	PO / AFE:		
Contact:	Todd Swenson	LSD:		
Address:	61 Wasson Place, Whitehorse, Yukon Y1A 0H7			
Phone:	604-759-4659 Fax:	Quote #:		
Lab Work Order # (lab use only)		ALS Contact:	Can Dang	Sampler: Pierre Stecko ~~Lisa Bowron~~

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Moisture (%)	High Resolution ICP-MS scan	Mercury in Tissue by CVAFS	~~See Complete Quote #Q51927~~	Number of Containers
13	Lmc-3	11-Sep-20		Tissue	X	X	X		1
14	Lmc-4	11-Sep-20		↓	X	X	X		1
15	Lmc-5	11-Sep-20		Tissue	X	X	X		1

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Small samples. The critical analyte of interest is selenium; please ensure best possible MDLs. Periphyton samples.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: S. Latimer ~~Lisa Bowron~~	Date (dd-mmm-yy) 18-Sep-20 ~~17-Sep-11~~	Time (hh-mm) ~~12:20~~	Received by:	Date:	Time:	Temperature: °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000903**	Page	: 1 of 11
Client	: **Minnow Environmental Inc.**	Laboratory	: Whitehorse - Environmental
Contact	: Lisa Bowron	Account Manager	: Heather McKenzie
Address	: 204 – 1006 Fort Street Victoria BC Canada V8V 3K4	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: 250 595 1627	Telephone	: +1 867 668 6689
Project	: Minnow Project 20-70	Date Samples Received	: 18-Sep-2020 11:45
PO	: ----	Date Analysis Commenced	: 29-Oct-2020
C-O-C number	: 1 of 2, 2 of 2	Issue Date	: 10-Nov-2020 18:22
Sampler	: Pierre Stecko		
Site	: ----		
Quote number	: Q75875		
No. of samples received	: 16		
No. of samples analysed	: 15		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Evan Ben-Oliel	Metal Analyst	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Kinny Wu	Lab Analyst	Metals, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
%	percent
mg/kg	milligrams per kilogram
mg/kg wwt	milligrams per kilogram wet weight

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Analytical Results

Sub-Matrix: **Tissue**
(Matrix: **Biota**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LWC-1	LWC-2	LWC-3	LWC-4	LWC-5
					Client sampling date / time	13-Sep-2020	12-Sep-2020	12-Sep-2020	12-Sep-2020	12-Sep-2020
						WR2000903-001	WR2000903-002	WR2000903-003	WR2000903-004	WR2000903-005
						Result	Result	Result	Result	Result
Physical Tests										
moisture	----	E144A	2.0	%		82.1	81.3	83.7	85.2	80.7
Metals										
aluminum	7429-90-5	E475	5.0	mg/kg		1340	3080	1060	1340	2680
aluminum	7429-90-5	E475A	1.0	mg/kg wwt		239	576	173	197	519
antimony	7440-36-0	E475	0.020	mg/kg		0.048	0.078	0.043	0.039	0.053
antimony	7440-36-0	E475A	0.0040	mg/kg wwt		0.0085	0.0145	0.0070	0.0058	0.0103
arsenic	7440-38-2	E475	0.050	mg/kg		1.42	2.37	1.00	1.10	2.14
arsenic	7440-38-2	E475A	0.010	mg/kg wwt		0.255	0.441	0.163	0.162	0.413
barium	7440-39-3	E475	0.050	mg/kg		44.5	120	45.3	33.1	91.8
barium	7440-39-3	E475A	0.010	mg/kg wwt		7.97	22.3	7.39	4.88	17.7
beryllium	7440-41-7	E475	0.010	mg/kg		0.070	0.163	0.066	0.068	0.164
beryllium	7440-41-7	E475A	0.0020	mg/kg wwt		0.0126	0.0303	0.0108	0.0100	0.0318
bismuth	7440-69-9	E475	0.010	mg/kg		0.011	0.018	<0.010	<0.010	0.011
bismuth	7440-69-9	E475A	0.0020	mg/kg wwt		<0.0020	0.0033	<0.0020	<0.0020	0.0022
boron	7440-42-8	E475	1.0	mg/kg		1.0	1.6	<1.0	<1.0	1.8
boron	7440-42-8	E475A	0.20	mg/kg wwt		<0.20	0.29	<0.20	<0.20	0.34
cadmium	7440-43-9	E475	0.010	mg/kg		1.21	0.692	0.863	1.40	0.585
cadmium	7440-43-9	E475A	0.0020	mg/kg wwt		0.216	0.129	0.141	0.207	0.113
calcium	7440-70-2	E475	20	mg/kg		2250	2290	1930	3570	4140
calcium	7440-70-2	E475A	4.0	mg/kg wwt		402	426	315	527	800
cesium	7440-46-2	E475	0.0050	mg/kg		0.152	0.333	0.121	0.159	0.184
cesium	7440-46-2	E475A	0.0010	mg/kg wwt		0.0272	0.0622	0.0198	0.0235	0.0356
chromium	7440-47-3	E475	0.20	mg/kg		4.24	9.43	3.48	3.86	9.01
chromium	7440-47-3	E475A	0.040	mg/kg wwt		0.760	1.76	0.568	0.569	1.74
cobalt	7440-48-4	E475	0.020	mg/kg		1.74	3.19	1.26	2.06	3.69
cobalt	7440-48-4	E475A	0.0040	mg/kg wwt		0.312	0.595	0.206	0.305	0.713
copper	7440-50-8	E475	0.20	mg/kg		27.7	24.5	19.4	36.3	25.2
copper	7440-50-8	E475A	0.040	mg/kg wwt		4.96	4.57	3.16	5.36	4.86
iron	7439-89-6	E475	5.0	mg/kg		2240	4960	1920	2210	5170
iron	7439-89-6	E475A	1.0	mg/kg wwt		400	925	313	326	999
lead	7439-92-1	E475	0.050	mg/kg		0.607	1.12	0.519	0.553	0.827

Analytical Results

Sub-Matrix: **Tissue**
(Matrix: **Biota**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LWC-1	LWC-2	LWC-3	LWC-4	LWC-5
					Client sampling date / time	13-Sep-2020	12-Sep-2020	12-Sep-2020	12-Sep-2020	12-Sep-2020
						WR2000903-001	WR2000903-002	WR2000903-003	WR2000903-004	WR2000903-005
						Result	Result	Result	Result	Result
Metals										
lead	7439-92-1	E475A	0.010	mg/kg wwt		0.108	0.209	0.085	0.082	0.160
lithium	7439-93-2	E475	0.50	mg/kg		1.04	2.19	0.73	0.90	2.06
lithium	7439-93-2	E475A	0.10	mg/kg wwt		0.19	0.41	0.12	0.13	0.40
magnesium	7439-95-4	E475	2.0	mg/kg		1900	2860	1770	2030	3250
magnesium	7439-95-4	E475A	0.40	mg/kg wwt		340	534	288	299	629
manganese	7439-96-5	E475	0.050	mg/kg		243	369	201	290	488
manganese	7439-96-5	E475A	0.010	mg/kg wwt		43.5	68.8	32.8	42.8	94.4
mercury	7439-97-6	E512	0.010	mg/kg		0.044	0.042	0.050	0.042	0.049
mercury	7439-97-6	E512A	0.0020	mg/kg wwt		0.0080	0.0079	0.0081	0.0062	0.0095
molybdenum	7439-98-7	E475	0.040	mg/kg		0.653	0.590	0.525	0.688	0.506
molybdenum	7439-98-7	E475A	0.0080	mg/kg wwt		0.117	0.110	0.0857	0.101	0.0979
nickel	7440-02-0	E475	0.20	mg/kg		3.60	8.23	2.95	3.17	6.63
nickel	7440-02-0	E475A	0.040	mg/kg wwt		0.644	1.54	0.482	0.468	1.28
phosphorus	7723-14-0	E475	20	mg/kg		9180	7780	8970	9590	9260
phosphorus	7723-14-0	E475A	4.0	mg/kg wwt		1640	1450	1460	1410	1790
potassium	7440-09-7	E475	20	mg/kg		7970	10500	7660	7370	9520
potassium	7440-09-7	E475A	4.0	mg/kg wwt		1430	1950	1250	1090	1840
rubidium	7440-17-7	E475	0.050	mg/kg		5.55	5.79	3.88	6.89	4.77
rubidium	7440-17-7	E475A	0.010	mg/kg wwt		0.993	1.08	0.634	1.02	0.922
selenium	7782-49-2	E475	0.10	mg/kg		4.11	2.31	3.65	5.08	2.93
selenium	7782-49-2	E475A	0.020	mg/kg wwt		0.735	0.431	0.595	0.750	0.567
sodium	7440-23-5	E475	20	mg/kg		3110	2720	3180	3190	2830
sodium	7440-23-5	E475A	4.0	mg/kg wwt		557	507	519	471	548
strontium	7440-24-6	E475	0.10	mg/kg		20.5	25.2	22.2	22.6	31.2
strontium	7440-24-6	E475A	0.020	mg/kg wwt		3.68	4.70	3.62	3.34	6.02
tellurium	13494-80-9	E475	0.020	mg/kg		<0.020	<0.020	<0.020	<0.020	<0.020
tellurium	13494-80-9	E475A	0.0040	mg/kg wwt		<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
thallium	7440-28-0	E475	0.0020	mg/kg		0.0176	0.0227	0.0128	0.0218	0.0180
thallium	7440-28-0	E475A	0.00040	mg/kg wwt		0.00316	0.00424	0.00208	0.00322	0.00348
tin	7440-31-5	E475	0.10	mg/kg		<0.10	<0.10	<0.10	<0.10	<0.10
tin	7440-31-5	E475A	0.020	mg/kg wwt		<0.020	<0.020	<0.020	<0.020	<0.020
uranium	7440-61-1	E475	0.0020	mg/kg		0.283	0.574	0.278	0.217	0.464

Analytical Results

Sub-Matrix: **Tissue**
(Matrix: **Biota**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LWC-1	LWC-2	LWC-3	LWC-4	LWC-5
					Client sampling date / time	13-Sep-2020	12-Sep-2020	12-Sep-2020	12-Sep-2020	12-Sep-2020
						WR2000903-001	WR2000903-002	WR2000903-003	WR2000903-004	WR2000903-005
						Result	Result	Result	Result	Result
Metals										
uranium	7440-61-1	E475A	0.00040	mg/kg wwt		0.0506	0.107	0.0453	0.0320	0.0898
vanadium	7440-62-2	E475	0.10	mg/kg		5.56	11.7	5.02	5.11	13.1
vanadium	7440-62-2	E475A	0.020	mg/kg wwt		0.994	2.18	0.819	0.753	2.53
zinc	7440-66-6	E475	1.0	mg/kg		162	178	170	151	178
zinc	7440-66-6	E475A	0.20	mg/kg wwt		29.0	33.2	27.7	22.3	34.5
zirconium	7440-67-7	E475	0.20	mg/kg		1.44	3.10	1.34	1.26	2.05
zirconium	7440-67-7	E475A	0.040	mg/kg wwt		0.257	0.578	0.219	0.185	0.397

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Tissue**
(Matrix: **Biota**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LBC-1	LBC-2	LBC-3	LBC-4	LBC-5
					Client sampling date / time	16-Sep-2020	16-Sep-2020	16-Sep-2020	16-Sep-2020	16-Sep-2020
						WR2000903-006	WR2000903-007	WR2000903-008	WR2000903-009	WR2000903-010
						Result	Result	Result	Result	Result
Physical Tests										
moisture	----	E144A	2.0	%		82.8	85.7	87.7	87.2	76.1
Metals										
aluminum	7429-90-5	E475	5.0	mg/kg		2620	2580	2330	2820	916
aluminum	7429-90-5	E475A	1.0	mg/kg wwt		450	369	286	362	218
antimony	7440-36-0	E475	0.020	mg/kg		0.158	0.164	0.153	0.153	0.090
antimony	7440-36-0	E475A	0.0040	mg/kg wwt		0.0272	0.0234	0.0188	0.0196	0.0216
arsenic	7440-38-2	E475	0.050	mg/kg		3.90	4.35	3.97	4.65	5.02
arsenic	7440-38-2	E475A	0.010	mg/kg wwt		0.670	0.622	0.487	0.597	1.20
barium	7440-39-3	E475	0.050	mg/kg		68.9	66.5	55.8	68.9	49.6
barium	7440-39-3	E475A	0.010	mg/kg wwt		11.8	9.51	6.85	8.84	11.8
beryllium	7440-41-7	E475	0.010	mg/kg		0.141	0.136	0.112	0.112	0.046
beryllium	7440-41-7	E475A	0.0020	mg/kg wwt		0.0243	0.0195	0.0138	0.0144	0.0110
bismuth	7440-69-9	E475	0.010	mg/kg		0.078	0.088	0.071	0.084	0.029
bismuth	7440-69-9	E475A	0.0020	mg/kg wwt		0.0134	0.0126	0.0087	0.0108	0.0070
boron	7440-42-8	E475	1.0	mg/kg		1.1	1.1	1.2	<1.0	<1.0
boron	7440-42-8	E475A	0.20	mg/kg wwt		<0.20	<0.20	<0.20	<0.20	<0.20
cadmium	7440-43-9	E475	0.010	mg/kg		3.10	2.25	1.44	1.98	0.278
cadmium	7440-43-9	E475A	0.0020	mg/kg wwt		0.533	0.322	0.177	0.254	0.0662
calcium	7440-70-2	E475	20	mg/kg		4040	3440	3630	3500	1080
calcium	7440-70-2	E475A	4.0	mg/kg wwt		694	492	446	449	257
cesium	7440-46-2	E475	0.0050	mg/kg		0.426	0.451	0.379	0.492	0.150
cesium	7440-46-2	E475A	0.0010	mg/kg wwt		0.0732	0.0645	0.0465	0.0631	0.0357
chromium	7440-47-3	E475	0.20	mg/kg		6.09	7.16	6.35	6.90	2.64
chromium	7440-47-3	E475A	0.040	mg/kg wwt		1.05	1.02	0.780	0.885	0.629
cobalt	7440-48-4	E475	0.020	mg/kg		3.82	3.59	2.68	3.25	1.14
cobalt	7440-48-4	E475A	0.0040	mg/kg wwt		0.656	0.513	0.329	0.417	0.271
copper	7440-50-8	E475	0.20	mg/kg		66.1	62.1	32.6	51.2	22.1
copper	7440-50-8	E475A	0.040	mg/kg wwt		11.4	8.88	4.00	6.58	5.27
iron	7439-89-6	E475	5.0	mg/kg		4360	4100	4180	4410	1670
iron	7439-89-6	E475A	1.0	mg/kg wwt		750	587	513	566	399
lead	7439-92-1	E475	0.050	mg/kg		2.10	2.00	2.00	1.79	0.734
lead	7439-92-1	E475A	0.010	mg/kg wwt		0.360	0.286	0.245	0.230	0.175

Analytical Results

Sub-Matrix: **Tissue**
(Matrix: **Biota**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LBC-1	LBC-2	LBC-3	LBC-4	LBC-5
					Client sampling date / time	16-Sep-2020	16-Sep-2020	16-Sep-2020	16-Sep-2020	16-Sep-2020
						WR2000903-006	WR2000903-007	WR2000903-008	WR2000903-009	WR2000903-010
						Result	Result	Result	Result	Result
Metals										
lithium	7439-93-2	E475	0.50	mg/kg		1.88	1.72	1.66	2.10	0.61
lithium	7439-93-2	E475A	0.10	mg/kg wwt		0.32	0.25	0.20	0.27	0.14
magnesium	7439-95-4	E475	2.0	mg/kg		2510	2450	2520	2760	1710
magnesium	7439-95-4	E475A	0.40	mg/kg wwt		431	351	310	354	408
manganese	7439-96-5	E475	0.050	mg/kg		467	403	249	351	199
manganese	7439-96-5	E475A	0.010	mg/kg wwt		80.2	57.6	30.6	45.0	47.4
mercury	7439-97-6	E512	0.010	mg/kg		0.060	0.052	0.046	0.064	0.046
mercury	7439-97-6	E512A	0.0020	mg/kg wwt		0.0102	0.0074	0.0057	0.0082	0.0110
molybdenum	7439-98-7	E475	0.040	mg/kg		0.880	0.768	0.658	0.673	1.07
molybdenum	7439-98-7	E475A	0.0080	mg/kg wwt		0.151	0.110	0.0808	0.0864	0.255
nickel	7440-02-0	E475	0.20	mg/kg		6.44	7.62	5.82	6.65	3.16
nickel	7440-02-0	E475A	0.040	mg/kg wwt		1.11	1.09	0.714	0.854	0.753
phosphorus	7723-14-0	E475	20	mg/kg		8850	9510	9730	9850	7190
phosphorus	7723-14-0	E475A	4.0	mg/kg wwt		1520	1360	1190	1260	1710
potassium	7440-09-7	E475	20	mg/kg		7760	8850	8900	9220	7520
potassium	7440-09-7	E475A	4.0	mg/kg wwt		1330	1270	1090	1180	1790
rubidium	7440-17-7	E475	0.050	mg/kg		10.0	8.48	7.53	9.31	4.69
rubidium	7440-17-7	E475A	0.010	mg/kg wwt		1.72	1.21	0.924	1.20	1.12
selenium	7782-49-2	E475	0.10	mg/kg		3.40	3.81	2.76	3.29	0.98
selenium	7782-49-2	E475A	0.020	mg/kg wwt		0.585	0.545	0.339	0.423	0.235
sodium	7440-23-5	E475	20	mg/kg		3370	3540	3340	3520	2760
sodium	7440-23-5	E475A	4.0	mg/kg wwt		578	506	410	452	659
strontium	7440-24-6	E475	0.10	mg/kg		35.7	33.5	37.4	34.4	11.8
strontium	7440-24-6	E475A	0.020	mg/kg wwt		6.14	4.79	4.58	4.42	2.80
tellurium	13494-80-9	E475	0.020	mg/kg		<0.020	<0.020	<0.020	<0.020	<0.020
tellurium	13494-80-9	E475A	0.0040	mg/kg wwt		<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
thallium	7440-28-0	E475	0.0020	mg/kg		0.0590	0.0515	0.0390	0.0534	0.0130
thallium	7440-28-0	E475A	0.00040	mg/kg wwt		0.0101	0.00737	0.00478	0.00685	0.00310
tin	7440-31-5	E475	0.10	mg/kg		0.10	<0.10	<0.10	0.11	<0.10
tin	7440-31-5	E475A	0.020	mg/kg wwt		<0.020	<0.020	<0.020	<0.020	<0.020
uranium	7440-61-1	E475	0.0020	mg/kg		1.03	0.863	0.768	0.611	0.476
uranium	7440-61-1	E475A	0.00040	mg/kg wwt		0.177	0.123	0.0942	0.0784	0.114

Analytical Results

Sub-Matrix: **Tissue**
(Matrix: **Biota**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LBC-1	LBC-2	LBC-3	LBC-4	LBC-5
					Client sampling date / time	16-Sep-2020	16-Sep-2020	16-Sep-2020	16-Sep-2020	16-Sep-2020
						WR2000903-006	WR2000903-007	WR2000903-008	WR2000903-009	WR2000903-010
						Result	Result	Result	Result	Result
Metals										
vanadium	7440-62-2	E475	0.10	mg/kg		10.4	10.1	10.5	10.8	4.29
vanadium	7440-62-2	E475A	0.020	mg/kg wwt		1.79	1.45	1.29	1.38	1.02
zinc	7440-66-6	E475	1.0	mg/kg		212	154	174	210	120
zinc	7440-66-6	E475A	0.20	mg/kg wwt		36.4	22.0	21.3	27.0	28.6
zirconium	7440-67-7	E475	0.20	mg/kg		2.74	2.44	2.27	2.18	0.73
zirconium	7440-67-7	E475A	0.040	mg/kg wwt		0.470	0.349	0.279	0.280	0.173

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Tissue**
(Matrix: **Biota**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LMC-1	LMC-2	LMC-3	LMC-4	LMC-5
					Client sampling date / time	15-Sep-2020	14-Sep-2020	11-Sep-2020	11-Sep-2020	11-Sep-2020
						WR2000903-011	WR2000903-012	WR2000903-013	WR2000903-014	WR2000903-015
						Result	Result	Result	Result	Result
Physical Tests										
moisture	----	E144A	2.0	%		83.0	83.6	85.7	74.9	83.4
Metals										
aluminum	7429-90-5	E475	5.0	mg/kg		3120	2480	2010	3930	3210
aluminum	7429-90-5	E475A	1.0	mg/kg wwt		529	407	288	986	531
antimony	7440-36-0	E475	0.020	mg/kg		0.134	0.088	0.079	0.133	0.091
antimony	7440-36-0	E475A	0.0040	mg/kg wwt		0.0227	0.0144	0.0114	0.0335	0.0151
arsenic	7440-38-2	E475	0.050	mg/kg		4.55	2.90	2.78	3.42	2.35
arsenic	7440-38-2	E475A	0.010	mg/kg wwt		0.773	0.474	0.399	0.858	0.390
barium	7440-39-3	E475	0.050	mg/kg		98.8	66.9	55.4	164	61.2
barium	7440-39-3	E475A	0.010	mg/kg wwt		16.8	11.0	7.94	41.3	10.1
beryllium	7440-41-7	E475	0.010	mg/kg		0.114	0.076	0.067	0.135	0.082
beryllium	7440-41-7	E475A	0.0020	mg/kg wwt		0.0193	0.0125	0.0097	0.0340	0.0136
bismuth	7440-69-9	E475	0.010	mg/kg		0.027	0.020	0.017	0.034	0.020
bismuth	7440-69-9	E475A	0.0020	mg/kg wwt		0.0045	0.0032	0.0025	0.0084	0.0034
boron	7440-42-8	E475	1.0	mg/kg		1.7	1.4	2.0	3.5	3.2
boron	7440-42-8	E475A	0.20	mg/kg wwt		0.30	0.22	0.29	0.89	0.54
cadmium	7440-43-9	E475	0.010	mg/kg		2.47	0.822	0.544	0.369	1.27
cadmium	7440-43-9	E475A	0.0020	mg/kg wwt		0.420	0.134	0.0780	0.0927	0.210
calcium	7440-70-2	E475	20	mg/kg		3580	3130	2710	2960	3960
calcium	7440-70-2	E475A	4.0	mg/kg wwt		607	512	389	742	656
cesium	7440-46-2	E475	0.0050	mg/kg		0.265	0.210	0.178	0.295	0.568
cesium	7440-46-2	E475A	0.0010	mg/kg wwt		0.0450	0.0343	0.0255	0.0740	0.0941
chromium	7440-47-3	E475	0.20	mg/kg		7.08	5.38	4.68	8.98	5.96
chromium	7440-47-3	E475A	0.040	mg/kg wwt		1.20	0.881	0.670	2.26	0.987
cobalt	7440-48-4	E475	0.020	mg/kg		2.58	1.88	1.70	3.61	2.24
cobalt	7440-48-4	E475A	0.0040	mg/kg wwt		0.438	0.308	0.244	0.906	0.371
copper	7440-50-8	E475	0.20	mg/kg		19.4	19.1	19.9	41.7	25.0
copper	7440-50-8	E475A	0.040	mg/kg wwt		3.29	3.13	2.85	10.5	4.14
iron	7439-89-6	E475	5.0	mg/kg		5520	4400	3700	7370	4710
iron	7439-89-6	E475A	1.0	mg/kg wwt		937	721	531	1850	781
lead	7439-92-1	E475	0.050	mg/kg		1.52	1.08	1.02	1.62	1.19
lead	7439-92-1	E475A	0.010	mg/kg wwt		0.258	0.176	0.145	0.407	0.196

Analytical Results

Sub-Matrix: **Tissue**
(Matrix: **Biota**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LMC-1	LMC-2	LMC-3	LMC-4	LMC-5
					Client sampling date / time	15-Sep-2020	14-Sep-2020	11-Sep-2020	11-Sep-2020	11-Sep-2020
						WR2000903-011	WR2000903-012	WR2000903-013	WR2000903-014	WR2000903-015
						Result	Result	Result	Result	Result
Metals										
lithium	7439-93-2	E475	0.50	mg/kg		2.60	1.91	1.55	2.95	2.19
lithium	7439-93-2	E475A	0.10	mg/kg wwt		0.44	0.31	0.22	0.74	0.36
magnesium	7439-95-4	E475	2.0	mg/kg		2330	1880	1820	2770	2000
magnesium	7439-95-4	E475A	0.40	mg/kg wwt		396	308	260	696	331
manganese	7439-96-5	E475	0.050	mg/kg		584	464	456	941	343
manganese	7439-96-5	E475A	0.010	mg/kg wwt		99.2	75.9	65.3	236	56.8
mercury	7439-97-6	E512	0.010	mg/kg		0.040	0.022	0.022	0.035	0.053
mercury	7439-97-6	E512A	0.0020	mg/kg wwt		0.0069	0.0036	0.0032	0.0087	0.0088
molybdenum	7439-98-7	E475	0.040	mg/kg		0.718	0.748	1.22	0.930	0.582
molybdenum	7439-98-7	E475A	0.0080	mg/kg wwt		0.122	0.122	0.175	0.234	0.0963
nickel	7440-02-0	E475	0.20	mg/kg		6.89	4.80	5.03	10.1	5.06
nickel	7440-02-0	E475A	0.040	mg/kg wwt		1.17	0.786	0.720	2.54	0.837
phosphorus	7723-14-0	E475	20	mg/kg		8400	7250	7780	7590	7340
phosphorus	7723-14-0	E475A	4.0	mg/kg wwt		1430	1180	1120	1900	1220
potassium	7440-09-7	E475	20	mg/kg		8690	6470	9010	12500	7270
potassium	7440-09-7	E475A	4.0	mg/kg wwt		1480	1060	1290	3140	1200
rubidium	7440-17-7	E475	0.050	mg/kg		4.73	3.82	3.66	4.21	3.85
rubidium	7440-17-7	E475A	0.010	mg/kg wwt		0.803	0.625	0.525	1.06	0.638
selenium	7782-49-2	E475	0.10	mg/kg		3.71	1.76	1.78	3.22	4.94
selenium	7782-49-2	E475A	0.020	mg/kg wwt		0.630	0.288	0.254	0.808	0.818
sodium	7440-23-5	E475	20	mg/kg		3840	2400	4770	2980	3760
sodium	7440-23-5	E475A	4.0	mg/kg wwt		652	393	684	747	622
strontium	7440-24-6	E475	0.10	mg/kg		33.1	26.8	25.0	27.1	21.0
strontium	7440-24-6	E475A	0.020	mg/kg wwt		5.62	4.39	3.58	6.80	3.48
tellurium	13494-80-9	E475	0.020	mg/kg		<0.020	<0.020	<0.020	<0.020	<0.020
tellurium	13494-80-9	E475A	0.0040	mg/kg wwt		<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
thallium	7440-28-0	E475	0.0020	mg/kg		0.0292	0.0213	0.0180	0.0297	0.0254
thallium	7440-28-0	E475A	0.00040	mg/kg wwt		0.00496	0.00349	0.00257	0.00746	0.00422
tin	7440-31-5	E475	0.10	mg/kg		0.12	<0.10	<0.10	0.12	0.11
tin	7440-31-5	E475A	0.020	mg/kg wwt		<0.020	<0.020	<0.020	0.030	<0.020
uranium	7440-61-1	E475	0.0020	mg/kg		0.451	0.267	0.320	0.600	0.275
uranium	7440-61-1	E475A	0.00040	mg/kg wwt		0.0765	0.0437	0.0459	0.150	0.0456

Analytical Results

Sub-Matrix: **Tissue**
(Matrix: **Biota**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LMC-1	LMC-2	LMC-3	LMC-4	LMC-5
					Client sampling date / time	15-Sep-2020	14-Sep-2020	11-Sep-2020	11-Sep-2020	11-Sep-2020
						WR2000903-011	WR2000903-012	WR2000903-013	WR2000903-014	WR2000903-015
						Result	Result	Result	Result	Result
Metals										
vanadium	7440-62-2	E475	0.10	mg/kg		12.0	8.88	8.11	16.8	12.7
vanadium	7440-62-2	E475A	0.020	mg/kg wwt		2.04	1.45	1.16	4.23	2.10
zinc	7440-66-6	E475	1.0	mg/kg		135	116	91.0	198	88.7
zinc	7440-66-6	E475A	0.20	mg/kg wwt		22.9	19.1	13.0	49.9	14.7
zirconium	7440-67-7	E475	0.20	mg/kg		2.45	1.90	1.83	2.71	2.58
zirconium	7440-67-7	E475A	0.040	mg/kg wwt		0.416	0.310	0.262	0.681	0.427

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WR2000903**	Page	: 1 of 13
Client	: **Minnow Environmental Inc.**	Laboratory	: Whitehorse - Environmental
Contact	: Lisa Bowron	Account Manager	: Heather McKenzie
Address	: 204 – 1006 Fort Street Victoria BC Canada V8V 3K4	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: 250 595 1627	Telephone	: +1 867 668 6689
Project	: Minnow Project 20-70	Date Samples Received	: 18-Sep-2020 11:45
PO	: ----	Issue Date	: 10-Nov-2020 18:22
C-O-C number	: 1 of 2, 2 of 2		
Sampler	: Pierre Stecko		
Site	: ----		
Quote number	: Q75875		
No. of samples received	: 16		
No. of samples analysed	: 15		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (DRY units, Biopsy)										
Compliant container LBC-1	E512	16-Sep-2020	02-Nov-2020	365 days	47 days	✓	04-Nov-2020	317 days	1 days	✓
Metals : Mercury in Biota by CVAAS (DRY units, Biopsy)										
Compliant container LBC-2	E512	16-Sep-2020	02-Nov-2020	365 days	47 days	✓	04-Nov-2020	317 days	1 days	✓
Metals : Mercury in Biota by CVAAS (DRY units, Biopsy)										
Compliant container LBC-3	E512	16-Sep-2020	02-Nov-2020	365 days	47 days	✓	04-Nov-2020	317 days	1 days	✓
Metals : Mercury in Biota by CVAAS (DRY units, Biopsy)										
Compliant container LBC-4	E512	16-Sep-2020	02-Nov-2020	365 days	47 days	✓	04-Nov-2020	317 days	1 days	✓
Metals : Mercury in Biota by CVAAS (DRY units, Biopsy)										
Compliant container LBC-5	E512	16-Sep-2020	02-Nov-2020	365 days	47 days	✓	04-Nov-2020	317 days	1 days	✓
Metals : Mercury in Biota by CVAAS (DRY units, Biopsy)										
Compliant container LMC-1	E512	15-Sep-2020	02-Nov-2020	365 days	48 days	✓	04-Nov-2020	316 days	1 days	✓
Metals : Mercury in Biota by CVAAS (DRY units, Biopsy)										
Compliant container LMC-2	E512	14-Sep-2020	02-Nov-2020	365 days	49 days	✓	04-Nov-2020	315 days	1 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (DRY units, Biopsy)										
Compliant container LWC-1	E512	13-Sep-2020	02-Nov-2020	365 days	50 days	✓	04-Nov-2020	314 days	1 days	✓
Metals : Mercury in Biota by CVAAS (DRY units, Biopsy)										
Compliant container LWC-2	E512	12-Sep-2020	02-Nov-2020	365 days	51 days	✓	04-Nov-2020	313 days	1 days	✓
Metals : Mercury in Biota by CVAAS (DRY units, Biopsy)										
Compliant container LWC-3	E512	12-Sep-2020	02-Nov-2020	365 days	51 days	✓	04-Nov-2020	313 days	1 days	✓
Metals : Mercury in Biota by CVAAS (DRY units, Biopsy)										
Compliant container LWC-4	E512	12-Sep-2020	02-Nov-2020	365 days	51 days	✓	04-Nov-2020	313 days	1 days	✓
Metals : Mercury in Biota by CVAAS (DRY units, Biopsy)										
Compliant container LWC-5	E512	12-Sep-2020	02-Nov-2020	365 days	51 days	✓	04-Nov-2020	313 days	1 days	✓
Metals : Mercury in Biota by CVAAS (DRY units, Biopsy)										
Compliant container LMC-3	E512	11-Sep-2020	02-Nov-2020	365 days	52 days	✓	04-Nov-2020	312 days	1 days	✓
Metals : Mercury in Biota by CVAAS (DRY units, Biopsy)										
Compliant container LMC-4	E512	11-Sep-2020	02-Nov-2020	365 days	52 days	✓	04-Nov-2020	312 days	1 days	✓
Metals : Mercury in Biota by CVAAS (DRY units, Biopsy)										
Compliant container LMC-5	E512	11-Sep-2020	02-Nov-2020	365 days	52 days	✓	04-Nov-2020	312 days	1 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Biopsy)										
Compliant container LBC-1	E512A	16-Sep-2020	02-Nov-2020	365 days	47 days	✓	04-Nov-2020	317 days	1 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (WET units, Biopsy)										
Compliant container LBC-2	E512A	16-Sep-2020	02-Nov-2020	365 days	47 days	✓	04-Nov-2020	317 days	1 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Biopsy)										
Compliant container LBC-3	E512A	16-Sep-2020	02-Nov-2020	365 days	47 days	✓	04-Nov-2020	317 days	1 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Biopsy)										
Compliant container LBC-4	E512A	16-Sep-2020	02-Nov-2020	365 days	47 days	✓	04-Nov-2020	317 days	1 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Biopsy)										
Compliant container LBC-5	E512A	16-Sep-2020	02-Nov-2020	365 days	47 days	✓	04-Nov-2020	317 days	1 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Biopsy)										
Compliant container LMC-1	E512A	15-Sep-2020	02-Nov-2020	365 days	48 days	✓	04-Nov-2020	316 days	1 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Biopsy)										
Compliant container LMC-2	E512A	14-Sep-2020	02-Nov-2020	365 days	49 days	✓	04-Nov-2020	315 days	1 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Biopsy)										
Compliant container LWC-1	E512A	13-Sep-2020	02-Nov-2020	365 days	50 days	✓	04-Nov-2020	314 days	1 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Biopsy)										
Compliant container LWC-2	E512A	12-Sep-2020	02-Nov-2020	365 days	51 days	✓	04-Nov-2020	313 days	1 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Biopsy)										
Compliant container LWC-3	E512A	12-Sep-2020	02-Nov-2020	365 days	51 days	✓	04-Nov-2020	313 days	1 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Biota by CVAAS (WET units, Biopsy)										
Compliant container LWC-4	E512A	12-Sep-2020	02-Nov-2020	365 days	51 days	✓	04-Nov-2020	313 days	1 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Biopsy)										
Compliant container LWC-5	E512A	12-Sep-2020	02-Nov-2020	365 days	51 days	✓	04-Nov-2020	313 days	1 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Biopsy)										
Compliant container LMC-3	E512A	11-Sep-2020	02-Nov-2020	365 days	52 days	✓	04-Nov-2020	312 days	1 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Biopsy)										
Compliant container LMC-4	E512A	11-Sep-2020	02-Nov-2020	365 days	52 days	✓	04-Nov-2020	312 days	1 days	✓
Metals : Mercury in Biota by CVAAS (WET units, Biopsy)										
Compliant container LMC-5	E512A	11-Sep-2020	02-Nov-2020	365 days	52 days	✓	04-Nov-2020	312 days	1 days	✓
Metals : Metals by CRC ICPMS (DRY units, Biopsy)										
Compliant container LBC-1	E475	16-Sep-2020	02-Nov-2020	730 days	47 days	✓	03-Nov-2020	682 days	1 days	✓
Metals : Metals by CRC ICPMS (DRY units, Biopsy)										
Compliant container LBC-2	E475	16-Sep-2020	02-Nov-2020	730 days	47 days	✓	03-Nov-2020	682 days	1 days	✓
Metals : Metals by CRC ICPMS (DRY units, Biopsy)										
Compliant container LBC-3	E475	16-Sep-2020	02-Nov-2020	730 days	47 days	✓	03-Nov-2020	682 days	1 days	✓
Metals : Metals by CRC ICPMS (DRY units, Biopsy)										
Compliant container LBC-4	E475	16-Sep-2020	02-Nov-2020	730 days	47 days	✓	03-Nov-2020	682 days	1 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Metals by CRC ICPMS (DRY units, Biopsy)										
Compliant container LBC-5	E475	16-Sep-2020	02-Nov-2020	730 days	47 days	✓	03-Nov-2020	682 days	1 days	✓
Metals : Metals by CRC ICPMS (DRY units, Biopsy)										
Compliant container LMC-1	E475	15-Sep-2020	02-Nov-2020	730 days	48 days	✓	03-Nov-2020	681 days	1 days	✓
Metals : Metals by CRC ICPMS (DRY units, Biopsy)										
Compliant container LMC-2	E475	14-Sep-2020	02-Nov-2020	730 days	49 days	✓	03-Nov-2020	680 days	1 days	✓
Metals : Metals by CRC ICPMS (DRY units, Biopsy)										
Compliant container LWC-1	E475	13-Sep-2020	02-Nov-2020	730 days	50 days	✓	03-Nov-2020	679 days	1 days	✓
Metals : Metals by CRC ICPMS (DRY units, Biopsy)										
Compliant container LWC-2	E475	12-Sep-2020	02-Nov-2020	730 days	51 days	✓	03-Nov-2020	678 days	1 days	✓
Metals : Metals by CRC ICPMS (DRY units, Biopsy)										
Compliant container LWC-3	E475	12-Sep-2020	02-Nov-2020	730 days	51 days	✓	03-Nov-2020	678 days	1 days	✓
Metals : Metals by CRC ICPMS (DRY units, Biopsy)										
Compliant container LWC-4	E475	12-Sep-2020	02-Nov-2020	730 days	51 days	✓	03-Nov-2020	678 days	1 days	✓
Metals : Metals by CRC ICPMS (DRY units, Biopsy)										
Compliant container LWC-5	E475	12-Sep-2020	02-Nov-2020	730 days	51 days	✓	03-Nov-2020	678 days	1 days	✓
Metals : Metals by CRC ICPMS (DRY units, Biopsy)										
Compliant container LMC-3	E475	11-Sep-2020	02-Nov-2020	730 days	52 days	✓	03-Nov-2020	677 days	1 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Metals by CRC ICPMS (DRY units, Biopsy)										
Compliant container LMC-4	E475	11-Sep-2020	02-Nov-2020	730 days	52 days	✓	03-Nov-2020	677 days	1 days	✓
Metals : Metals by CRC ICPMS (DRY units, Biopsy)										
Compliant container LMC-5	E475	11-Sep-2020	02-Nov-2020	730 days	52 days	✓	03-Nov-2020	677 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Biopsy)										
Compliant container LBC-1	E475A	16-Sep-2020	02-Nov-2020	730 days	47 days	✓	03-Nov-2020	682 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Biopsy)										
Compliant container LBC-2	E475A	16-Sep-2020	02-Nov-2020	730 days	47 days	✓	03-Nov-2020	682 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Biopsy)										
Compliant container LBC-3	E475A	16-Sep-2020	02-Nov-2020	730 days	47 days	✓	03-Nov-2020	682 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Biopsy)										
Compliant container LBC-4	E475A	16-Sep-2020	02-Nov-2020	730 days	47 days	✓	03-Nov-2020	682 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Biopsy)										
Compliant container LBC-5	E475A	16-Sep-2020	02-Nov-2020	730 days	47 days	✓	03-Nov-2020	682 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Biopsy)										
Compliant container LMC-1	E475A	15-Sep-2020	02-Nov-2020	730 days	48 days	✓	03-Nov-2020	681 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Biopsy)										
Compliant container LMC-2	E475A	14-Sep-2020	02-Nov-2020	730 days	49 days	✓	03-Nov-2020	680 days	1 days	✓

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Metals in Biota by CRC ICPMS (WET units, Biopsy)										
Compliant container LWC-1	E475A	13-Sep-2020	02-Nov-2020	730 days	50 days	✓	03-Nov-2020	679 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Biopsy)										
Compliant container LWC-2	E475A	12-Sep-2020	02-Nov-2020	730 days	51 days	✓	03-Nov-2020	678 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Biopsy)										
Compliant container LWC-3	E475A	12-Sep-2020	02-Nov-2020	730 days	51 days	✓	03-Nov-2020	678 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Biopsy)										
Compliant container LWC-4	E475A	12-Sep-2020	02-Nov-2020	730 days	51 days	✓	03-Nov-2020	678 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Biopsy)										
Compliant container LWC-5	E475A	12-Sep-2020	02-Nov-2020	730 days	51 days	✓	03-Nov-2020	678 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Biopsy)										
Compliant container LMC-3	E475A	11-Sep-2020	02-Nov-2020	730 days	52 days	✓	03-Nov-2020	677 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Biopsy)										
Compliant container LMC-4	E475A	11-Sep-2020	02-Nov-2020	730 days	52 days	✓	03-Nov-2020	677 days	1 days	✓
Metals : Metals in Biota by CRC ICPMS (WET units, Biopsy)										
Compliant container LMC-5	E475A	11-Sep-2020	02-Nov-2020	730 days	52 days	✓	03-Nov-2020	677 days	1 days	✓
Physical Tests : Moisture Content by Gravimetry (Biopsy)										
Compliant container LBC-1	E144A	16-Sep-2020	----	----	----		29-Oct-2020	----	----	

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Moisture Content by Gravimetry (Biopsy)										
Compliant container LBC-2	E144A	16-Sep-2020	----	----	----		29-Oct-2020	----	----	
Physical Tests : Moisture Content by Gravimetry (Biopsy)										
Compliant container LBC-3	E144A	16-Sep-2020	----	----	----		29-Oct-2020	----	----	
Physical Tests : Moisture Content by Gravimetry (Biopsy)										
Compliant container LBC-4	E144A	16-Sep-2020	----	----	----		29-Oct-2020	----	----	
Physical Tests : Moisture Content by Gravimetry (Biopsy)										
Compliant container LBC-5	E144A	16-Sep-2020	----	----	----		29-Oct-2020	----	----	
Physical Tests : Moisture Content by Gravimetry (Biopsy)										
Compliant container LMC-1	E144A	15-Sep-2020	----	----	----		29-Oct-2020	----	----	
Physical Tests : Moisture Content by Gravimetry (Biopsy)										
Compliant container LMC-2	E144A	14-Sep-2020	----	----	----		29-Oct-2020	----	----	
Physical Tests : Moisture Content by Gravimetry (Biopsy)										
Compliant container LMC-3	E144A	11-Sep-2020	----	----	----		29-Oct-2020	----	----	
Physical Tests : Moisture Content by Gravimetry (Biopsy)										
Compliant container LMC-4	E144A	11-Sep-2020	----	----	----		29-Oct-2020	----	----	
Physical Tests : Moisture Content by Gravimetry (Biopsy)										
Compliant container LMC-5	E144A	11-Sep-2020	----	----	----		29-Oct-2020	----	----	

Matrix: **Biota**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Moisture Content by Gravimetry (Biopsy)										
Compliant container LWC-1	E144A	13-Sep-2020	----	----	----		29-Oct-2020	----	----	
Physical Tests : Moisture Content by Gravimetry (Biopsy)										
Compliant container LWC-2	E144A	12-Sep-2020	----	----	----		29-Oct-2020	----	----	
Physical Tests : Moisture Content by Gravimetry (Biopsy)										
Compliant container LWC-3	E144A	12-Sep-2020	----	----	----		29-Oct-2020	----	----	
Physical Tests : Moisture Content by Gravimetry (Biopsy)										
Compliant container LWC-4	E144A	12-Sep-2020	----	----	----		29-Oct-2020	----	----	
Physical Tests : Moisture Content by Gravimetry (Biopsy)										
Compliant container LWC-5	E144A	12-Sep-2020	----	----	----		29-Oct-2020	----	----	

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Biota**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Control Samples (LCS)							
Mercury in Biota by CVAAS (DRY units, Biopsy)	E512	110480	2	15	13.3	10.0	✓
Mercury in Biota by CVAAS (WET units, Biopsy)	E512A	110481	2	15	13.3	10.0	✓
Metals by CRC ICPMS (DRY units, Biopsy)	E475	110482	2	15	13.3	10.0	✓
Metals in Biota by CRC ICPMS (WET units, Biopsy)	E475A	110479	2	15	13.3	10.0	✓
Moisture Content by Gravimetry (Biopsy)	E144A	110478	1	15	6.6	5.0	✓
Method Blanks (MB)							
Mercury in Biota by CVAAS (DRY units, Biopsy)	E512	110480	1	15	6.6	5.0	✓
Mercury in Biota by CVAAS (WET units, Biopsy)	E512A	110481	1	15	6.6	5.0	✓
Metals by CRC ICPMS (DRY units, Biopsy)	E475	110482	1	15	6.6	5.0	✓
Metals in Biota by CRC ICPMS (WET units, Biopsy)	E475A	110479	1	15	6.6	5.0	✓
Moisture Content by Gravimetry (Biopsy)	E144A	110478	1	15	6.6	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Moisture Content by Gravimetry (Biopsy)	E144A Vancouver - Environmental	Biota	Puget Sound Water Quality Authority/CCME PHC in Soil - Tier 1	This analysis is carried out gravimetrically by drying the sample at < 60 deg. C for a minimum of three days.
Metals by CRC ICPMS (DRY units, Biopsy)	E475 Vancouver - Environmental	Biota	EPA 200.3/6020B (mod)	Samples are digested with nitric acid, hydrochloric acid, and hydrogen peroxide. Analysis is by Collision/Reaction Cell ICPMS: This method employs a strong acid/peroxide digestion, and is intended to provide a conservative estimate of bio-available metals. Near complete recoveries are achieved for most toxicologically important metals, but elements associated with recalcitrant minerals may be only partially recovered.
Metals in Biota by CRC ICPMS (WET units, Biopsy)	E475A Vancouver - Environmental	Biota	EPA 200.3/6020B (mod)	Samples are digested with nitric acid, hydrochloric acid, and hydrogen peroxide. Analysis is by Collision/Reaction Cell ICPMS. Method Limitation: This method employs a strong acid/peroxide digestion, and is intended to provide a conservative estimate of bio-available metals. Near complete recoveries are achieved for most toxicologically important metals, but elements associated with recalcitrant minerals may be only partially recovered.
Mercury in Biota by CVAAS (DRY units, Biopsy)	E512 Vancouver - Environmental	Biota	EPA 200.3/1631E (mod)	Samples are digested with nitric acid, hydrochloric acid, and hydrogen peroxide. Analysis is by CVAAS.
Mercury in Biota by CVAAS (WET units, Biopsy)	E512A Vancouver - Environmental	Biota	EPA 200.3/1631E (mod)	Samples are homogenized digested with nitric acid, hydrochloric acid, and hydrogen peroxide. Analysis is by CVAAS.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Metals and Mercury Biota Digestion (Micro)	EP472 Vancouver - Environmental	Biota	EPA 200.3	This method, designed for small sample amounts, uses a heated strong acid digestion with HNO3, HCl, and H2O2 and is intended to provide a conservative estimate of bio-available metals.
Metals and Mercury Biota Digestion (Biopsy)	EP475 Vancouver - Environmental	Biota	EPA 200.3/200.8 (mod)	Samples are digested with nitric acid, hydrochloric acid, and hydrogen peroxide. Method Limitation: This method employs a strong acid/peroxide digestion, and is intended to provide a conservative estimate of bio-available metals. Near complete recoveries are achieved for most toxicologically important metals, but elements associated with recalcitrant minerals may be only partially recovered.

QUALITY CONTROL REPORT

Work Order	: **WR2000903**	Page	: 1 of 11
Client	: Minnow Environmental Inc.	Laboratory	: Whitehorse - Environmental
Contact	: Lisa Bowron	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: 250 595 1627	Telephone	: +1 867 668 6689
Project	: Minnow Project 20-70	Date Samples Received	: 18-Sep-2020 11:45
PO	: ----	Date Analysis Commenced	: 29-Oct-2020
C-O-C number	: 1 of 2, 2 of 2	Issue Date	: 10-Nov-2020 18:22
Sampler	: Pierre Stecko		
Site	: ----		
Quote number	: Q75875		
No. of samples received	: 16		
No. of samples analysed	: 15		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Evan Ben-Oliel	Metal Analyst	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Kinny Wu	Lab Analyst	Metals, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Biota**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 110478)						
moisture	----	E144A	2	%	<2.0	----
Metals (QCLot: 110479)						
aluminum	7429-90-5	E475A	1	mg/kg wwt	<1.0	----
antimony	7440-36-0	E475A	0.004	mg/kg wwt	<0.0040	----
arsenic	7440-38-2	E475A	0.01	mg/kg wwt	<0.010	----
barium	7440-39-3	E475A	0.01	mg/kg wwt	<0.010	----
beryllium	7440-41-7	E475A	0.002	mg/kg wwt	<0.0020	----
bismuth	7440-69-9	E475A	0.002	mg/kg wwt	<0.0020	----
boron	7440-42-8	E475A	0.2	mg/kg wwt	<0.20	----
cadmium	7440-43-9	E475A	0.002	mg/kg wwt	<0.0020	----
calcium	7440-70-2	E475A	4	mg/kg wwt	<4.0	----
cesium	7440-46-2	E475A	0.001	mg/kg wwt	<0.0010	----
chromium	7440-47-3	E475A	0.04	mg/kg wwt	<0.040	----
cobalt	7440-48-4	E475A	0.004	mg/kg wwt	<0.0040	----
copper	7440-50-8	E475A	0.04	mg/kg wwt	<0.040	----
iron	7439-89-6	E475A	1	mg/kg wwt	<1.0	----
lead	7439-92-1	E475A	0.01	mg/kg wwt	<0.010	----
lithium	7439-93-2	E475A	0.1	mg/kg wwt	<0.10	----
magnesium	7439-95-4	E475A	0.4	mg/kg wwt	<0.40	----
manganese	7439-96-5	E475A	0.01	mg/kg wwt	<0.010	----
molybdenum	7439-98-7	E475A	0.008	mg/kg wwt	<0.0080	----
nickel	7440-02-0	E475A	0.04	mg/kg wwt	<0.040	----
phosphorus	7723-14-0	E475A	4	mg/kg wwt	<4.0	----
potassium	7440-09-7	E475A	4	mg/kg wwt	<4.0	----
rubidium	7440-17-7	E475A	0.01	mg/kg wwt	<0.010	----
selenium	7782-49-2	E475A	0.02	mg/kg wwt	<0.020	----
sodium	7440-23-5	E475A	4	mg/kg wwt	<4.0	----
strontium	7440-24-6	E475A	0.02	mg/kg wwt	<0.020	----
tellurium	13494-80-9	E475A	0.004	mg/kg wwt	<0.0040	----
thallium	7440-28-0	E475A	0.0004	mg/kg wwt	<0.00040	----
tin	7440-31-5	E475A	0.02	mg/kg wwt	<0.020	----
uranium	7440-61-1	E475A	0.0004	mg/kg wwt	<0.00040	----
vanadium	7440-62-2	E475A	0.02	mg/kg wwt	<0.020	----

Sub-Matrix: **Biota**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Metals (QCLot: 110479) - continued						
zinc	7440-66-6	E475A	0.2	mg/kg wwt	<0.20	----
zirconium	7440-67-7	E475A	0.04	mg/kg wwt	<0.040	----
Metals (QCLot: 110480)						
mercury	7439-97-6	E512	0.01	mg/kg	<0.010	----
Metals (QCLot: 110481)						
mercury	7439-97-6	E512A	0.002	mg/kg wwt	<0.0020	----
Metals (QCLot: 110482)						
aluminum	7429-90-5	E475	5	mg/kg	<5.0	----
antimony	7440-36-0	E475	0.02	mg/kg	<0.020	----
arsenic	7440-38-2	E475	0.05	mg/kg	<0.050	----
barium	7440-39-3	E475	0.05	mg/kg	<0.050	----
beryllium	7440-41-7	E475	0.01	mg/kg	<0.010	----
bismuth	7440-69-9	E475	0.01	mg/kg	<0.010	----
boron	7440-42-8	E475	1	mg/kg	<1.0	----
cadmium	7440-43-9	E475	0.01	mg/kg	<0.010	----
calcium	7440-70-2	E475	20	mg/kg	<20	----
cesium	7440-46-2	E475	0.005	mg/kg	<0.0050	----
chromium	7440-47-3	E475	0.2	mg/kg	<0.20	----
cobalt	7440-48-4	E475	0.02	mg/kg	<0.020	----
copper	7440-50-8	E475	0.2	mg/kg	<0.20	----
iron	7439-89-6	E475	5	mg/kg	<5.0	----
lead	7439-92-1	E475	0.05	mg/kg	<0.050	----
lithium	7439-93-2	E475	0.5	mg/kg	<0.50	----
magnesium	7439-95-4	E475	2	mg/kg	<2.0	----
manganese	7439-96-5	E475	0.05	mg/kg	<0.050	----
molybdenum	7439-98-7	E475	0.04	mg/kg	<0.040	----
nickel	7440-02-0	E475	0.2	mg/kg	<0.20	----
phosphorus	7723-14-0	E475	20	mg/kg	<20	----
potassium	7440-09-7	E475	20	mg/kg	<20	----
rubidium	7440-17-7	E475	0.05	mg/kg	<0.050	----
selenium	7782-49-2	E475	0.1	mg/kg	<0.10	----
sodium	7440-23-5	E475	20	mg/kg	<20	----
strontium	7440-24-6	E475	0.1	mg/kg	<0.10	----
tellurium	13494-80-9	E475	0.02	mg/kg	<0.020	----
thallium	7440-28-0	E475	0.002	mg/kg	<0.0020	----
tin	7440-31-5	E475	0.1	mg/kg	<0.10	----

Sub-Matrix: **Biota**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Metals (QCLot: 110482) - continued						
uranium	7440-61-1	E475	0.002	mg/kg	<0.0020	----
vanadium	7440-62-2	E475	0.1	mg/kg	<0.10	----
zinc	7440-66-6	E475	1	mg/kg	<1.0	----
zirconium	7440-67-7	E475	0.2	mg/kg	<0.20	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Biota**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 110478)									
moisture	----	E144A	2	%	100 %	100	90.0	110	----
Metals (QCLot: 110479)									
aluminum	7429-90-5	E475A	1	mg/kg wwt	50 mg/kg wwt	111	80.0	120	----
antimony	7440-36-0	E475A	0.004	mg/kg wwt	25 mg/kg wwt	106	80.0	120	----
arsenic	7440-38-2	E475A	0.01	mg/kg wwt	25 mg/kg wwt	103	80.0	120	----
barium	7440-39-3	E475A	0.01	mg/kg wwt	6.25 mg/kg wwt	108	80.0	120	----
beryllium	7440-41-7	E475A	0.002	mg/kg wwt	2.5 mg/kg wwt	99.9	80.0	120	----
bismuth	7440-69-9	E475A	0.002	mg/kg wwt	25 mg/kg wwt	99.3	80.0	120	----
boron	7440-42-8	E475A	0.2	mg/kg wwt	25 mg/kg wwt	101	80.0	120	----
cadmium	7440-43-9	E475A	0.002	mg/kg wwt	2.5 mg/kg wwt	100	80.0	120	----
calcium	7440-70-2	E475A	4	mg/kg wwt	1250 mg/kg wwt	104	80.0	120	----
cesium	7440-46-2	E475A	0.001	mg/kg wwt	1.25 mg/kg wwt	102	80.0	120	----
chromium	7440-47-3	E475A	0.04	mg/kg wwt	6.25 mg/kg wwt	106	80.0	120	----
cobalt	7440-48-4	E475A	0.004	mg/kg wwt	6.25 mg/kg wwt	104	80.0	120	----
copper	7440-50-8	E475A	0.04	mg/kg wwt	6.25 mg/kg wwt	102	80.0	120	----
iron	7439-89-6	E475A	1	mg/kg wwt	25 mg/kg wwt	105	80.0	120	----
lead	7439-92-1	E475A	0.01	mg/kg wwt	12.5 mg/kg wwt	101	80.0	120	----
lithium	7439-93-2	E475A	0.1	mg/kg wwt	6.25 mg/kg wwt	104	80.0	120	----
magnesium	7439-95-4	E475A	0.4	mg/kg wwt	1250 mg/kg wwt	109	80.0	120	----
manganese	7439-96-5	E475A	0.01	mg/kg wwt	6.25 mg/kg wwt	108	80.0	120	----
molybdenum	7439-98-7	E475A	0.008	mg/kg wwt	6.25 mg/kg wwt	106	80.0	120	----
nickel	7440-02-0	E475A	0.04	mg/kg wwt	12.5 mg/kg wwt	103	80.0	120	----
phosphorus	7723-14-0	E475A	4	mg/kg wwt	250 mg/kg wwt	108	80.0	120	----
potassium	7440-09-7	E475A	4	mg/kg wwt	1250 mg/kg wwt	106	80.0	120	----
rubidium	7440-17-7	E475A	0.01	mg/kg wwt	2.5 mg/kg wwt	109	80.0	120	----
selenium	7782-49-2	E475A	0.02	mg/kg wwt	25 mg/kg wwt	100	80.0	120	----
sodium	7440-23-5	E475A	4	mg/kg wwt	1250 mg/kg wwt	111	80.0	120	----
strontium	7440-24-6	E475A	0.02	mg/kg wwt	6.25 mg/kg wwt	104	80.0	120	----
tellurium	13494-80-9	E475A	0.004	mg/kg wwt	2.5 mg/kg wwt	99.8	80.0	120	----
thallium	7440-28-0	E475A	0.0004	mg/kg wwt	25 mg/kg wwt	99.7	80.0	120	----
tin	7440-31-5	E475A	0.02	mg/kg wwt	12.5 mg/kg wwt	107	80.0	120	----
uranium	7440-61-1	E475A	0.0004	mg/kg wwt	0.125 mg/kg wwt	105	80.0	120	----
vanadium	7440-62-2	E475A	0.02	mg/kg wwt	12.5 mg/kg wwt	109	80.0	120	----

Sub-Matrix: **Biota**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Metals (QCLot: 110479) - continued									
zinc	7440-66-6	E475A	0.2	mg/kg wwt	12.5 mg/kg wwt	95.0	80.0	120	----
zirconium	7440-67-7	E475A	0.04	mg/kg wwt	2.5 mg/kg wwt	103	80.0	120	----
Metals (QCLot: 110480)									
mercury	7439-97-6	E512	0.01	mg/kg	0.05 mg/kg	107	80.0	120	----
Metals (QCLot: 110481)									
mercury	7439-97-6	E512A	0.002	mg/kg wwt	0.05 mg/kg wwt	107	80.0	120	----
Metals (QCLot: 110482)									
aluminum	7429-90-5	E475	5	mg/kg	50 mg/kg	111	80.0	120	----
antimony	7440-36-0	E475	0.02	mg/kg	25 mg/kg	106	80.0	120	----
arsenic	7440-38-2	E475	0.05	mg/kg	25 mg/kg	103	80.0	120	----
barium	7440-39-3	E475	0.05	mg/kg	6.25 mg/kg	108	80.0	120	----
beryllium	7440-41-7	E475	0.01	mg/kg	2.5 mg/kg	99.9	80.0	120	----
bismuth	7440-69-9	E475	0.01	mg/kg	25 mg/kg	99.3	80.0	120	----
boron	7440-42-8	E475	1	mg/kg	25 mg/kg	101	80.0	120	----
cadmium	7440-43-9	E475	0.01	mg/kg	2.5 mg/kg	100	80.0	120	----
calcium	7440-70-2	E475	20	mg/kg	1250 mg/kg	104	80.0	120	----
cesium	7440-46-2	E475	0.005	mg/kg	1.25 mg/kg	102	80.0	120	----
chromium	7440-47-3	E475	0.2	mg/kg	6.25 mg/kg	106	80.0	120	----
cobalt	7440-48-4	E475	0.02	mg/kg	6.25 mg/kg	104	80.0	120	----
copper	7440-50-8	E475	0.2	mg/kg	6.25 mg/kg	102	80.0	120	----
iron	7439-89-6	E475	5	mg/kg	25 mg/kg	105	80.0	120	----
lead	7439-92-1	E475	0.05	mg/kg	12.5 mg/kg	101	80.0	120	----
lithium	7439-93-2	E475	0.5	mg/kg	6.25 mg/kg	104	80.0	120	----
magnesium	7439-95-4	E475	2	mg/kg	1250 mg/kg	109	80.0	120	----
manganese	7439-96-5	E475	0.05	mg/kg	6.25 mg/kg	108	80.0	120	----
molybdenum	7439-98-7	E475	0.04	mg/kg	6.25 mg/kg	106	80.0	120	----
nickel	7440-02-0	E475	0.2	mg/kg	12.5 mg/kg	103	80.0	120	----
phosphorus	7723-14-0	E475	20	mg/kg	250 mg/kg	108	80.0	120	----
potassium	7440-09-7	E475	20	mg/kg	1250 mg/kg	106	80.0	120	----
rubidium	7440-17-7	E475	0.05	mg/kg	2.5 mg/kg	109	80.0	120	----
selenium	7782-49-2	E475	0.1	mg/kg	25 mg/kg	100	80.0	120	----
sodium	7440-23-5	E475	20	mg/kg	1250 mg/kg	111	80.0	120	----
strontium	7440-24-6	E475	0.1	mg/kg	6.25 mg/kg	104	80.0	120	----
tellurium	13494-80-9	E475	0.02	mg/kg	2.5 mg/kg	99.8	80.0	120	----
thallium	7440-28-0	E475	0.002	mg/kg	25 mg/kg	99.7	80.0	120	----
tin	7440-31-5	E475	0.1	mg/kg	12.5 mg/kg	107	80.0	120	----
uranium	7440-61-1	E475	0.002	mg/kg	0.125 mg/kg	105	80.0	120	----

Sub-Matrix: **Biota**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Metals (QCLot: 110482) - continued									
vanadium	7440-62-2	E475	0.1	mg/kg	12.5 mg/kg	109	80.0	120	----
zinc	7440-66-6	E475	1	mg/kg	12.5 mg/kg	95.0	80.0	120	----
zirconium	7440-67-7	E475	0.2	mg/kg	2.5 mg/kg	103	80.0	120	----

Reference Material (RM) Report

A Reference Material (RM) is a homogenous material with known and well-established analyte concentrations. RMs are processed in an identical manner to test samples, and are used to monitor and control the accuracy and precision of a test method for a typical sample matrix. RM results are expressed as percent recovery of the target analyte concentration. RM targets may be certified target concentrations provided by the RM supplier, or may be ALS long-term mean values (for empirical test methods).

Sub-Matrix: **Biota**

					Reference Material (RM) Report				
					RM Target	Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Metals (QCLot: 110479)									
QC-110479-003	RM	aluminum	7429-90-5	E475A	1280 mg/kg wwt	118	70.0	130	----
QC-110479-003	RM	arsenic	7440-38-2	E475A	6.87 mg/kg wwt	107	70.0	130	----
QC-110479-003	RM	barium	7440-39-3	E475A	4.4 mg/kg wwt	114	70.0	130	----
QC-110479-003	RM	boron	7440-42-8	E475A	9.24 mg/kg wwt	99.4	70.0	130	----
QC-110479-003	RM	cadmium	7440-43-9	E475A	0.299 mg/kg wwt	108	70.0	130	----
QC-110479-003	RM	calcium	7440-70-2	E475A	2360 mg/kg wwt	109	70.0	130	----
QC-110479-003	RM	cesium	7440-46-2	E475A	0.078 mg/kg wwt	96.4	70.0	130	----
QC-110479-003	RM	chromium	7440-47-3	E475A	1.58 mg/kg wwt	113	70.0	130	----
QC-110479-003	RM	cobalt	7440-48-4	E475A	0.25 mg/kg wwt	106	70.0	130	----
QC-110479-003	RM	copper	7440-50-8	E475A	15.7 mg/kg wwt	105	70.0	130	----
QC-110479-003	RM	iron	7439-89-6	E475A	318 mg/kg wwt	112	70.0	130	----
QC-110479-003	RM	lead	7439-92-1	E475A	0.231 mg/kg wwt	111	70.0	130	----
QC-110479-003	RM	lithium	7439-93-2	E475A	1.21 mg/kg wwt	99.4	50.0	150	----
QC-110479-003	RM	magnesium	7439-95-4	E475A	910 mg/kg wwt	107	70.0	130	----
QC-110479-003	RM	manganese	7439-96-5	E475A	3.17 mg/kg wwt	105	70.0	130	----
QC-110479-003	RM	molybdenum	7439-98-7	E475A	0.29 mg/kg wwt	99.8	70.0	130	----
QC-110479-003	RM	nickel	7440-02-0	E475A	1.34 mg/kg wwt	104	70.0	130	----
QC-110479-003	RM	phosphorus	7723-14-0	E475A	8000 mg/kg wwt	105	70.0	130	----
QC-110479-003	RM	potassium	7440-09-7	E475A	12840 mg/kg wwt	108	70.0	130	----
QC-110479-003	RM	rubidium	7440-17-7	E475A	5.59 mg/kg wwt	114	70.0	130	----
QC-110479-003	RM	selenium	7782-49-2	E475A	3.45 mg/kg wwt	115	70.0	130	----
QC-110479-003	RM	sodium	7440-23-5	E475A	14000 mg/kg wwt	114	70.0	130	----
QC-110479-003	RM	strontium	7440-24-6	E475A	10.1 mg/kg wwt	98.6	70.0	130	----
QC-110479-003	RM	thallium	7440-28-0	E475A	0.0093 mg/kg wwt	102	70.0	130	----
QC-110479-003	RM	uranium	7440-61-1	E475A	0.0481 mg/kg wwt	98.3	70.0	130	----
QC-110479-003	RM	vanadium	7440-62-2	E475A	1.48 mg/kg wwt	113	70.0	130	----
QC-110479-003	RM	zinc	7440-66-6	E475A	46.2 mg/kg wwt	112	70.0	130	----
Metals (QCLot: 110480)									

Sub-Matrix: **Biota**

					Reference Material (RM) Report				
					RM Target	Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Metals (QCLot: 110480) - continued									
QC-110480-003	RM	mercury	7439-97-6	E512	0.332 mg/kg	123	70.0	130	----
Metals (QCLot: 110481)									
QC-110481-003	RM	mercury	7439-97-6	E512A	0.322 mg/kg wwt	127	70.0	130	----
Metals (QCLot: 110482)									
QC-110482-003	RM	aluminum	7429-90-5	E475	1280 mg/kg	118	70.0	130	----
QC-110482-003	RM	arsenic	7440-38-2	E475	6.87 mg/kg	107	70.0	130	----
QC-110482-003	RM	barium	7440-39-3	E475	4.4 mg/kg	114	70.0	130	----
QC-110482-003	RM	boron	7440-42-8	E475	9.24 mg/kg	99.4	70.0	130	----
QC-110482-003	RM	cadmium	7440-43-9	E475	0.299 mg/kg	108	70.0	130	----
QC-110482-003	RM	calcium	7440-70-2	E475	2360 mg/kg	109	70.0	130	----
QC-110482-003	RM	cesium	7440-46-2	E475	0.078 mg/kg	96.4	70.0	130	----
QC-110482-003	RM	chromium	7440-47-3	E475	1.58 mg/kg	113	70.0	130	----
QC-110482-003	RM	cobalt	7440-48-4	E475	0.25 mg/kg	106	70.0	130	----
QC-110482-003	RM	copper	7440-50-8	E475	15.7 mg/kg	105	70.0	130	----
QC-110482-003	RM	iron	7439-89-6	E475	318 mg/kg	112	70.0	130	----
QC-110482-003	RM	lead	7439-92-1	E475	0.231 mg/kg	111	70.0	130	----
QC-110482-003	RM	lithium	7439-93-2	E475	1.21 mg/kg	99.4	50.0	150	----
QC-110482-003	RM	magnesium	7439-95-4	E475	910 mg/kg	107	70.0	130	----
QC-110482-003	RM	manganese	7439-96-5	E475	3.17 mg/kg	105	70.0	130	----
QC-110482-003	RM	molybdenum	7439-98-7	E475	0.29 mg/kg	99.8	70.0	130	----
QC-110482-003	RM	nickel	7440-02-0	E475	1.34 mg/kg	104	70.0	130	----
QC-110482-003	RM	phosphorus	7723-14-0	E475	8000 mg/kg	105	70.0	130	----
QC-110482-003	RM	potassium	7440-09-7	E475	12840 mg/kg	108	70.0	130	----
QC-110482-003	RM	rubidium	7440-17-7	E475	5.59 mg/kg	114	70.0	130	----
QC-110482-003	RM	selenium	7782-49-2	E475	3.45 mg/kg	115	70.0	130	----
QC-110482-003	RM	sodium	7440-23-5	E475	14000 mg/kg	114	70.0	130	----
QC-110482-003	RM	strontium	7440-24-6	E475	10.1 mg/kg	98.6	70.0	130	----
QC-110482-003	RM	thallium	7440-28-0	E475	0.0093 mg/kg	102	70.0	130	----
QC-110482-003	RM	uranium	7440-61-1	E475	0.0481 mg/kg	98.3	70.0	130	----
QC-110482-003	RM	vanadium	7440-62-2	E475	1.48 mg/kg	113	70.0	130	----
QC-110482-003	RM	zinc	7440-66-6	E475	46.2 mg/kg	112	70.0	130	----

ALS Environmental

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www.alsglobal.com

~~Plant~~ Benthic Tissue

COC # _____

Page 1 of 2

Report To		Report Format / Distribution		Service Requested (Rush for routine analysis subject to availability)
Company:	Minnow Environmental Inc.	☑ Standard ☐ Other		◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Pierre Stecko	☑ PDF ☑ Excel ☐ Digital ☐ Fax		○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	204-1006 Fort Street	Email 1: pstecko@minnow.ca		○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Victoria, BC	Email 2: slatimer@minnow.ca		○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	(250)595-1627 x24 Fax: (250) 595-1625	Email 3:		
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information		Analysis Request
Hardcopy of Invoice with Report?	☑ Yes ☐ No	Job #:	Minnow Project 20-70	Please indicate below Filtered, Preserved or both (F, P, F/P)
Company:	Minto Exploration Ltd	PO / AFE:		
Contact:	Todd Swenson	LSD:		
Address:	61 Wasson Place, Whitehorse, Yukon Y1A 0H7			
Phone:	604-759-4659 Fax:	Quote #:		
Lab Work Order # (lab use only)		ALS Contact:	Can Dang	Sampler: Pierre Stecko ~~Lisa Bowron~~

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Moisture (%)	High Resolution ICP-MS scan	Mercury in Tissue by CVAFS	~~Site Quote #0054327~~	Number of Containers
1	LWC-1	13-Sep-20		Tissue	X	X	X		1
2	LWC-2	12-Sep-20			X	X	X		1
3	LWC-3	12-Sep-20			X	X	X		1
4	LWC-4	12-Sep-20			X	X	X		1
5	LWC-5	12-Sep-20			X	X	X		1
6	LBC-1	16-Sep-20			X	X	X		1
7	LBC-2	16-Sep-20			X	X	X		1
8	LBC-3	16-Sep-20			X	X	X		1
9	LBC-4	16-Sep-20			X	X	X		1
10	LBC-5	16-Sep-20			X	X	X		1
11	LMC-1	15-Sep-20			X	X	X		1
12	LMC-2	14-Sep-20			X	X	X		1

Environmental Division
Whitehorse
Work Order Reference
WR2000903

Telephone : +1 867 668 6689

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Small samples. The critical analyte of interest is selenium; please ensure best possible MDLs. Benthic samples.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)			SHIPMENT VERIFICATION (lab use only)			
Released by: S. Lahmer	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Sarah Lahmer	18-Sep-20			Sept 18/20	11:45	1° °C	HA	9/19	2:10p	

8 C

ALS Environmental

Chain of Custody / Analytical Request Form
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Benthic Tissue.

COC # _____ Page 2 of 2

Report To		Report Format / Distribution		Service Requested (Rush for routine analysis subject to availability)
Company:	Minnow Environmental Inc.	☑ Standard ☐ Other		● Regular (Standard Turnaround Times - Business Days)
Contact:	Pierre Stecko			○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	204-1006 Fort Street	Email 1:	pstecko@minnow.ca	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Victoria, BC	Email 2:	slatimer@minnow.ca	● Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	(250)595-1627 x24 Fax: (250) 595-1625	Email 3:		
Invoice To	Same as Report ? ☐ Yes ☑ No	Client / Project Information		Analysis Request
Hardcopy of Invoice with Report?	☑ Yes ☐ No	Job #:	Minnow Project 20-70	Please indicate below Filtered, Preserved or both (F, P, F/P)
Company:	Minto Exploration Ltd	PO / AFE:		
Contact:	Todd Swenson	LSD:		
Address:	61 Wasson Place, Whitehorse, Yukon Y1A 0H7			
Phone:	604-759-4659 Fax:	Quote #:		
Lab Work Order # (lab use only)		ALS Contact:	Can Dang	Sampler: Lisa Bowron

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Moisture (%)	High Resolution ICP-MS scan	Mercury in Tissue by CVAFS	**See Comments Section ~~#351327~~	Number of Containers
13	LMC -3	11-Sep-20		Tissue	X	X	X		1
14	LMC -4	11-Sep-20			X	X	X		1
15	LMC-5	11-Sep-20			X	X	X		1

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Small samples. The critical analyte of interest is selenium; please ensure best possible MDLs. Benthic samples

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: S. Latimer	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Sarah Latimer	18-Sep-20					5 °C	HA	09/19	21:08	

Table C.1: Sediment Chemistry Data Collected at Reference and Exposed Areas, Minto Mine AEMP, 2020

Analyte		Units	CSQG[a]		Upper McGinty Creek (Reference)						Upper Minto Creek (Exposed)					
					URC-1	URC-2	URC-3	URC-4	URC-5	URC	UMC-1	UMC-2	UMC-3	UMC-4	UMC-5	UMC
			ISQG	PEL	13-Sep-20	13-Sep-20	13-Sep-20	14-Sep-20	14-Sep-20	14-Sep-20	14-Sep-20	14-Sep-20	10-Sep-20	10-Sep-20	10-Sep-20	14-Sep-20
Particle size, TKN, carbon analytes and pH	Loss on Ignition @ 550 °C	%	-	-	9.30	14.9	15.2	15.3	3.40	-	8.80	12.1	7.30	5.90	4.30	-
	pH (1:2 soil:water)	pH units	-	-	6.34	6.67	6.46	6.67	7.06	-	7.88	7.92	8.04	7.92	7.84	-
	Gravel (> 2 mm)	%	-	-	-	-	-	-	-	<1	-	-	-	-	-	1.20
	Sand (2.0mm - 0.063mm)	%	-	-	-	-	-	-	-	28.0	-	-	-	-	-	38.3
	Silt (0.063 mm - 4 µm)	%	-	-	-	-	-	-	-	63.8	-	-	-	-	-	51.8
	Clay (< 4 µm)	%	-	-	-	-	-	-	-	8.2	-	-	-	-	-	8.7
	Total Kjeldahl Nitrogen (TKN)	%	-	-	0.264	0.332	0.376	0.302	0.136	-	0.247	0.288	0.260	0.156	0.132	-
	Inorganic Carbon	%	-	-	0.111	0.150	0.156	0.141	0.0840	-	0.241	0.223	0.230	0.105	0.122	-
	Inorganic Carbon (as $CaCO_3$ Equivalent)	%	-	-	0.920	1.25	1.30	1.17	0.700	-	2.01	1.86	1.92	0.880	1.02	-
	Total Carbon by Combustion	%	-	-	4.98	6.54	7.26	5.89	2.75	-	4.54	4.98	4.25	2.54	2.84	-
	Total Organic Carbon	%	-	-	4.87	6.39	7.10	5.75	2.67	-	4.30	4.76	4.02	2.44	2.72	-
Total Metals	Aluminum (Al)	mg/kg	-	-	14,400	14,400	16,200	12,100	7,140	-	15,800	16,200	11,800	12,300	11,000	-
	Antimony (Sb)	mg/kg	-	-	0.420	0.460	0.520	0.430	0.390	-	0.510	0.550	0.510	0.470	0.440	-
	Arsenic (As)	mg/kg	5.9	17	6.50	5.59	5.54	4.58	4.41	-	7.66	7.25	6.10	5.91	5.31	-
	Barium (Ba)	mg/kg	-	-	250	254	278	217	115	-	470	608	579	193	178	-
	Beryllium (Be)	mg/kg	-	-	0.360	0.380	0.480	0.330	0.230	-	0.530	0.520	0.410	0.420	0.420	-
	Bismuth (Bi)	mg/kg	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2	<0.2	<0.2	<0.2	<0.2	-
	Boron (B)	mg/kg	-	-	<5	<5	<5	<5	<5	-	<5	5.20	<5	<5	<5	-
	Cadmium (Cd)	mg/kg	0.60	3.5	0.171	0.178	0.215	0.182	0.106	-	0.318	0.467	0.457	0.187	0.157	-
	Calcium (Ca)	mg/kg	-	-	8,440	8,840	10,000	8,060	5,230	-	10,300	12,500	11,000	9,160	7,890	-
	Chromium (Cr)	mg/kg	37.3	90	26.4	27.2	30.3	24.4	16.3	-	28.8	29.4	25.2	29.0	27.2	-
	Cobalt (Co)	mg/kg	-	-	10.4	9.32	10.8	8.60	6.36	-	14.1	15.1	13.0	9.82	9.63	-
	Copper (Cu)	mg/kg	35.7	197	25.0	25.8	29.8	23.9	14.0	-	249	351	268	87.7	108	-
	Iron (Fe)	mg/kg	-	-	23,300	22,500	23,800	20,100	16,000	-	29,600	28,800	23,700	22,200	22,200	-
	Lead (Pb)	mg/kg	35	91.3	4.94	5.06	5.71	4.46	3.39	-	6.27	6.62	5.66	5.48	5.36	-
	Lithium (Li)	mg/kg	-	-	7.40	7.60	8.50	6.80	4.80	-	9.80	10.0	7.60	8.30	7.20	-
	Magnesium (Mg)	mg/kg	-	-	4,580	4,830	5,370	4,190	3,160	-	8,130	8,210	6,620	6,930	6,240	-
	Manganese (Mn)	mg/kg	-	-	874	487	352	376	390	-	6,010	12,100	11,400	837	1,260	-
	Mercury (Hg)	mg/kg	0.17	0.49	<0.05	0.0514	0.0584	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	-
	Molybdenum (Mo)	mg/kg	-	-	0.540	0.780	0.540	0.630	0.460	-	2.44	6.52	6.50	0.920	1.13	-
	Nickel (Ni)	mg/kg	-	-	18.5	18.9	21.7	17.7	13.7	-	32.8	35.2	32.6	29.6	26.5	-
	Phosphorus (P)	mg/kg	-	-	875	817	979.0	790	626	-	1,100	1,050	969.0	943.0	1,020	-
	Potassium (K)	mg/kg	-	-	740	770	810	700	480	-	1,770	1,720	1,280	1,160	1,180	-
	Selenium (Se)	mg/kg	2.0	-	0.410	0.720	0.580	0.570	0.300	-	0.860	1.29	1.04	0.430	0.450	-
	Silver (Ag)	mg/kg	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	-	0.150	0.200	0.140	<0.1	<0.1	-
	Sodium (Na)	mg/kg	-	-	207	226	243	208	133	-	337	324	286	301	319	-
	Strontium (Sr)	mg/kg	-	-	70.2	74.1	72.4	66.9	40.4	-	126	189	162	105	93.9	-
	Sulfur	mg/kg	-	-	<1,000	<1,000	<1,000	<1,000	<1,000	-	<1,000	<1,000	<1,000	<1,000	<1,000	-
	Thallium (Tl)	mg/kg	-	-	0.0740	0.0710	0.0810	0.0670	<0.05	-	0.109	0.115	0.0920	0.0900	0.0760	-
	Tin (Sn)	mg/kg	-	-	<2	<2	<2	<2	<2	-	<2	<2	<2	<2	<2	-
	Titanium (Ti)	mg/kg	-	-	688	724	776	662	464	-	758	679	572	607	678	-
	Tungsten (W)	mg/kg	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	-
	Uranium (U)	mg/kg	-	-	1.21	1.50	1.57	1.38	0.863	-	1.17	1.27	0.982	0.888	0.724	-
	Vanadium (V)	mg/kg	-	-	50.6	51.4	57.9	48.4	36.9	-	58.2	59.2	53.6	49.4	51.6	-
	Zinc (Zn)	mg/kg	123	315	47.8	48.2	54.8	43.8	32.1	-	78.3	84.7	70.8	56.6	55.5	-
	Zirconium (Zr)	mg/kg	-	-	1.80	2.40	3.40	2.40	2.00	-	2.70	2.30	1.80	3.20	2.70	-

Indicates sediment concentration exceeding CSQG ISQG.

Indicates sediment concentration exceeding CSQG PEL.

Notes: CSQG = Canadian Sediment Quality Guidelines; ISQG = interim sediment quality guideline; PEL = probable effect level; - = no guideline available or no data available.

[a] CSQG (CCME 1999 plus updates) and BC Sediment Quality Guideline for Selenium (BCMOE 2014).

Table C.1: Sediment Chemistry Data Collected at Reference and Exposed Areas, Minto Mine AEMP, 2020

Analyte		Units	CSQG[a]		Lower Wolverine Creek (Reference)					Lower Minto Creek (Exposed)				
					LWC-1	LWC-2	LWC-3	LWC-4	LWC-5	LMC-1	LMC-2	LMC-3	LMC-4	LMC-5
			ISQG	PEL	13-Sep-20	13-Sep-20	13-Sep-20	13-Sep-20	13-Sep-20	15-Sep-20	15-Sep-20	15-Sep-20	15-Sep-20	15-Sep-20
Particle size, TKN, carbon analytes and pH	Loss on Ignition @ 550 °C	%	-	-	12.8	4.80	8.40	12.0	14.0	9.60	13.1	8.30	9.10	5.20
	pH (1:2 soil:water)	pH units	-	-	7.54	7.11	6.97	6.86	6.56	8.01	8.00	7.98	7.83	7.88
	Gravel (> 2 mm)	%	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Sand (2.0mm - 0.063mm)	%	-	-	28.2	52.2	36.0	18.9	5.50	16.8	17.1	17.7	19.1	45.0
	Silt (0.063 mm - 4 µm)	%	-	-	66.1	43.3	58.6	73.4	87.4	70.9	72.7	72.3	70.7	48.0
	Clay (< 4 µm)	%	-	-	5.70	4.50	5.40	7.70	7.10	12.2	10.2	10.0	10.1	7.00
	Total Kjeldahl Nitrogen (TKN)	%	-	-	0.307	0.168	0.240	0.359	0.383	0.288	0.357	0.246	0.285	0.205
	Inorganic Carbon	%	-	-	0.168	0.102	0.128	0.154	0.162	0.181	0.200	0.157	0.179	0.138
	Inorganic Carbon (as $CaCO_3$ Equivalent)	%	-	-	1.40	0.850	1.06	1.28	1.35	1.50	1.67	1.31	1.49	1.15
	Total Carbon by Combustion	%	-	-	5.86	3.13	4.03	6.12	6.16	4.30	6.00	4.30	4.76	3.45
	Total Organic Carbon	%	-	-	5.69	3.03	3.90	5.97	6.00	4.12	5.80	4.14	4.58	3.31
Total Metals	Aluminum (Al)	mg/kg	-	-	16,500	13,900	16,000	17,400	18,400	16,500	17,900	13,900	13,000	10,600
	Antimony (Sb)	mg/kg	-	-	0.510	0.370	0.400	0.450	0.430	0.560	0.600	0.460	0.470	0.400
	Arsenic (As)	mg/kg	5.9	17	7.02	5.59	6.00	4.54	4.27	8.42	9.07	6.98	7.12	6.04
	Barium (Ba)	mg/kg	-	-	245	175	198	234	255	287	338	249	232	188
	Beryllium (Be)	mg/kg	-	-	0.850	0.590	0.660	0.710	0.790	0.480	0.580	0.440	0.430	0.380
	Bismuth (Bi)	mg/kg	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	Boron (B)	mg/kg	-	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
	Cadmium (Cd)	mg/kg	0.60	3.5	0.280	0.170	0.186	0.237	0.268	0.215	0.299	0.199	0.213	0.139
	Calcium (Ca)	mg/kg	-	-	12,100	7,570	8,330	9,600	9,320	10,600	13,200	9,680	9,180	7,070
	Chromium (Cr)	mg/kg	37.3	90	46.9	39.0	45.2	48.7	51.2	34.6	36.2	29.4	29.3	25.0
	Cobalt (Co)	mg/kg	-	-	14.2	12.1	13.1	12.8	13.5	11.4	12.6	10.5	9.99	9.02
	Copper (Cu)	mg/kg	35.7	197	30.2	20.3	23.0	32.0	31.8	61.8	71.8	48.3	47.3	38.1
	Iron (Fe)	mg/kg	-	-	28,400	25,100	26,600	27,400	32,500	28,000	29,600	24,300	26,000	23,200
	Lead (Pb)	mg/kg	35	91.3	6.31	4.99	5.68	6.42	6.98	6.46	6.86	5.50	5.27	4.69
	Lithium (Li)	mg/kg	-	-	10.3	8.80	10.2	11.0	11.6	11.4	11.7	9.60	9.30	7.90
	Magnesium (Mg)	mg/kg	-	-	9,840	8,670	9,680	9,980	10,200	7,870	8,440	7,120	6,540	5,580
	Manganese (Mn)	mg/kg	-	-	785	480	630	219	221	1,240	1,700	1,070	1,120	847
	Mercury (Hg)	mg/kg	0.17	0.49	<0.05	<0.05	<0.05	<0.05	0.0504	<0.05	<0.05	<0.05	<0.05	<0.05
	Molybdenum (Mo)	mg/kg	-	-	0.610	0.550	0.480	0.810	0.480	0.810	0.900	0.690	0.740	0.640
	Nickel (Ni)	mg/kg	-	-	39.0	32.7	36.2	38.2	39.3	30.1	34.4	27.6	26.0	21.9
	Phosphorus (P)	mg/kg	-	-	1,100	1,030	1,070	1,040	1,090	997.0	985.0	980.0	828	721
	Potassium (K)	mg/kg	-	-	1,080	940.0	1,040	1,140	1,080	1,340	1,420	1,300	1,190	1,020
	Selenium (Se)	mg/kg	2.0	-	0.440	0.240	0.260	0.310	0.370	0.650	0.790	0.470	0.520	0.430
	Silver (Ag)	mg/kg	-	-	0.100	<0.1	<0.1	<0.1	<0.1	0.100	0.120	<0.1	<0.1	<0.1
	Sodium (Na)	mg/kg	-	-	399	383	414	426	393	298	295	315	262	257
	Strontium (Sr)	mg/kg	-	-	138	78.8	85.7	95.3	92.3	108	144	97.4	95.1	74.7
	Sulfur	mg/kg	-	-	<1,000	<1,000	<1,000	2,400	1,700	<1,000	<1,000	<1,000	<1,000	<1,000
	Thallium (Tl)	mg/kg	-	-	0.0820	0.0560	0.0770	0.0880	0.0970	0.101	0.106	0.0880	0.0830	0.0710
	Tin (Sn)	mg/kg	-	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	Titanium (Ti)	mg/kg	-	-	830	819	837	912.0	739	706	649	703	672	617
	Tungsten (W)	mg/kg	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Uranium (U)	mg/kg	-	-	3.71	1.76	2.06	2.77	2.49	1.09	1.43	1.10	1.11	0.837
	Vanadium (V)	mg/kg	-	-	72.4	64.0	67.8	71.8	67.5	61.4	60.5	54.1	58.4	53.0
	Zinc (Zn)	mg/kg	123	315	62.3	55.4	61.2	68.9	73.8	64.5	69.1	58.3	56.0	49.3
	Zirconium (Zr)	mg/kg	-	-	4.70	3.60	3.60	5.10	4.70	3.00	3.80	2.80	2.30	2.20

Indicates sediment concentration exceeding CSQG ISQG.

Indicates sediment concentration exceeding CSQG PEL.

Notes: CSQG = Canadian Sediment Quality Guidelines; ISQG = interim sediment quality guideline; PEL = probable effect level; - = no guideline available or no data available.

[a] CSQG (CCME 1999 plus updates) and BC Sediment Quality Guideline for Selenium (BCMOE 2014).

Table C.2: Periphyton Tissue Quality Results at Reference and Exposure Areas, Minto Mine AEMP, 2020

Analyte		Units	Lower Wolverine Creek (Reference)							Lower Big Creek (Reference)							Lower Minto Creek (Exposed)						
			LWC-1	LWC-2	LWC-3	LWC-4	LWC-5	Mean	Standard Deviation	LBC-1	LBC-2	LBC-3	LBC-4	LBC-5	Mean	Standard Deviation	LMC-1	LMC-2	LMC-3	LMC-4	LMC-5	Mean	Standard Deviation
Physical Tests	Moisture	%	65.6	72.4	82.9	78.8	84.9	76.9	7.93	60.6	79.6	84.3	89.2	64.1	75.6	12.6	74.9	64.2	77.1	72.2	72.2	72.1	4.88
Total Metals	Total Aluminum (Al)	mg/kg dw	13,900	13,400	14,000	13,800	12,700	13,560	532	8,760	13,300	10,900	13,300	9,960	11,244	2,024	4,470	13,900	9,210	4,900	4,530	7,402	4,141
	Total Antimony (Sb)	mg/kg dw	0.0570	0.0850	0.163	0.119	0.143	0.113	0.0429	0.149	0.374	0.374	0.605	0.137	0.328	0.193	0.302	0.0680	0.221	0.210	0.206	0.201	0.0843
	Total Arsenic (As)	mg/kg dw	3.71	3.85	4.69	4.88	4.48	4.32	0.517	7.20	11.8	11.2	18.4	8.66	11.5	4.31	16.3	7.33	12.1	11.1	8.22	11.0	3.55
	Total Barium (Ba)	mg/kg dw	154	157	163	169	153	159	6.72	204	190	156	197	138	177	28.5	1,980	257	646	765	342	798	693
	Total Beryllium (Be)	mg/kg dw	0.505	0.496	0.541	0.546	0.479	0.513	0.0291	0.291	0.440	0.381	0.462	0.330	0.381	0.0720	0.240	0.419	0.327	0.203	0.224	0.283	0.0897
	Total Bismuth (Bi)	mg/kg dw	0.0600	0.0600	0.0630	0.0700	0.0590	0.0624	0.00451	0.476	0.526	0.396	0.644	0.245	0.457	0.149	0.0480	0.0920	0.0790	0.0530	0.0540	0.0652	0.0192
	Total Boron (B)	mg/kg dw	5.10	4.80	11.3	13.0	9.80	8.80	3.69	2.70	5.40	3.90	7.30	2.40	4.34	2.03	18.4	5.40	15.1	26.8	16.0	16.3	7.66
	Total Cadmium (Cd)	mg/kg dw	0.121	0.130	0.149	0.160	0.138	0.140	0.0154	0.0950	0.158	0.144	0.188	0.123	0.142	0.0352	0.719	0.227	0.451	0.494	0.330	0.444	0.186
	Total Calcium (Ca)	mg/kg dw	6,460	6,420	6,840	6,500	6,890	6,622	224	6,400	7,360	6,480	8,440	5,470	6,830	1,121	12,300	10,200	11,600	12,200	18,600	12,980	3,251
	Total Cesium (Cs)	mg/kg dw	1.50	1.45	1.51	1.56	1.37	1.48	0.0719	1.18	1.97	1.74	2.32	1.49	1.74	0.437	0.329	1.04	0.737	0.386	0.409	0.580	0.303
	Total Chromium (Cr)	mg/kg dw	37.8	34.6	36.2	36.4	78.0	44.6	18.7	32.4	32.1	34.3	36.0	24.4	31.8	4.45	132	45.0	145	37.6	249	122	86.3
	Total Cobalt (Co)	mg/kg dw	9.18	8.89	9.37	10.1	9.14	9.34	0.460	5.60	8.00	6.87	7.55	6.12	6.83	0.988	38.1	9.31	18.4	21.2	11.5	19.7	11.4
	Total Copper (Cu)	mg/kg dw	15.5	16.2	19.8	19.7	19.2	18.1	2.06	13.5	21.3	17.0	24.8	14.0	18.1	4.86	38.6	33.3	42.6	46.6	59.1	44.0	9.75
	Total Iron (Fe)	mg/kg dw	20,700	20,000	21,800	23,100	20,300	21,180	1,272	19,400	20,200	19,400	20,200	16,200	19,080	1,659	12,300	22,700	19,200	12,200	12,800	15,840	4,831
	Total Lead (Pb)	mg/kg dw	4.32	4.19	4.22	4.39	4.37	4.30	0.0893	4.88	7.83	5.91	7.99	5.31	6.38	1.44	2.63	4.86	4.05	2.62	2.78	3.39	1.02
	Total Lithium (Li)	mg/kg dw	9.40	9.20	9.17	9.38	8.04	9.04	0.567	6.00	8.78	7.41	8.14	6.87	7.44	1.08	3.29	10.8	6.98	3.72	3.82	5.72	3.20
	Total Magnesium (Mg)	mg/kg dw	7,580	7,200	7,600	7,910	7,460	7,550	257	4,500	6,990	5,520	6,680	5,150	5,768	1,046	3,910	6,610	5,580	3,770	3,750	4,724	1,305
	Total Manganese (Mn)	mg/kg dw	549	613	644	807	745	672	104	287	472	441	517	320	407	99.3	30,300	1,600	9,600	12,600	4,640	11,748	11,214
	Total Mercury (Hg)	mg/kg dw	0.0390	0.0614	0.0428	0.0854	0.0491	0.0555	0.0187	0.0188	0.0738	0.0780	0.0397	0.0288	0.0478	0.0267	0.0259	0.0421	0.0477	0.0453	0.0362	0.0394	0.00871
	Total Molybdenum (Mo)	mg/kg dw	0.373	0.357	0.462	0.471	0.761	0.485	0.163	0.555	0.754	0.770	1.19	0.585	0.771	0.254	3.71	0.764	2.47	2.76	3.20	2.58	1.12
	Total Nickel (Ni)	mg/kg dw	25.0	24.2	26.1	29.1	27.2	26.3	1.92	14.8	25.6	19.9	23.5	18.5	20.5	4.24	34.7	24.5	30.3	23.6	24.2	27.5	4.87
	Total Phosphorus (P)	mg/kg dw	1,170	1,250	2,210	1,620	1,710	1,592	416	1,490	1,410	1,290	1,650	949.0	1,358	263	3,380	1,090	2,930	2,390	3,640	2,686	1,011
	Total Potassium (K)	mg/kg dw	1,370	1,620	3,000	1,980	2,200	2,034	628	1,100	2,530	2,170	3,860	1,350	2,202	1,095	4,760	2,130	5,130	4,470	7,160	4,730	1,795
	Total Rubidium (Rb)	mg/kg dw	12.1	11.6	13.7	12.4	11.7	12.3	0.846	7.38	13.8	12.0	17.4	9.59	12.0	3.86	5.00	12.4	9.46	5.78	6.80	7.89	3.03
	Total Selenium (Se)	mg/kg dw	0.520	0.640	1.22	1.05	1.04	0.894	0.298	0.200	0.520	0.550	0.780	0.250	0.460	0.238	2.16	0.860	1.98	1.64	1.96	1.72	0.516
	Total Sodium (Na)	mg/kg dw	428	378	583	366	524	456	94.5	336	554	476	699	328	479	156	295	313	450	272	486	363	97.6
	Total Strontium (Sr)	mg/kg dw	66.5	68.3	73.4	69.9	72.5	70.1	2.87	49.1	77.9	63.1	89.8	51.8	66.3	17.3	196	102	139	153	121	142	35.7
	Total Tellurium (Te)	mg/kg dw	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-	<0.02	0.0300	0.0380	0.0420	0.0220	0.0304	0.00942	0.0410	0.0210	0.0290	0.0280	<0.02	0.0278	0.00845
	Total Thallium (Tl)	mg/kg dw	0.0724	0.0736	0.0776	0.0831	0.0722	0.0758	0.00463	0.0593	0.102	0.0922	0.124	0.0784	0.0912	0.0244	0.0397	0.0995	0.0735	0.0449	0.0419	0.0599	0.0260
	Total Tin (Sn)	mg/kg dw	1.07	0.650	0.840	0.910	0.810	0.856	0.153	0.610	0.700	0.760	1.27	0.480	0.764	0.302	0.910	0.680	2.08	0.410	1.84	1.18	0.735
	Total Uranium (U)	mg/kg dw	0.804	0.751	0.836	0.835	0.740	0.793	0.0456	0.838	1.03	1.20	1.15	0.854	1.01	0.166	0.741	0.932	0.936	0.576	1.34	0.905	0.286
	Total Vanadium (V)	mg/kg dw	51.9	50.0	52.0	54.2	46.8	51.0	2.77	58.6	52.1	51.1	46.0	42.9	50.1	6.04	39.0	49.0	42.9	35.5	30.5	39.4	7.05
	Total Zinc (Zn)	mg/kg dw	46.3	44.1	50.7	47.8	43.6	46.5	2.90	34.8	51.2	46.6	55.4	38.1	45.2	8.67	89.8	52.1	70.6	52.1	66.9	66.3	15.6
	Total Zirconium (Zr)	mg/kg dw	8.79	7.38	8.10	8.33	8.41	8.20	0.522	4.95	6.55	5.76	7.32	4.86	5.89	1.05	3.84	8.92	6.51	3.85	3.99	5.42	2.26

Indicates periphyton tissue concentration exceeding the higher reference mean by more than two times.

Notes: - = no data available. dw = dry weight.

Table C.3: Benthic Tissue Quality Results at Reference and Exposure Areas, Minto Mine AEMP, 2020

Analyte		Units	Lower Wolverine Creek (Reference)							Lower Big Creek (Reference)							Lower Minto Creek (Exposed)						
			LWC-1	LWC-2	LWC-3	LWC-4	LWC-5	Mean	Standard Deviation	LBC-1	LBC-2	LBC-3	LBC-4	LBC-5	Mean	Standard Deviation	LMC-1	LMC-2	LMC-3	LMC-4	LMC-5	Mean	Standard Deviation
Physical Tests	Moisture	%	82.1	81.3	83.7	85.2	80.7	82.6	1.84	82.8	85.7	87.7	87.2	76.1	83.9	4.76	83.0	83.6	85.7	74.9	83.4	82.1	4.17
Total Metals	Total Aluminum (Al)	mg/kg dw	1,340	3,080	1,060	1,340	2,680	1,900	912.9	2,620	2,580	2,330	2,820	916.0	2,253	768	3,120	2,480	2,010	3,930	3,210	2,950	735
	Total Antimony (Sb)	mg/kg dw	0.0480	0.0780	0.0430	0.0390	0.0530	0.0522	0.0154	0.158	0.164	0.153	0.153	0.0900	0.144	0.0303	0.134	0.0880	0.0790	0.133	0.0910	0.105	0.0264
	Total Arsenic (As)	mg/kg dw	1.42	2.37	1.00	1.10	2.14	1.61	0.618	3.90	4.35	3.97	4.65	5.02	4.38	0.470	4.55	2.90	2.78	3.42	2.35	3.20	0.846
	Total Barium (Ba)	mg/kg dw	44.5	120	45.3	33.1	91.8	66.9	37.3	68.9	66.5	55.8	68.9	49.6	61.9	8.77	98.8	66.9	55.4	164	61.2	89.3	45.0
	Total Beryllium (Be)	mg/kg dw	0.0700	0.163	0.0660	0.0680	0.164	0.106	0.0523	0.141	0.136	0.112	0.112	0.0460	0.109	0.0379	0.114	0.0760	0.0670	0.135	0.0820	0.0948	0.0286
	Total Bismuth (Bi)	mg/kg dw	0.0110	0.0180	<0.01	<0.01	0.0110	0.0120	0.00343	0.0780	0.0880	0.0710	0.0840	0.0290	0.0700	0.0238	0.0270	0.0200	0.0170	0.0340	0.0200	0.0236	0.00688
	Total Boron (B)	mg/kg dw	1.00	1.60	<1	<1	1.80	1.28	0.427	1.10	1.10	1.20	<1	<1	1.08	0.0490	1.70	1.40	2.00	3.50	3.20	2.36	0.934
	Total Cadmium (Cd)	mg/kg dw	1.21	0.692	0.863	1.40	0.585	0.950	0.345	3.10	2.25	1.44	1.98	0.278	1.81	1.05	2.47	0.822	0.544	0.369	1.27	1.10	0.841
	Total Calcium (Ca)	mg/kg dw	2,250	2,290	1,930	3,570	4,140	2,836	962	4,040	3,440	3,630	3,500	1,080	3,138	1,174	3,580	3,130	2,710	2,960	3,960	3,268	500
	Total Cesium (Cs)	mg/kg dw	0.152	0.333	0.121	0.159	0.184	0.190	0.0831	0.426	0.451	0.379	0.492	0.150	0.380	0.135	0.265	0.210	0.178	0.295	0.568	0.303	0.155
	Total Chromium (Cr)	mg/kg dw	4.24	9.43	3.48	3.86	9.01	6.00	2.95	6.09	7.16	6.35	6.90	2.64	5.83	1.83	7.08	5.38	4.68	8.98	5.96	6.42	1.68
	Total Cobalt (Co)	mg/kg dw	1.74	3.19	1.26	2.06	3.69	2.39	1.02	3.82	3.59	2.68	3.25	1.14	2.90	1.07	2.58	1.88	1.70	3.61	2.24	2.40	0.755
	Total Copper (Cu)	mg/kg dw	27.7	24.5	19.4	36.3	25.2	26.6	6.19	66.1	62.1	32.6	51.2	22.1	46.8	19.0	19.4	19.1	19.9	41.7	25.0	25.0	9.63
	Total Iron (Fe)	mg/kg dw	2,240	4,960	1,920	2,210	5,170	3,300	1,618	4,360	4,100	4,180	4,410	1,670	3,744	1,166	5,520	4,400	3,700	7,370	4,710	5,140	1,407
	Total Lead (Pb)	mg/kg dw	0.607	1.12	0.519	0.553	0.827	0.725	0.251	2.10	2.00	2.00	1.79	0.734	1.72	0.565	1.52	1.08	1.02	1.62	1.19	1.29	0.269
	Total Lithium (Li)	mg/kg dw	1.04	2.19	0.730	0.900	2.06	1.38	0.687	1.88	1.72	1.66	2.10	0.610	1.59	0.576	2.60	1.91	1.55	2.95	2.19	2.24	0.553
	Total Magnesium (Mg)	mg/kg dw	1,900	2,860	1,770	2,030	3,250	2,362	654	2,510	2,450	2,520	2,760	1,710	2,390	398	2,330	1,880	1,820	2,770	2,000	2,160	394
	Total Manganese (Mn)	mg/kg dw	243	369	201	290	488	318	114	467	403	249	351	199	334	110	584	464	456	941.0	343	558	231
	Total Mercury (Hg)	mg/kg dw	0.0440	0.0420	0.0500	0.0420	0.0490	0.0454	0.00385	0.0600	0.0520	0.0460	0.0640	0.0460	0.0536	0.00817	0.0400	0.0220	0.0220	0.0350	0.0530	0.0344	0.0131
	Total Molybdenum (Mo)	mg/kg dw	0.653	0.590	0.525	0.688	0.506	0.592	0.0788	0.880	0.768	0.658	0.673	1.07	0.810	0.170	0.718	0.748	1.22	0.930	0.582	0.840	0.246
	Total Nickel (Ni)	mg/kg dw	3.60	8.23	2.95	3.17	6.63	4.92	2.38	6.44	7.62	5.82	6.65	3.16	5.94	1.68	6.89	4.80	5.03	10.1	5.06	6.38	2.24
	Total Phosphorus (P)	mg/kg dw	9,180	7,780	8,970	9,590	9,260	8,956	694	8,850	9,510	9,730	9,850	7,190	9,026	1,097	8,400	7,250	7,780	7,590	7,340	7,672	457
	Total Potassium (K)	mg/kg dw	7,970	10,500	7,660	7,370	9,520	8,604	1,346	7,760	8,850	8,900	9,220	7,520	8,450	758	8,690	6,470	9,010	12,500	7,270	8,788	2,319
	Total Rubidium (Rb)	mg/kg dw	5.55	5.79	3.88	6.89	4.77	5.38	1.13	10.0	8.48	7.53	9.31	4.69	8.00	2.07	4.73	3.82	3.66	4.21	3.85	4.05	0.428
	Total Selenium (Se)	mg/kg dw	4.11	2.31	3.65	5.08	2.93	3.62	1.07	3.40	3.81	2.76	3.29	0.980	2.85	1.11	3.71	1.76	1.78	3.22	4.94	3.08	1.35
	Total Sodium (Na)	mg/kg dw	3,110	2,720	3,180	3,190	2,830	3,006	217	3,370	3,540	3,340	3,520	2,760	3,306	318	3,840	2,400	4,770	2,980	3,760	3,550	903
	Total Strontium (Sr)	mg/kg dw	20.5	25.2	22.2	22.6	31.2	24.3	4.19	35.7	33.5	37.4	34.4	11.8	30.6	10.6	33.1	26.8	25.0	27.1	21.0	26.6	4.37
	Total Tellurium (Te)	mg/kg dw	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-
	Total Thallium (Tl)	mg/kg dw	0.0176	0.0227	0.0128	0.0218	0.0180	0.0186	0.00394	0.0590	0.0515	0.0390	0.0534	0.0130	0.0432	0.0184	0.0292	0.0213	0.0180	0.0297	0.0254	0.0247	0.00505
	Total Tin (Sn)	mg/kg dw	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	0.100	<0.1	<0.1	0.110	<0.1	0.102	0.00566	0.120	<0.1	<0.1	0.120	0.110	0.110	0.00600
	Total Uranium (U)	mg/kg dw	0.283	0.574	0.278	0.217	0.464	0.363	0.150	1.03	0.863	0.768	0.611	0.476	0.750	0.216	0.451	0.267	0.320	0.600	0.275	0.383	0.142
	Total Vanadium (V)	mg/kg dw	5.56	11.7	5.02	5.11	13.1	8.10	3.96	10.4	10.1	10.5	10.8	4.29	9.22	2.77	12.0	8.88	8.11	16.8	12.7	11.7	3.46
	Total Zinc (Zn)	mg/kg dw	162	178	170	151	178	168	11.5	212	154	174	210	120	174	38.9	135	116	91.0	198	88.7	126	44.7
	Total Zirconium (Zr)	mg/kg dw	1.44	3.10	1.34	1.26	2.05	1.84	0.771	2.74	2.44	2.27	2.18	0.730	2.07	0.780	2.45	1.90	1.83	2.71	2.58	2.29	0.403

Indicates benthic tissue concentration exceeding the higher reference mean by more than two times.

Indicates benthic tissue concentration exceeding the BCMOE interim selenium guideline for invertebrate tissue (4 µg/g dw; BCMOE 2014).

Notes: - = no data available. dw = dry weight.

APPENDIX D

PERIPHYTON COMMUNITY DATA

Tables

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APPENDIX D

PERIPHYTON COMMUNITY DATA

Tables

Table D.1: Periphyton Community Density (cells/cm^2) at Lower Wolverine Creek and Lower Minto Creek, Minto Mine AEMP, 2020

Sample Location		Lower Wolverine Creek (Reference)					Lower Minto Creek (Exposed)				
		LWC-1	LWC-2	LWC-3	LWC-4	LWC-5	LMC-1	LMC-2	LMC-3	LMC-4	LMC-5
		13-Sep-20	12-Sep-20	12-Sep-20	12-Sep-20	12-Sep-20	14-Sep-20	14-Sep-20	11-Sep-20	11-Sep-20	11-Sep-20
Group	**Genera and species**										
Cyanophyte	Anabaenopsis sp.	4,479	4,594	4,594	-	-	-	-	-	-	-
	Pseudanabaena sp.	-	-	-	-	-	724	-	-	-	-
	Gloeocapsa punctata	16,193	-	6,891	9,905	3,618	4,341	834	6,661	3,777	6,934
	Phormidium autumnale Agardh	517	8,326	861	12,059	1,034	241	250	402	497	43.1
	Heteroleibeinia profunda Komarek	28,252	18,088	18,949	5,383	6,891	241	2,862	6,891	1,193	646
	Chamaesiphon incrustans Smith	-	-	14,643	-	-	-	-	3,790	-	1,034
	Homoeothrix varians Komarek & Kalina	-	20,385	2,010	8,613	7,063	-	250	861	-	129
Chlorophyte	Ulothrix sp.	-	-	5,455	8,613	-	-	-	-	-	431
Diatoms	Gomphonema truncatum Ehrenberg	-	-	-	-	-	-	27.8	-	-	-
	Cymbella minuta Kutzing	172	1,148	-	215	172	-	-	-	-	-
	Rhoicosphenia curvata (Kutzing) Grunow	345	574	1,148	-	-	-	-	-	-	-
	Achnanthes minutissima Kutzing	-	287	-	646	-	172	250	-	464	560
	Nitzschia linearis W. Smith	517	-	287	-	-	103	83.4	57.4	1,126	86.1
	Encyonema silesiacum (Bleisch) D.G. Mann	517	1,148	-	1,077	1,895	34.5	27.8	-	33.1	172
	Nitzschia filiformis (W. Smith) Hustedt	-	-	-	-	-	-	-	115	431	86.1
	Diatoma vulgare Bory	18,260	68,045	73,500	59,862	-	3,101	3,140	2,125	497	43.1
	Navicula pupula Kutzing	517	-	-	-	-	-	-	-	-	-
	Neidium iridis (Ehrenberg) Cleve	-	-	-	-	-	103	-	-	-	-
	Gomphonema minutum	1,206	861	2,584	431	1,378	172	194	287	629	129
	Cocconies disculus Schum.	-	-	-	-	172	-	-	57.4	-	-
	Anomoenies vitrea Ross	-	-	574	1,077	172	103	111	115	530	258
	Navicula exigua (Greg.) Muller	-	-	-	-	53,402	-	27.8	-	166	86.1
	Fragilaria capucina Grunow	517	287	574	215	689	-	-	-	265	-
	Hannaea arcus Patrick	-	287	-	-	172	-	-	-	-	-
	Meridion circulare Agardh	-	-	-	-	-	68.9	-	-	-	-
Red Algae	Audouinella / Chantransia stage. Red alga	-	4,881	20,959	646	1,723	345	1,556	689	-	1,077

Notes: "-" = taxon not present; "sp." = species.

Table D.2: Periphyton Community Biomass (µg/cm^2) at Lower Wolverine Creek and Lower Minto Creek, Minto Mine AEMP, 2020

Sample Location		Lower Wolverine Creek (Reference)					Lower Minto Creek (Exposed)				
		LWC-1	LWC-2	LWC-3	LWC-4	LWC-5	LMC-1	LMC-2	LMC-3	LMC-4	LMC-5
		13-Sep-20	12-Sep-20	12-Sep-20	12-Sep-20	12-Sep-20	14-Sep-20	14-Sep-20	11-Sep-20	11-Sep-20	11-Sep-20
Group	**Genera and species**										
Cyanophyte	Anabaenopsis sp.	0.0367	0.0377	0.0377	-	-	-	-	-	-	-
	Pseudanabaena sp.	-	-	-	-	-	0.0153	-	-	-	-
	Gloeocapsa punctata	0.542	-	0.231	0.332	0.121	0.145	0.0279	0.223	0.127	0.232
	Phormidium autumnale Agardh	1.51	26.1	2.68	45.3	4.12	0.716	1.14	1.20	1.56	0.117
	Heteroleibeinia profunda Komarek	2.93	1.70	1.46	0.507	0.649	0.0273	0.243	0.715	0.101	0.0487
	Chamaesiphon incrustans Smith	-	-	0.526	-	-	-	-	0.122	-	0.0312
	Homoeothrix varians Komarek & Kalina	-	9.54	1.11	5.01	3.84	-	0.143	0.449	-	0.0556
Chlorophyte	Ulothrix sp.	-	-	6.85	6.02	-	-	-	-	-	0.173
Diatoms	Gomphonema truncatum Ehrenberg	-	-	-	-	-	-	0.0342	-	-	-
	Cymbella minuta Kutzing	0.0680	0.453	-	0.0861	0.0688	-	-	-	-	-
	Rhoicosphenia curvata (Kutzing) Grunow	0.162	0.269	0.539	-	-	-	-	-	-	-
	Achnanthes minutissima Kutzing	-	0.0191	-	0.0430	-	0.0115	0.0168	-	0.0311	0.0375
	Nitzschia linearis W. Smith	0.623	-	0.308	-	-	0.133	0.113	0.0683	1.53	0.117
	Encyonema silesiacum (Bleisch) D.G. Mann	0.609	1.35	-	1.27	2.23	0.0406	0.0327	-	0.0390	0.203
	Nitzschia filiformis (W. Smith) Hustedt	-	-	-	-	-	-	-	0.0108	0.0385	0.00751
	Diatoma vulgare Bory	4.30	16.0	18.1	14.1	-	0.760	0.740	0.521	0.117	0.0102
	Navicula pupula Kutzing	0.242	-	-	-	-	-	-	-	-	-
	Neidium iridis (Ehrenberg) Cleve	-	-	-	-	-	0.149	-	-	-	-
	Gomphonema minutum	0.284	0.203	0.609	0.101	0.312	0.0750	0.0847	0.125	0.160	0.0329
	Cocconies disculus Schum.	-	-	-	-	0.274	-	-	0.108	-	-
	Anomoenies vitrea Ross	-	-	0.189	0.355	0.0568	0.0341	0.0367	0.0379	0.175	0.0853
	Navicula exigua (Greg.) Muller	-	-	-	-	12.6	-	0.00978	-	0.0453	0.0195
	Fragilaria capucina Grunow	0.580	0.295	0.595	0.225	0.786	-	-	-	0.272	-
	Hannaea arcus Patrick	-	0.170	-	-	0.106	-	-	-	-	-
	Meridion circulare Agardh	-	-	-	-	-	0.114	-	-	-	-
Red Algae	Audouinella / Chantransia stage. Red alga	-	1.28	5.53	0.170	0.585	0.0870	0.829	0.337	-	0.282

Notes: "-" = taxon not present; "sp." = species.

Table D.3: Summary Statistics for Periphyton Density (cells/cm^2) at Lower Wolverine Creek and Lower Minto Creek Stations, Minto Mine AEMP, 2020

Sample Location		Lower Wolverine Creek (Reference)					Lower Minto Creek (Exposed)				
Group	**Genera and species**	**Mean**	**Median**	**Minimum**	**Maximum**	**Standard Deviation**	**Mean**	**Median**	**Minimum**	**Maximum**	**Standard Deviation**
Cyanophyte	Anabaenopsis sp.	4,555	4,594	4,479	4,594	66.3	-	-	-	-	-
	Pseudanabaena sp.	-	-	-	-	-	724	724	724	724	-
	Gloeocapsa punctata	9,152	8,398	3,618	16,193	5,351	4,509	4,341	834	6,934	2,479
	Phormidium autumnale Agardh	4,559	1,034	517	12,059	5,312	287	250	43.1	497	173
	Heteroleibeinia profunda Komarek	15,512	18,088	5,383	28,252	9,456	2,366	1,193	241	6,891	2,719
	Chamaesiphon incrustans Smith	14,643	14,643	14,643	14,643	-	2,412	2,412	1,034	3,790	-
	Homoeothrix varians Komarek & Kalina	9,518	7,838	2,010	20,385	7,774	414	250	129	861	392
Chlorophyte	Ulothrix sp.	7,034	7,034	5,455	8,613	-	431	431	431	431	-
Diatoms	Gomphonema truncatum Ehrenberg	-	-	-	-	-	27.8	27.8	27.8	27.8	-
	Cymbella minuta Kutzing	427	194	172	1,148	481	-	-	-	-	-
	Rhoicosphenia curvata (Kutzing) Grunow	689	574	345	1,148	414	-	-	-	-	-
	Achnanthes minutissima Kutzing	467	467	287	646	-	361	357	172	560	181
	Nitzschia linearis W. Smith	402	402	287	517	-	291	86.1	57.4	1,126	467
	Encyonema silesiacum (Bleisch) D.G. Mann	1,159	1,113	517	1,895	566	66.9	33.8	27.8	172	70.3
	Nitzschia filiformis (W. Smith) Hustedt	-	-	-	-	-	211	115	86.1	431	191
	Diatoma vulgare Bory	54,917	63,953	18,260	73,500	25,072	1,781	2,125	43.1	3,140	1,447
	Navicula pupula Kutzing	517	517	517	517	-	-	-	-	-	-
	Neidium iridis (Ehrenberg) Cleve	-	-	-	-	-	103	103	103	103	-
	Gomphonema minutum	1,292	1,206	431	2,584	808	283	194	129	629	202
	Cocconies disculus Schum.	172	172	172	172	-	57.4	57.4	57.4	57.4	-
	Anomoenies vitrea Ross	608	574	172	1,077	453	224	115	103	530	183
	Navicula exigua (Greg.) Muller	53,402	53,402	53,402	53,402	-	93.2	86.1	27.8	166	69.2
	Fragilaria capucina Grunow	457	517	215	689	199	265	265	265	265	-
	Hannaea arcus Patrick	230	230	172	287	-	-	-	-	-	-
	Meridion circulare Agardh	-	-	-	-	-	68.9	68.9	68.9	68.9	-
Red Algae	Audouinella / Chantransia stage. Red alga	7,052	3,302	646	20,959	9,444	917	883	345	1,556	521

Notes: "-" = taxon not present / summary stats could not be calculated; "sp." = species. Standard deviation was only calculated for when taxa were present in more than 2 samples (i.e., n > 2).

Table D.4: Summary Statistics for Periphyton Biomass (µg/cm^2) at Lower Wolverine Creek and Lower Minto Creek Stations, Minto Mine AEMP, 2020

Sample Location		Lower Wolverine Creek (Reference)					Lower Minto Creek (Exposed)				
Group	**Genera and species**	**Mean**	**Median**	**Minimum**	**Maximum**	**Standard Deviation**	**Mean**	**Median**	**Minimum**	**Maximum**	**Standard Deviation**
Cyanophyte	Anabaenopsis sp.	0.0374	0.0377	0.0367	0.0377	0.000543	-	-	-	-	-
	Pseudanabaena sp.	-	-	-	-	-	0.0153	0.0153	0.0153	0.0153	-
	Gloeocapsa punctata	0.307	0.281	0.121	0.542	0.179	0.151	0.145	0.0279	0.232	0.0831
	Phormidium autumnale Agardh	16.0	4.12	1.51	45.3	19.3	0.947	1.14	0.117	1.56	0.552
	Heteroleibeinia profunda Komarek	1.45	1.46	0.507	2.93	0.973	0.227	0.101	0.0273	0.715	0.285
	Chamaesiphon incrustans Smith	0.526	0.526	0.526	0.526	-	0.0766	0.0766	0.0312	0.122	-
	Homoeothrix varians Komarek & Kalina	4.87	4.42	1.11	9.54	3.51	0.216	0.143	0.0556	0.449	0.206
Chlorophyte	Ulothrix sp.	6.44	6.44	6.02	6.85	-	0.173	0.173	0.173	0.173	-
Diatoms	Gomphonema truncatum Ehrenberg	-	-	-	-	-	0.0342	0.0342	0.0342	0.0342	-
	Cymbella minuta Kutzing	0.169	0.0774	0.0680	0.453	0.190	-	-	-	-	-
	Rhoicosphenia curvata (Kutzing) Grunow	0.323	0.269	0.162	0.539	0.194	-	-	-	-	-
	Achnanthes minutissima Kutzing	0.0311	0.0311	0.0191	0.0430	-	0.0242	0.0239	0.0115	0.0375	0.0121
	Nitzschia linearis W. Smith	0.466	0.466	0.308	0.623	-	0.392	0.117	0.0683	1.53	0.636
	Encyonema silesiacum (Bleisch) D.G. Mann	1.37	1.31	0.609	2.23	0.667	0.0788	0.0398	0.0327	0.203	0.0828
	Nitzschia filiformis (W. Smith) Hustedt	-	-	-	-	-	0.0190	0.0108	0.00751	0.0385	0.0170
	Diatoma vulgare Bory	13.1	15.1	4.30	18.1	6.10	0.429	0.521	0.0102	0.760	0.349
	Navicula pupula Kutzing	0.242	0.242	0.242	0.242	-	-	-	-	-	-
	Neidium iridis (Ehrenberg) Cleve	-	-	-	-	-	0.149	0.149	0.149	0.149	-
	Gomphonema minutum	0.302	0.284	0.101	0.609	0.190	0.0956	0.0847	0.0329	0.160	0.0488
	Cocconies disculus Schum.	0.274	0.274	0.274	0.274	-	0.108	0.108	0.108	0.108	-
	Anomoenies vitrea Ross	0.200	0.189	0.0568	0.355	0.149	0.0738	0.0379	0.0341	0.175	0.0604
	Navicula exigua (Greg.) Muller	12.6	12.6	12.6	12.6	-	0.0248	0.0195	0.00978	0.0453	0.0183
	Fragilaria capucina Grunow	0.496	0.580	0.225	0.786	0.232	0.272	0.272	0.272	0.272	-
	Hannaea arcus Patrick	0.138	0.138	0.106	0.170	-	-	-	-	-	-
	Meridion circulare Agardh	-	-	-	-	-	0.114	0.114	0.114	0.114	-
Red Algae	Audouinella / Chantransia stage. Red alga	1.89	0.932	0.170	5.53	2.47	0.384	0.310	0.0870	0.829	0.316

Notes: "-" = taxon not present / summary stats could not be calculated; "sp." = species. Standard deviation was only calculated for when taxa were present in more than 2 samples (i.e., n > 2).

Table D.5: Presence/Absence of Periphyton Taxa at Lower Wolverine Creek and Lower Minto Creek, Minto Mine AEMP, 2020

Sample Location		Lower Wolverine Creek (Reference)					Lower Minto Creek (Exposed)				
		LWC-1	LWC-2	LWC-3	LWC-4	LWC-5	LMC-1	LMC-2	LMC-3	LMC-4	LMC-5
		13-Sep-20	12-Sep-20	12-Sep-20	12-Sep-20	12-Sep-20	14-Sep-20	14-Sep-20	11-Sep-20	11-Sep-20	11-Sep-20
Group	**Genera and species**										
Cyanophyte	Anabaenopsis sp.	1	1	1	0	0	0	0	0	0	0
	Pseudanabaena sp.	0	0	0	0	0	1	0	0	0	0
	Gloeocapsa punctata	1	0	1	1	1	1	1	1	1	1
	Phormidium autumnale Agardh	1	1	1	1	1	1	1	1	1	1
	Heteroleibeinia profunda Komarek	1	1	1	1	1	1	1	1	1	1
Chlorophyte	Chamaesiphon incrustans Smith	0	0	1	0	0	0	0	1	0	1
	Homoeothrix varians Komarek & Kalina	0	1	1	1	1	0	1	1	0	1
	Ulothrix sp.	0	0	1	1	0	0	0	0	0	1
Diatoms	Gomphonema truncatum Ehrenberg	0	0	0	0	0	0	1	0	0	0
	Cymbella minuta Kutzing	1	1	0	1	1	0	0	0	0	0
	Rhoicosphenia curvata (Kutzing) Grunow	1	1	1	0	0	0	0	0	0	0
	Achnanthes minutissima Kutzing	0	1	0	1	0	1	1	0	1	1
	Nitzschia linearis W. Smith	1	0	1	0	0	1	1	1	1	1
	Encyonema silesiacum (Bleisch) D.G. Mann	1	1	0	1	1	1	1	0	1	1
	Nitzschia filiformis (W. Smith) Hustedt	0	0	0	0	0	0	0	1	1	1
	Diatoma vulgare Bory	1	1	1	1	0	1	1	1	1	1
	Navicula pupula Kutzing	1	0	0	0	0	0	0	0	0	0
	Neidium iridis (Ehrenberg) Cleve	0	0	0	0	0	1	0	0	0	0
	Gomphonema minutum	1	1	1	1	1	1	1	1	1	1
	Cocconies disculus Schum.	0	0	0	0	1	0	0	1	0	0
	Anomoenies vitrea Ross	0	0	1	1	1	1	1	1	1	1
	Navicula exigua (Greg.) Muller	0	0	0	0	1	0	1	0	1	1
	Fragilaria capucina Grunow	1	1	1	1	1	0	0	0	1	0
	Hannaea arcus Patrick	0	1	0	0	1	0	0	0	0	0
	Meridion circulare Agardh	0	0	0	0	0	1	0	0	0	0
Red Algae	Audouinella / Chantransia stage. Red alga	0	1	1	1	1	1	1	1	0	1
	Total	**12**	**13**	**14**	**13**	**13**	**13**	**13**	**12**	**12**	**15**

Notes: 0 = taxa absent; 1 = taxa present; "sp." = species.

APPENDIX D

PERIPHYTON COMMUNITY DATA

Laboratory Reports

PERIPHYTON COMMUNITY ANALYSIS

PROVIDED BY:

PLANKTON R US INC.

(WINNIPEG, MB)

Epilithic algal biomass (µg/cm2) for **Minto WUL Monitoring 2020 - (Project 20-70)**
(for Pierre Stecko MinnowEnvironmental Inc.)

R = QAQC recount

Project	Location	Date	Cyanobacteria µg/cm^2	Chlorophyte µg/cm^2	Diatom µg/cm^2	Red Algae µg/cm^2	Total µg/cm^2
20-70	LMC - 1	14/Sep/20	0.904	0	1.32	0.0870	2.31
20-70	LMC - 2	14/Sep/20	1.55	0	1.07	0.829	3.45
20-70	LMC - 3	11/Sep/20	2.71	0	0.871	0.337	3.92
20-70	LMC - 4	11/Sep/20	1.79	0	2.41	0	4.19
20-70	LMC - 5	11/Sep/20	0.485	0.173	0.513	0.282	1.45
20-70	LWC - 1	13/Sep/20	5.01	0	6.87	0	11.9
20-70	LWC - 2	12/Sep/20	37.4	0	18.8	1.28	57.5
20-70	LWC - 2R	12/Sep/20	42.5	0	18.3	1.43	62.2
20-70	LWC - 3	12/Sep/20	6.05	6.85	20.3	5.53	38.8
20-70	LWC - 4	12/Sep/20	51.2	6.02	16.2	0.170	73.6
20-70	LWC - 5	12/Sep/20	8.73	0	16.4	0.584	25.7

Epilithic algal density (cells/cm2) for **Minto WUL Monitoring 2020 - (Project 20-70)**
(for Pierre Stecko Minnow Environmental Inc.)

R = QAQC recount

Project	Location	Date	Cyanobacteria cells/cm^2	Chlorophyte cells/cm^2	Diatom cells/cm^2	Red Algae cells/cm^2	Total cells/cm^2
20-70	LMC - 1	14/Sep/20	5,547	0	3,859	345	9,750
20-70	LMC - 2	14/Sep/20	4,195	0	3,862	1,556	9,614
20-70	LMC - 3	11/Sep/20	18,605	0	2,756	689	22,050
20-70	LMC - 4	11/Sep/20	5,466	0	4,141	0	9,607
20-70	LMC - 5	11/Sep/20	8,786	431	1,421	1,077	11,714
20-70	LWC - 1	13/Sep/20	49,440	0	22,050	0	71,490
20-70	LWC - 2	12/Sep/20	51,392	0	72,639	4,881	128,912
20-70	LWC - 2R	12/Sep/20	45,650	0	69,767	5,455	120,873
20-70	LWC - 3	12/Sep/20	47,947	5,455	78,668	20,959	153,029
20-70	LWC - 4	12/Sep/20	35,960	8,613	63,523	646	108,742
20-70	LWC - 5	12/Sep/20	18,605	0	58,053	1,723	78,381

Epilithic algal species data **for Minto WUL Monitoring 2020 - (Project 20-70)** (Pierre Stecko) Minnow Environmental Inc.)

**** 1st number in species code = group 1=cyanophyte 2=chlorophyte 5=diatoms 8= red algae**
**** total daily biomass is sum of all species on a date**

R = QAQC recount

Project	Location	Date	Species code	Species name	density cells/cm^2	biomass µg/cm^2	length µm	width µm	cell volume µm^3
20-70	LMC - 1	14/Sep/20	1077	Pseudanabaena sp.	724	0.0153	3.00	3.00	21.2
20-70	LMC - 1	14/Sep/20	1084	Gloeocapsa punctata	4,341	0.145	4.00	4.00	33.5
20-70	LMC - 1	14/Sep/20	1122	Phormidium autumnale Agardh	241	0.716	105	6.00	2,969
20-70	LMC - 1	14/Sep/20	1131	Heteroleibeinia profunda Komarek	241	0.0273	36.0	2.00	113
20-70	LMC - 1	14/Sep/20	5702	Achnanthes minutissima Kutzing	172	0.0115	16.0	4.00	67.0
20-70	LMC - 1	14/Sep/20	5768	Nitzschia linearis W. Smith	103	0.133	77.0	8.00	1,290
20-70	LMC - 1	14/Sep/20	5792	Neidium iridis (Ehrenberg) Cleve	103	0.149	55.0	10.0	1,440
20-70	LMC - 1	14/Sep/20	5836	Encyonema silesiacum (Bleisch) D.G. Mann	34.5	0.0406	30.0	10.0	1,178
20-70	LMC - 1	14/Sep/20	5860	Diatoma vulgare Bory	3,101	0.760	26.0	6.00	245
20-70	LMC - 1	14/Sep/20	5873	Gomphonema minutum	172	0.0750	26.0	8.00	436
20-70	LMC - 1	14/Sep/20	5882	Anomoenies vitrea Ross	103	0.0341	35.0	6.00	330
20-70	LMC - 1	14/Sep/20	5986	Meridion circulare Agardh	68.9	0.114	44.0	12.0	1,659
20-70	LMC - 1	14/Sep/20	8001	Audouinella / Chantransia stage. Red alga	345	0.0870	13.4	6.00	253
20-70	LMC - 2	14/Sep/20	1084	Gloeocapsa punctata	834	0.0279	4.00	4.00	33.5
20-70	LMC - 2	14/Sep/20	1122	Phormidium autumnale Agardh	250	1.14	161	6.00	4,552
20-70	LMC - 2	14/Sep/20	1131	Heteroleibeinia profunda Komarek	2,862	0.243	27.0	2.00	84.8
20-70	LMC - 2	14/Sep/20	1239	Homoeothrix varians Komarek & Kalina	250	0.143	76.0	3.10	574
20-70	LMC - 2	14/Sep/20	5460	Gomphonema truncatum Ehrenberg	27.8	0.0342	47.0	10.0	1,231
20-70	LMC - 2	14/Sep/20	5702	Achnanthes minutissima Kutzing	250	0.0168	16.0	4.00	67.0
20-70	LMC - 2	14/Sep/20	5768	Nitzschia linearis W. Smith	83.4	0.113	81.0	8.00	1,357
20-70	LMC - 2	14/Sep/20	5836	Encyonema silesiacum (Bleisch) D.G. Mann	27.8	0.0327	30.0	10.0	1,178
20-70	LMC - 2	14/Sep/20	5860	Diatoma vulgare Bory	3,140	0.740	25.0	6.00	236
20-70	LMC - 2	14/Sep/20	5873	Gomphonema minutum	194	0.0847	26.0	8.00	436
20-70	LMC - 2	14/Sep/20	5882	Anomoenies vitrea Ross	111	0.0367	35.0	6.00	330
20-70	LMC - 2	14/Sep/20	5910	Navicula exigua (Greg.) Muller	27.8	0.0098	21.0	8.00	352
20-70	LMC - 2	14/Sep/20	8001	Audouinella / Chantransia stage. Red alga	1,556	0.829	15.9	8.00	533
20-70	LMC - 3	11/Sep/20	1084	Gloeocapsa punctata	6,661	0.223	4.00	4.00	33.5
20-70	LMC - 3	11/Sep/20	1122	Phormidium autumnale Agardh	402	1.20	106	6.00	2,997
20-70	LMC - 3	11/Sep/20	1131	Heteroleibeinia profunda Komarek	6,891	0.715	33.0	2.00	104
20-70	LMC - 3	11/Sep/20	1223	Chamaesiphon incrustans Smith	3,790	0.122	6.40	3.10	32.2
20-70	LMC - 3	11/Sep/20	1239	Homoeothrix varians Komarek & Kalina	861	0.449	69.0	3.10	521
20-70	LMC - 3	11/Sep/20	5768	Nitzschia linearis W. Smith	57.4	0.0683	71.0	8.00	1,190
20-70	LMC - 3	11/Sep/20	5857	Nitzschia filiformis (W. Smith) Hustedt	115	0.0108	40.0	3.00	94.2
20-70	LMC - 3	11/Sep/20	5860	Diatoma vulgare Bory	2,125	0.521	26.0	6.00	245
20-70	LMC - 3	11/Sep/20	5873	Gomphonema minutum	287	0.125	26.0	8.00	436
20-70	LMC - 3	11/Sep/20	5875	Cocconies disculus Schum.	57.4	0.108	32.0	15.0	1,885
20-70	LMC - 3	11/Sep/20	5882	Anomoenies vitrea Ross	115	0.0379	35.0	6.00	330
20-70	LMC - 3	11/Sep/20	8001	Audouinella / Chantransia stage. Red alga	689	0.337	14.6	8.00	489
20-70	LMC - 4	11/Sep/20	1084	Gloeocapsa punctata	3,777	0.127	4.00	4.00	33.5
20-70	LMC - 4	11/Sep/20	1122	Phormidium autumnale Agardh	497	1.56	111	6.00	3,139
20-70	LMC - 4	11/Sep/20	1131	Heteroleibeinia profunda Komarek	1,193	0.101	27.0	2.00	84.8
20-70	LMC - 4	11/Sep/20	5702	Achnanthes minutissima Kutzing	464	0.0311	16.0	4.00	67.0
20-70	LMC - 4	11/Sep/20	5768	Nitzschia linearis W. Smith	1,126	1.53	81.0	8.00	1,357
20-70	LMC - 4	11/Sep/20	5836	Encyonema silesiacum (Bleisch) D.G. Mann	33.1	0.0390	30.0	10.0	1,178
20-70	LMC - 4	11/Sep/20	5857	Nitzschia filiformis (W. Smith) Hustedt	431	0.0385	38.0	3.00	89.5
20-70	LMC - 4	11/Sep/20	5860	Diatoma vulgare Bory	497	0.117	25.0	6.00	236
20-70	LMC - 4	11/Sep/20	5873	Gomphonema minutum	629	0.160	27.0	6.00	255
20-70	LMC - 4	11/Sep/20	5882	Anomoenies vitrea Ross	530	0.175	35.0	6.00	330
20-70	LMC - 4	11/Sep/20	5910	Navicula exigua (Greg.) Muller	166	0.0453	29.0	6.00	273
20-70	LMC - 4	11/Sep/20	5916	Fragilaria capucina Grunow	265	0.272	109	6.00	1,027
20-70	LMC - 5	11/Sep/20	1084	Gloeocapsa punctata	6,934	0.232	4.00	4.00	33.5
20-70	LMC - 5	11/Sep/20	1122	Phormidium autumnale Agardh	43.1	0.117	96.0	6.00	2,714
20-70	LMC - 5	11/Sep/20	1131	Heteroleibeinia profunda Komarek	646	0.0487	24.0	2.00	75.4
20-70	LMC - 5	11/Sep/20	1223	Chamaesiphon incrustans Smith	1,034	0.0312	6.40	3.00	30.2
20-70	LMC - 5	11/Sep/20	1239	Homoeothrix varians Komarek & Kalina	129	0.0556	57.0	3.10	430
20-70	LMC - 5	11/Sep/20	2226	Ulothrix sp.	431	0.173	14.2	6.00	402
20-70	LMC - 5	11/Sep/20	5702	Achnanthes minutissima Kutzing	560	0.0375	16.0	4.00	67.0
20-70	LMC - 5	11/Sep/20	5768	Nitzschia linearis W. Smith	86.1	0.117	81.0	8.00	1,357
20-70	LMC - 5	11/Sep/20	5836	Encyonema silesiacum (Bleisch) D.G. Mann	172	0.203	30.0	10.0	1,178
20-70	LMC - 5	11/Sep/20	5857	Nitzschia filiformis (W. Smith) Hustedt	86.1	0.0075	37.0	3.00	87.2
20-70	LMC - 5	11/Sep/20	5860	Diatoma vulgare Bory	43.1	0.0102	25.0	6.00	236
20-70	LMC - 5	11/Sep/20	5873	Gomphonema minutum	129	0.0329	27.0	6.00	255
20-70	LMC - 5	11/Sep/20	5882	Anomoenies vitrea Ross	258	0.0853	35.0	6.00	330
20-70	LMC - 5	11/Sep/20	5910	Navicula exigua (Greg.) Muller	86.1	0.0195	24.0	6.00	226
20-70	LMC - 5	11/Sep/20	8001	Audouinella / Chantransia stage. Red alga	1,077	0.282	13.9	6.00	262
20-70	LWC - 1	13/Sep/20	1070	Anabaenopsis sp.	4,479	0.0367	2.50	2.50	8.20
20-70	LWC - 1	13/Sep/20	1084	Gloeocapsa punctata	16,193	0.542	4.00	4.00	33.5
20-70	LWC - 1	13/Sep/20	1122	Phormidium autumnale Agardh	517	1.51	103	6.00	2,912
20-70	LWC - 1	13/Sep/20	1131	Heteroleibeinia profunda Komarek	28,252	2.93	33.0	2.00	104
20-70	LWC - 1	13/Sep/20	5311	Cymbella minuta Kutzing	172	0.0680	15.7	8.00	395
20-70	LWC - 1	13/Sep/20	5768	Nitzschia linearis W. Smith	517	0.623	72.0	8.00	1,206
20-70	LWC - 1	13/Sep/20	5784	Rhoicosphenia curvata (Kutzing) Grunow	345	0.162	28.0	8.00	469
20-70	LWC - 1	13/Sep/20	5836	Encyonema silesiacum (Bleisch) D.G. Mann	517	0.609	30.0	10.0	1,178
20-70	LWC - 1	13/Sep/20	5860	Diatoma vulgare Bory	18,260	4.30	25.0	6.00	236
20-70	LWC - 1	13/Sep/20	5873	Gomphonema minutum	1,206	0.284	25.0	6.00	236
20-70	LWC - 1	13/Sep/20	5887	Navicula pupula Kutzing	517	0.242	27.9	8.00	468
20-70	LWC - 1	13/Sep/20	5916	Fragilaria capucina Grunow	517	0.580	119	6.00	1,122
20-70	LWC - 2	12/Sep/20	1070	Anabaenopsis sp.	4,594	0.0377	2.50	2.50	8.20
20-70	LWC - 2	12/Sep/20	1122	Phormidium autumnale Agardh	8,326	26.1	111	6.00	3,139
20-70	LWC - 2	12/Sep/20	1131	Heteroleibeinia profunda Komarek	18,088	1.70	30.0	2.00	94.2
20-70	LWC - 2	12/Sep/20	1239	Homoeothrix varians Komarek & Kalina	20,385	9.54	62.0	3.10	468
20-70	LWC - 2	12/Sep/20	5311	Cymbella minuta Kutzing	1,148	0.453	15.7	8.00	395

Epilithic algal species data **for Minto WUL Monitoring 2020 - (Project 20-70)** (Pierre Stecko) Minnow Environmental Inc.)

**** 1st number in species code = group 1=cyanophyte 2=chlorophyte 5=diatoms 8= red algae**
**** total daily biomass is sum of all species on a date**

R = QAQC recount

Project	Location	Date	Species code	Species name	density cells/cm^2	biomass µg/cm^2	length µm	width µm	cell volume µm^3
20-70	LWC - 2	12/Sep/20	5702	Achnanthes minutissima Kutzing	287	0.0191	15.9	4.00	66.6
20-70	LWC - 2	12/Sep/20	5784	Rhoicosphenia curvata (Kutzing) Grunow	574	0.269	28.0	8.00	469
20-70	LWC - 2	12/Sep/20	5836	Encyonema silesiacum (Bleisch) D.G. Mann	1,148	1.35	30.0	10.0	1,178
20-70	LWC - 2	12/Sep/20	5860	Diatoma vulgare Bory	68,045	16.0	25.0	6.00	236
20-70	LWC - 2	12/Sep/20	5873	Gomphonema minutum	861	0.203	25.0	6.00	236
20-70	LWC - 2	12/Sep/20	5916	Fragilaria capucina Grunow	287	0.295	109	6.00	1,027
20-70	LWC - 2	12/Sep/20	5917	Hannaea arcus Patrick	287	0.170	63.0	6.00	594
20-70	LWC - 2	12/Sep/20	8001	Audouinella / Chantransia stage. Red alga	4,881	1.28	13.9	6.00	262
20-70	LWC - 2R	12/Sep/20	1122	Phormidium autumnale Agardh	9,762	30.6	111	6.00	3,139
20-70	LWC - 2R	12/Sep/20	1131	Heteroleibeinia profunda Komarek	13,207	1.24	30.0	2.00	94.2
20-70	LWC - 2R	12/Sep/20	1239	Homoeothrix varians Komarek & Kalina	22,682	10.6	62.0	3.10	468
20-70	LWC - 2R	12/Sep/20	5311	Cymbella minuta Kutzing	861	0.344	15.9	8.00	400
20-70	LWC - 2R	12/Sep/20	5702	Achnanthes minutissima Kutzing	287	0.0191	15.9	4.00	66.6
20-70	LWC - 2R	12/Sep/20	5768	Nitzschia linearis W. Smith	287	0.404	84.0	8.00	1,407
20-70	LWC - 2R	12/Sep/20	5784	Rhoicosphenia curvata (Kutzing) Grunow	1,723	0.808	28.0	8.00	469
20-70	LWC - 2R	12/Sep/20	5836	Encyonema silesiacum (Bleisch) D.G. Mann	574	0.676	30.0	10.0	1,178
20-70	LWC - 2R	12/Sep/20	5860	Diatoma vulgare Bory	63,451	14.9	25.0	6.00	236
20-70	LWC - 2R	12/Sep/20	5873	Gomphonema minutum	1,436	0.338	25.0	6.00	236
20-70	LWC - 2R	12/Sep/20	5887	Navicula pupula Kutzing	574	0.158	16.4	8.00	275
20-70	LWC - 2R	12/Sep/20	5916	Fragilaria capucina Grunow	574	0.590	109	6.00	1,027
20-70	LWC - 2R	12/Sep/20	8001	Audouinella / Chantransia stage. Red alga	5,455	1.43	13.9	6.00	262
20-70	LWC - 3	12/Sep/20	1070	Anabaenopsis sp.	4,594	0.0377	2.50	2.50	8.20
20-70	LWC - 3	12/Sep/20	1084	Gloeocapsa punctata	6,891	0.231	4.00	4.00	33.5
20-70	LWC - 3	12/Sep/20	1122	Phormidium autumnale Agardh	861	2.68	110	6.00	3,110
20-70	LWC - 3	12/Sep/20	1131	Heteroleibeinia profunda Komarek	18,949	1.46	24.6	2.00	77.3
20-70	LWC - 3	12/Sep/20	1223	Chamaesiphon incrustans Smith	14,643	0.526	6.70	3.20	35.9
20-70	LWC - 3	12/Sep/20	1239	Homoeothrix varians Komarek & Kalina	2,010	1.11	73.0	3.10	551
20-70	LWC - 3	12/Sep/20	2226	Ulothrix sp.	5,455	6.85	16.0	10.0	1,257
20-70	LWC - 3	12/Sep/20	5768	Nitzschia linearis W. Smith	287	0.308	64.0	8.00	1,072
20-70	LWC - 3	12/Sep/20	5784	Rhoicosphenia curvata (Kutzing) Grunow	1,148	0.539	28.0	8.00	469
20-70	LWC - 3	12/Sep/20	5860	Diatoma vulgare Bory	73,500	18.1	26.1	6.00	246
20-70	LWC - 3	12/Sep/20	5873	Gomphonema minutum	2,584	0.609	25.0	6.00	236
20-70	LWC - 3	12/Sep/20	5882	Anomoenies vitrea Ross	574	0.189	35.0	6.00	330
20-70	LWC - 3	12/Sep/20	5916	Fragilaria capucina Grunow	574	0.595	110	6.00	1,037
20-70	LWC - 3	12/Sep/20	8001	Audouinella / Chantransia stage. Red alga	20,959	5.53	14.0	6.00	264
20-70	LWC - 4	12/Sep/20	1084	Gloeocapsa punctata	9,905	0.332	4.00	4.00	33.5
20-70	LWC - 4	12/Sep/20	1122	Phormidium autumnale Agardh	12,059	45.3	133	6.00	3,761
20-70	LWC - 4	12/Sep/20	1131	Heteroleibeinia profunda Komarek	5,383	0.507	30.0	2.00	94.2
20-70	LWC - 4	12/Sep/20	1239	Homoeothrix varians Komarek & Kalina	8,613	5.01	77.0	3.10	581
20-70	LWC - 4	12/Sep/20	2226	Ulothrix sp.	8,613	6.02	13.9	8.00	699
20-70	LWC - 4	12/Sep/20	5311	Cymbella minuta Kutzing	215	0.0861	15.9	8.00	400
20-70	LWC - 4	12/Sep/20	5702	Achnanthes minutissima Kutzing	646	0.0430	15.9	4.00	66.6
20-70	LWC - 4	12/Sep/20	5836	Encyonema silesiacum (Bleisch) D.G. Mann	1,077	1.27	30.0	10.0	1,178
20-70	LWC - 4	12/Sep/20	5860	Diatoma vulgare Bory	59,862	14.1	25.0	6.00	236
20-70	LWC - 4	12/Sep/20	5873	Gomphonema minutum	431	0.101	25.0	6.00	236
20-70	LWC - 4	12/Sep/20	5882	Anomoenies vitrea Ross	1,077	0.355	35.0	6.00	330
20-70	LWC - 4	12/Sep/20	5916	Fragilaria capucina Grunow	215	0.225	111	6.00	1,046
20-70	LWC - 4	12/Sep/20	8001	Audouinella / Chantransia stage. Red alga	646	0.170	14.0	6.00	264
20-70	LWC - 5	12/Sep/20	1084	Gloeocapsa punctata	3,618	0.121	4.00	4.00	33.5
20-70	LWC - 5	12/Sep/20	1122	Phormidium autumnale Agardh	1,034	4.12	141	6.00	3,987
20-70	LWC - 5	12/Sep/20	1131	Heteroleibeinia profunda Komarek	6,891	0.649	30.0	2.00	94.2
20-70	LWC - 5	12/Sep/20	1239	Homoeothrix varians Komarek & Kalina	7,063	3.84	72.0	3.10	543
20-70	LWC - 5	12/Sep/20	5311	Cymbella minuta Kutzing	172	0.0688	15.9	8.00	400
20-70	LWC - 5	12/Sep/20	5836	Encyonema silesiacum (Bleisch) D.G. Mann	1,895	2.23	30.0	10.0	1,178
20-70	LWC - 5	12/Sep/20	5873	Gomphonema minutum	1,378	0.312	24.0	6.00	226
20-70	LWC - 5	12/Sep/20	5875	Cocconies disculus Schum.	172	0.274	31.0	14.0	1,591
20-70	LWC - 5	12/Sep/20	5882	Anomoenies vitrea Ross	172	0.0568	35.0	6.00	330
20-70	LWC - 5	12/Sep/20	5910	Navicula exigua (Greg.) Muller	53,402	12.6	25.0	6.00	236
20-70	LWC - 5	12/Sep/20	5916	Fragilaria capucina Grunow	689	0.786	121	6.00	1,140
20-70	LWC - 5	12/Sep/20	5917	Hannaea arcus Patrick	172	0.106	65.0	6.00	613
20-70	LWC - 5	12/Sep/20	8001	Audouinella / Chantransia stage. Red alga	1,723	0.585	18.0	6.00	339

APPENDIX E

BENTHIC INVERTEBRATE COMMUNITY DATA

Figures and Tables

Laboratory Reports

APPENDIX E

BENTHIC INVERTEBRATE COMMUNITY DATA

Figures and Tables

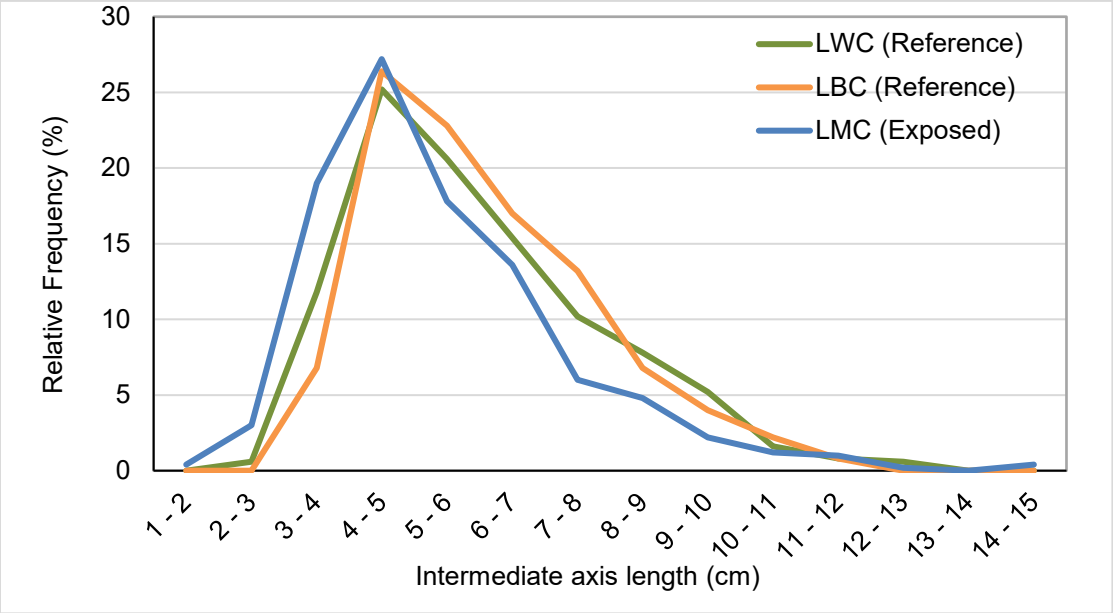


Figure E.1: Intermediate Axis Length of 100 Rocks Measured at Five Benthic Stations in Lower Wolverine Creek, Lower Big Creek, and Lower Minto Creek, Minto Mine, 2020

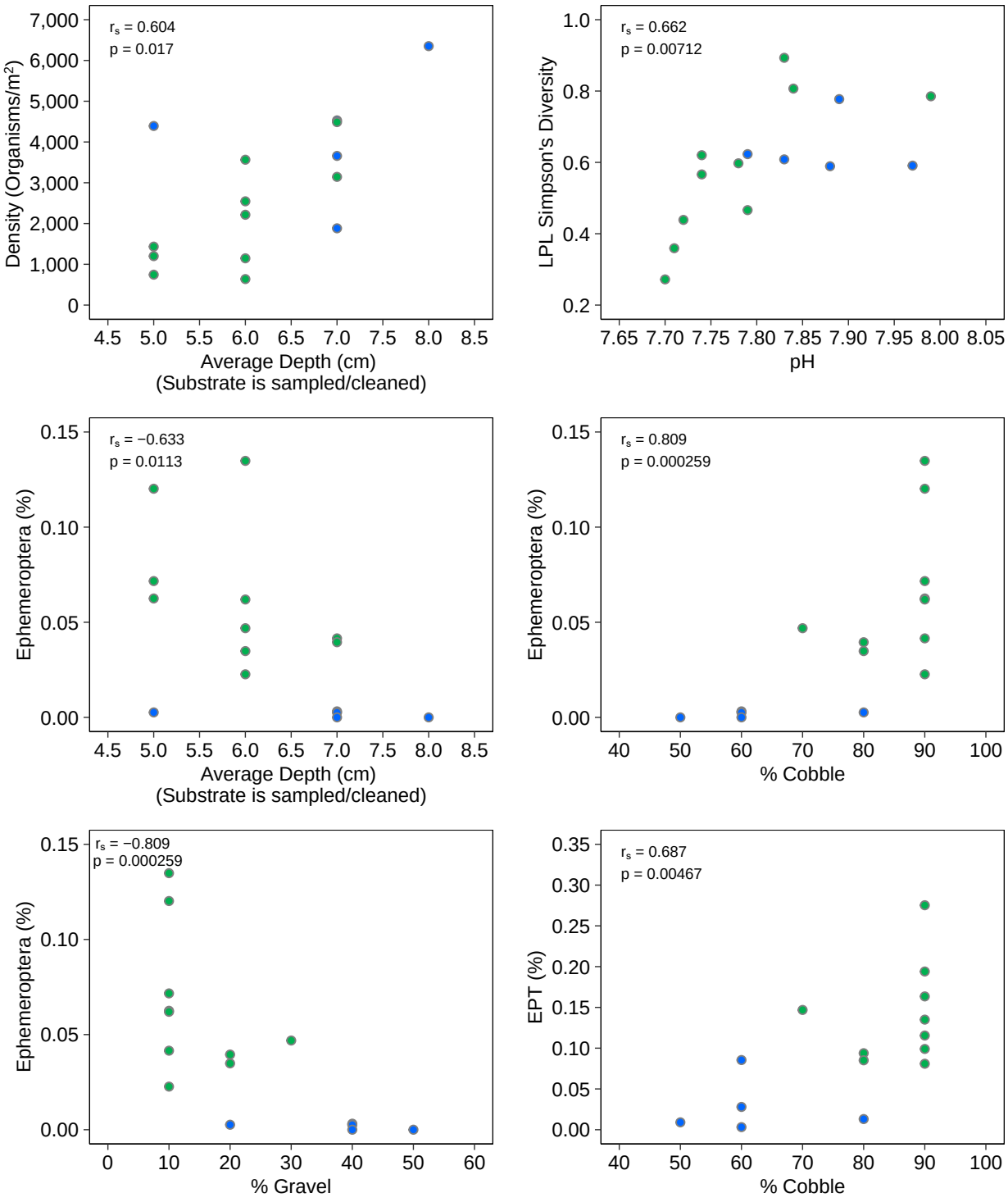


Figure E.2: Correlations between Selected Benthic Invertebrate Environmental Measurements and Biological Endpoints, Minto Mine, 2020

Notes: Green dots represent reference stations (LWC, LBC) and blue dots represent the mine−exposed station, LMC. EPT = Ephemeroptera, Plecoptera, Trichoptera. Correlations that were significantly different (p−value < 0.05) and strongly correlated between environmental measures and biological endpoints (r_s >= 0.6 or <= −0.6) were presented.

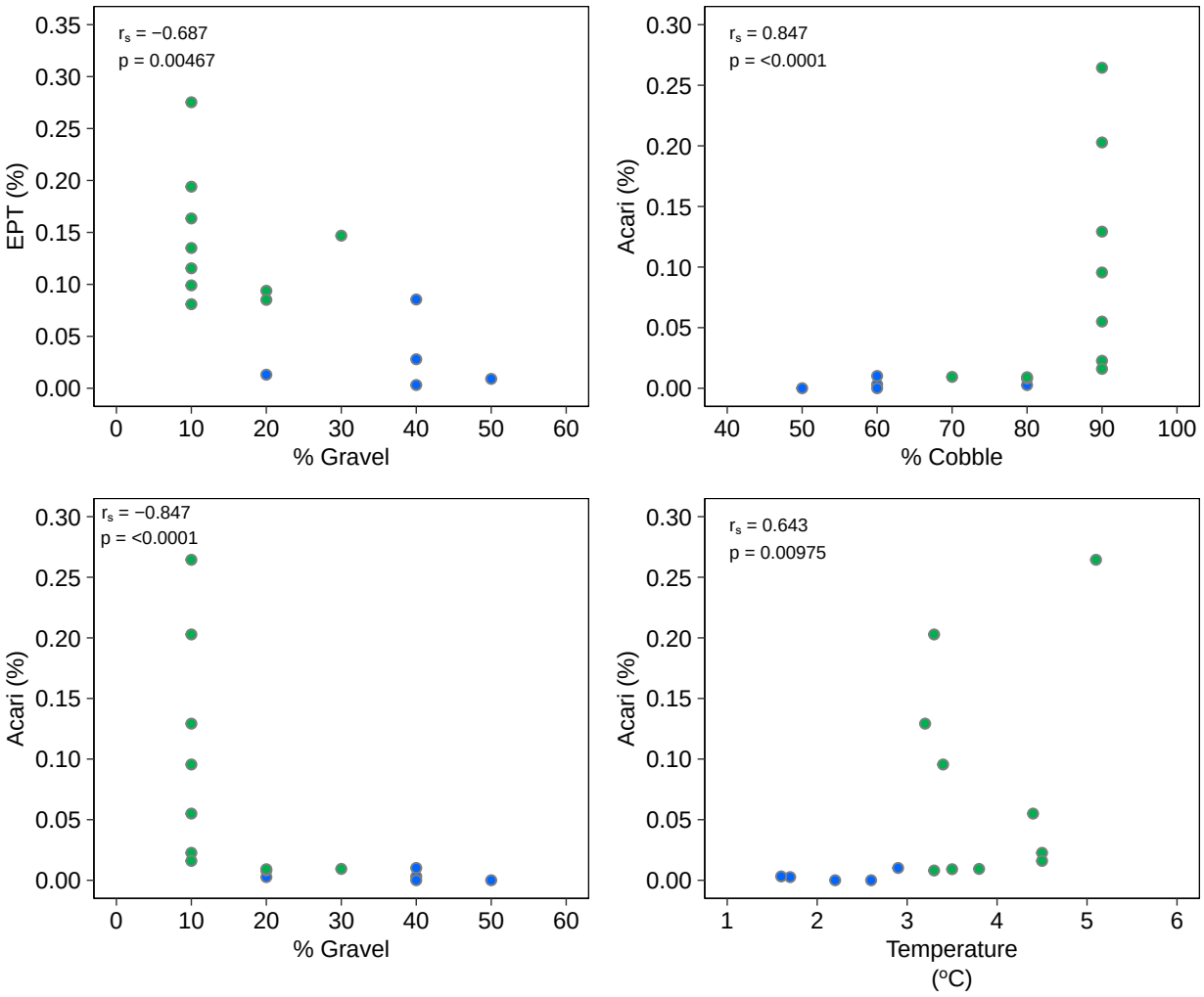


Figure E.2: Correlations between Selected Benthic Invertebrate Environmental Measurements and Biological Endpoints, Minto Mine, 2020

Notes: Green dots represent reference stations (LWC, LBC) and blue dots represent the mine−exposed station, LMC. EPT = Ephemeroptera, Plecoptera, Trichoptera. Correlations that were significantly different (p−value < 0.05) and strongly correlated between environmental measures and biological endpoints (r_s >= 0.6 or <= −0.6) were presented.

Table E.1: Benthic Invertebrates (Organisms per Sample) Collected by Surber Sampler (500 µm Sieve), Minto Mine AEMP, 2020

Invertebrate	Lower Wolverine Creek (Reference)					Lower Big Creek (Reference)					Lower Minto Creek (Exposed)				
	LWC-1	LWC-2	LWC-3	LWC-4	LWC-5	LBC-1	LBC-2	LBC-3	LBC-4	LBC-5	LMC-1	LMC-2	LMC-3	LMC-4	LMC-5
Phylum: Arthropoda	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Order: Collembola	-	-	-	-	-	-	-	-	-	-	6	-	-	3	16
Subphylum: Hexapoda	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Class: Insecta	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Order: Ephemeroptera	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Family: Ameletidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ameletus	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Family: Baetidae	3	-	12	-	3	5	1	5	1	6	-	-	-	-	-
Acentrella	-	-	-	1	3	3	3	2	3	6	-	-	-	-	-
Baetis	3	2	4	5	5	2	5	1	4	16	-	4	1	-	-
Baetis rhodani group	-	4	-	-	-	-	1	-	-	-	3	-	-	-	-
Family: Ephemerellidae	-	2	8	2	3	2	8	5	3	4	-	-	-	-	-
Drunella	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Drunella grandis group	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
Drunella doddsii	-	-	-	-	3	-	-	-	-	4	-	-	-	-	-
Drunella spinifera	-	-	-	-	-	-	-	2	-	6	-	-	-	-	-
Ephemerella	-	-	-	-	-	6	3	-	1	-	-	-	-	-	-
Ephemerella tibialis	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Family: Heptageniidae	13	6	28	6	19	2	4	9	6	2	-	-	-	-	-
Cinygmula	8	-	-	1	-	4	-	-	3	-	-	-	-	-	-
Order: Plecoptera	-	2	-	-	-	-	-	1	-	-	-	-	-	-	-
Family: Capniidae	5	4	-	8	3	3	13	28	8	20	-	-	-	-	4
Family: Chloroperlidae	5	2	-	8	-	1	1	-	-	-	-	-	-	-	-
Haploperla	-	-	-	-	-	2	-	1	-	-	-	-	-	-	-
Suwallia	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-
Sweltsa	3	-	-	-	-	-	1	10	8	6	-	-	-	-	-
Family: Leuctridae	-	4	-	-	-	-	1	-	-	-	-	-	3	-	-
Family: Nemouridae	5	2	-	-	-	-	3	-	-	-	3	12	5	-	4
Nemoura	-	-	-	-	-	-	-	-	-	-	10	-	-	-	-
Ostrocerca	-	-	-	-	-	-	-	-	-	-	-	56	1	3	8
Zapada	-	-	4	2	5	-	-	-	-	-	-	-	-	-	-
Zapada cinctipes	5	2	8	-	-	-	-	-	1	-	-	-	-	-	-
Zapada columbiana	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Family: Perlodidae	5	4	24	7	5	3	2	-	5	-	-	-	-	-	-
Isoperla	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Kogotus	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-
Rickera sorpta	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-
Order: Trichoptera	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-
Family: Brachycentridae	-	-	-	-	-	-	1	-	-	2	-	-	-	-	-
Brachycentrus americanus	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Family: Glossosomatidae	8	-	12	-	5	-	-	-	-	-	-	-	-	-	-
Glossosoma	13	4	4	3	8	-	-	-	1	-	-	-	-	-	-

Notes: Dash represents zero taxa or no taxa identified to that taxonomic level.

Table E.1: Benthic Invertebrates (Organisms per Sample) Collected by Surber Sampler (500 µm Sieve), Minto Mine AEMP, 2020

Invertebrate	Lower Wolverine Creek (Reference)					Lower Big Creek (Reference)					Lower Minto Creek (Exposed)				
	LWC-1	LWC-2	LWC-3	LWC-4	LWC-5	LBC-1	LBC-2	LBC-3	LBC-4	LBC-5	LMC-1	LMC-2	LMC-3	LMC-4	LMC-5
Family: Lepidostomatidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lepidostoma	-	-	-	-	3	-	-	-	-	6	-	-	-	-	-
Family: Limnephilidae	-	4	4	2	-	-	7	-	2	-	-	36	3	-	-
Limnephilus	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Family: Rhyacophilidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rhyacophila	-	2	-	1	-	-	-	1	-	-	-	-	-	-	-
Rhyacophila brunnea / vemna group	5	4	12	1	5	-	-	-	-	-	-	-	-	-	-
Order: Coleoptera	-	-	-	-	-	-	-	-	-	-	6	-	1	-	-
Family: Curculionidae	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Family: Hydrophilidae	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
Enochrus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
Order: Diptera	-	4	4	-	-	1	-	-	-	-	-	4	-	-	-
Family: Ceratopogonidae	-	-	-	-	-	-	-	1	1	-	-	-	1	-	-
Dasyhelea	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
Family: Chironomidae	19	72	-	4	13	15	37	7	9	20	6	16	31	32	16
Subfamily: Chironominae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tribe: Chironomini	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phaenopsectra	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
Tribe: Tanytarsini	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Micropsectra	-	2	-	-	5	-	-	-	-	-	-	8	19	22	16
Rheotanytarsus	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Subfamily: Diamesinae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tribe: Diamesini	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diamesa	5	4	16	8	5	3	7	14	6	4	16	-	1	6	4
Pagastia	3	-	-	-	-	-	-	-	-	2	-	-	-	3	-
Pseudodiamesa	-	-	-	-	-	-	-	-	-	-	3	4	1	-	-
Subfamily: Orthocladiinae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cardiocladius	-	-	-	-	-	-	-	-	-	-	3	4	-	10	40
Eukiefferiella	8	4	4	5	3	3	1	-	5	-	714	752	203	554	1076
Heterotrissocladius	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Hydrobaenus	-	2	-	-	-	-	-	-	-	-	-	4	75	6	36
Hydrosmittia	-	-	-	-	-	-	3	-	-	8	-	-	-	-	-
Limnophyes	-	-	-	-	-	1	-	-	-	-	6	32	33	67	52
Metriocnemus	-	-	-	-	-	1	1	-	-	2	-	8	8	6	8
Orthocladius complex	829	420	920	204	432	14	256	195	65	262	96	108	39	224	216
Parametriocnemus	-	-	-	-	-	-	-	-	-	-	22	8	-	-	-
Rheocricotopus	3	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Tvetenia	-	-	-	-	-	1	2	1	1	6	-	-	4	-	4
Family: Empididae	-	4	-	-	-	1	-	1	-	18	-	-	1	3	4
Clinocerinae Unknown Genus A	-	14	-	3	-	-	-	-	-	-	-	-	-	-	-
Neoplasta	-	2	-	-	-	2	1	1	-	18	-	-	-	-	-
Family: Ephydridae	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-

Notes: Dash represents zero taxa or no taxa identified to that taxonomic level.

Table E.1: Benthic Invertebrates (Organisms per Sample) Collected by Surber Sampler (500 µm Sieve), Minto Mine AEMP, 2020

Invertebrate	Lower Wolverine Creek (Reference)					Lower Big Creek (Reference)					Lower Minto Creek (Exposed)				
	LWC-1	LWC-2	LWC-3	LWC-4	LWC-5	LBC-1	LBC-2	LBC-3	LBC-4	LBC-5	LMC-1	LMC-2	LMC-3	LMC-4	LMC-5
Family: Muscidae	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
Limnophora	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Family: Psychodidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pericoma / Telmatoscopus	-	-	-	-	-	-	-	-	-	-	-	4	1	-	-
Family: Simuliidae	-	2	-	3	3	8	8	-	5	16	-	-	4	-	-
Prosimulium / Helodon	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Simulium	3	2	-	2	-	22	1	7	6	2	-	4	3	-	8
Family: Tipulidae	-	4	4	8	-	-	-	-	-	-	-	-	-	-	-
Dicranota	-	4	8	7	-	3	-	2	-	2	16	28	5	3	8
Rhabdomastix	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Tipula	-	-	-	-	-	-	-	-	-	-	-	-	3	-	4
Order: Hemiptera	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
Family: Mesoveliidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mesovelia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
Order: Lepidoptera	-	-	-	-	-	1	-	-	-	-	-	4	-	-	-
Subphylum: Chelicerata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Class: Arachnida	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Order: Trombidiformes	-	-	-	-	-	-	-	1	-	-	-	4	1	-	-
Family: Hygrobatidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Atractides	3	-	-	-	3	13	2	3	1	20	-	-	-	-	-
Hygrobates	-	-	-	-	-	5	2	1	1	12	-	-	-	-	-
Family: Lebertiidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lebertia	5	14	20	3	5	30	13	24	18	104	-	-	-	-	-
Family: Sperchontidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sperchon	-	-	-	-	-	6	3	3	2	8	-	-	-	-	-
Order: Acari	-	-	-	-	-	1	-	-	1	-	-	-	1	-	-
Order: Sarcoptiformes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Order: Oribatida	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Family: Hydrozetidae	-	-	-	-	-	-	1	-	-	-	3	-	3	-	-
Phylum: Mollusca	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Class: Gastropoda	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Phylum: Annelida	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Subphylum: Clitellata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Class: Oligochaeta	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Order: Lumbriculida	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Family: Lumbriculidae	-	4	152	25	333	42	4	8	5	124	16	112	53	-	12
Rhynchelmis	-	-	-	-	-	-	-	-	-	-	-	4	3	-	-
Order: Tubificida	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Family: Enchytraeidae	-	-	-	-	-	-	-	-	-	-	294	44	-	-	-
Family: Naididae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Subfamily: Tubificinae with hair chaetae	-	-	-	-	-	-	-	-	-	-	-	-	3	3	-
Subfamily: Tubificinae without hair chaetae	21	10	-	-	-	-	-	-	-	-	-	-	11	64	228
Totals	**994**	**618**	**1,252**	**320**	**878**	**208**	**400**	**335**	**178**	**710**	**1,223**	**1,264**	**524**	**1,018**	**1,772**

Notes: Dash represents zero taxa or no taxa identified to that taxonomic level.

Table E.2: Benthic Invertebrate Community Metrics by Station for Samples Collected by Surber Sampler, Minto Mine, 2020

Area	Station	Density (organisms/m^2)	LPL Richness	LPL Simpson's Diversity	LPL Simpson's Evenness	Ephemeroptera (%)	Plecoptera (%)	Trichoptera (%)	EPT (%)	Chironomids (%)	Oligochaeta (%)	Acari (%)	CA Axis-1 (47.5%)	CA Axis-2 (15.6%)
Lower Wolverine Creek (Reference)	LWC-1	3,565	20	0.272	0.0687	3.49	3.22	2.68	9.38	87.1	2.14	0.804	-0.862	-1.09
	LWC-2	2,215	25	0.359	0.0624	2.27	3.24	2.59	8.09	82.2	2.27	2.27	-0.380	-0.802
	LWC-3	4,487	15	0.439	0.119	4.15	3.19	2.56	9.90	75.4	12.1	1.60	-0.834	-1.67
	LWC-4	1,147	21	0.566	0.110	4.69	7.81	2.19	14.7	69.4	7.81	0.938	-0.762	-0.605
	LWC-5	3,145	21	0.597	0.118	3.95	2.13	2.43	8.51	52.3	38.0	0.912	-0.793	-1.05
Lower Big Creek (Reference)	LBC-1	746	25	0.893	0.374	12.0	4.33	0	16.3	18.5	20.2	26.4	-0.499	1.28
	LBC-2	1,434	28	0.466	0.0669	6.25	5.25	2.00	13.5	77.0	1.00	5.50	-0.609	1.15
	LBC-3	1,201	22	0.620	0.120	7.16	11.9	0.299	19.4	65.1	2.39	9.55	-0.859	1.46
	LBC-4	638	26	0.807	0.199	13.5	12.4	1.69	27.5	49.4	2.81	12.9	-0.922	0.249
	LBC-5	2,545	25	0.785	0.186	6.20	3.94	1.41	11.5	42.8	17.5	20.3	-0.670	1.88
Lower Minto Creek (Exposed)	LMC-1	4,393	15	0.591	0.163	0.261	1.04	0	1.31	70.8	25.3	0.261	1.18	-0.583
	LMC-2	4,530	20	0.608	0.128	0.316	5.38	2.85	8.54	75.0	12.7	0.316	1.03	0.252
	LMC-3	1,883	26	0.777	0.173	0.254	1.78	0.761	2.79	78.7	13.2	1.02	1.15	0.207
	LMC-4	3,659	17	0.623	0.156	0	0.313	0	0.313	91.2	6.58	0	1.75	-0.248
	LMC-5	6,351	20	0.589	0.122	0	0.903	0	0.903	82.8	13.5	0	1.53	0.0279

Notes: LPL = lowest practicable level. EPT = Ephemeroptera, Plecoptera, Trichoptera.

[a] Calculated as recommended by Environment Canada 2012.

Table E.3: Statistical Comparisons of Benthic Invertebrate Community Characteristics Among Areas, Minto Mine AEMP, 2020

Endpoint	Overall 3-group Comparison			Post-hoc comparisons[b]			Magnitude of Difference (Group 1 - Group 2) /Pooled SD
	Data Transformation	Test[a]	Test p-value	Groups		Test P-value	
				Group 1	Group 2		
Density (organisms/m^2)	none	ANOVA	0.013	LMC	LWC	0.145	0.98
					LBC	0.004	3.7
				LBC	LWC	0.069	-1.2
LPL Richness (# of Taxa)	none	ANOVA	0.048	LMC	LWC	0.717	-0.22
					LBC	0.023	-2.6
				LBC	LWC	0.046	1.3
LPL Simpson's Diversity	none	ANOVA	0.023	LMC	LWC	0.044	1.4
					LBC	0.385	-0.45
				LBC	LWC	0.008	2.0
LPL Simpson's Evenness	log10	ANOVA	0.118	LMC	LWC	-	-
					LBC	-	-
				LBC	LWC	-	-
Ephemeroptera (%)	log10(x+1)	ANOVA	<0.001	LMC	LWC	0.013	-3.9
					LBC	<0.001	-2.7
				LBC	LWC	0.001	5.6
Plecoptera (%)	log10	ANOVA	0.011	LMC	LWC	0.042	-2.2
					LBC	0.003	-3.0
				LBC	LWC	0.196	1.3
Trichoptera (%)	log10(x+1)	ANOVA	0.019	LMC	LWC	0.008	-9.4
					LBC	0.530	-0.41
				LBC	LWC	0.027	-7.5
EPT (%)	none	ANOVA	<0.001	LMC	LWC	0.021	-2.8
					LBC	<0.001	-2.4
				LBC	LWC	0.018	2.8
Chironomidae (%)	none	ANOVA	0.031	LMC	LWC	0.531	0.48
					LBC	0.013	1.3
				LBC	LWC	0.042	-1.7
Oligochaeta (%)	log10	ANOVA	0.352	LMC	LWC	-	-
					LBC	-	-
				LBC	LWC	-	-
Acari (%)	rank	K-W	0.004	LMC	LWC	0.179	-3.4
					LBC	<0.001	-1.2
				LBC	LWC	0.048	61
CA1 (47.5%)	none	ANOVA	<0.001	LMC	LWC	<0.001	10
					LBC	<0.001	12
				LBC	LWC	0.923	0.074
CA2 (15.6%)	none	ANOVA	<0.001	LMC	LWC	0.006	2.4
					LBC	<0.001	-2.1
				LBC	LWC	<0.001	5.6

Notes: Magnitude of Difference = (group 1 mean - group 2 mean)/pooled standard deviation. Test p-values and MODs are only displayed for endpoints that had a 3 group comparison p-value < 0.1. EPT = Ephemeroptera, Plecoptera, Trichoptera.

P-value < 0.1

P-value < 0.1 and MOD < -2

P-value < 0.1 and MOD > 2

[a] ANOVA = Analysis of Variance; K-W = Kruskal-Wallis.

[b] Pairwise comparisions calculated using Least-squares means with Tukey's adjustment for multiple comparisions for ANOVAs and Dunn's Test with no adjustment for K-W.

Table E.4: Correspondence Analysis (CA) Axis Station Scores Using Benthic Invertebrate Abundances at the Lowest Practical Level of Taxonomic Resolution, Minto Mine, 2020

Area	Exposure	Replicate	CA1 (47.5%)	CA2 (15.6%)
Lower Wolverine Creek (LWC)	Reference	1	-0.862	-1.09
		2	-0.380	-0.802
		3	-0.834	-1.67
		4	-0.762	-0.605
		5	-0.793	-1.05
Lower Big Creek (LBC)	Reference	1	-0.499	1.28
		2	-0.609	1.15
		3	-0.859	1.46
		4	-0.922	0.249
		5	-0.670	1.88
Lower Minto Creek (LMC)	Exposed	1	1.18	-0.583
		2	1.03	0.252
		3	1.15	0.207
		4	1.75	-0.248
		5	1.53	0.0279

Table E.5: Taxon Scores of Benthic Invertebrate Correspondence Analysis (CA) of Taxa Relative Densities, Minto Mine, 2020

Order or Higher	Family	Taxa	CA1 (47.5%)	CA2 (15.6%)
Collembola	-	-	1.47	-0.242
Oligochaeta	Lumbriculidae	-	-0.105	0.0696
	Naididae	*Tubificinae*	0.802	-0.333
Acari	Hygrobatidae	*Atractides*	-0.713	0.758
	Lebertiidae	*Lebertia*	-0.520	0.271
Diptera	Chironomidae	*Cardiocladius*	1.43	-0.111
		Diamesa	-0.160	-0.0196
		Eukiefferiella	0.587	-0.188
		Hydrobaenus	1.15	-0.0315
		Limnophyes	1.22	0.0640
		Metriocnemus	0.778	0.484
		Micropsectra	0.895	-0.196
		Orthocladius complex	-0.0857	-0.0482
	Empididae	*Neoplasta*	0.125	0.745
	Simuliidae	*Simulium*	-0.229	0.410
Diptera	Tipulidae	*Dicranota*	0.301	-0.0682
Coleoptera	Hydrophilidae	-	1.41	-0.200
Ephemeroptera	Baetidae	*Baetis*	-0.387	0.0313
	Ephemerellidae	*Ephemerella*	-0.703	0.335
		-	-0.714	0.234
	Heptageniidae	Heptageniidae	-0.738	-0.125
Plecoptera	Capniidae	-	-0.531	0.403
	Nemouridae	*Ostrocerca*	1.04	0.250
	Perlodidae	-	-0.726	-0.492
	Chloroperlidae	*Sweltsa*	-0.752	0.325
	Nemouridae	*Zapada cinctipes*	-0.755	-0.984
Trichoptera	Glossosomatidae	-	-0.765	-0.996
	Limnephilidae	-	-0.0326	-0.0951
	Rhyacophilidae	*Rhyacophila brunnea/vemna* group	-0.735	-1.13

Note: "-" = no further taxonomic resolution.

Table E.6: Intermediate Axis Length and Embeddedness of 100 Cobble Washed at Benthic Invertebrate Sampling Stations, Minto Mine, September 2020

Cobble Number	LWC-1		LWC-2		LWC-3		LWC-4	
	Intermediate Axis Length (cm)	Embeddedness (%)	Intermediate Axis Length (cm)	Embeddedness (%)	Intermediate Axis Length (cm)	Embeddedness (%)	Intermediate Axis Length (cm)	Embeddedness (%)
1	6.1		6.7		7.9		8.2	
2	14.4		6.8		8.4		7.2	
3	7.4		5.4		7.2		8.0	
4	3.5		6.4		5.6		11.0	
5	2.9		2.7		10.1		6.5	
6	5.7		5.2		4.2		7.0	
7	4.8		2.4		8.1		4.5	
8	6.3		4.3		4.1		5.5	
9	3.4		5.1		7.2		8.5	
10	4.1	25	5.3	50	5.1	25	5.0	25
11	4.7		3.1		6.5		5.7	
12	4.9		4.4		5.3		6.1	
13	4.2		3.7		4.6		4.5	
14	2.7		4.2		5.8		3.0	
15	4.0		4.4		6.6		6.0	
16	4.0		4.0		5.7		1.5	
17	6.8		3.0		6.2		4.7	
18	4.0		4.0		4.6		6.9	
19	4.6		2.9		5.5		8.0	
20	7.0	50	3.1	25	9.2	25	11.0	0
21	4.5		3.3		7.1		5.5	
22	3.0		2.7		7.3		9.5	
23	3.0		4.1		7.5		4.0	
24	3.1		2.4		7.2		3.9	
25	2.7		2.7		5.1		2.1	
26	2.9		1.9		3.4		1.9	
27	8.5		2.0		3.8		3.7	
28	11.0		2.3		5.2		2.7	
29	4.5		2.1		5.0		3.1	
30	8.5	25	9.7	25	7.1	50	7.0	25
31	6.0		6.3		3.1		9.0	
32	5.5		3.1		6.4		6.4	
33	8.4		4.7		3.3		5.5	
34	6.0		3.5		7.8		7.9	
35	5.2		5.6		6.8		4.2	
36	3.4		2.9		4.3		3.6	
37	5.4		5.0		3.6		5.5	
38	4.0		6.2		6.0		6.3	
39	3.5		5.2		4.5		3.4	
40	3.0	25	4.1	50	4.7	25	4.2	25
41	3.5		6.1		4.9		3.8	
42	2.2		7.0		4.4		5.1	
43	4.2		5.7		4.7		5.6	
44	6.9		6.6		2.8		3.9	
45	5.0		6.5		3.5		3.6	
46	9.2		7.2		3.7		3.8	
47	8.0		7.5		3.7		4.0	
48	8.1		7.1		4.3		4.3	
49	8.3		5.2		4.7		4.4	
50	6.6	25	10.2	25	3.4	25	3.8	25
51	5.7		5.5		3.0		3.4	
52	5.0		4.6		2.6		3.5	
53	4.9		5.6		3.9		3.5	
54	4.1		5.5		3.0		4.3	
55	2.5		3.9		8.2		3.8	
56	9.7		5.4		5.0		2.8	
57	3.8		5.9		5.2		2.4	
58	4.4		4.5		3.8		2.9	
59	4.2		5.4		7.2		2.3	
60	3.9	25	5.2	25	7.5	75	2.4	0
61	3.0		4.6		3.4		7.7	
62	3.5		5.0		5.0		7.1	
63	4.1		3.6		4.2		6.2	
64	3.4		4.0		2.9		4.8	
65	3.7		3.6		3.6		4.7	
66	3.0		3.0		6.8		5.1	
67	3.8		3.1		6.7		6.6	
68	4.6		4.2		6.4		5.4	
69	4.1		3.9		6.8		6.3	
70	3.1	50	4.4	25	6.9	25	5.2	25
71	3.6		3.2		5.0		4.6	
72	2.8		3.0		5.2		3.4	
73	3.5		3.5		4.7		4.2	
74	2.7		4.5		4.0		3.4	
75	2.6		4.6		4.8		6.1	
76	7.2		3.5		3.9		2.9	
77	4.5		3.1		2.6		5.5	
78	4.4		3.8		3.0		5.6	
79	4.3		3.3		2.7		3.2	
80	5.5	50	5.0	25	2.7	25	3.6	0
81	4.9		3.5		2.7		2.3	
82	7.8		3.6		4.0		2.4	
83	4.3		3.1		3.3		3.6	
84	5.1		4.1		3.5		3.3	
85	8.2		3.2		3.0		3.7	
86	8.5		2.7		8.8		2.4	
87	5.6		3.0		6.3		3.0	
88	8.9		3.9		6.0		3.2	
89	9.6		7.5		4.1		2.9	
90	4.6	25	3.8	50	7.7	50	2.8	25
91	2.8		5.1		4.1		2.3	
92	8.1		8.4		6.9		7.0	
93	8.5		7.7		4.7		2.0	
94	7.6		6.8		4.3		6.5	
95	5.2		3.5		4.1		5.9	
96	5.4		5.4		2.1		3.5	
97	10.3		5.4		6.4		6.4	
98	7.3		2.9		5.5		4.5	
99	3.4		4.7		3.8		3.6	
100	8.4	25	5.7	25	3.5	50	3.3	25
Minimum	**2.2**		**1.9**		**2.1**		**1.5**	
Maximum	**14.4**		**10.2**		**10.1**		**11.0**	
Mean	**5.3**		**4.6**		**5.1**		**4.8**	
Geometric mean	**4.9**		**4.3**		**4.8**		**4.4**	
Median	**4.6**	**25.0**	**4.4**	**25.0**	**4.8**	**25.0**	**4.3**	**25.0**

Notes: Intermediate axis length is the second longest axis on a cobble. Embeddedness refers to how deeply the cobble is surrounded or buried by other substrate. Embeddedness was measured for every 10th (n=10) cobble.

Table E.6: Intermediate Axis Length and Embeddedness of 100 Cobble Washed at Benthic Invertebrate Sampling Stations, Minto Mine, September 2020

Cobble Number	LWC-5		LBC-1		LBC-2		LBC-3	
	Intermediate Axis Length (cm)	Embeddedness (%)	Intermediate Axis Length (cm)	Embeddedness (%)	Intermediate Axis Length (cm)	Embeddedness (%)	Intermediate Axis Length (cm)	Embeddedness (%)
1	6.2		9.5		6.3		8.2	
2	5.5		4.9		5.2		7.0	
3	5.9		6.8		8.1		8.0	
4	5.6		5.6		3.4		7.7	
5	3.4		6.9		7.2		6.8	
6	7.9		7.3		4.0		8.9	
7	3.6		4.3		6.6		5.5	
8	6.5		3.5		2.8		4.0	
9	8.0		4.2		5.6		6.1	
10	4.9	0	3.0	25	4.2	25	4.5	25
11	4.6		3.4		6.9		7.6	
12	4.7		4.9		4.7		4.4	
13	5.0		3.2		4.2		8.7	
14	3.9		4.3		5.2		5.2	
15	5.8		3.8		3.8		5.4	
16	4.6		3.2		3.7		3.6	
17	3.0		3.9		3.6		5.0	
18	5.0		2.9		3.4		4.2	
19	4.2		3.8		2.7		4.7	
20	3.2	25	4.4	0	3.1	25	6.8	25
21	5.1		2.9		5.4		7.0	
22	5.4		7.3		3.6		2.8	
23	4.2		4.9		4.4		5.1	
24	3.6		3.3		5.0		3.8	
25	4.5		3.1		4.5		4.5	
26	4.1		2.5		3.0		2.4	
27	3.5		3.4		7.3		4.3	
28	2.6		7.6		3.5		3.6	
29	3.0		8.0		3.9		4.1	
30	3.5	25	5.7	25	3.5	50	2.9	0
31	4.1		3.6		5.2		3.0	
32	3.0		5.3		5.2		3.4	
33	8.0		6.5		6.4		3.1	
34	6.9		4.8		7.0		2.7	
35	7.6		5.3		4.9		6.8	
36	5.7		5.4		6.1		5.5	
37	3.9		4.1		6.0		5.5	
38	4.6		3.2		6.4		5.4	
39	8.2		3.7		5.0		4.4	
40	7.0	25	6.9	25	8.0	25	8.3	50
41	7.1		5.3		5.5		7.5	
42	8.3		6.1		6.5		4.2	
43	7.8		4.4		5.2		4.8	
44	3.8		3.1		2.6		3.9	
45	6.0		5.1		5.4		6.5	
46	6.8		4.5		4.7		8.1	
47	4.8		5.2		5.6		3.9	
48	4.2		3.6		3.3		5.1	
49	6.9		5.8		3.9		6.7	
50	3.5	0	6.4	50	3.4	25	3.5	25
51	6.7		6.1		4.1		7.2	
52	7.4		3.8		3.6		5.1	
53	5.9		6.1		4.6		7.0	
54	5.5		3.7		3.6		4.3	
55	4.1		4.9		5.0		5.6	
56	4.0		4.5		5.0		3.9	
57	2.8		4.1		3.6		4.5	
58	3.3		3.2		2.9		5.6	
59	2.4		5.0		3.7		6.4	
60	3.5	25	3.4	25	3.2	50	6.2	25
61	2.7		4.6		2.9		7.0	
62	3.0		4.0		3.4		6.8	
63	2.9		3.5		2.6		4.4	
64	2.2		3.3		2.9		3.5	
65	8.3		5.3		3.3		5.2	
66	9.1		3.0		2.5		4.7	
67	6.1		3.8		2.9		6.1	
68	4.4		3.2		8.3		4.0	
69	5.3		5.0		4.4		3.8	
70	2.7	0	4.1	25	4.7	25	4.0	50
71	10.1		5.1		5.5		4.1	
72	4.5		3.1		9.3		4.4	
73	7.5		5.4		3.8		4.0	
74	3.9		3.3		7.0		3.8	
75	5.9		4.2		5.6		4.7	
76	4.6		3.7		3.7		3.6	
77	4.3		3.9		3.5		2.5	
78	3.0		4.2		6.3		3.2	
79	4.1		4.0		4.0		3.4	
80	3.9	25	3.6	25	4.0	25	3.7	25
81	3.4		3.4		4.2		3.7	
82	2.9		3.9		4.1		3.8	
83	2.4		3.3		4.0		4.2	
84	2.9		2.9		8.8		3.9	
85	7.4		3.4		6.3		3.0	
86	5.7		3.1		5.5		3.6	
87	4.8		3.5		4.4		2.8	
88	2.7		3.7		7.0		3.2	
89	3.4		6.3		3.6		7.7	
90	3.2	0	6.0	50	7.2	25	5.4	25
91	3.0		4.4		4.2		6.1	
92	3.1		4.0		3.6		4.4	
93	3.3		3.1		3.2		5.1	
94	2.8		3.2		4.9		3.1	
95	3.0		5.7		4.4		7.7	
96	3.0		5.2		5.1		5.6	
97	4.7		4.9		3.5		5.0	
98	3.5		2.7		3.4		5.1	
99	2.9		3.9		3.4		4.1	
100	2.4	25	5.0	25	4.2	25	5.6	50
Minimum	**2.2**		**2.5**		**2.5**		**2.4**	
Maximum	**10.1**		**9.5**		**9.3**		**8.9**	
Mean	**4.7**		**4.5**		**4.7**		**5.0**	
Geometric mean	**4.4**		**4.3**		**4.5**		**4.8**	
Median	**4.3**	**25.0**	**4.1**	**25.0**	**4.3**	**25.0**	**4.6**	**25.0**

Notes: Intermediate axis length is the second longest axis on a cobble. Embeddedness refers to how deeply the cobble is surrounded or buried by other substrate. Embeddedness was measured for every 10th (n=10) cobble.

Table E.6: Intermediate Axis Length and Embeddedness of 100 Cobble Washed at Benthic Invertebrate Sampling Stations, Minto Mine, September 2020

Cobble Number	LBC-4		LBC-5		LMC-1		LMC-2	
	Intermediate Axis Length (cm)	Embeddedness (%)	Intermediate Axis Length (cm)	Embeddedness (%)	Intermediate Axis Length (cm)	Embeddedness (%)	Intermediate Axis Length (cm)	Embeddedness (%)
1	8.2		5.6		7.5		10.1	
2	9.2		7.4		5.2		4.5	
3	9.7		5.1		5.2		11.1	
4	9.8		4.6		3.8		7.3	
5	5.2		6.0		4.0		5.5	
6	9.6		5.3		4.4		5.4	
7	6.9		3.7		5.2		4.5	
8	3.4		3.2		6.9		4.7	
9	6.4		2.1		5.5		3.5	
10	6.2	25	8.3	25	4.2	50	13.0	25
11	3.7		4.1		3.9		5.6	
12	5.2		3.7		5.1		2.3	
13	5.3		4.0		4.7		3.3	
14	5.7		7.3		3.9		4.5	
15	6.1		6.1		4.9		3.4	
16	6.0		2.9		3.0		3.3	
17	7.1		6.2		3.8		5.7	
18	3.4		4.5		5.7		6.0	
19	2.9		4.1		4.3		5.0	
20	4.6	25	4.4	0	3.8	75	4.4	50
21	4.5		6.2		3.2		3.8	
22	5.6		4.2		3.5		3.2	
23	6.7		4.8		3.5		3.1	
24	3.5		4.6		3.3		5.6	
25	3.0		3.7		9.2		8.5	
26	4.1		3.6		7.3		4.5	
27	8.7		2.7		7.5		4.1	
28	5.1		3.6		10.8		2.9	
29	10.1		3.7		6.5		4.2	
30	5.2	25	3.5	25	7.5	25	9.0	25
31	4.9		3.7		5.2		6.9	
32	3.9		2.6		6.5		3.5	
33	6.3		2.7		5.5		3.3	
34	4.4		2.1		5.2		3.1	
35	3.5		7.7		3.9		3.6	
36	9.1		8.5		3.7		9.4	
37	4.8		5.1		2.8		5.4	
38	5.4		7.8		3.0		5.6	
39	6.0		6.1		4.7		7.4	
40	4.1	25	5.2	25	2.6	50	5.3	25
41	5.8		6.9		2.5		5.0	
42	3.2		6.2		4.2		5.9	
43	3.7		4.3		2.6		5.4	
44	4.1		4.4		2.9		5.8	
45	6.7		7.0		2.5		4.9	
46	5.5		6.3		2.5		5.0	
47	4.8		5.2		10.4		3.3	
48	6.8		3.2		5.7		3.5	
49	5.9		4.1		5.4		5.2	
50	3.1	0	4.2	25	3.5	25	4.2	50
51	4.3		3.9		5.3		4.2	
52	5.4		4.0		13.9		3.0	
53	5.2		2.8		8.6		6.5	
54	7.2		7.7		6.4		3.1	
55	4.3		10.6		4.9		7.0	
56	4.6		7.6		6.7		3.2	
57	4.1		6.9		4.6		4.0	
58	6.4		6.9		5.0		4.1	
59	3.4		5.3		2.9		4.2	
60	3.3	25	6.7	0	4.1	25	3.2	25
61	3.5		5.3		3.3		3.2	
62	6.6		5.0		3.2		3.9	
63	4.4		4.4		2.9		3.6	
64	5.6		5.0		2.3		6.2	
65	4.3		6.0		2.9		5.1	
66	4.1		4.6		6.0		8.1	
67	6.0		5.4		4.3		4.9	
68	4.5		4.6		3.5		9.9	
69	3.1		4.8		4.4		3.5	
70	3.0	25	3.6	25	7.6	50	4.1	25
71	6.0		5.4		4.2		2.9	
72	3.4		3.2		3.7		4.0	
73	6.9		2.9		5.1		4.0	
74	8.7		3.9		8.6		3.4	
75	5.4		2.7		7.1		2.7	
76	7.8		3.2		4.4		3.5	
77	6.0		3.6		9.9		5.2	
78	4.0		2.7		6.7		6.3	
79	8.4		8.4		4.3		4.6	
80	6.1	25	7.7	25	5.6	25	3.9	50
81	2.2		7.7		5.6		2.7	
82	5.8		6.4		5.9		2.7	
83	2.9		3.7		4.7		2.9	
84	3.2		3.4		7.1		4.6	
85	5.4		3.6		4.6		3.1	
86	4.5		7.5		3.5		7.3	
87	7.8		9.2		8.3		6.6	
88	5.3		10.4		6.1		3.9	
89	6.1		9.2		4.2		4.1	
90	10.8	25	9.1	50	8.0	50	3.2	25
91	6.3		6.8		7.5		5.7	
92	4.8		6.2		2.7		5.1	
93	9.2		6.1		10.4		5.8	
94	8.1		5.4		3.0		4.7	
95	5.1		3.5		5.3		7.6	
96	3.0		4.9		4.2		4.0	
97	7.4		4.7		4.6		3.2	
98	7.0		4.4		8.0		5.1	
99	8.4		4.8		7.3		6.8	
100	4.9	25	4.2	25	7.8	25	4.3	25
Minimum	**2.2**		**2.1**		**2.3**		**2.3**	
Maximum	**10.8**		**10.6**		**13.9**		**13.0**	
Mean	**5.6**		**5.2**		**5.2**		**4.9**	
Geometric mean	**5.3**		**4.9**		**4.9**		**4.6**	
Median	**5.4**	**25.0**	**4.8**	**25.0**	**4.7**	**37.5**	**4.5**	**25.0**

Notes: Intermediate axis length is the second longest axis on a cobble. Embeddedness refers to how deeply the cobble is surrounded or buried by other substrate. Embeddedness was measured for every 10th (n=10) cobble.

Table E.6: Intermediate Axis Length and Embeddedness of 100 Cobble Washed at Benthic Invertebrate Sampling Stations, Minto Mine, September 2020

Cobble Number	LMC-3		LMC-4		LMC-5	
	Intermediate Axis Length (cm)	Embeddedness (%)	Intermediate Axis Length (cm)	Embeddedness (%)	Intermediate Axis Length (cm)	Embeddedness (%)
1	5.6		6.8		6.2	
2	4.1		2.7		6.0	
3	6.6		3.3		4.4	
4	4.1		3.6		7.2	
5	5.0		6.3		3.4	
6	5.0		5.5		2.6	
7	4.5		7.4		5.1	
8	3.9		4.1		3.4	
9	4.4		7.3		3.9	
10	4.9	50	2.9	25	4.9	75
11	2.8		3.0		3.5	
12	3.1		3.7		3.6	
13	3.4		3.5		4.9	
14	5.0		4.0		3.4	
15	4.5		2.2		4.4	
16	3.2		3.7		6.9	
17	2.9		3.1		5.4	
18	2.2		2.9		3.9	
19	2.7		1.7		3.9	
20	1.9	50	4.2	25	7.2	50
21	2.8		4.8		3.5	
22	6.0		3.0		4.7	
23	5.6		6.1		3.2	
24	4.5		5.7		3.9	
25	4.5		7.2		3.4	
26	4.3		2.8		3.6	
27	3.5		5.4		3.1	
28	3.6		4.3		3.3	
29	4.2		5.0		2.8	
30	4.7	25	1.8	50	3.1	25
31	3.5		6.9		3.5	
32	3.0		5.7		5.1	
33	2.3		8.5		4.1	
34	2.4		5.0		2.5	
35	2.7		5.3		3.4	
36	7.4		4.1		4.3	
37	5.8		4.2		3.7	
38	3.7		4.6		2.7	
39	4.0		4.3		2.2	
40	4.1	50	2.9	25	2.9	50
41	3.4		4.2		3.0	
42	2.0		3.5		2.3	
43	2.9		3.6		3.9	
44	1.9		3.7		2.6	
45	2.4		3.8		3.0	
46	5.1		1.8		2.6	
47	5.3		2.6		3.9	
48	7.0		3.0		3.3	
49	4.7		4.4		2.2	
50	4.2	25	3.2	25	4.5	50
51	3.8		3.1		6.4	
52	1.9		2.1		3.4	
53	5.4		3.3		3.6	
54	6.2		2.0		6.7	
55	5.3		2.6		2.7	
56	3.6		1.9		1.8	
57	4.7		2.1		3.7	
58	3.7		2.2		4.6	
59	4.5		9.4		2.7	
60	3.5	25	10.3	25	3.9	75
61	3.6		8.0		0.9	
62	5.7		5.9		1.5	
63	3.4		8.3		2.0	
64	3.7		5.9		0.7	
65	4.7		8.4		3.9	
66	2.6		3.3		3.5	
67	3.0		4.7		3.7	
68	4.5		2.9		4.9	
69	2.4		5.1		6.1	
70	3.2	25	6.2	-	3.5	50
71	2.6		3.1		3.9	
72	3.9		7.2		2.0	
73	2.8		4.7		2.5	
74	5.4		3.8		2.0	
75	2.9		2.9		3.5	
76	1.9		2.8		3.1	
77	3.5		2.9		2.3	
78	2.4		2.2		3.0	
79	3.0		2.0		2.7	
80	2.5	50	2.2	50	6.9	50
81	3.2		2.1		4.0	
82	3.0		3.0		2.0	
83	3.1		2.1		2.7	
84	2.7		2.2		2.4	
85	-	-	2.1		3.6	
86	-	-	5.4		2.0	
87	-	-	4.7		1.7	
88	-	-	2.8		2.1	
89	-	-	2.9		2.7	
90	-	-	1.7	50	2.4	25
91	-	-	3.2		1.1	
92	-	-	4.7		2.2	
93	-	-	3.3		2.1	
94	-	-	3.2		2.5	
95	-	-	5.7		5.5	
96	-	-	2.0		2.3	
97	-	-	2.7		1.9	
98	-	-	3.9		2.5	
99	-	-	2.7		1.5	
100	-	-	7.1	25	3.1	75
Minimum	**1.9**		**1.7**		**0.7**	
Maximum	**7.4**		**10.3**		**7.2**	
Mean	**3.9**		**4.1**		**3.5**	
Geometric mean	**3.7**		**3.7**		**3.2**	
Median	**3.7**	**37.5**	**3.6**	**25.0**	**3.4**	**50.0**

Notes: Intermediate axis length is the second longest axis on a cobble. Embeddedness refers to how deeply the cobble is surrounded or buried by other substrate. Embeddedness was measured for every 10th (n=10) cobble.

APPENDIX E

BENTHIC INVERTEBRATE COMMUNITY DATA

Laboratory Reports

BENTHIC INVERTEBRATE COMMUNITY ANALYSIS

PROVIDED BY:

CORDILLERA CONSULTING

(SUMMERLAND, BC)

Methods and QC Report 2021

Project ID: Minto AEMP (20-70)

Client: Minnow Environmental

Prepared by:
Cordillera Consulting Inc.
Summerland, BC
© 2021

Unit 1, 13216 Henry Ave B1202
Summerland, BC, V0H 1Z0
www.cordilleraconsulting.ca

P: 250.494.7553
F: 250.494.7562

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Sample Reception

On September 24, 2020, Cordillera Consulting received 15 benthic samples from Minnow Environmental. When samples arrived to Cordillera Consulting, exterior packaging was initially inspected for damage or wet spots that would have indicated damage to the interior containers.

Samples were logged into a proprietary software database (INSTAR1) where the clients assigned sample name was recorded along with a Cordillera Consulting (CC) number for cross-reference. Each sample was checked to ensure that all sites and replicates recorded on field sheets or packing lists were delivered intact and with adequate preservative. Any missing, mislabelled or extra samples were reported to the client immediately to confirm the total numbers and correct names on the sample jars. The client representative was notified of the arrival of the shipment and provided a sample inventory once intake was completed.
See table below for sample inventory:

Table 1: Summary of sample information including Cordillera Consulting (CC) number

Site	Sample	CC#	Date	Size	# of Jars
LMC	LMC-1	CC210753	9/15/2020	500µM	1
LMC	LMC-2	CC210754	9/14/2020	500µM	2
LMC	LMC-3	CC210755	9/11/2020	500µM	1
LMC	LMC-4	CC210756	9/11/2020	500µM	1
LMC	LMC-5	CC210757	9/11/2020	500µM	2
LWC	LWC-1	CC210758	9/13/2020	500µM	1
LWC	LWC-2	CC210759	9/12/2020	500µM	1
LWC	LWC-3	CC210760	9/12/2020	500µM	2
LWC	LWC-4	CC210761	9/12/2020	500µM	1
LWC	LWC-5	CC210762	9/12/2020	500µM	1
LBC	LBC-1	CC210763	9/16/2020	500µM	1
LBC	LBC-2	CC210764	9/16/2020	500µM	1
LBC	LBC-3	CC210765	9/16/2020	500µM	1
LBC	LBC-4	CC210766	9/16/2020	500µM	1
LBC	LBC-5	CC210767	9/16/2020	500µM	1

Sample Sorting

- Using a gridded Petri dish, fine forceps and a low power stereo-microscope (Olympus, Nikon, Leica) the sorting technicians removed the invertebrates and sorted them into family/orders.
- The sorting technician kept a running tally of total numbers excluding organisms from Porifera, Nemata, Platyhelminthes, Ostracoda, Copepoda, Cladocera and terrestrial drop-ins such as aphids. These organisms were marked for their presence

(given a value of 1) only and left in the sample. They were not included towards the 300-organism subsample count.

- Where specimens are broken or damaged, only heads were counted.
- Subsampling was conducted with the use of a Marchant Box.
- When using the Marchant box, cells were extracted at the same time in the order indicated by a random number table. If the 300th organism was found part way into sorting a cell then the balance of that cell was sorted. If the organism count had not reached 300 by the 50th cell then the entire sample was sorted.
- The total number of cells sorted and the number of organisms removed were recorded manually on a bench sheet and then recorded into INSTAR1
- Organisms were stored in vials containing 80% ethanol and an interior label indicating the site names, date of sampling, site code numbers and portion subsampled. This information was also recorded on the laboratory bench sheet and on INSTAR1.
- The sorted portion of the debris was preserved and labeled separately from the unsorted portion and was tested for sorting efficiency (Sorting Quality Control – Sorting Efficiency). The unsorted portion was also labeled and preserved in separate jars.

Percent sub-sampled and total countable invertebrates pulled from the samples were summarized in the table below.

Table 2: Percent sub-sample and invertebrate count for each sample

Site	Sample	Date	CC#	500 micron fraction	
				% Sampled	# Invertebrates
LMC	LMC-1	15-Sep-20	CC210753	31.25%	383
LMC	LMC-2	14-Sep-20	CC210754	25%	316
LMC	LMC-3	11-Sep-20	CC210755	75%	394
LMC	LMC-4	11-Sep-20	CC210756	31.25%	319
LMC	LMC-5	11-Sep-20	CC210757	25%	443
LWC	LWC-1	13-Sep-20	CC210758	37.5%	373
LWC	LWC-2	12-Sep-20	CC210759	50%	309
LWC	LWC-3	12-Sep-20	CC210760	25%	313
LWC	LWC-4	12-Sep-20	CC210761	100%	320
LWC	LWC-5	12-Sep-20	CC210762	37.5%	329
LBC	LBC-1	16-Sep-20	CC210763	100%	208
LBC	LBC-2	16-Sep-20	CC210764	100%	400
LBC	LBC-3	16-Sep-20	CC210765	100%	335
LBC	LBC-4	16-Sep-20	CC210766	100%	178
LBC	LBC-5	16-Sep-20	CC210767	50%	355

Sorting Quality Control - Sorting Efficiency

As a part of Cordillera's laboratory policy, all projects undergo sorting efficiency checks.

- As sorting progresses, 10% of samples were randomly chosen by senior members of the sorting team for resorting.
- All sorters working on a project had at least 1 sample resorted by another sorter.
- An efficiency of 90 % was expected (95% for CABIN samples).
- If 90/95% efficiency was not met, samples from that sorter were resorted.
- To calculated sorting efficiency the following formula was used:

$$\frac{\#OrganismsMissed}{TotalOrganismsFound} * 100 = \%OM$$

Table 3 Summary of sorting efficiency

			Total from Sample	Percent Efficiency
Site - QC, Sample - QC1, CC# - CC210762, Percent sampled = 37.5%, Sieve size = 500				
No Invertebrates Found	None	0		
	Total:	**0**	**329**	**100%**
Site - QC, Sample - QC2, CC# - CC210765, Percent sampled = 100%, Sieve size = 500				
No Invertebrates Found	None	0		
	Total:	**0**	**335**	**100%**

Sorting Quality Control - Sub-Sampling QC

Certain Provincial and Mining projects require additional sorting checks in the form of sub-sampling QC, (Environmental Effects Monitoring (EEM) protocol). This ensured that any fraction of the total sample that was examined was actually an accurate representation of the number of total organisms. Organisms from the additional sub-samples were not identified; rather total organism count only was compared.

Sub-Sampling efficiency was measured on 10% of the number of sub-sampled samples in the project. Ex. In a project where 50 of 100 total samples were processed through

subsampling using a Marchant box, then 10% of 50; or 5 samples were used for sub sampling efficiency.

Sub-Sampling efficiency was performed by fractioning the entire sample into sub-sample percentages. On each sub-sampled portion, a total organism count was recorded and compared to the rest of the sub-samples. In order to pass, all fractions were required to be within 20% of total organism count.

Example: If 300 organisms are found in 10% of the sample, the sorter will continue to sample in 10% fractions until the entire sample is separated. They will then count the total number of organisms in each of the 10 fractions of 10% and compare the organism count.

When divergence is >20% the sorting manager examines for the source of the problem and takes steps to correct it. With the Marchant box, the problem typically rested with how the box is flipped back to the upright position. For this reason, subsampling was performed by experienced employees only. Another common source of error would be the type of debris in the sample. Samples with algae or heavy with periphyton have a higher incident of failure due to clumping than clear samples.

Table 4 Summary of Sub Sample efficiency

Station ID		Organisms in Subsample																			Sorter		Actual Total	Precision		Accuracy	
CC#	Sample Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	By	Time		Percent Range		Min	Max
210759	LWC-2	310	250																			CM	240	560	19.35	19.35	10.71	10.71

Taxonomic Effort

The next procedure was the identification to genus-species level where possible of all the organisms in the sample.

- Identifications were made at the genus/species level for all insect organisms found including Chironomidae (Based on CABIN protocol).
- Non-insect organisms (except those not included in CABIN count) were identified to genus/species where possible and to a minimum of family level with intact and mature specimens.
- The Standard Taxonomic Effort lists compiled by the CABIN manual[1], SAFIT[2] , and PNAMP[3] were used as a guide line for what level of identification to achieve where the condition and maturity of the organism enabled.
- Organisms from the same families/order were kept in separate vials with 80% ethanol and an interior label of printed laser paper.
- Chironomidae was identified to genus/species level where possible and was aided by slide mounts. CMC-10 was used to clear and mount the slide.
- Oligochaetes was identified to family/genus level with the aid of slide mounts. CMC-10 was used to clear and mount the slide.
- Other Annelida (leeches, polychaetes) were identified to the family/genus/species level with undamaged, mature specimens.
- Mollusca was identified to family and genus/species where possible
- Decapoda, Amphipoda and Isopoda were identified at family/genus/species level where possible.
- Bryozoans and Nemata remained at the phylum level
- Hydrachnidae and Cnidaria were identified at the family/genus level where possible.
- When requested, reference collections were made containing at least one individual from each taxa listed. Organisms represented will have been identified to the lowest practical level.
- Reference collection specimens were stored in 55 mm glass vials with screw-cap lids with polyseal inserts (museum quality). They were labeled with taxa name, site code, date identified and taxonomist name. The same information was applied to labels on the slide mounts.

Taxonomists

The taxonomists for this project were certified by the Society of Freshwater Science (SFS) Taxonomic Certification Program at level 2 which is the required certification for CABIN projects:

Scott Finlayson: Group 1 General Arthropods (East/West); Group 2 EPT (East/West); Group 3 Chironomidae (East/West); Group 4 Oligochaeta

Adam Bliss: Group 1 General Arthropods (East/West); Group 2 EPT (East/West); Group 3 Chironomidae
Rita Avery: Group 1 General Arthropods (East/West); Group 2 EPT (East/West)

Taxonomic QC

Taxonomic QC was performed in house by someone other than the original taxonomist.

- Quality control protocol involved complete, blind re-identification and re-enumeration of at least 10% of samples by a second SFS-certified taxonomist.
- Samples for taxonomic quality control were randomly selected and quality control procedures were conducted as the project progresses through the laboratories.

- The second (QC) taxonomist will calculate and record four types of errors:
    1. Misidentification error
    2. Enumeration error
    3. Questionable taxonomic resolution error
    4. Insufficient taxonomic resolution error

The QC coordinator then calculates the following estimates of taxonomic precision.

1. The percent total identification error rate is calculated as:

$$\frac{Sum\ of\ incorrect\ identifications}{total\ organisms\ counted\ in\ audit} * (100)$$

The average total identification error rate of audited samples did not exceed 5%. All samples that exceed a 5% error rate were re-evaluated to determine whether repeated errors or patterns in error contributed.

2. The percent difference in enumeration (PDE) to quantify the consistency of specimen counts.

$$PDE = \frac{|n_1 - n_2|}{n_1 + n_2} x100$$

3. The percent taxonomic disagreement (PTD) to quantify the shared precision between two sets of identifications.

$$PTD = \left(1 - \left[\frac{a}{N}\right]\right) x100$$

4. Bray Curtis dissimilarity Index to quantify the differences in identifications.

$$BC_{ij} = 1 - \frac{2C_{ij}}{S_j + S_i}$$

Error Summary

All samples report errors within the acceptable limits for CABIN Laboratory methods (less than 5% error).

Table 5 Summary of taxonomic error following QC

Site	Taxa Identified	% Error	PDE	PTD	Bray - Curtis Dissimilarity index
Site - LMC, Sample - LMC-2, CC# - CC210754, Percent sampled = 25%, Sieve size = 500	316	0.00	0	0.3164557	0.00316456
Site - LWC, Sample - LWC-4, CC# - CC210761, Percent sampled = 100%, Sieve size = 500	319	0.00	0.15649452	0.3125	0.00156495

There will always be disagreements between taxonomists regarding the degree of taxonomic resolution in immature specimens and when laboratories make use of different keys for certain groups (Mollusks is an especially disputed group). It is always possible that some taxa found by the original taxonomist were overlooked in QC.

All of the Taxonomic QC samples that were observed passed testing according to the CABIN misidentification protocols. See the tables below for results from taxonomic QC audit.

Error Rationale

Site - LMC, Sample - LMC-2, CC# - CC210754, Percent sampled = 25%, Sieve size = 500	Laboratory Count	QC Audit Count	Agreement	Misidentification	Questionable Taxonomic Resolution	Enumeration	Insufficient Taxonomic Resolution	Comments
Baetis	1	1						
Cardiocladius	1	1						
Chironomidae	4	4						
Dicranota	7	7						
Diptera	1	1						
Enchytraeidae	11	10	No			X		
Ephydridae	1	1						

Eukiefferiella	188	189	No			X		
Hydrobaenus	1	1						
Lepidoptera	1	1						
Limnephilidae	9	9						
Limnophyes	8	8						
Lumbriculidae	28	28						
Metriocnemus	2	2						
Micropsectra	2	2						
Nemouridae	3	3						
Orthocladius complex	27	27						
Ostrocerca	14	14						
Parametriocnemus	2	2						
Pericoma/Telmatoscopus	1	1						
Pseudodiamesa	1	1						
Rhynchelmis	1	1						
Simulium	1	1						
Trombidiformes	1	1						
Total:	**316**	**316**						
					0	2	0	
% Total Misidentification Rate =	misidentifications / total number	x100 =	0.00	**Pass**				

Site - LWC, Sample - LWC-4, CC# - CC210761, Percent sampled = 100%, Sieve size = 500	Laboratory Count	QC Audit Count	Agreement	Misidentification	Questionable Taxonomic Resolution	Enumeration	Insufficient Taxonomic Resolution	Comments
Acentrella	1	1						
Baetis	2	2						
Baetis	3	3						
Capniidae	8	8						
Chironomidae	4	4						
Chloroperlidae	8	8						
Cinygmula	1	1						
Clinocerinae Unknown Genus A	3	3						
Diamesa	8	8						
Dicranota	7	7						
Ephemerellidae	2	2						

Eukiefferiella	5	5						
Glossosoma	3	3						
Heptageniidae	6	6						
Lebertia	3	2	No			X		
Limnephilidae	2	2						
Lumbriculidae	25	25						
Orthocladius complex	204	204						
Perlodidae	7	7						
Rheocricotopus	1	1						
Rhyacophila	1	1						
Rhyacophila brunnea/vemna group	1	1						
Simuliidae	3	3						
Simulium	2	2						
Tipulidae	8	8						
Zapada	2	2						
Total:	**320**	**319**						
					0	**1**	**0**	
% Total Misidentification Rate =	misidentifications / total number	x100 =	0.00	**Pass**				

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[3] Pacific Northwest Aquatic Monitoring Partnership (Accessed 2015). www.pnamp.org

Taxonomic Keys

Below is a reference list of taxonomic keys utilized by taxonomists at Cordillera Consulting. Cordillera taxonomists routinely seek out new literature to ensure the most accurate identification keys are being utilized. This is not reflective of the exhaustive list of resources that we use for identification. A more complete list of taxonomic resources can be found at Southwest Association of Freshwater Invertebrate Taxonomists. (2015).
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Project: Minto Mine AEMP (20-70)
Minnow Environmental (BC)
Taxonomist: Scott Finlayson
250-494-7553

Site:	LMC	LMC	LMC	LMC	LMC	LWC	LWC	LWC	LWC	LWC	LBC	LBC	LBC	LBC	LBC
Sample:	LMC-1	LMC-2	LMC-3	LMC-4	LMC-5	LWC-1	LWC-2	LWC-3	LWC-4	LWC-5	LBC-1	LBC-2	LBC-3	LBC-4	LBC-5
Sample Collection Date:	15-Sep-20	14-Sep-20	11-Sep-20	11-Sep-20	11-Sep-20	13-Sep-20	12-Sep-20	12-Sep-20	12-Sep-20	12-Sep-20	16-Sep-20	16-Sep-20	16-Sep-20	16-Sep-20	16-Sep-20
CC#:	CC210753	CC210754	CC210755	CC210756	CC210757	CC210758	CC210759	CC210760	CC210761	CC210762	CC210763	CC210764	CC210765	CC210766	CC210767
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Collembola	6	0	0	3	16	0	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ameletus	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
| Family: Baetidae	0	0	0	0	0	3	0	12	0	3	5	1	5	1	6
Acentrella	0	0	0	0	0	0	0	0	1	3	3	3	2	3	6
Baetis	0	4	1	0	0	3	2	4	5	5	2	5	1	4	16
Baetis rhodani group	3	0	0	0	0	0	4	0	0	0	0	1	0	0	0
| Family: Ephemerellidae	0	0	0	0	0	0	2	8	2	3	2	8	5	3	4
Drunella	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Drunella grandis group	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
Drunella doddsii	0	0	0	0	0	0	0	0	0	3	0	0	0	0	4
Drunella spinifera	0	0	0	0	0	0	0	0	0	0	0	0	2	0	6
Ephemerella	0	0	0	0	0	0	0	0	0	0	6	3	0	1	0
Ephemerella tibialis	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0
| Family: Heptageniidae	0	0	0	0	0	13	6	28	6	19	2	4	9	6	2
Cinygmula	0	0	0	0	0	8	0	0	1	0	4	0	0	3	0
| Order: Plecoptera	0	0	0	0	0	0	2	0	0	0	0	0	1	0	0
| Family: Capniidae	0	0	0	0	4	5	4	0	8	3	3	13	28	8	20
| Family: Chloroperlidae	0	0	0	0	0	5	2	0	8	0	1	1	0	0	0
Haploperla	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0
Suwallia	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
Sweltsa	0	0	0	0	0	3	0	0	0	0	0	1	10	8	6
| Family: Leuctridae	0	0	3	0	0	0	4	0	0	0	0	1	0	0	0
| Family: Nemouridae	3	12	5	0	4	5	2	0	0	0	0	3	0	0	0
Nemoura	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ostrocerca	0	56	1	3	8	0	0	0	0	0	0	0	0	0	0
Zapada	0	0	0	0	0	0	0	4	2	5	0	0	0	0	0
Zapada cinctipes	0	0	0	0	0	5	2	8	0	0	0	0	0	1	0
Zapada columbiana	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
| Family: Perlodidae	0	0	0	0	0	5	4	24	7	5	3	2	0	5	0
Isoperla	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0
Kogotus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Rickera sorpta	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
| Order: Trichoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
| Family: Brachycentridae	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2
Brachycentrus americanus	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
| Family: Glossosomatidae	0	0	0	0	0	8	0	12	0	5	0	0	0	0	0
Glossosoma	0	0	0	0	0	13	4	4	3	8	0	0	0	1	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lepidostoma	0	0	0	0	0	0	0	0	0	3	0	0	0	0	6
| Family: Limnephilidae	0	36	3	0	0	0	4	4	2	0	0	7	0	2	0
Limnephilus	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhyacophila	0	0	0	0	0	0	2	0	1	0	0	0	1	0	0
Rhyacophila brunnea/vemna group	0	0	0	0	0	5	4	12	1	5	0	0	0	0	0
| Order: Coleoptera	6	0	1	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
| Family: Hydrophilidae	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0
Enochrus	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0
| Order: Diptera	0	4	0	0	0	0	4	4	0	0	1	0	0	0	0
| Family: Ceratopogonidae	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0
Dasyhelea	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0
| Family: Chironomidae	6	16	31	32	16	19	72	0	4	13	15	37	7	9	20
| Subfamily: Chironominae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Chironomini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaenopsectra	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
| Tribe: Tanytarsini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Micropsectra	0	8	19	22	16	0	2	0	0	5	0	0	0	0	0
Rheotanytarsus	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
| Subfamily: Diamesinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diamesa	16	0	1	6	4	5	4	16	8	5	3	7	14	6	4
Pagastia	0	0	0	3	0	3	0	0	0	0	0	0	0	0	2
Pseudodiamesa	3	4	1	0	0	0	0	0	0	0	0	0	0	0	0

Project: Minto Mine AEMP (20-70)
Minnow Environmental (BC)
Taxonomist: Scott Finlayson
250-494-7553

Site:	LMC	LMC	LMC	LMC	LMC	LWC	LWC	LWC	LWC	LWC	LBC	LBC	LBC	LBC	LBC
Sample:	LMC-1	LMC-2	LMC-3	LMC-4	LMC-5	LWC-1	LWC-2	LWC-3	LWC-4	LWC-5	LBC-1	LBC-2	LBC-3	LBC-4	LBC-5
Sample Collection Date:	15-Sep-20	14-Sep-20	11-Sep-20	11-Sep-20	11-Sep-20	13-Sep-20	12-Sep-20	12-Sep-20	12-Sep-20	12-Sep-20	16-Sep-20	16-Sep-20	16-Sep-20	16-Sep-20	16-Sep-20
CC#:	CC210753	CC210754	CC210755	CC210756	CC210757	CC210758	CC210759	CC210760	CC210761	CC210762	CC210763	CC210764	CC210765	CC210766	CC210767
| **Subfamily: Orthocladiinae**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cardiocladius	3	4	0	10	40	0	0	0	0	0	0	0	0	0	0
Eukiefferiella	714	752	203	554	1076	8	4	4	5	3	3	1	0	5	0
Heterotrissocladius	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Hydrobaenus	0	4	75	6	36	0	2	0	0	0	0	0	0	0	0
Hydrosmittia	0	0	0	0	0	0	0	0	0	0	0	3	0	0	8
Limnophyes	6	32	33	67	52	0	0	0	0	0	1	0	0	0	0
Metriocnemus	0	8	8	6	8	0	0	0	0	0	1	1	0	0	2
Orthocladius complex	96	108	39	224	216	829	420	920	204	432	14	256	195	65	262
Parametriocnemus	22	8	0	0	0	0	0	0	0	0	0	0	0	0	0
Rheocricotopus	0	0	0	0	0	3	0	0	1	0	0	0	0	0	0
Tvetenia	0	0	4	0	4	0	0	0	0	0	1	2	1	1	6
| **Family: Empididae**	0	0	1	3	4	0	4	0	0	0	1	0	1	0	18
Clinocerinae Unknown Genus A	0	0	0	0	0	0	14	0	3	0	0	0	0	0	0
Neoplasta	0	0	0	0	0	0	2	0	0	0	2	1	1	0	18
| **Family: Ephydridae**	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
| **Family: Muscidae**	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0
Limnophora	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
| **Family: Psychodidae**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pericoma/Telmatoscopus	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0
| **Family: Simuliidae**	0	0	4	0	0	0	2	0	3	3	8	8	0	5	16
Prosimulium/Helodon	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Simulium	0	4	3	0	8	3	2	0	2	0	22	1	7	6	2
| **Family: Tipulidae**	0	0	0	0	0	0	4	4	8	0	0	0	0	0	0
Dicranota	16	28	5	3	8	0	4	8	7	0	3	0	2	0	2
Rhabdomastix	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Tipula	0	0	3	0	4	0	0	0	0	0	0	0	0	0	0
| **Order: Hemiptera**	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
| **Family: Mesoveliidae**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mesovelia	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0
| **Order: Lepidoptera**	0	4	0	0	0	0	0	0	0	0	1	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| **Class: Arachnida**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| **Order: Trombidiformes**	0	4	1	0	0	0	0	0	0	0	0	0	1	0	0
| **Family: Hygrobatidae**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atractides	0	0	0	0	0	3	0	0	0	3	13	2	3	1	20
Hygrobates	0	0	0	0	0	0	0	0	0	0	5	2	1	1	12
| **Family: Lebertiidae**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lebertia	0	0	0	0	0	5	14	20	3	5	30	13	24	18	104
| **Family: Sperchontidae**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperchon	0	0	0	0	0	0	0	0	0	0	6	3	3	2	8
| **Order: Acari**	0	0	1	0	0	0	0	0	0	0	1	0	0	1	0
| **Order: Sarcoptiformes**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| **Order: Oribatida**	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
| **Family: Hydrozetidae**	3	0	3	0	0	0	0	0	0	0	0	1	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| **Class: Gastropoda**	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| **Class: Oligochaeta**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| **Order: Lumbriculida**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| **Family: Lumbriculidae**	16	112	53	0	12	0	4	152	25	333	42	4	8	5	124
Rhynchelmis	0	4	3	0	0	0	0	0	0	0	0	0	0	0	0
| **Order: Tubificida**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| **Family: Enchytraeidae**	294	44	0	0	0	0	0	0	0	0	0	0	0	0	0
| **Family: Naididae**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| **Subfamily: Tubificinae with hair chaetae**	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0
| **Subfamily: Tubificinae without hair chaetae**	0	0	11	64	228	21	10	0	0	0	0	0	0	0	0
Totals:	**1223**	**1264**	**524**	**1018**	**1772**	**994**	**618**	**1252**	**320**	**878**	**208**	**400**	**335**	**178**	**710**

Taxa present but not included:

Project: Minto Mine AEMP (20-70)
Minnow Environmental (BC)
Taxonomist: Scott Finlayson
250-494-7553

Site:	LMC	LMC	LMC	LMC	LMC	LWC	LWC	LWC	LWC	LWC	LBC	LBC	LBC	LBC	LBC
Sample:	LMC-1	LMC-2	LMC-3	LMC-4	LMC-5	LWC-1	LWC-2	LWC-3	LWC-4	LWC-5	LBC-1	LBC-2	LBC-3	LBC-4	LBC-5
Sample Collection Date:	15-Sep-20	14-Sep-20	11-Sep-20	11-Sep-20	11-Sep-20	13-Sep-20	12-Sep-20	12-Sep-20	12-Sep-20	12-Sep-20	16-Sep-20	16-Sep-20	16-Sep-20	16-Sep-20	16-Sep-20
CC#:	CC210753	CC210754	CC210755	CC210756	CC210757	CC210758	CC210759	CC210760	CC210761	CC210762	CC210763	CC210764	CC210765	CC210766	CC210767
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Cecidomyiidae	3	0	12	10	68	0	0	0	0	0	0	0	0	0	0
| Order: Hemiptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Tingidae	0	0	1	0	0	0	2	0	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Ostracoda	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Maxillipoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Copepoda	0	0	1	3	4	0	0	4	0	3	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Family: Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Phylum: Nemata	3	4	1	3	4	3	2	0	0	0	1	1	1	1	2
Phylum: Platyhelminthes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
| Class: Turbellaria	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0
Totals:	**6**	**8**	**17**	**16**	**76**	**3**	**4**	**4**	**0**	**3**	**1**	**1**	**1**	**1**	**6**

ND designation of a taxa represents a non-distinct taxa. This adjusts where the associated taxa fall in the metrics for this sample because the individuals are likely represented by Genus or Species level identifications.

Appendix M – Minto Creek Fish Monitoring Program Review and Recommendations

Technical Memo

Date: November 17th, 2020

To: Todd Swenson, Minto Explorations Ltd.

From: Jacquelyn Wood, Minnow Environmental Inc.

Cc: Journey Paulus, Ian Smith, Minto Explorations Ltd.

Pierre Stecko, Minnow Environmental Inc.

RE: Minto Mine AEMP Fisheries Monitoring Program Evaluation

Background

Minto Explorations Ltd. (MEL), owns and operates the Minto Mine, a high-grade copper mine, located approximately 240 km northwest of Whitehorse, Yukon, within Selkirk First Nation (SFN) Category A Settlement Land Parcel R6A (Figure 1). The Minto Mine commenced commercial operation in October 2007 and is permitted to conduct mining and milling operations at a rate of 4,200 tonnes of ore per day. Some of the Minto ore deposits (copper/gold/silver) currently being mined are located in the upper reaches of the Minto Creek watershed, approximately 12 km to the west of the Minto Creek confluence with the Yukon River (Figure 2).

MEL is required, under the terms of its water use license (WUL) #QZ14-031 (Amendment 1), to conduct an aquatic environmental monitoring program (AEMP) which includes annual fisheries monitoring in Minto Creek. Under the WUL, the AEMP is reviewed every three years and changes or modifications to the program are considered or recommended. Based on a recent review by Minnow Environmental Inc. (Minnow), it was recommended that the AEMP fisheries monitoring program (FMP) be reduced from annually to once every three years, coinciding with the Environmental Effects Monitoring (EEM) program that MEL is required to undertake as prescribed under the Metal and Diamond Mining Effluent Regulations (MDMER) of the federal *Fisheries Act*; additional monitoring would be considered in response to meaningful changes in effluent discharge (quantity or quality) from the mine. Also recommended was a formal statistical evaluation and interpretation of the FMP data to support decisions regarding FMP frequency, specifically the recommendation to reduce monitoring to once every three years. Minnow has been retained by MEL to conduct the Minto Mine FMP evaluation.

Minto Creek Fisheries Monitoring

The Minto Creek FMP has been undertaken annually since 2008 (Table 1). Every three years, the FMP is supported by field sampling conducted under the Minto Mine EEM program; additional studies have also been undertaken over time (e.g., ACG 2010) and together with the FMP and EEM have provided a foundational understanding of fish use in Minto Creek.

The majority of fish documented during monitoring in Minto Creek are juvenile chinook salmon (JCS; *Onchoryhnchus tshawytscha*) which use the creek for brief periods as they out-migrate from natal streams to the Bering Sea. Use of Minto Creek by JCS is transient and likely short-lived (i.e., residency time for most fish is two weeks or less; ACG 2010), as has been found in other non-natal chinook salmon rearing creeks (Walker 1976; Scrivener et al. 1994). JCS have not been documented in Minto Creek during every annual monitoring event (MEL 2020); when present, JCS have rarely been observed in the creek before July with peak numbers generally observed in late August or early September. Slimy sculpin (*Cottus cognatus*) are the only other fish caught regularly in Minto Creek although at much lower numbers; round whitefish (*Prosopium cylindraceum*), arctic grayling (*Thymallus arcticus*), and burbot (*Lota lota*) have also been caught occasionally in low numbers.

Fish habitat in Minto Creek is restricted to the lower 2.0 km of the system by a canyon which acts as a permanent high-gradient barrier to fish passage. Since 2010, a temporary barrier has further restricted fish to the lower 1.2 km section of the creek (Figure 2). Despite substantial effort, no fish have been captured upstream of the temporary barrier since it was first observed. With regards to habitat suitability for fish, Minto Creek does not provide preferred spawning or overwintering habitat; the substrate is primarily silt and sand with limited substrate suitable for salmon spawning (i.e., cobble and gravel) and the creek freezes to the bottom during winter with no flow in the lower portion of the creek (CCL 2006). There is also no spawning habitat at the confluence of Minto Creek with the Yukon River; during aerial surveys for spawning chinook salmon conducted from 2011 to 2014, no adult fish or evidence of spawning (e.g., redds, carcasses) was observed near the mouth of Minto Creek. In general, there is no evidence or traditional knowledge indicating that spawning occurs in Minto Creek (HKP 1994; R&D 2006, 2007).

In addition to providing poor spawning and overwintering habitat, Minto Creek is a “losing stream” system which has likely limited the opportunity for resident fish populations to become established in the creek. During summer dry periods, surface flows in lower Minto Creek can be very low to zero while flow is still observed in upper sections of the creek, likely due to infiltration of Minto Creek flows into the alluvial materials of the Yukon River floodplain (CCL 2006). Water temperatures also tend to remain cooler in Minto Creek than in the Yukon River and fluctuate

more widely throughout the day (up to 5°C or more) which likely deters fish from entering the system.

Monitoring conducted since 2008 has suggested that JCS presence in Minto Creek may also be influenced by mine water discharge. Abundance and catch-per-unit-effort (CPUE) of JCS during two major emergency discharge events in 2009 and 2010 was 10 or more times higher in the system than during the baseline year or years when little or no effluent was discharged (see Table 2); it has been hypothesized that higher flow and higher water temperature in the creek (i.e., water temperatures more consistent with temperatures observed in the Yukon River) resulting from the discharge may have made conditions more attractive for use by JCS. No JCS have been caught in Minto Creek since 2016 coinciding with tighter restrictions on discharge under the WUL and no additional emergency discharge; this provides further evidence that use of the creek by JCS may be influenced by flow and the subsequent temperature difference between the Yukon River and Minto Creek.

Objective

Subject to the background provided above, the primary objective of the FMP evaluation is to determine if ongoing monitoring as currently undertaken is providing value to the Minto Mine and includes:

- a statistical analysis and integrated interpretation of data collected from 2007 to 2019; and
- a critical examination of the program with recommendations for future monitoring.

Interpretation will specifically consider whether an annual monitoring frequency is justified, whether an alternate approach might be warranted, and whether relationships between seasonal fish use of lower Minto Creek with habitat conditions (i.e., flow and temperature) are sufficiently clear to allow their use in defining when additional fisheries monitoring would enhance understanding of fish occupancy in Minto Creek.

Methods

Data Collection

AEMP fisheries monitoring in Minto Creek was conducted monthly during the open water season (i.e., May to October; Table 1) from 2008 to 2019. In 2007 and 2009, fish sampling was also conducted to the support development of the EEM Cycle 1 Study Design and Minto Creek fish re-location project, respectively. Sampling from 2007 to 2019 was primarily conducted using Gee-type minnow traps (42 cm length, 0.6 cm mesh, 2.5 cm diameter opening) that were baited and deployed at locations downstream of the permanent fish barrier (i.e., the canyon located 2.0 km

upstream from the confluence of Minto Creek with the Yukon River). Trap sites were consistent from 2011 to 2019 with most sites located downstream of the temporary fish barrier. The number of minnow traps set during each FMP monthly sampling event ranged from 2 to 15 depending on water level and the availability of pools and backwater areas that were suitable for setting traps. Supplementary electrofishing was also conducted in Minto Creek in 2008, 2012, and 2013 but since there were only a small number of data points associated with electrofishing, this data was excluded from the analysis.

All JCS captured in minnow traps during sampling events were enumerated and released live near their trapping location. CPUE was calculated as number of fish caught per trap day.

In situ water temperature was collected in Minto Creek at station W2 (Figure 2) during each of the monthly sampling events using a calibrated YSI Professional Plus multimeter; *in situ* temperature was not collected in Minto Creek during monthly sampling events when no flow was observed in the creek. Additionally, a Levelogger was used to collect continuous water temperature and water level data at station W1 in Minto Creek (Figure 2); water level data was used to calculate continuous flow in Minto Creek. Instantaneous discharge was also measured at W1 during each monthly sampling event if flow was present using a Hach FH950 electromagnetic flow meter.

Data Analysis

CPUE data from minnow trapping during monthly monitoring events from 2007 to 2011 and 2013 to 2019 were combined with corresponding routine temperature and flow data from Minto Creek for the same time period. No CPUE data was available for fisheries monitoring conducted in 2012. CPUE data was matched with the average temperature and flow for the two weeks prior to the date of the CPUE data collection. Two weeks was chosen since mark-recapture data from Minto Creek suggests that 90% of the population may only spend up to approximately two weeks in the system (ACG 2010). Of the 282 total JCS CPUE records, one CPUE record from 2007 and five records from 2010 were excluded from the analysis because there was no date associated with the records. Additionally, 25 CPUE records were excluded from the CPUE vs. temperature analysis because there was no corresponding temperature data available, and 96 CPUE records were excluded from the CPUE vs. flow analysis because there was no corresponding flow data. Thus, 89% and 64% of CPUE records were used in the analysis of CPUE with temperature and flow, respectively.

Using the combined data set, statistical comparison of CPUE with temperature or flow was conducted using a two-way Analysis of Covariance (ANCOVA) with $\log_{10}$-transformed CPUE as the response variable, *Month* as a factor, *Temperature* or *Flow* as a covariate, and a *Month* × *Temperature* or *Flow* interaction term. Significance of the model terms was assessed using α =

0.05 werein a p-value of less than 0.05 for the covariate (i.e., temperature or flow) suggested a statistical relationship between the covariate and CPUE; a significant interaction term suggested that the relationship of the covariate with CPUE differed by month. If the interaction term was significant, post-hoc contrasts were conducted to test for a significant relationship between CPUE and the covariate for each month. Since the dataset contained an excess of zero values for CPUE (i.e., no fish were caught) the residuals were non-normally distributed and violated the assumptions of the ANCOVA model; transformation of the data did not improve normality. Therefore, non-parametric models were run using rank-transformation to confirm the results.

Results

Across years, JCS were documented in Minto Creek from May to November but were caught very infrequently in May, June, and November (n = 3 minnow trap CPUE records from 2007 to 2019; Figure 3, Appendix Table A.1). During the seasonal period where most JCS were captured (i.e., from July to October), mean CPUE was highest in July (3.3 fish/trap day from 2007 to 2019; Figure 3, Appendix Table A.1) primarily as a result of the two major discharge events that substantially increased flow and temperature in Minto Creek in 2009 and 2010. Mean CPUE in September and October was similarly driven by the fish re-location project undertaken in 2009 which resulted in the capture of 987 JCS (Figure 3). In years without emergency discharge (i.e., excluding CPUE records from 2009 and 2010), JCS have been caught most regularly in September (43% of remaining records with CPUE greater than zero) although this still constitutes a small number of records overall (3.4% of all CPUE records; Appendix Table A.1).

Mean annual CPUE for JCS ranged from 0.0 to 14.5 fish/trap day from 2007 to 2019 (Figure 4, Appendix Table A.1); JCS mean CPUE was highest in 2010 (Figure 4) during one of the two major discharge events. In years without emergency discharge, JCS mean CPUE was highest in 2007 (mean CPUE = 3.3 fish/trap day). No JCS were caught in Minto Creek during FMP monitoring from 2017 to 2019 and only 12 JCS have been caught in the creek since 2015 (Figure 4, Appendix Table A.1).

Using the combined dataset, JCS CPUE was significantly related to temperature in Minto Creek and the *Temperature* × *Month* interaction term was also significant, indicating that the relationship of temperature and CPUE varied seasonally (Figure 5, Table 3, and Appendix Table A.2). Results of post-hoc comparisons indicated that CPUE increased significantly with increasing temperature in July, September, and October but the relationship was not significant in either June or August (there was insufficient data to determine the relationship of CPUE and temperature for May; Figure 6). Results of non-parametric models using rank transformed CPUE data were similar to the results of the ANCOVA models. JCS CPUE was not significantly related to flow in Minto Creek from 2007 to 2019 (Figure 5, Table 3) although a higher proportion of JCS CPUE records

were greater than zero at flows above 0.1 m/s than at flows below this threshold (27% versus 5% of CPUE records greater than zero; Figure 5).

Summary

JCS occupy Minto Creek for brief periods (i.e., residency time for most fish is likely two weeks or less based on mark-recapture data; ACG 2010) as they out-migrate from natal streams to the Bering Sea. The use of non-natal streams by JCS has been documented frequently in the literature; JCS were observed using upper and lower Fraser River tributaries in which there was no record of spawning adults (Delaney et al. 1982; Russell et al. 1983; Murray and Rosenau 1989; Scrivener et al. 1994) and environmental studies related to mining or pipeline projects in the Yukon basin have suggested that JCS make extensive use of small, non-natal tributaries in summer for rearing (Bradford et al. 2001).

Non-natal streams may act as valuable JCS rearing habitat by providing a temporary refuge from high flows and suspended sediments in main stem habitats as well as by increasing overall available habitat, thereby reducing competition and possibly also predation risk (Scrivener et al. 1994; Bourret et al. 2016). For example, concentrations of suspended sediment in Hawks Creek, a small tributary of the Fraser River, were lower than those of the river main stem, coinciding with increasing densities of JCS in the creek (Scrivener et al. 1994). High concentrations of sediments are known to reduce feeding efficiency in juvenile salmonids (Berg and Northcote 1985; Gregory 1990), reduce growth rates and lead to downstream displacement of salmon and trout (Sigler et al. 1984; Lloyd 1987), and reduce resistance to pathogens (Herbert and Merkens 1961; Neitzel et al. 1985). In Minto Creek, mean concentrations of total suspended solids (TSS) in spring are frequently as high or higher than TSS in nearby monitoring stations in the Yukon River (Figure 7), including concentrations that have been reported to reduce feeding efficiently in salmonids (Scrivener et al. 1994); this may partially explain the observation that JCS are rarely observed in Minto Creek before July.

From 2007 to 2019, CPUE of JCS in Minto Creek was not significantly related to flow although there was a higher probability of JCS presence at flows above 0.1 m/s. Conversely, JCS CPUE was significantly related to temperature wherein CPUE generally increased with increasing water temperature although the relationship was not consistent across all months. JCS CPUE was substantially higher during the major discharge event in 2009 when water temperature reached approximately 10^{o}C, however CPUE increased significantly with increasing temperature even when data from 2009 was removed from the analysis. This suggests that the substantial increase in JCS CPUE observed during the major discharge events in 2009 and 2010 was driven by the higher than normal creek temperatures rather than flow, and more generally that habitat in the creek may be more attractive to JCS as temperatures increase. Water temperature is a primary

factor affecting juvenile life history diversity (Brett 1979; Connor et al. 2002, 2005) influencing metabolic rate, physiological processes, and maximum scope for growth (Bourret et al. 2016) where warmer temperatures typically enhance juvenile growth within a certain range (Sommer et al. 2001). In a study comparing JCS use of shoreline and offshore habitat in the mainstem of the Columbia River, the difference between shoreline and offshore water temperature was the most important predictor of JCS use of shoreline habitats (Tiffan et al. 2006); each 0.1°C increase in temperature difference in the shoreline over the offshore habitat increased the likelihood of JCS presence by 5.3 times (Tiffan et al. 2006).

Overall, JCS use of Minto Creek is likely controlled by a combination of factors. Lack of overwintering habitat, concentrations of suspended sediments in spring that are frequently as high or higher than the Yukon River, and water temperatures in summer that are much lower on average than the main stem limits the suitability of the habitat for JCS rearing throughout the year. Further, JCS prefer deeper waters in small streams (e.g., Everest and Chapman 1972; Hillman et al. 1987; Roper et al. 1994; Bradford et al. 2001) such that the capacity of small streams to support JCS in summer is likely related to the availability of pool habitat. In Minto Creek, surface flows in the lower portion of the creek during summer dry periods can be very low to zero due to the infiltration of Minto Creek flows into the alluvial materials of the Yukon River floodplain upstream of the temporary fish barrier. Thus, although JCS may be more attracted to the creek as the temperature differential with the Yukon River decreases, Minto Creek likely does not provide preferred rearing habitat for migrating JCS; no JCS have been caught in the creek since 2016 under the more restrictive WUL and excluding data from the two major discharge events in 2009 and 2010, only 341 JCS have been caught in Minto Creek since 2007.

Recommendations

Considering the results of the Minto Mine FMP evaluation outlined above, FMP monitoring as currently undertaken is providing limited value to Minto Mine. Further, continuing FMP monitoring on an annual basis will likely not provide any substantial new information to enhance understanding of JCS occupancy and use of Minto Creek and may present some risk for the small number of fish that do use the creek (e.g., incidental mortality from sampling). Therefore, the following recommendations are made regarding FMP monitoring in Minto Creek:

- reduce FMP monitoring in Minto Creek to once every three years coinciding with EEM monitoring;
- continue monitoring TSS and continuous temperature and flow in Minto Creek and TSS and continuous temperature in the Yukon River;

- additional FMP monitoring should be considered if/when flows in Minto Creek exceed 0.1 m/s after July 1st;
- additional FMP monitoring should be considered if/when water temperatures in Minto Creek approach 10°C; and
- additional fisheries monitoring should be conducted under conditions of emergency discharge from Minto Mine.

Monitoring programs conducted annually or more frequently that will provide an additional safeguard for the aquatic resources of Minto Creek include:

- Compliance water quality and toxicity monitoring under WUL #QZ14-031;
- Benthic invertebrate monitoring program under WUL #QZ14-031;
- Compliance water quality and toxicity monitoring required under the MDMER; and
- MDMER EEM sub-lethal toxicity testing.

These ongoing monitoring programs will provide an early warning system for degrading aquatic environmental conditions and, combined with FMP monitoring every three years, will provide substantial protection for the fish resources of Minto Creek.

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FIGURES



Map of Canada



Location of the Minto Mine

0 105 210 420
Kilometers

N
W E
S

Projection: North American Datum 1983 UTM Zone 8V

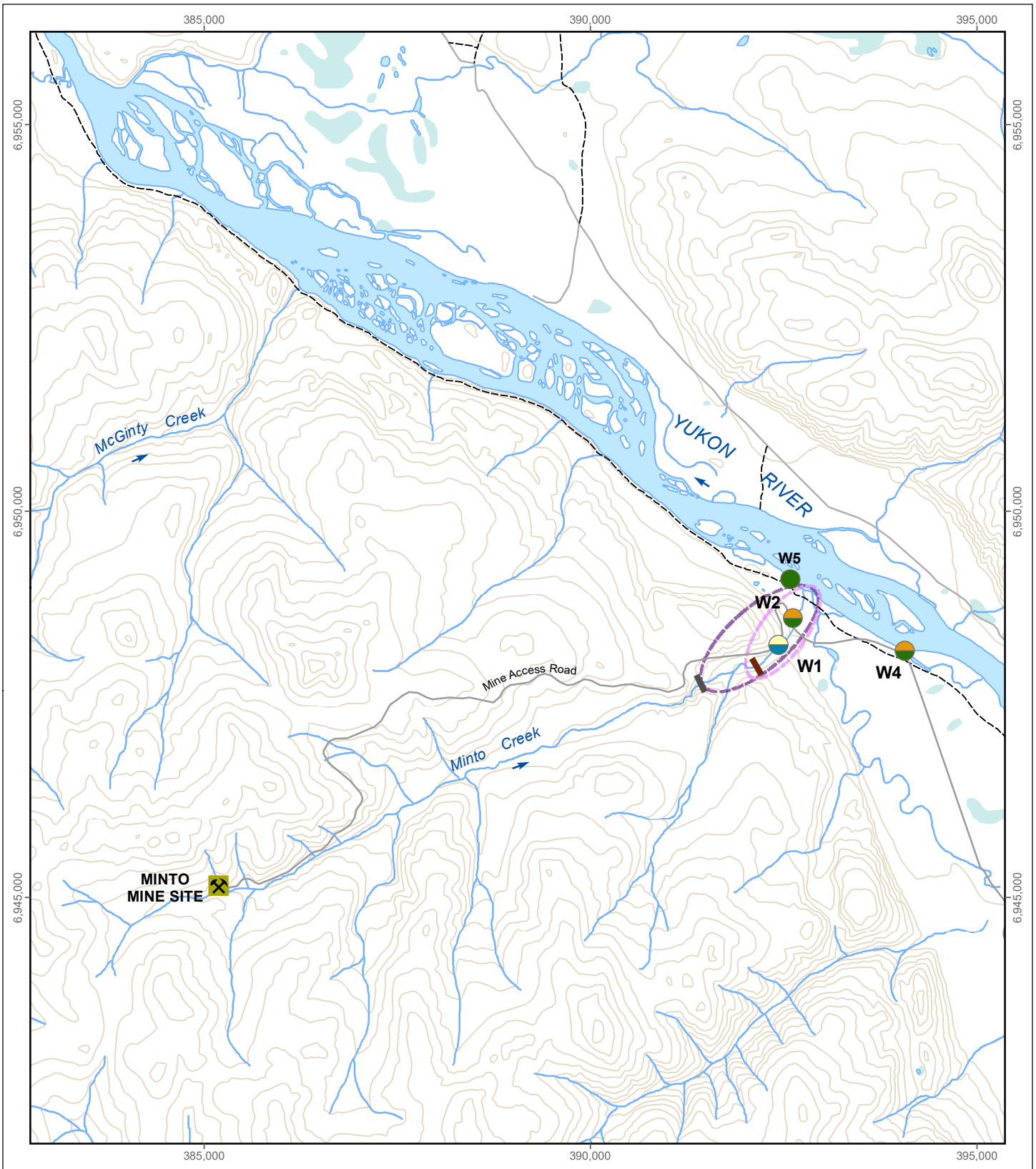
Reproduced under licence from Her Majesty the Queen in Right of Canada, Department of Natural Resources Canada. All rights reserved.

Date October 2020
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Figure 1

Document Path: C:\Users\MLaPalme\Trinity Consultants, Inc\Pembridge Resources - 207202.0059 - Fisheries Program Evaluation\4 - GIS\Report\20-59 Figure 1 Minto Mine Location.mxd



LEGEND

- In Situ Temperature Monitoring
- TSS Monitoring Station
- Continuous Temperature and Flow Monitoring Station
- Instantaneous Flow Monitoring Station
- Permanent Fish Barrier
- Temporary Fish Barrier
- Fish Sampling Area 2007 to 2010
- Fish Sampling Area 2011 to 2019

Sampling Locations for Minto Creek Fisheries Monitoring 2007 to 2019

0 1 2 4
Kilometers

Datum: NAD 83 Map Projection: UTM Zone 8V
Data Source: National Topographic Data Base (NTDB) compiled by Department of Natural Resources Canada at a scale of 1:50,000. All rights reserved.

N W E S

Date: October 2020
Project 207202.0059

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Figure 2

Document Path: C:\Users\MLaPalme\Trinity Consultants, Inc\Pembridge Resources - 207202.0059 - Fisheries Program Evaluation\4 - GIS\Report\20-59 Figure 2 Sampling Locations for Fisheries Monitoring Program.mxd

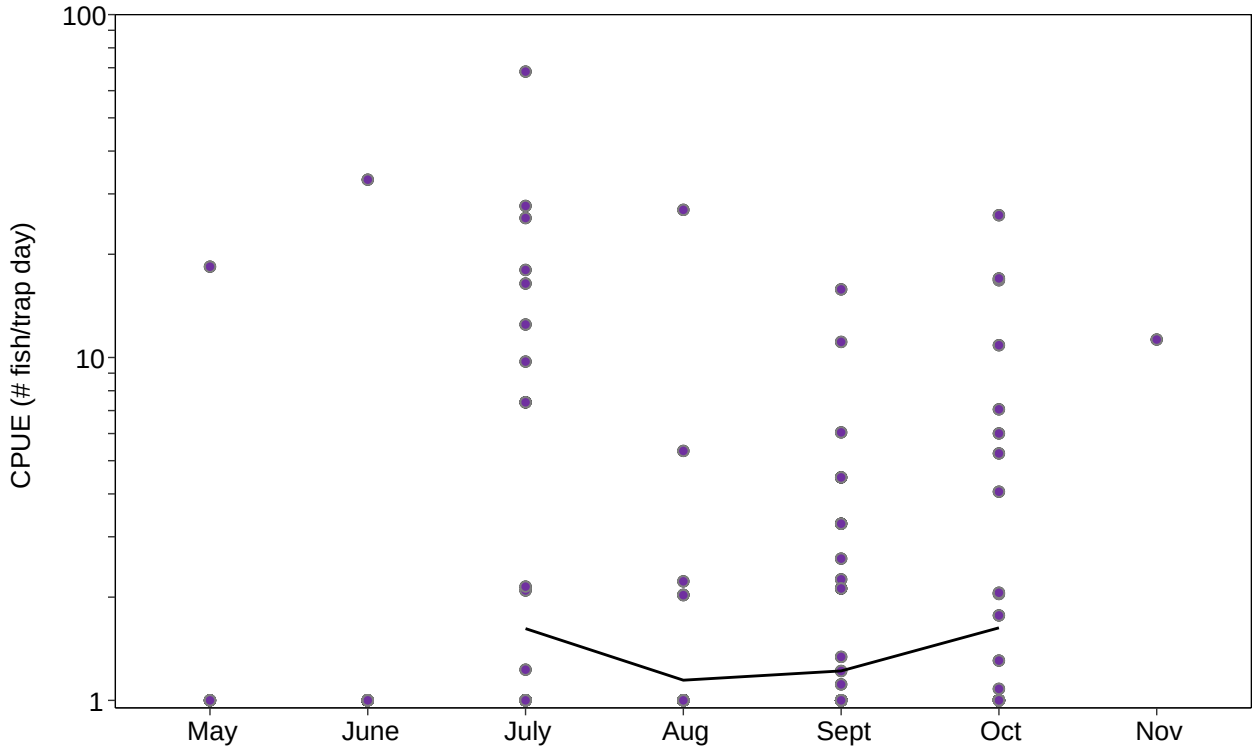


Figure 3: Seasonal Change in Catch-per-Unit-Effort for Fisheries Monitoring Events in Minto Creek, 2007 to 2019

Notes: One was added to CPUE for representation on a $\log_{10}$ scale. The black line represents the geometric mean of individual months.

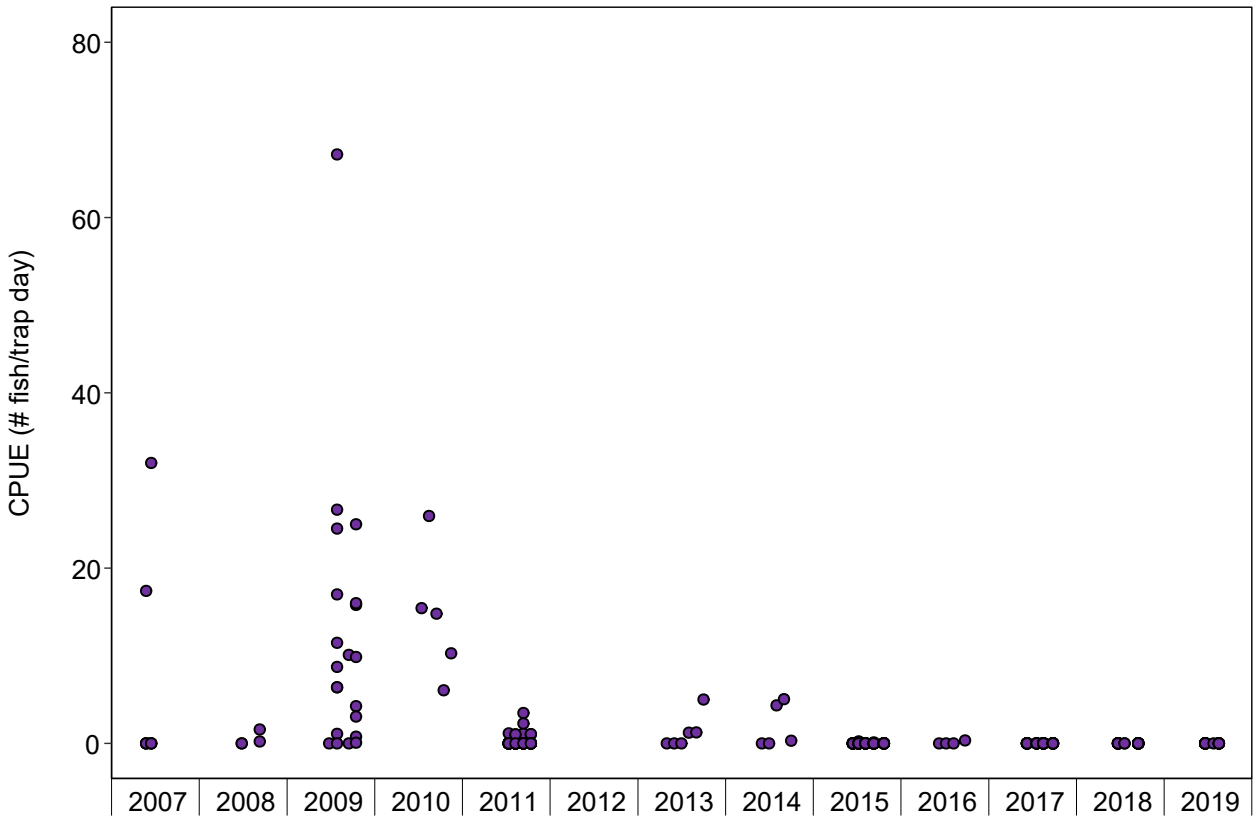


Figure 4: Catch-per-Unit-Effort for Juvenile Chinook Salmon During Fisheries Monitoring Events in Minto Creek, 2007 to 2019

Notes: Data includes AEMP fisheries monitoring data from 2008 to 2019 and data collected to support the development of the EEM Cycle 1 Study Design in 2007. Monthly CPUE data was not available for 2012.

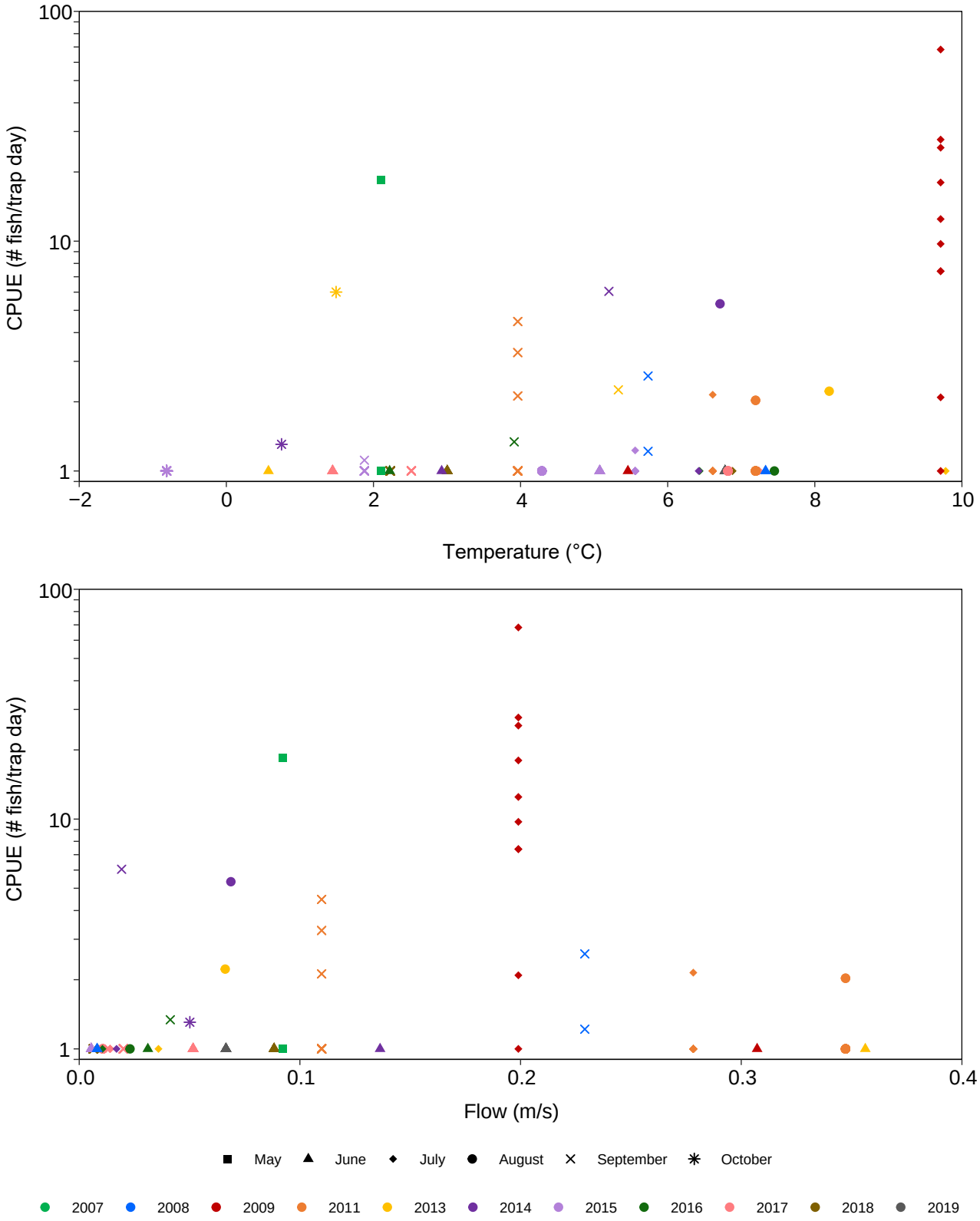


Figure 5: Relationship of Juvenile Chinook Salmon Catch-per-Unit-Effort with Temperature and Flow in Minto Creek, 2007 to 2019

Notes: One added to CPUE for representation on a $\log_{10}$ scale.

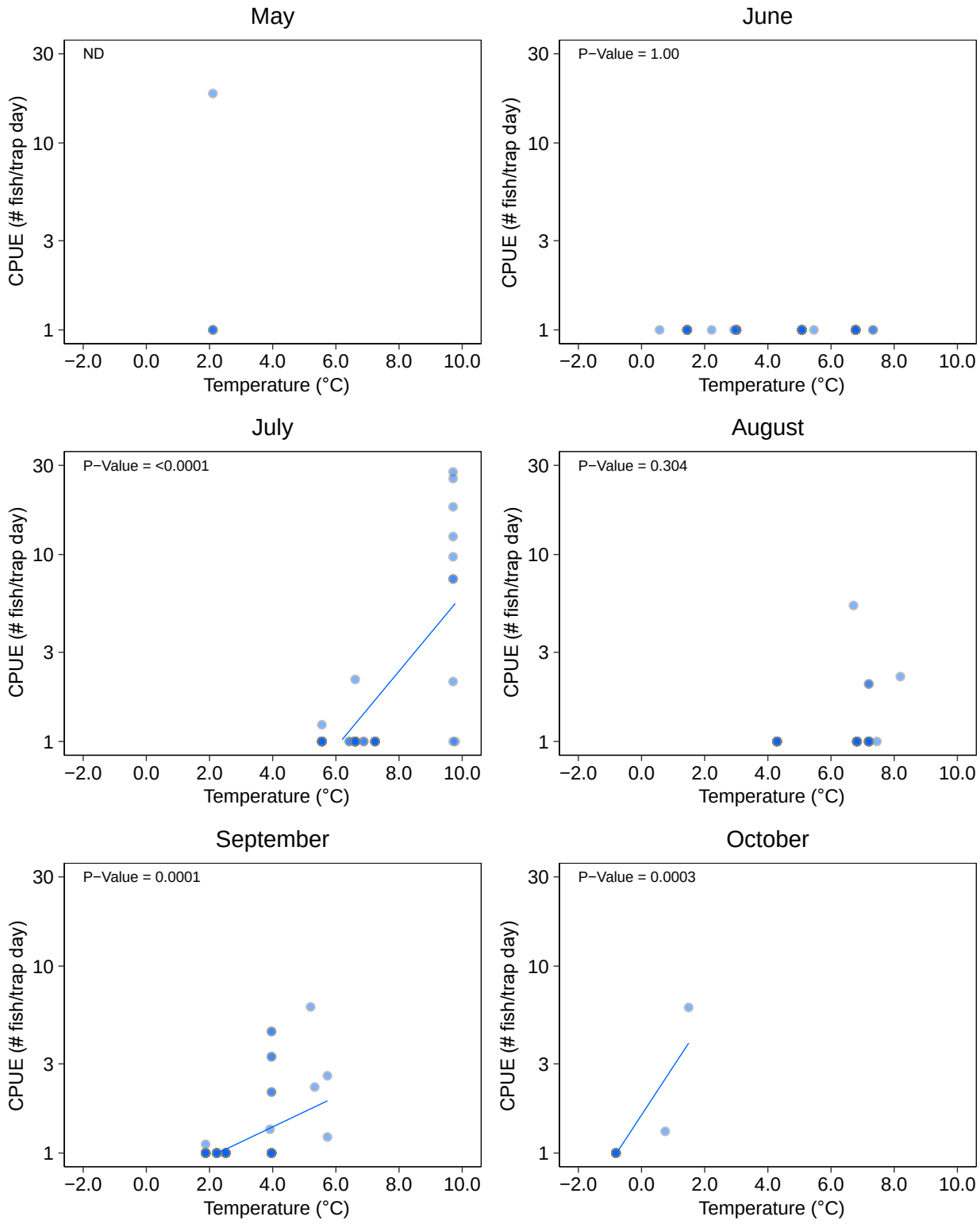


Figure 6: Seasonal Relationship of Juvenile Chinook Salmon Catch-per-Unit-Effort With Temperature in Minto Creek, 2007 to 2019

Notes: Darker symbol shading indicates a larger number of overlapping points. ND = Insufficient data to determine relationship of CPUE and temperature.

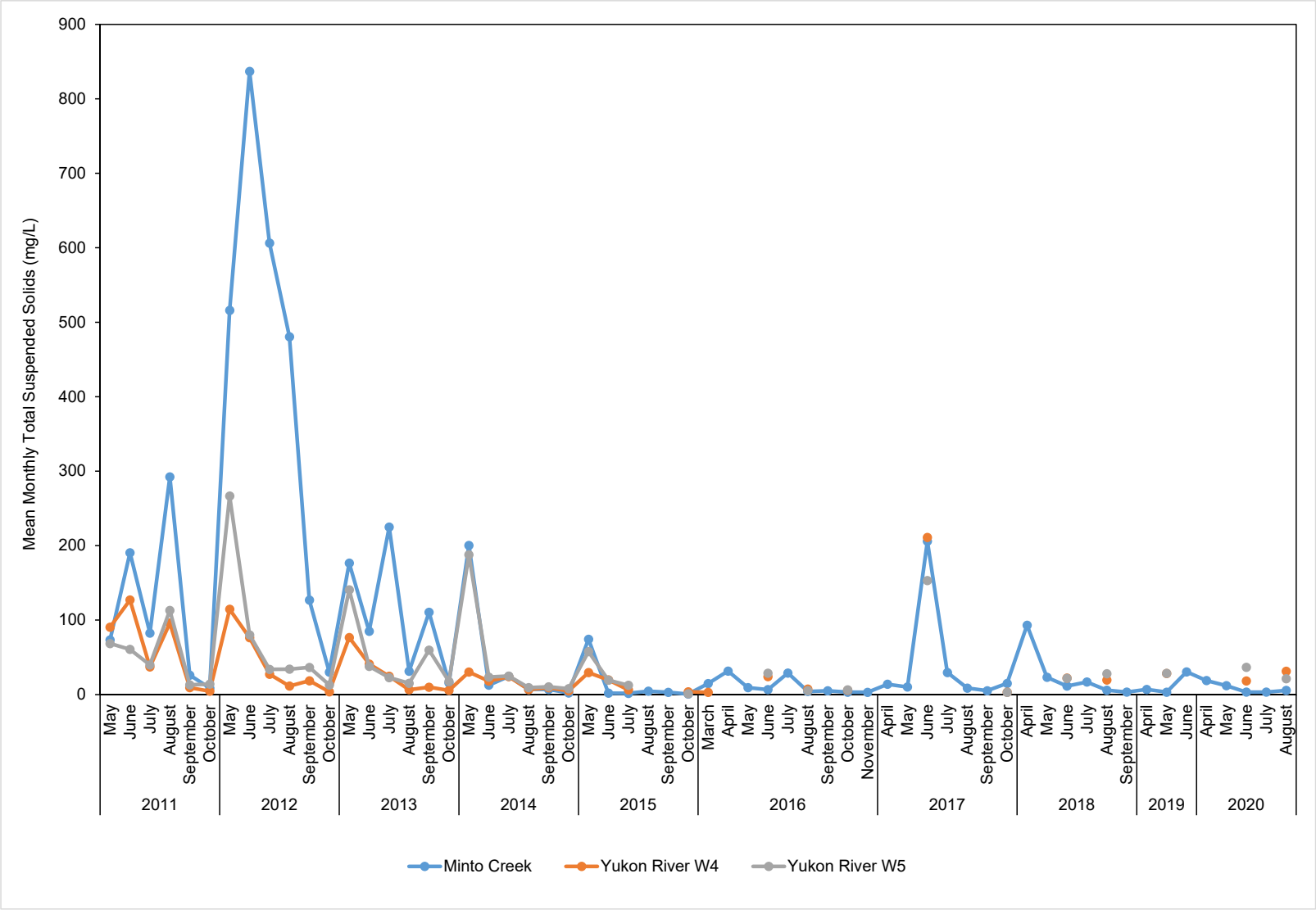


Figure 7: Mean Monthly Total Suspended Solids from Minto Creek and Stations W4 and W5 in the Yukon River, 2011 to 2020

TABLES

Table 1: Fisheries Monitoring in Minto Creek, 1994 to 2019

Year	Month	Purpose of Study	Reference
1994	June, August, September	Baseline Collection	HKP 1994
2006	September	Baseline Collection	ACG (R&D Environmental 2006)
2007	May, June, August, September	EEM Study Design Development	Minnow and ACG 2007; R&D Environmental 2007
2008	June, September	Cycle 1 EEM	Minnow and ACG 2009
2009	June, July	Compliance Monitoring	ACG 2009
2009	September, October	Fish Re-location	ACG 2009
2010	June - October	JCS Mark-Recapture Study; Compliance Monitoring	ACG 2010
2011	July - October	Compliance Monitoring; Cycle 2 EEM	ACG 2011; Minnow and ACG 2012
2011	July, August	Cycle 2 EEM – Growth Trials	Minnow and ACG 2012
2012	May - September	Compliance Monitoring; Tissue Selenium Study	ACG 2013
2013	May - October	Compliance Monitoring	ACG 2014a
2014	May - October	Compliance Monitoring	ACG 2014b
2015	May - October	Compliance Monitoring	AEG 2015
2016	June - September	Compliance Monitoring	MEL 2017a
2017	June - September	Compliance Monitoring	MEL 2017b
2018	June - September	Compliance Monitoring	MEL 2018
2019	June - September	Compliance Monitoring	MEL 2020

Notes: HKP = Hallam Knight Piesold; ACG = Access Consulting Group; Minnow = Minnow Environmental Inc.; MEL = Minto Exploration Ltd.

Table 2: Maximum Catch-per-Unit-Effort of Juvenile Chinook Salmon in Relation to Conditions in Minto Creek, 1994 to 2019

Year	Month	CPUE [a]	Minto Creek Conditions
1994	September	0.00	Pre-development – no discharge
2008	September	0.90	Operational – no discharge
2009	September/October	20.0	Emergency Discharge
2010	August	30.0	Emergency Discharge
2011	September	0.43	No discharge – high TSS contribution from tributary
2012	September	0.19	No discharge – high TSS contribution from tributary
2013	October	5.01	Operational – no discharge
2014	September	5.05	Operational – no discharge
2015	July	0.30	Operational – no discharge
2016	July	0.30	Operational – no discharge
2017	June-September	0.00	Discharge only during June trapping
2018	June-September	0.00	Discharge only during June trapping
2019	June-September	0.00	Operational – no discharge

[a] CPUE = no. fish /trap day

Table 3: Relationship of Juvenile Chinook Salmon Catch-per-Unit-Effort with Temperature and Flow in Minto Creek, 2007 to 2019

Covariate	Significance of ANCOVA Terms		
	Month	Covariate	Covariate x Month
Temperature	<0.001	<0.001	<0.001
Flow	<0.001	0.304	0.493

Notes: CPUE was $\log_{10}$ transformed. Model residuals were not normally distributed, but results were consistent with an ANCOVA model using a rank transformation of CPUE (i.e., non-parametric test).

APPENDIX A
DATA

Table A.1: Juvenile Chinook Salmon Catch and Catch-per-Unit-Effort from Minnow Traps in Minto Creek, 2007 to 2019

Year	Month	Date	Trap Site	Number of Traps	Set Date	Lift Date	Set Time	Lift Time	Net Hours	Trap Days	Catch	CPUE
2019	June	21-Jun-19	MCF-16	1	21-Jun-19	22-Jun-19	17:20	16:19	23.0	0.958	0	0
2019	June	21-Jun-19	MCF-15	1	21-Jun-19	22-Jun-19	17:22	16:21	23.0	0.958	0	0
2019	June	21-Jun-19	MCF-15.5	1	21-Jun-19	22-Jun-19	17:25	16:20	22.9	0.955	0	0
2019	June	21-Jun-19	MCF-25	1	21-Jun-19	22-Jun-19	17:30	16:25	22.9	0.955	0	0
2019	June	21-Jun-19	MCF-26	1	21-Jun-19	22-Jun-19	17:33	16:33	23.0	0.958	0	0
2019	June	21-Jun-19	MCF-17	1	21-Jun-19	22-Jun-19	17:44	16:36	22.9	0.953	0	0
2019	June	21-Jun-19	MCF-18	1	21-Jun-19	22-Jun-19	17:56	16:42	22.8	0.949	0	0
2019	June	21-Jun-19	MCF-W1	1	21-Jun-19	22-Jun-19	18:01	16:41	22.7	0.944	0	0
2019	June	21-Jun-19	MCF-19	1	21-Jun-19	22-Jun-19	18:05	16:57	22.9	0.953	0	0
2019	June	21-Jun-19	MCF-20	1	21-Jun-19	22-Jun-19	18:10	17:02	22.9	0.953	0	0
2019	June	21-Jun-19	MCF-21	1	21-Jun-19	22-Jun-19	18:15	17:05	22.8	0.951	0	0
2019	June	21-Jun-19	MCF-23	1	21-Jun-19	22-Jun-19	18:23	17:11	22.8	0.950	0	0
2019	June	21-Jun-19	MCF-22	1	21-Jun-19	22-Jun-19	18:27	17:11	22.7	0.947	0	0
2019	June	21-Jun-19	MCF-24	1	21-Jun-19	22-Jun-19	18:31	17:20	22.8	0.951	0	0
2019	June	21-Jun-19	MCF-25	1	21-Jun-19	22-Jun-19	18:33	17:25	22.9	0.953	0	0
2019	July	26-Jul-19	MCF-22	1	26-Jul-19	27-Jul-19	16:45	15:15	22.5	0.938	0	0
2018	June	23-Jun-18	MCF-14	1	23-Jun-18	24-Jun-18	14:57	14:50	23.9	0.995	0	0
2018	June	23-Jun-18	MCF-16	1	23-Jun-18	24-Jun-18	15:03	14:55	23.9	0.994	0	0
2018	June	23-Jun-18	MCF-15	1	23-Jun-18	24-Jun-18	15:06	14:56	23.8	0.993	0	0
2018	June	23-Jun-18	MCF-25	1	23-Jun-18	24-Jun-18	15:10	14:58	23.8	0.992	0	0
2018	June	23-Jun-18	MCF-27	1	23-Jun-18	24-Jun-18	15:35	15:14	23.7	0.985	0	0
2018	June	23-Jun-18	MCF-24	1	23-Jun-18	24-Jun-18	15:38	15:16	23.6	0.985	0	0
2018	June	23-Jun-18	MCF-B1	1	23-Jun-18	24-Jun-18	15:41	15:20	23.7	0.985	0	0
2018	June	23-Jun-18	MCF-22	1	23-Jun-18	24-Jun-18	15:53	15:25	23.5	0.981	0	0
2018	June	23-Jun-18	MCF-21	1	23-Jun-18	24-Jun-18	15:59	15:29	23.5	0.979	0	0
2018	June	23-Jun-18	MCF-W1	1	23-Jun-18	24-Jun-18	16:08	15:47	23.6	0.985	0	0
2018	June	23-Jun-18	MCF-18	1	23-Jun-18	24-Jun-18	16:09	15:48	23.6	0.985	0	0
2018	June	23-Jun-18	MCF-17	1	23-Jun-18	24-Jun-18	16:14	15:53	23.7	0.985	0	0
2018	June	23-Jun-18	MCF-26	1	23-Jun-18	24-Jun-18	16:18	15:58	23.7	0.986	0	0
2018	July	20-Jul-18	MCF-17	1	20-Jul-18	21-Jul-18	15:24	15:21	23.9	0.998	0	0
2018	July	20-Jul-18	MCF-21	1	20-Jul-18	21-Jul-18	15:43	15:31	23.8	0.992	0	0
2018	August	17-Aug-19	MCF-25	1	17-Aug-18	18-Aug-18	17:00	15:05	22.1	0.920	0	0
2018	August	17-Aug-19	MCF-18	1	17-Aug-18	18-Aug-18	17:08	15:11	22.1	0.919	0	0
2018	August	17-Aug-19	MCF-24	1	17-Aug-18	18-Aug-18	17:20	15:37	22.3	0.928	0	0
2018	August	17-Aug-19	MCF-B1	1	17-Aug-18	18-Aug-18	17:23	15:37	22.2	0.926	0	0
2018	August	17-Aug-19	MCF-22	1	17-Aug-18	18-Aug-18	17:28	15:40	22.2	0.925	0	0
2018	August	17-Aug-19	MCF-21	1	17-Aug-18	18-Aug-18	17:31	15:30	22.0	0.916	0	0
2018	August	17-Aug-19	MCF-26	1	17-Aug-18	18-Aug-18	17:43	15:17	21.6	0.899	0	0
2018	September	15-Sep-18	MCF-12	1	15-Sep-18	16-Sep-18	15:17	14:11	22.9	0.954	0	0
2018	September	15-Sep-18	MCF-13	1	15-Sep-18	16-Sep-18	15:19	14:12	22.9	0.953	0	0
2018	September	15-Sep-18	MCF-14	1	15-Sep-18	16-Sep-18	15:22	14:15	22.9	0.953	0	0
2018	September	15-Sep-18	MCF-16	1	15-Sep-18	16-Sep-18	15:29	14:22	22.9	0.953	0	0
2018	September	15-Sep-18	MCF-15	1	15-Sep-18	16-Sep-18	15:31	14:24	22.9	0.953	0	0
2018	September	15-Sep-18	MCF-25	1	15-Sep-18	16-Sep-18	15:34	14:04	22.5	0.938	0	0
2018	September	15-Sep-18	MCF-24	1	15-Sep-18	16-Sep-18	15:59	14:42	22.7	0.947	0	0
2018	September	15-Sep-18	MCF-B1	1	15-Sep-18	16-Sep-18	16:00	14:40	22.7	0.944	0	0
2018	September	15-Sep-18	MCF-22	1	15-Sep-18	16-Sep-18	16:05	14:52	22.8	0.949	0	0
2018	September	15-Sep-18	MCF-21	1	15-Sep-18	16-Sep-18	16:09	14:52	22.7	0.947	0	0
2018	September	15-Sep-18	MCF-20	1	15-Sep-18	16-Sep-18	16:11	14:59	22.8	0.950	0	0
2018	September	15-Sep-18	MCF-W1	1	15-Sep-18	16-Sep-18	16:16	16:03	23.8	0.991	0	0
2018	September	15-Sep-18	MCF-18	1	15-Sep-18	16-Sep-18	16:17	16:05	23.8	0.992	0	0
2018	September	15-Sep-18	MCF-17	1	15-Sep-18	16-Sep-18	16:22	14:17	21.9	0.913	0	0
2018	September	15-Sep-18	MCF-26	1	15-Sep-18	16-Sep-18	16:25	14:19	21.9	0.912	0	0
2017	June	9-Jun-17	MCF-12	1	09-Jun-17	10-Jun-17	15:50	14:48	23.0	0.957	0	0
2017	June	9-Jun-17	MCF-13	1	09-Jun-17	10-Jun-17	15:55	14:50	22.9	0.955	0	0
2017	June	9-Jun-17	MCF-14	1	09-Jun-17	10-Jun-17	16:00	14:54	22.9	0.954	0	0
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2017	June	9-Jun-17	MCF-16	1	09-Jun-17	10-Jun-17	16:30	15:09	22.6	0.944	0	0
2017	June	9-Jun-17	MCF-26	1	09-Jun-17	10-Jun-17	16:35	15:20	22.8	0.948	0	0
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2017	June	9-Jun-17	MCF-20	1	09-Jun-17	10-Jun-17	17:25	16:13	22.8	0.950	0	0
2017	June	9-Jun-17	MCF-21	1	09-Jun-17	10-Jun-17	17:30	16:10	22.7	0.944	0	0
2017	June	9-Jun-17	MCF-22	1	09-Jun-17	10-Jun-17	17:34	15:34	22.0	0.917	0	0
2017	June	9-Jun-17	MCF-23	1	09-Jun-17	10-Jun-17	17:35	15:36	22.0	0.917	0	0
2017	July	19-Jul-17	MCF-15	1	19-Jul-17	20-Jul-17	14:24	13:46	23.4	0.974	0	0
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2017	July	19-Jul-17	MCF-22	1	19-Jul-17	20-Jul-17	15:00	14:23	23.4	0.974	0	0
2017	July	19-Jul-17	MCF-B1	1	19-Jul-17	20-Jul-17	15:18	14:17	23.0	0.958	0	0
2017	July	19-Jul-17	MCF-24	1	19-Jul-17	20-Jul-17	15:24	14:14	22.8	0.951	0	0
2017	August	16-Aug-17	MCF-14	1	16-Aug-17	17-Aug-17	14:41	13:14	22.5	0.940	0	0
2017	August	16-Aug-17	MCF-15	1	16-Aug-17	17-Aug-17	14:33	13:39	23.1	0.963	0	0
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2017	August	16-Aug-17	MCF-19	1	16-Aug-17	17-Aug-17	15:30	14:36	23.1	0.962	0	0
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2017	August	16-Aug-17	MCF-21	1	16-Aug-17	17-Aug-17	16:08	14:15	22.1	0.922	0	0
2017	August	16-Aug-17	MCF-22	1	16-Aug-17	17-Aug-17	15:45	14:21	22.6	0.942	0	0
2017	August	16-Aug-17	MCF-B1	1	16-Aug-17	17-Aug-17	16:15	15:03	22.8	0.950	0	0
2017	August	16-Aug-17	MCF-24	1	16-Aug-17	17-Aug-17	16:23	14:13	21.8	0.910	0	0
2017	August	16-Aug-17	MCF-27	1	16-Aug-17	17-Aug-17	16:27	14:15	21.8	0.908	0	0
2017	September	25-Sep-17	MCF-12	1	25-Sep-17	26-Sep-17	14:06	9:26	19.3	0.806	0	0
2017	September	25-Sep-17	MCF-13	1	25-Sep-17	26-Sep-17	14:11	9:28	19.3	0.803	0	0
2017	September	25-Sep-17	MCF-14	1	25-Sep-17	26-Sep-17	14:15	9:32	19.3	0.803	0	0
2017	September	25-Sep-17	MCF-15	1	25-Sep-17	26-Sep-17	14:23	9:39	19.3	0.803	0	0

Notes: "-" = Missing Data

Table A.1: Juvenile Chinook Salmon Catch and Catch-per-Unit-Effort from Minnow Traps in Minto Creek, 2007 to 2019

Year	Month	Date	Trap Site	Number of Traps	Set Date	Lift Date	Set Time	Lift Time	Net Hours	Trap Days	Catch	CPUE
2017	September	25-Sep-17	MCF-25	1	25-Sep-17	26-Sep-17	14:27	13:39	23.2	0.967	0	0
2017	September	25-Sep-17	MCF-27	1	25-Sep-17	26-Sep-17	14:51	13:50	23.0	0.958	0	0
2017	September	25-Sep-17	MCF-24	1	25-Sep-17	26-Sep-17	14:56	13:54	23.0	0.957	0	0
2017	September	25-Sep-17	MCF-B1	1	25-Sep-17	26-Sep-17	15:00	13:57	23.0	0.956	0	0
2017	September	25-Sep-17	MCF-22	1	25-Sep-17	26-Sep-17	15:09	14:02	22.9	0.953	0	0
2017	September	25-Sep-17	MCF-21	1	25-Sep-17	26-Sep-17	15:14	14:07	22.9	0.953	0	0
2017	September	25-Sep-17	MCF-20	1	25-Sep-17	26-Sep-17	15:18	14:10	22.9	0.953	0	0
2017	September	25-Sep-17	MCF-18	1	25-Sep-17	26-Sep-17	15:31	14:27	22.9	0.956	0	0
2017	September	25-Sep-17	MCF-17	1	25-Sep-17	26-Sep-17	15:37	14:32	22.9	0.955	0	0
2017	September	25-Sep-17	MCF-26	1	25-Sep-17	26-Sep-17	15:41	14:34	22.9	0.953	0	0
2016	June	8-Jun-16	MCF	-	-	-	-	-	424.2	17.68	0	0
2016	July	7-Jul-16	MCF	-	-	-	-	-	390.9	16.29	0	0
2016	August	7-Aug-16	MCF	-	-	-	-	-	424	17.67	0	0
2016	September	24-Sep-16	MCF-12	-	-	-	-	-	424	17.67	6	0.339
2015	June	15-Jun-15	MCF-16	1	15-Jun-15	16-Jun-15	14:32	8:52	18.3	0.764	0	0
2015	June	15-Jun-15	MCF-15.5	1	15-Jun-15	16-Jun-15	14:59	8:54	17.9	0.747	0	0
2015	June	15-Jun-15	MCF-14	1	15-Jun-15	16-Jun-15	14:41	8:45	18.1	0.753	0	0
2015	June	15-Jun-15	MCF-25	1	15-Jun-15	16-Jun-15	15:05	8:58	17.9	0.745	0	0
2015	June	15-Jun-15	MCF-26	1	15-Jun-15	16-Jun-15	15:05	8:58	17.9	0.745	0	0
2015	June	15-Jun-15	MCF-17	1	15-Jun-15	16-Jun-15	15:13	9:52	18.7	0.777	0	0
2015	June	15-Jun-15	MCF-W1	2	15-Jun-15	16-Jun-15	15:21	9:47	18.4	0.768	0	0
2015	June	15-Jun-15	MCF-19	2	15-Jun-15	16-Jun-15	15:28	9:40	18.2	0.758	0	0
2015	June	15-Jun-15	MCF-20	1	15-Jun-15	16-Jun-15	15:37	9:35	18.0	0.749	0	0
2015	June	15-Jun-15	MCF-21	1	15-Jun-15	16-Jun-15	15:42	9:32	17.8	0.743	0	0
2015	June	15-Jun-15	MCF-22	1	15-Jun-15	16-Jun-15	15:51	9:28	17.6	0.734	0	0
2015	June	15-Jun-15	MCF-B1	2	15-Jun-15	16-Jun-15	16:00	9:22	17.4	0.724	0	0
2015	June	15-Jun-15	MCF-24	1	15-Jun-15	16-Jun-15	16:03	9:19	17.3	0.719	0	0
2015	June	15-Jun-15	MCF-27	1	15-Jun-15	16-Jun-15	16:06	9:17	17.2	0.716	0	0
2015	July	9-Jul-15	MCF-16	1	09-Jul-15	10-Jul-15	14:50	8:54	18.1	0.753	0	0
2015	July	9-Jul-15	MCF-15	1	09-Jul-15	10-Jul-15	14:52	8:55	18.1	0.752	0	0
2015	July	9-Jul-15	MCF-14	1	09-Jul-15	10-Jul-15	15:01	8:47	17.8	0.740	0	0
2015	July	9-Jul-15	MCF-13	1	09-Jul-15	10-Jul-15	15:05	8:43	17.6	0.735	0	0
2015	July	9-Jul-15	MCF-12	1	09-Jul-15	10-Jul-15	15:08	8:37	17.5	0.728	4	0.229
2015	July	9-Jul-15	MCF-25	1	09-Jul-15	10-Jul-15	15:17	8:48	17.5	0.730	0	0
2015	July	9-Jul-15	MCF-26	1	09-Jul-15	10-Jul-15	15:19	8:49	17.5	0.729	0	0
2015	July	9-Jul-15	MCF-17	1	09-Jul-15	10-Jul-15	15:24	9:44	18.3	0.764	0	0
2015	July	9-Jul-15	MCF-W1	2	09-Jul-15	10-Jul-15	15:30	9:39	18.1	0.756	0	0
2015	July	9-Jul-15	MCF-19	2	09-Jul-15	10-Jul-15	15:38	9:34	17.9	0.747	0	0
2015	July	9-Jul-15	MCF-20	1	09-Jul-15	10-Jul-15	15:43	9:30	17.8	0.741	0	0
2015	July	9-Jul-15	MCF-21	1	09-Jul-15	10-Jul-15	15:47	9:27	17.7	0.736	0	0
2015	July	9-Jul-15	MCF-22	1	09-Jul-15	10-Jul-15	15:52	9:22	17.5	0.729	0	0
2015	July	9-Jul-15	MCF-B1	2	09-Jul-15	10-Jul-15	15:59	9:17	17.3	0.721	0	0
2015	July	9-Jul-15	MCF-24	1	09-Jul-15	10-Jul-15	16:03	9:15	17.2	0.717	0	0
2015	July	9-Jul-15	MCF-27	1	09-Jul-15	10-Jul-15	16:05	9:13	17.1	0.714	0	0
2015	August	6-Aug-15	MCF-16	1	06-Aug-15	07-Aug-15	14:05	9:56	19.9	0.827	0	0
2015	August	6-Aug-15	MCF-15	1	06-Aug-15	07-Aug-15	14:07	9:56	19.8	0.826	0	0
2015	August	6-Aug-15	MCF-25	2	06-Aug-15	07-Aug-15	14:29	9:54	19.4	0.809	0	0
2015	August	6-Aug-15	MCF-26	1	06-Aug-15	07-Aug-15	14:33	9:52	19.3	0.805	0	0
2015	August	6-Aug-15	MCF-17	1	06-Aug-15	07-Aug-15	14:36	9:50	19.2	0.801	0	0
2015	August	6-Aug-15	MCF-W1	2	06-Aug-15	07-Aug-15	14:45	9:42	18.9	0.790	0	0
2015	August	6-Aug-15	MCF-19	2	06-Aug-15	07-Aug-15	14:50	9:36	18.8	0.782	0	0
2015	August	6-Aug-15	MCF-20	1	06-Aug-15	07-Aug-15	14:55	9:33	18.6	0.776	0	0
2015	August	6-Aug-15	MCF-21	1	06-Aug-15	07-Aug-15	14:59	9:30	18.5	0.772	0	0
2015	August	6-Aug-15	MCF-22	1	06-Aug-15	07-Aug-15	15:04	9:25	18.3	0.765	0	0
2015	August	6-Aug-15	MCF-B1	2	06-Aug-15	07-Aug-15	15:12	9:21	18.1	0.756	0	0
2015	August	6-Aug-15	MCF-24	1	06-Aug-15	07-Aug-15	15:15	9:19	18.1	0.753	0	0
2015	August	6-Aug-15	MCF-27	1	06-Aug-15	07-Aug-15	15:17	9:16	18.0	0.749	0	0
2015	September	10-Sep-15	MCF-15	1	10-Sep-15	11-Sep-15	14:40	8:50	18.2	0.757	0	0
2015	September	10-Sep-15	MCF-14	1	10-Sep-15	11-Sep-15	14:52	8:43	17.9	0.744	0	0
2015	September	10-Sep-15	MCF-13	1	10-Sep-15	11-Sep-15	14:56	8:40	17.7	0.739	0	0
2015	September	10-Sep-15	MCF-12	1	10-Sep-15	11-Sep-15	14:57	8:34	17.6	0.734	2	0.114
2015	September	10-Sep-15	MCF-25	2	10-Sep-15	11-Sep-15	14:44	8:53	18.1	0.756	0	0
2015	September	10-Sep-15	MCF-26	1	10-Sep-15	11-Sep-15	14:44	8:54	18.2	0.757	0	0
2015	September	10-Sep-15	MCF-17	1	10-Sep-15	11-Sep-15	15:08	9:37	18.5	0.770	0	0
2015	September	10-Sep-15	MCF-W1	2	10-Sep-15	11-Sep-15	15:15	9:30	18.3	0.760	0	0
2015	September	10-Sep-15	MCF-19	2	10-Sep-15	11-Sep-15	15:22	9:26	18.1	0.753	0	0
2015	September	10-Sep-15	MCF-20	1	10-Sep-15	11-Sep-15	15:25	9:23	18.0	0.749	0	0
2015	September	10-Sep-15	MCF-21	1	10-Sep-15	11-Sep-15	15:30	9:20	17.8	0.743	0	0
2015	September	10-Sep-15	MCF-22	1	10-Sep-15	11-Sep-15	15:34	9:17	17.7	0.738	0	0
2015	September	10-Sep-15	MCF-B1	1	10-Sep-15	11-Sep-15	14:42	9:12	18.5	0.771	0	0
2015	September	10-Sep-15	MCF-24	1	10-Sep-15	11-Sep-15	15:45	9:11	17.4	0.726	0	0
2015	September	10-Sep-15	MCF-27	1	10-Sep-15	11-Sep-15	15:46	9:09	17.4	0.724	0	0
2015	October	22-Oct-15	MCF-16	1	22-Oct-15	23-Oct-15	14:10	10:18	20.1	0.839	0	0
2015	October	22-Oct-15	MCF-15	1	22-Oct-15	23-Oct-15	14:10	10:19	20.1	0.840	0	0
2015	October	22-Oct-15	MCF-14	1	22-Oct-15	23-Oct-15	14:20	9:24	19.1	0.794	0	0
2015	October	22-Oct-15	MCF-13	1	22-Oct-15	23-Oct-15	14:22	9:20	19.0	0.790	0	0
2015	October	22-Oct-15	MCF-12	1	22-Oct-15	23-Oct-15	14:24	9:19	18.9	0.788	0	0
2015	October	22-Oct-15	MCF-25	1	22-Oct-15	23-Oct-15	14:05	10:16	20.2	0.841	0	0
2015	October	22-Oct-15	MCF-26	1	22-Oct-15	23-Oct-15	14:07	10:16	20.2	0.840	0	0
2015	October	22-Oct-15	MCF-17	1	22-Oct-15	23-Oct-15	14:36	10:13	19.6	0.817	0	0
2015	October	22-Oct-15	MCF-W1	2	22-Oct-15	23-Oct-15	14:42	10:07	19.4	0.809	0	0
2015	October	22-Oct-15	MCF-19	2	22-Oct-15	23-Oct-15	14:48	10:03	19.2	0.802	0	0
2015	October	22-Oct-15	MCF-20	1	22-Oct-15	23-Oct-15	14:53	10:00	19.1	0.797	0	0
2015	October	22-Oct-15	MCF-21	1	22-Oct-15	23-Oct-15	14:56	9:58	19.0	0.793	0	0
2015	October	22-Oct-15	MCF-22	1	22-Oct-15	23-Oct-15	14:59	9:54	18.9	0.788	0	0
2015	October	22-Oct-15	MCF-B1	1	22-Oct-15	23-Oct-15	15:05	9:50	18.8	0.781	0	0
2015	October	22-Oct-15	MCF-24	1	22-Oct-15	23-Oct-15	15:08	9:48	18.7	0.778	0	0
2014	June	1-Jun-14	-	-	-	-	-	-	228.0	9.50	0	0
2014	July	1-Jul-14	-	-	-	-	-	-	337.8	14.08	0	0

Notes: "-" = Missing Data

Table A.1: Juvenile Chinook Salmon Catch and Catch-per-Unit-Effort from Minnow Traps in Minto Creek, 2007 to 2019

Year	Month	Date	Trap Site	Number of Traps	Set Date	Lift Date	Set Time	Lift Time	Net Hours	Trap Days	Catch	CPUE
2014	August	1-Aug-14	-	-	-	-	-	-	320.8	13.37	58	4.34
2014	September	1-Sep-14	-	-	-	-	-	-	423.2	17.63	89	5.05
2014	October	1-Oct-14	-	-	-	-	-	-	313.8	13.08	4	0.306
2013	May	1-May-13	-	-	-	-	-	-	121.0	5.04	0	0
2013	June	1-Jun-13	-	-	-	-	-	-	241.3	10.05	0	0
2013	July	1-Jul-13	-	-	-	-	-	-	244	10.17	0	0
2013	August	1-Aug-13	-	-	-	-	-	-	372.6	15.53	19	1.22
2013	September	1-Sep-13	-	-	-	-	-	-	363.6	15.15	19	1.25
2013	October	1-Oct-13	-	-	-	-	-	-	398	16.58	83	5.01
2011	July	13-Jul-11	MCF-12	1	13-Jul-11	14-Jul-11	12:51	9:47	20.9	0.872	1	1.15
2011	July	13-Jul-11	MCF-13	1	13-Jul-11	14-Jul-11	12:44	9:50	21.1	0.879	0	0
2011	July	13-Jul-11	MCF-14	1	13-Jul-11	14-Jul-11	12:40	9:54	21.2	0.885	0	0
2011	July	13-Jul-11	MCF-15.5	1	13-Jul-11	14-Jul-11	13:06	10:20	21.2	0.885	0	0
2011	July	13-Jul-11	MCF-17	1	13-Jul-11	14-Jul-11	13:27	10:43	21.3	0.886	0	0
2011	July	13-Jul-11	MCF-18	1	13-Jul-11	14-Jul-11	13:35	10:35	21.0	0.875	0	0
2011	July	13-Jul-11	MCF-19	3	13-Jul-11	14-Jul-11	13:53	10:23	20.5	0.854	0	0
2011	July	13-Jul-11	MCF-20	1	13-Jul-11	14-Jul-11	14:00	11:39	21.7	0.902	0	0
2011	July	13-Jul-11	MCF-21	1	13-Jul-11	14-Jul-11	14:05	11:30	21.4	0.892	0	0
2011	July	13-Jul-11	MCF-22	1	13-Jul-11	14-Jul-11	14:10	11:25	21.2	0.885	0	0
2011	July	13-Jul-11	MCF-23	1	13-Jul-11	14-Jul-11	14:15	11:22	21.1	0.880	0	0
2011	July	13-Jul-11	MCF-24	3	13-Jul-11	14-Jul-11	14:35	11:10	20.6	0.858	0	0
2011	July	13-Jul-11	MCF-25	1	13-Jul-11	14-Jul-11	13:15	9:49	20.6	0.857	0	0
2011	July	13-Jul-11	MCF-26	1	13-Jul-11	14-Jul-11	13:15	10:10	20.9	0.872	0	0
2011	July	13-Jul-11	MCF-B1	2	13-Jul-11	14-Jul-11	14:25	11:15	20.8	0.868	0	0
2011	July	13-Jul-11	MCF-W1	2	13-Jul-11	14-Jul-11	14:50	10:30	19.7	0.819	0	0
2011	July	13-Jul-11	MCF-W1	2	13-Jul-11	14-Jul-11	13:41	10:30	20.8	0.867	0	0
2011	August	10-Aug-11	MCF-12	2	10-Aug-11	11-Aug-11	11:27	10:43	23.3	0.969	1	1.03
2011	August	10-Aug-11	MCF-13	1	10-Aug-11	11-Aug-11	11:23	10:47	23.4	0.975	0	0
2011	August	10-Aug-11	MCF-14	2	10-Aug-11	11-Aug-11	11:19	10:51	23.5	0.981	0	0
2011	August	10-Aug-11	MCF-15	1	10-Aug-11	11-Aug-11	11:40	11:00	23.3	0.972	0	0
2011	August	10-Aug-11	MCF15.5	1	10-Aug-11	11-Aug-11	11:43	11:03	23.3	0.972	0	0
2011	August	10-Aug-11	MCF-17	1	10-Aug-11	11-Aug-11	12:00	12:22	24.4	1.015	0	0
2011	August	10-Aug-11	MCF-18	1	10-Aug-11	11-Aug-11	12:08	12:15	24.1	1.005	0	0
2011	August	10-Aug-11	MCF-19	3	10-Aug-11	11-Aug-11	12:25	12:02	23.6	0.984	1	0
2011	August	10-Aug-11	MCF-20	1	10-Aug-11	11-Aug-11	12:33	11:54	23.3	0.973	0	0
2011	August	10-Aug-11	MCF-21	1	10-Aug-11	11-Aug-11	12:41	11:45	23.1	0.961	0	0
2011	August	10-Aug-11	MCF-22	1	10-Aug-11	11-Aug-11	12:45	11:35	22.8	0.951	0	0
2011	August	10-Aug-11	MCF-23	1	10-Aug-11	11-Aug-11	12:48	11:32	22.7	0.947	0	0
2011	August	10-Aug-11	MCF-24	1	10-Aug-11	11-Aug-11	13:00	11:28	22.5	0.936	0	0
2011	August	10-Aug-11	MCF-26	1	10-Aug-11	11-Aug-11	11:43	11:05	23.4	0.974	1	1.03
2011	August	10-Aug-11	MCF-W1	1	10-Aug-11	11-Aug-11	12:13	12:12	24.0	0.999	0	0
2011	September	12-Sep-11	MCF-12	1	12-Sep-11	13-Sep-11	13:49	10:34	20.8	0.865	3	3.47
2011	September	12-Sep-11	MCF-13	1	12-Sep-11	13-Sep-11	13:39	10:43	21.1	0.878	0	0
2011	September	12-Sep-11	MCF-14	1	12-Sep-11	13-Sep-11	13:53	10:47	20.9	0.871	0	0
2011	September	12-Sep-11	MCF-17	1	12-Sep-11	13-Sep-11	14:14	11:53	21.7	0.902	0	0
2011	September	12-Sep-11	MCF-18	1	12-Sep-11	13-Sep-11	14:20	11:46	21.4	0.893	1	1.12
2011	September	12-Sep-11	MCF-19	1	12-Sep-11	13-Sep-11	14:28	11:34	21.1	0.879	2	2.27
2011	September	12-Sep-11	MCF-20	1	12-Sep-11	13-Sep-11	14:32	11:29	21.0	0.873	0	0
2011	September	12-Sep-11	MCF-21	1	12-Sep-11	13-Sep-11	14:35	11:23	20.8	0.867	0	0
2011	September	12-Sep-11	MCF-22	1	12-Sep-11	13-Sep-11	14:39	11:18	20.6	0.860	0	0
2011	September	12-Sep-11	MCF-23	1	12-Sep-11	13-Sep-11	14:42	11:15	20.5	0.856	0	0
2011	September	12-Sep-11	MCF-24	1	12-Sep-11	13-Sep-11	14:46	11:08	20.4	0.849	0	0
2011	September	12-Sep-11	MCF-26	1	12-Sep-11	13-Sep-11	15:04	11:57	20.9	0.870	0	0
2011	September	12-Sep-11	MCF-B1	1	12-Sep-11	13-Sep-11	14:48	11:09	20.3	0.848	0	0
2011	September	12-Sep-11	MCF-W1	1	12-Sep-11	13-Sep-11	14:24	11:43	21.3	0.888	0	0
2011	October	13-Oct-11	MCF-12	1	13-Oct-11	14-Oct-11	13:22	12:00	22.6	0.943	0	0
2011	October	13-Oct-11	MCF-13	1	13-Oct-11	14-Oct-11	13:18	12:05	22.8	0.949	0	0
2011	October	13-Oct-11	MCF-14	1	13-Oct-11	14-Oct-11	13:15	12:08	22.9	0.953	0	0
2011	October	13-Oct-11	MCF15.5	1	13-Oct-11	14-Oct-11	13:34	12:13	22.6	0.944	0	0
2011	October	13-Oct-11	MCF-16	1	13-Oct-11	14-Oct-11	13:32	12:12	22.7	0.944	0	0
2011	October	13-Oct-11	MCF-17	1	13-Oct-11	14-Oct-11	13:45	13:19	23.6	0.982	0	0
2011	October	13-Oct-11	MCF-18	1	13-Oct-11	14-Oct-11	13:51	13:15	23.4	0.975	0	0
2011	October	13-Oct-11	MCF-19	1	13-Oct-11	14-Oct-11	13:59	13:00	23.0	0.959	1	1.04
2011	October	13-Oct-11	MCF-20	1	13-Oct-11	14-Oct-11	14:05	12:57	22.9	0.953	0	0
2011	October	13-Oct-11	MCF-21	1	13-Oct-11	14-Oct-11	14:08	12:47	22.6	0.944	1	1.06
2011	October	13-Oct-11	MCF-22	1	13-Oct-11	14-Oct-11	14:13	12:43	22.5	0.938	0	0
2011	October	13-Oct-11	MCF-23	1	13-Oct-11	14-Oct-11	14:17	12:40	22.4	0.933	0	0
2011	October	13-Oct-11	MCF-24	1	13-Oct-11	14-Oct-11	14:31	12:32	22.0	0.917	0	0
2011	October	13-Oct-11	MCF-26	1	13-Oct-11	14-Oct-11	13:38	12:17	22.6	0.944	0	0
2011	October	13-Oct-11	MCF-B1	1	13-Oct-11	14-Oct-11	14:24	12:34	22.2	0.924	0	0
2011	October	13-Oct-11	MCF-W1	1	13-Oct-11	14-Oct-11	13:55	13:10	23.3	0.969	0	0
2010	July	-	-	-	-	-	-	-	768	32.0	493	15.4
2010	August	-	-	-	-	-	-	-	840	35.0	901	26.0
2010	September	-	-	-	-	-	-	-	702.24	29.3	433	14.8
2010	October	-	-	-	-	-	-	-	384	16.0	95	6.06
2010	November	-	-	-	-	-	-	-	864	36.0	371	10.3
2009	June	25-Jun-09	-	6	-	-	-	-	144	6.0	0	0
2009	July	28-Jul-09	US1	1	-	-	-	-	22.5	0.938	25	26.7
2009	July	28-Jul-09	US2	1	-	-	-	-	24	1.0	17	17
2009	July	28-Jul-09	US3	1	-	-	-	-	23.5	0.979	24	24.5
2009	July	28-Jul-09	US4	1	-	-	-	-	23	0.958	11	11.5
2009	July	28-Jul-09	US5	1	-	-	-	-	22	0.917	1	1.09
2009	July	28-Jul-09	US6	1	-	-	-	-	22	0.917	8	8.73
2009	July	28-Jul-09	DS1	1	-	-	-	-	15	0.625	0	0
2009	July	28-Jul-09	DS2	1	-	-	-	-	15	0.625	4	6.40
2009	July	28-Jul-09	DS3	1	-	-	-	-	15	0.625	4	6.40
2009	July	28-Jul-09	DS4	1	-	-	-	-	15	0.625	42	67.2

Notes: "-" = Missing Data

Table A.1: Juvenile Chinook Salmon Catch and Catch-per-Unit-Effort from Minnow Traps in Minto Creek, 2007 to 2019

Year	Month	Date	Trap Site	Number of Traps	Set Date	Lift Date	Set Time	Lift Time	Net Hours	Trap Days	Catch	CPUE
2009	September	-	Barrier 900m US of culvert at km 11 on Minto Mine Road	3	-	-	-	-	72	3.0	0	0
2009	September	-	0 to 900m US of culvert at km 11 on Minto Mine Road	29	-	-	-	-	696	29.0	292	10.1
2009	October	-	Barrier 900m US of culvert at km 11 on Minto Mine Road	7	-	-	-	-	168	7.0	69	9.86
2009	October	-	0 to 900m US of culvert at km 11 on Minto Mine Road	9	-	-	-	-	216	9.0	142	15.8
2009	October	-	Barrier 900m US of culvert at km 11 on Minto Mine Road	7	-	-	-	-	168	7.0	175	25.0
2009	October	-	0 to 900m US of culvert at km 11 on Minto Mine Road	9	-	-	-	-	216	9.0	144	16.0
2009	October	-	Barrier 900m US of culvert at km 11 on Minto Mine Road	24	-	-	-	-	576	24.0	102	4.25
2009	October	-	0 to 900m US of culvert at km 11 on Minto Mine Road	17	-	-	-	-	408	17.0	52	3.06
2009	October	-	Barrier 900m US of culvert at km 11 on Minto Mine Road	13	-	-	-	-	312	13.0	10	0.769
2009	October	-	0 to 900m US of culvert at km 11 on Minto Mine Road	12	-	-	-	-	288	12.0	1	0.0800
2008	June	26-Jun-08	DS of Haul road	5	-	-	-	-	120	5.0	0	0
2008	June	26-Jun-08	US of Haul road	6	-	-	-	-	144	6.0	0	0
2008	September	9-Sep-08	DS of Haul road	5	-	-	-	-	220.08	9.2	2	0.218
2008	September	9-Sep-08	US of Haul road	5	-	-	-	-	226.08	9.4	15	1.59
2007	May	25-May-07	Haul road culvert to 300 DS	8	-	-	-	-	15	0.625	0	0
2007	May	25-May-07	Haul road culvert to 75 m US	3	-	-	-	-	15	0.625	0	0
2007	May	25-May-07	At base of canyon	5	-	-	-	-	15	0.625	0	0
2007	May	25-May-07	At Yukon River to 100 m US	6	-	-	-	-	5.5	0.229	4	17.4
2007	June	-	Haul road culvert to 300 DS	8	-	-	-	-	22.08	0.920	0	0
2007	June	-	Haul road culvert to 75 m US	2	-	-	-	-	22.08	0.920	0	0
2007	June	-	At base of canyon	5	-	-	-	-	19.92	0.830	0	0
2007	June	-	At Yukon River to 100 m US	5	-	-	-	-	18	0.750	24	32.0

Notes: "-" = Missing Data

Table A.2: Juvenile Chinook Salmon Catch and Catch-per-Unit-Effort from Minnow Traps Matched With Corresponding Temperature and Flow Data from Minto Creek, 2007 to 2019

Year	Month	Date	Catch	CPUE	*In Situ* Temperature[a]	Instantaneous Flow[b]	Mean Temperature[c]	Mean Temperature *n*[d]	Mean Flow[c]	Mean Flow *n*[d]
2019	June	2019-06-21	0	0	10.6	0.0306	6.78	2	0.0665	16
2019	June	2019-06-21	0	0	10.6	0.0306	6.78	2	0.0665	16
2019	June	2019-06-21	0	0	10.6	0.0306	6.78	2	0.0665	16
2019	June	2019-06-21	0	0	10.6	0.0306	6.78	2	0.0665	16
2019	June	2019-06-21	0	0	10.6	0.0306	6.78	2	0.0665	16
2019	June	2019-06-21	0	0	10.6	0.0306	6.78	2	0.0665	16
2019	June	2019-06-21	0	0	10.6	0.0306	6.78	2	0.0665	16
2019	June	2019-06-21	0	0	10.6	0.0306	6.78	2	0.0665	16
2019	June	2019-06-21	0	0	10.6	0.0306	6.78	2	0.0665	16
2019	June	2019-06-21	0	0	10.6	0.0306	6.78	2	0.0665	16
2019	June	2019-06-21	0	0	10.6	0.0306	6.78	2	0.0665	16
2019	June	2019-06-21	0	0	10.6	0.0306	6.78	2	0.0665	16
2019	June	2019-06-21	0	0	10.6	0.0306	6.78	2	0.0665	16
2019	June	2019-06-21	0	0	10.6	0.0306	6.78	2	0.0665	16
2019	June	2019-06-21	0	0	10.6	0.0306	6.78	2	0.0665	16
2019	July	2019-07-26	0	0	4	0	-	0	-	0
2019	August	2019-08-17	0	0	-	-	-	0	-	0
2019	August	2019-08-17	0	0	-	-	-	0	-	0
2019	August	2019-08-17	0	0	-	-	-	0	-	0
2019	August	2019-08-17	0	0	-	-	-	0	-	0
2019	August	2019-08-17	0	0	-	-	-	0	-	0
2019	August	2019-08-17	0	0	-	-	-	0	-	0
2019	August	2019-08-17	0	0	-	-	-	0	-	0
2018	June	2018-06-23	0	0	5.8	0.013	3	16	0.0883	16
2018	June	2018-06-23	0	0	5.8	0.013	3	16	0.0883	16
2018	June	2018-06-23	0	0	5.8	0.013	3	16	0.0883	16
2018	June	2018-06-23	0	0	5.8	0.013	3	16	0.0883	16
2018	June	2018-06-23	0	0	5.8	0.013	3	16	0.0883	16
2018	June	2018-06-23	0	0	5.8	0.013	3	16	0.0883	16
2018	June	2018-06-23	0	0	5.8	0.013	3	16	0.0883	16
2018	June	2018-06-23	0	0	5.8	0.013	3	16	0.0883	16
2018	June	2018-06-23	0	0	5.8	0.013	3	16	0.0883	16
2018	June	2018-06-23	0	0	5.8	0.013	3	16	0.0883	16
2018	July	2018-07-20	0	0	5.6	0	6.88	5	0.0088	16
2018	July	2018-07-20	0	0	5.6	0	6.88	5	0.0088	16
2018	September	2018-09-15	0	0	1.4	0.026	2.23	16	0.0064	16
2018	September	2018-09-15	0	0	1.4	0.026	2.23	16	0.0064	16
2018	September	2018-09-15	0	0	1.4	0.026	2.23	16	0.0064	16
2018	September	2018-09-15	0	0	1.4	0.026	2.23	16	0.0064	16
2018	September	2018-09-15	0	0	1.4	0.026	2.23	16	0.0064	16
2018	September	2018-09-15	0	0	1.4	0.026	2.23	16	0.0064	16
2018	September	2018-09-15	0	0	1.4	0.026	2.23	16	0.0064	16
2018	September	2018-09-15	0	0	1.4	0.026	2.23	16	0.0064	16
2018	September	2018-09-15	0	0	1.4	0.026	2.23	16	0.0064	16
2018	September	2018-09-15	0	0	1.4	0.026	2.23	16	0.0064	16
2018	September	2018-09-15	0	0	1.4	0.026	2.23	16	0.0064	16
2018	September	2018-09-15	0	0	1.4	0.026	2.23	16	0.0064	16
2017	June	2017-06-09	0	0	-	-	1.44	16	0.0516	16
2017	June	2017-06-09	0	0	-	-	1.44	16	0.0516	16
2017	June	2017-06-09	0	0	-	-	1.44	16	0.0516	16
2017	June	2017-06-09	0	0	-	-	1.44	16	0.0516	16
2017	June	2017-06-09	0	0	-	-	1.44	16	0.0516	16
2017	June	2017-06-09	0	0	-	-	1.44	16	0.0516	16
2017	June	2017-06-09	0	0	-	-	1.44	16	0.0516	16
2017	June	2017-06-09	0	0	-	-	1.44	16	0.0516	16
2017	June	2017-06-09	0	0	-	-	1.44	16	0.0516	16
2017	June	2017-06-09	0	0	-	-	1.44	16	0.0516	16
2017	June	2017-06-09	0	0	-	-	1.44	16	0.0516	16
2017	June	2017-06-09	0	0	-	-	1.44	16	0.0516	16
2017	July	2017-07-19	0	0	-	-	7.24	16	0.014	16
2017	July	2017-07-19	0	0	-	-	7.24	16	0.014	16
2017	July	2017-07-19	0	0	-	-	7.24	16	0.014	16
2017	July	2017-07-19	0	0	-	-	7.24	16	0.014	16
2017	July	2017-07-19	0	0	-	-	7.24	16	0.014	16
2017	July	2017-07-19	0	0	-	-	7.24	16	0.014	16
2017	August	2017-08-16	0	0	6.7	0.006	6.82	16	0.0107	16
2017	August	2017-08-16	0	0	6.7	0.006	6.82	16	0.0107	16
2017	August	2017-08-16	0	0	6.7	0.006	6.82	16	0.0107	16
2017	August	2017-08-16	0	0	6.7	0.006	6.82	16	0.0107	16
2017	August	2017-08-16	0	0	6.7	0.006	6.82	16	0.0107	16
2017	August	2017-08-16	0	0	6.7	0.006	6.82	16	0.0107	16
2017	August	2017-08-16	0	0	6.7	0.006	6.82	16	0.0107	16
2017	August	2017-08-16	0	0	6.7	0.006	6.82	16	0.0107	16
2017	August	2017-08-16	0	0	6.7	0.006	6.82	16	0.0107	16
2017	August	2017-08-16	0	0	6.7	0.006	6.82	16	0.0107	16
2017	August	2017-08-16	0	0	6.7	0.006	6.82	16	0.0107	16
2017	September	2017-09-25	0	0	1.3	0.009	2.51	16	0.02	16
2017	September	2017-09-25	0	0	1.3	0.009	2.51	16	0.02	16
2017	September	2017-09-25	0	0	1.3	0.009	2.51	16	0.02	16
2017	September	2017-09-25	0	0	1.3	0.009	2.51	16	0.02	16
2017	September	2017-09-25	0	0	1.3	0.009	2.51	16	0.02	16
2017	September	2017-09-25	0	0	1.3	0.009	2.51	16	0.02	16
2017	September	2017-09-25	0	0	1.3	0.009	2.51	16	0.02	16
2017	September	2017-09-25	0	0	1.3	0.009	2.51	16	0.02	16
2017	September	2017-09-25	0	0	1.3	0.009	2.51	16	0.02	16

Notes: "-" = Missing Data

[a] In Situ temperature measured once per monthly sampling event at station W2.

[b] Instantaneous flow measured once per monthly sampling event at station W1.

[c] Mean of continuous temperature and flow data for two weeks prior to the date of the CPUE data collection from station W1.

[d] Sample size of continuous temperature and flow data from station W1 used to calculate mean temperature and flow.

Table A.2: Juvenile Chinook Salmon Catch and Catch-per-Unit-Effort from Minnow Traps Matched With Corresponding Temperature and Flow Data from Minto Creek, 2007 to 2019

Year	Month	Date	Catch	CPUE	*In Situ* Temperature[a]	Instantaneous Flow[b]	Mean Temperature[c]	Mean Temperature *n*[d]	Mean Flow[c]	Mean Flow *n*[d]
2017	September	2017-09-25	0	0	1.3	0.009	2.51	16	0.02	16
2017	September	2017-09-25	0	0	1.3	0.009	2.51	16	0.02	16
2017	September	2017-09-25	0	0	1.3	0.009	2.51	16	0.02	16
2017	September	2017-09-25	0	0	1.3	0.009	2.51	16	0.02	16
2016	June	2016-06-08	0	0	6.4	0.0365	2.22	16	0.0311	16
2016	July	2016-07-07	0	0	8.2	0.007	6.43	16	0.0105	16
2016	August	2016-08-07	0	0	7.7	0.02	7.45	16	0.023	16
2016	September	2016-09-24	6	0.339	4.4	0.056	3.91	16	0.0413	16
2015	June	2015-06-15	0	0	8.8	0.006	5.08	2	0.0054	3
2015	June	2015-06-15	0	0	8.8	0.006	5.08	2	0.0054	3
2015	June	2015-06-15	0	0	8.8	0.006	5.08	2	0.0054	3
2015	June	2015-06-15	0	0	8.8	0.006	5.08	2	0.0054	3
2015	June	2015-06-15	0	0	8.8	0.006	5.08	2	0.0054	3
2015	June	2015-06-15	0	0	8.8	0.006	5.08	2	0.0054	3
2015	June	2015-06-15	0	0	8.8	0.006	5.08	2	0.0054	3
2015	June	2015-06-15	0	0	8.8	0.006	5.08	2	0.0054	3
2015	June	2015-06-15	0	0	8.8	0.006	5.08	2	0.0054	3
2015	June	2015-06-15	0	0	8.8	0.006	5.08	2	0.0054	3
2015	June	2015-06-15	0	0	8.8	0.006	5.08	2	0.0054	3
2015	June	2015-06-15	0	0	8.8	0.006	5.08	2	0.0054	3
2015	June	2015-06-15	0	0	8.8	0.006	5.08	2	0.0054	3
2015	July	2015-07-09	0	0	8.05	0.009	5.56	2	-	0
2015	July	2015-07-09	0	0	8.05	0.009	5.56	2	-	0
2015	July	2015-07-09	0	0	8.05	0.009	5.56	2	-	0
2015	July	2015-07-09	0	0	8.05	0.009	5.56	2	-	0
2015	July	2015-07-09	4	0.229	8.05	0.009	5.56	2	-	0
2015	July	2015-07-09	0	0	8.05	0.009	5.56	2	-	0
2015	July	2015-07-09	4	0.229	8.05	0.009	5.56	2	-	0
2015	July	2015-07-09	0	0	8.05	0.009	5.56	2	-	0
2015	July	2015-07-09	0	0	8.05	0.009	5.56	2	-	0
2015	July	2015-07-09	0	0	8.05	0.009	5.56	2	-	0
2015	July	2015-07-09	0	0	8.05	0.009	5.56	2	-	0
2015	July	2015-07-09	0	0	8.05	0.009	5.56	2	-	0
2015	July	2015-07-09	0	0	8.05	0.009	5.56	2	-	0
2015	July	2015-07-09	0	0	8.05	0.009	5.56	2	-	0
2015	August	2015-08-06	0	0	9.4	0.0085	4.29	1	-	0
2015	August	2015-08-06	0	0	9.4	0.0085	4.29	1	-	0
2015	August	2015-08-06	0	0	9.4	0.0085	4.29	1	-	0
2015	August	2015-08-06	0	0	9.4	0.0085	4.29	1	-	0
2015	August	2015-08-06	0	0	9.4	0.0085	4.29	1	-	0
2015	August	2015-08-06	0	0	9.4	0.0085	4.29	1	-	0
2015	August	2015-08-06	0	0	9.4	0.0085	4.29	1	-	0
2015	August	2015-08-06	0	0	9.4	0.0085	4.29	1	-	0
2015	August	2015-08-06	0	0	9.4	0.0085	4.29	1	-	0
2015	August	2015-08-06	0	0	9.4	0.0085	4.29	1	-	0
2015	August	2015-08-06	0	0	9.4	0.0085	4.29	1	-	0
2015	September	2015-09-10	0	0	5.15	0.019	1.88	1	-	0
2015	September	2015-09-10	0	0	5.15	0.019	1.88	1	-	0
2015	September	2015-09-10	0	0	5.15	0.019	1.88	1	-	0
2015	September	2015-09-10	2	0.114	5.15	0.019	1.88	1	-	0
2015	September	2015-09-10	0	0	5.15	0.019	1.88	1	-	0
2015	September	2015-09-10	0	0	5.15	0.019	1.88	1	-	0
2015	September	2015-09-10	0	0	5.15	0.019	1.88	1	-	0
2015	September	2015-09-10	0	0	5.15	0.019	1.88	1	-	0
2015	September	2015-09-10	0	0	5.15	0.019	1.88	1	-	0
2015	September	2015-09-10	0	0	5.15	0.019	1.88	1	-	0
2015	September	2015-09-10	0	0	5.15	0.019	1.88	1	-	0
2015	September	2015-09-10	0	0	5.15	0.019	1.88	1	-	0
2015	September	2015-09-10	0	0	5.15	0.019	1.88	1	-	0
2015	October	2015-10-22	0	0	0.7	0.019	-0.81	2	-	0
2015	October	2015-10-22	0	0	0.7	0.019	-0.81	2	-	0
2015	October	2015-10-22	0	0	0.7	0.019	-0.81	2	-	0
2015	October	2015-10-22	0	0	0.7	0.019	-0.81	2	-	0
2015	October	2015-10-22	0	0	0.7	0.019	-0.81	2	-	0
2015	October	2015-10-22	0	0	0.7	0.019	-0.81	2	-	0
2015	October	2015-10-22	0	0	0.7	0.019	-0.81	2	-	0
2015	October	2015-10-22	0	0	0.7	0.019	-0.81	2	-	0
2015	October	2015-10-22	0	0	0.7	0.019	-0.81	2	-	0
2015	October	2015-10-22	0	0	0.7	0.019	-0.81	2	-	0
2015	October	2015-10-22	0	0	0.7	0.019	-0.81	2	-	0
2015	October	2015-10-22	0	0	0.7	0.019	-0.81	2	-	0
2015	October	2015-10-22	0	0	0.7	0.019	-0.81	2	-	0
2014	June	2014-06-01	0	0	8.2	0.036	2.93	15	0.1363	2
2014	July	2014-07-01	0	0	8.3	0.109	6.42	16	0.0169	3
2014	August	2014-08-01	58	4.34	8	0.013	6.71	16	0.0687	2
2014	September	2014-09-01	89	5.05	3.5	0.015	5.2	16	0.0192	3
2014	October	2014-10-01	4	0.306	-0.1	0.015	0.75	16	0.0501	2
2013	May	2013-05-01	0	0	0.55	0.508	-	0	-	0
2013	June	2013-06-01	0	0	3.9	0.079	0.57	16	0.3562	3
2013	July	2013-07-01	0	0	6.05	0.0765	9.78	16	0.0359	3
2013	August	2013-08-01	19	1.22	6.2	0.0475	8.2	4	0.0662	3
2013	September	2013-09-01	19	1.25	3.6	0.129	5.33	16	-	0
2013	October	2013-10-01	83	5.01	0	0.0713	1.49	16	-	0
2011	July	2011-07-13	1	1.15	8.3	0.113	6.61	16	0.2783	16
2011	July	2011-07-13	0	0	8.3	0.113	6.61	16	0.2783	16
2011	July	2011-07-13	0	0	8.3	0.113	6.61	16	0.2783	16

Notes: "-" = Missing Data

[a] In Situ temperature measured once per monthly sampling event at station W2.

[b] Instantaneous flow measured once per monthly sampling event at station W1.

[c] Mean of continuous temperature and flow data for two weeks prior to the date of the CPUE data collection from station W1.

[d] Sample size of continuous temperature and flow data from station W1 used to calculate mean temperature and flow.

Table A.2: Juvenile Chinook Salmon Catch and Catch-per-Unit-Effort from Minnow Traps Matched With Corresponding Temperature and Flow Data from Minto Creek, 2007 to 2019

Year	Month	Date	Catch	CPUE	*In Situ* Temperature[a]	Instantaneous Flow[b]	Mean Temperature[c]	Mean Temperature *n*[d]	Mean Flow[c]	Mean Flow *n*[d]
2011	July	2011-07-13	0	0	8.3	0.113	6.61	16	0.2783	16
2011	July	2011-07-13	0	0	8.3	0.113	6.61	16	0.2783	16
2011	July	2011-07-13	0	0	8.3	0.113	6.61	16	0.2783	16
2011	July	2011-07-13	0	0	8.3	0.113	6.61	16	0.2783	16
2011	July	2011-07-13	0	0	8.3	0.113	6.61	16	0.2783	16
2011	July	2011-07-13	0	0	8.3	0.113	6.61	16	0.2783	16
2011	July	2011-07-13	0	0	8.3	0.113	6.61	16	0.2783	16
2011	July	2011-07-13	0	0	8.3	0.113	6.61	16	0.2783	16
2011	July	2011-07-13	0	0	8.3	0.113	6.61	16	0.2783	16
2011	July	2011-07-13	0	0	8.3	0.113	6.61	16	0.2783	16
2011	July	2011-07-13	0	0	8.3	0.113	6.61	16	0.2783	16
2011	July	2011-07-13	0	0	8.3	0.113	6.61	16	0.2783	16
2011	July	2011-07-13	0	0	8.3	0.113	6.61	16	0.2783	16
2011	August	2011-08-10	1	1.03	7.2	0.369	7.2	16	0.3473	16
2011	August	2011-08-10	0	0	7.2	0.369	7.2	16	0.3473	16
2011	August	2011-08-10	0	0	7.2	0.369	7.2	16	0.3473	16
2011	August	2011-08-10	0	0	7.2	0.369	7.2	16	0.3473	16
2011	August	2011-08-10	0	0	7.2	0.369	7.2	16	0.3473	16
2011	August	2011-08-10	0	0	7.2	0.369	7.2	16	0.3473	16
2011	August	2011-08-10	0	0	7.2	0.369	7.2	16	0.3473	16
2011	August	2011-08-10	1	0	7.2	0.369	7.2	16	0.3473	16
2011	August	2011-08-10	0	0	7.2	0.369	7.2	16	0.3473	16
2011	August	2011-08-10	0	0	7.2	0.369	7.2	16	0.3473	16
2011	August	2011-08-10	0	0	7.2	0.369	7.2	16	0.3473	16
2011	August	2011-08-10	0	0	7.2	0.369	7.2	16	0.3473	16
2011	August	2011-08-10	0	0	7.2	0.369	7.2	16	0.3473	16
2011	August	2011-08-10	1	1.03	7.2	0.369	7.2	16	0.3473	16
2011	August	2011-08-10	1	1.03	7.2	0.369	7.2	16	0.3473	16
2011	August	2011-08-10	0	0	7.2	0.369	7.2	16	0.3473	16
2011	September	2011-09-12	3	3.47	4	-	3.96	16	0.1098	16
2011	September	2011-09-12	3	3.47	-	0.115	3.96	16	0.1098	16
2011	September	2011-09-12	0	0	4	-	3.96	16	0.1098	16
2011	September	2011-09-12	0	0	-	0.115	3.96	16	0.1098	16
2011	September	2011-09-12	0	0	4	-	3.96	16	0.1098	16
2011	September	2011-09-12	0	0	-	0.115	3.96	16	0.1098	16
2011	September	2011-09-12	0	0	4	-	3.96	16	0.1098	16
2011	September	2011-09-12	0	0	-	0.115	3.96	16	0.1098	16
2011	September	2011-09-12	1	1.12	4	-	3.96	16	0.1098	16
2011	September	2011-09-12	1	1.12	-	0.115	3.96	16	0.1098	16
2011	September	2011-09-12	2	2.27	4	-	3.96	16	0.1098	16
2011	September	2011-09-12	2	2.27	-	0.115	3.96	16	0.1098	16
2011	September	2011-09-12	0	0	4	-	3.96	16	0.1098	16
2011	September	2011-09-12	0	0	-	0.115	3.96	16	0.1098	16
2011	September	2011-09-12	0	0	4	-	3.96	16	0.1098	16
2011	September	2011-09-12	0	0	-	0.115	3.96	16	0.1098	16
2011	September	2011-09-12	0	0	4	-	3.96	16	0.1098	16
2011	September	2011-09-12	0	0	-	0.115	3.96	16	0.1098	16
2011	September	2011-09-12	0	0	4	-	3.96	16	0.1098	16
2011	September	2011-09-12	0	0	-	0.115	3.96	16	0.1098	16
2011	September	2011-09-12	0	0	4	-	3.96	16	0.1098	16
2011	September	2011-09-12	0	0	-	0.115	3.96	16	0.1098	16
2011	September	2011-09-12	0	0	4	-	3.96	16	0.1098	16
2011	September	2011-09-12	0	0	-	0.115	3.96	16	0.1098	16
2011	September	2011-09-12	0	0	4	-	3.96	16	0.1098	16
2011	September	2011-09-12	0	0	-	0.115	3.96	16	0.1098	16
2011	October	2011-10-13	0	0	0	0.061	-	0	-	0
2011	October	2011-10-13	0	0	0	0.061	-	0	-	0
2011	October	2011-10-13	0	0	0	0.061	-	0	-	0
2011	October	2011-10-13	0	0	0	0.061	-	0	-	0
2011	October	2011-10-13	0	0	0	0.061	-	0	-	0
2011	October	2011-10-13	0	0	0	0.061	-	0	-	0
2011	October	2011-10-13	0	0	0	0.061	-	0	-	0
2011	October	2011-10-13	1	1.04	0	0.061	-	0	-	0
2011	October	2011-10-13	0	0	0	0.061	-	0	-	0
2011	October	2011-10-13	1	1.06	0	0.061	-	0	-	0
2011	October	2011-10-13	0	0	0	0.061	-	0	-	0
2011	October	2011-10-13	0	0	0	0.061	-	0	-	0
2011	October	2011-10-13	0	0	0	0.061	-	0	-	0
2011	October	2011-10-13	0	0	0	0.061	-	0	-	0
2011	October	2011-10-13	0	0	0	0.061	-	0	-	0
2009	June	2009-06-25	0	0	8.148	0.0213	5.46	16	0.3072	16
2009	July	2009-07-28	25	26.7	9.77	-	9.71	16	0.199	16
2009	July	2009-07-28	17	17	9.77	-	9.71	16	0.199	16
2009	July	2009-07-28	24	24.5	9.77	-	9.71	16	0.199	16
2009	July	2009-07-28	11	11.5	9.77	-	9.71	16	0.199	16
2009	July	2009-07-28	1	1.09	9.77	-	9.71	16	0.199	16
2009	July	2009-07-28	8	8.73	9.77	-	9.71	16	0.199	16
2009	July	2009-07-28	0	0	9.77	-	9.71	16	0.199	16
2009	July	2009-07-28	4	6.4	9.77	-	9.71	16	0.199	16
2009	July	2009-07-28	4	6.4	9.77	-	9.71	16	0.199	16
2009	July	2009-07-28	42	67.2	9.77	-	9.71	16	0.199	16
2008	June	2008-06-26	0	0	-	-	7.33	16	0.0081	16
2008	June	2008-06-26	0	0	-	-	7.33	16	0.0081	16
2008	September	2008-09-09	2	0.218	-	-	5.73	16	0.2291	16
2008	September	2008-09-09	15	1.59	-	-	5.73	16	0.2291	16
2007	May	2007-05-25	0	0	2.3	-	2.11	16	0.0922	16
2007	May	2007-05-25	0	0	2.3	-	2.11	16	0.0922	16
2007	May	2007-05-25	0	0	2.3	-	2.11	16	0.0922	16
2007	May	2007-05-25	4	17.4	2.3	-	2.11	16	0.0922	16

Notes: "-" = Missing Data

[a] In Situ temperature measured once per monthly sampling event at station W2.

[b] Instantaneous flow measured once per monthly sampling event at station W1.

[c] Mean of continuous temperature and flow data for two weeks prior to the date of the CPUE data collection from station W1.

[d] Sample size of continuous temperature and flow data from station W1 used to calculate mean temperature and flow.

Appendix N – Waste Rock Verification and ABA Program Results

Minto Explorations Ltd.
ATTN: Laura Battison
Suite 2100- 510 West Georgia St
Vancouver BC V6B 0M3

Date Received: 21-JAN-20
Report Date: 02-MAR-20 14:29 (MT)
Version: FINAL

Client Phone: 604-759-0860

Certificate of Analysis

Lab Work Order #: L2407917

Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers: 1 of 1
Legal Site Desc:

Heather McKenzie
Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2407917-1				
	Description	Rock				
	Sampled Date					
	Sampled Time					
	Client ID	MM 170440				
Grouping	**Analyte**					
SOIL						
Physical Tests	pH (Unity)	8.2				
Organic / Inorganic Carbon	Carbon (C) (%)	0.27				
Acid Base Accounting	FIZZ RATING (Unity)	2				
	MPA (tCaCO3/1Kt)	8.4				
	Neutralization Potential (NP) (tCaCO3/1Kt)	34				
	NNP (tCaCO3/1Kt)	26				
	Ratio (NP/MPA) (Unity)	4.03				
	Sulfate Sulfur (carbonate leach) (%)	0.13				
	Sulfate Sulfur (HCl leach) (%)	0.09				
	Sulfide Sulfur (T minus HCl leach) (%)	0.18				
	Total Sulfur (combustion) (%)	0.27				
Total Metals	Aluminum (Al) (%)	1.20				
	Antimony (Sb) (ppm)	0.08				
	Arsenic (As) (ppm)	1.1				
	Barium (Ba) (ppm)	300				
	Beryllium (Be) (ppm)	0.37				
	Bismuth (Bi) (ppm)	0.03				
	Boron (B) (ppm)	10				
	Cadmium (Cd) (ppm)	0.10				
	Calcium (Ca) (%)	1.58				
	Cerium (Ce) (ppm)	27.2				
	Cesium (Cs) (ppm)	0.34				
	Chromium (Cr) (ppm)	6				
	Cobalt (Co) (ppm)	8.7				
	Copper (Cu) (ppm)	391				
	Gallium (Ga) (ppm)	6.16				
	Germanium (Ge) (ppm)	0.09				
	Gold (Au) (ppm)	<0.02				
	Hafnium (Hf) (ppm)	0.08				
	Indium (In) (ppm)	0.028				
	Iron (Fe) (%)	2.59				
	Lanthanum (La) (ppm)	15.0				
	Lead (Pb) (ppm)	5.4				
	Lithium (Li) (ppm)	6.0				
	Magnesium (Mg) (%)	0.71				
	Manganese (Mn) (ppm)	598				

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2407917-1				
	Description	Rock				
	Sampled Date					
	Sampled Time					
	Client ID	MM 170440				
Grouping	**Analyte**					
SOIL						
Total Metals	Mercury (Hg) (ppm)	0.01				
	Molybdenum (Mo) (ppm)	5.19				
	Nickel (Ni) (ppm)	2.3				
	Niobium (Nb) (ppm)	0.31				
	Phosphorus (P) (ppm)	780				
	Potassium (K) (%)	0.45				
	Rhenium (Re) (ppm)	0.011				
	Rubidium (Rb) (ppm)	23.1				
	Scandium (Sc) (ppm)	4.5				
	Selenium (Se) (ppm)	0.2				
	Silver (Ag) (ppm)	0.14				
	Sodium (Na) (%)	0.08				
	Strontium (Sr) (ppm)	138.0				
	Sulfur (S) (%)	0.30				
	Tantalum (Ta) (ppm)	<0.01				
	Tellurium (Te) (ppm)	0.02				
	Thallium (Tl) (ppm)	0.13				
	Thorium (Th) (ppm)	3.6				
	Tin (Sn) (ppm)	0.7				
	Titanium (Ti) (%)	0.126				
	Tungsten (W) (ppm)	0.08				
	Uranium (U) (ppm)	0.50				
	Vanadium (V) (ppm)	58				
	Yttrium (Y) (ppm)	7.40				
	Zinc (Zn) (ppm)	81				
	Zirconium (Zr) (ppm)	1.5				
Permanent Gases	Carbon Dioxide (CO2) (%)	1.0				

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ABA-OA-VOL08-AX	Soil	Acid Base Accounting	OA-VOL08
CARBON-C-GAS05-AX	Soil	Carbon, TOC and CO2	C-GAS05
ME-MS41-AX	Soil	Aqua Regia ICPMS	Aqua Regia ICPMS

A prepared sample (0.50 g) is digested with aqua regia in a graphite heating block. After cooling, the resulting solution is diluted to with deionized water, mixed and analyzed by inductively coupled plasma-atomic emission spectrometry. Following this analysis, the results are reviewed for high concentrations of bismuth, mercury, molybdenum, silver and tungsten and diluted accordingly. Samples are then analysed by ICP-MS for the remaining suite of elements. The analytical results are corrected for inter-element spectral interferences.

PH-OA-ELE07-AX	Soil	pH	OA-ELE07
SULPHUR-S-CAL06A-AX	Soil	Sulfide Sulfur Calc from HCl Leach	ALS Minerals S-CAL06A

Sulfide Sulfur (as S) is calculated by subtracting the HCl Leachable Sulfate Sulfur (as S) from the Total Sulfur (as S) obtained from combustion.

SULPHUR-S-GRA06-AX	Soil	Sulfate Sulfur in Soil (Carbonate Leach)	ALS Minerals S-GRA06

A prepared sample is boiled with a sodium carbonate solution for 30 minutes. Any insoluble materials are removed by filtration and ferric iron is reduced to ferrous iron by the addition of hydroxylamine hydrochloride. The sulfate in the resulting filtrate is then precipitated with barium chloride in a dilute hydrochloric acid medium. The barium sulfate precipitate is filtered, ignited, weighed and the Sulfate Sulfur is calculated (as S).

SULPHUR-S-GRA06A-AX	Soil	Sulfate Sulfur in Soil (HCl Leach)	ALS Minerals S-GRA06A

A prepared sample is heated with dilute hydrochloric acid for 30 minutes. Silica and any acid-insoluble materials are removed by filtration and ferric iron is reduced to ferrous iron by the addition of hydroxylamine hydrochloride. The sulfate in the resulting filtrate is then precipitated with barium chloride in a dilute hydrochloric acid medium. The barium sulfate precipitate is filtered, ignited, weighed and the Sulfate Sulfur is calculated (as S).

SULPHUR-S-IR08-AX	Soil	Total Sulfur in Soil by Combustion	ALS Minerals S-IR08

The sample is heated to approximately 1350 °C in an induction furnace while passing a stream of oxygen through the sample. Sulfur dioxide released from the sample is measured by an IR detection system and the Total Sulfur result is provided.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
AX	ALS MINERALS - VANCOUVER, B.C., CANADA

Chain of Custody Numbers:

1 of 1

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Sample Submittal Form

ALS Minerals

Company Name: Minto Exploration Ltd
Submitted by: Peter Pang
Telephone: 250-203-1850
Courier/Waybill:
Containers:
Date Shipped:
PO Number:

Internal Use Only

Date Received: JAN 21, 2020
Client Code:
Workorder No: L2407917
Quote: Q78311
Template:

Standard Project: Minto Mine - WRMP
Commodity: ☐ Ore ☑ Trace ☐ Potentially Hazardous Materials
Special Instructions:
Sample Type: ☑ Rock ☐ Pulp ☑ Percussion ☐ Soil ☐ Sediment ☐ Drill Core Other

Results to

Name: Laura Battsion
Email: LauraB@mintomine.com
Address:
City: Whitehorse State: Yukon
Country: Canada Zip:

☑ Invoice
☑ Certificate
☑ QC Certificate
☑ Data File
☐ Webtrieve Only

Copy to

Name: Peter Pang
Email: PeterP@mintomine.com

☑ Webtrieve Only
☐ Certificate
☑ Data File

Copy to

Name: Danica Pascua
Email: DanicaP@mintomine.com

☑ Webtrieve Only
☐ Certificate
☑ Data File

Sample Return

Pulps	Rejects
☑ Return after analysis	☑ Return after analysis
☐ Return after 90 days	☐ Return after 45 days
☐ Discard	☐ Discard
☐ Paid Storage	☐ Paid Storage

Failure to indicate pulp & reject disposition considered as paid storage.

Return Address:
Minto Mine, c/o Smalls Expediting
25 Pilgram Pl Suite 2
Whitehorse, Yukon,

Attention: Laura Battison

Authorized By:

Name: Laura Battison (Please Print)
Signature:

L240791 7-COFC

*All shipments received are subject to inspection upon layout; all services are rendered in accordance with ALS Minerals Terms & Conditions (see the current Schedule of Services & Fees).

Samples ID's		Quantity	Sample Preparation Required (Prep Code)	Analytical (Elements or Method Code)	Check here for Rush Premium Service
Start No.	Finish No.				
MM 170440		1		ME-MS41-AX	
		1		ACIDBASE-ACC04-AX	
		1		SULPHUR-S-GRA06-AX	☐
	Total Samples	1			

Minto Explorations Ltd.
ATTN: Laura Battison
Suite 2100- 510 West Georgia St
Vancouver BC V6B 0M3

Date Received: 26-MAR-20
Report Date: 30-APR-20 14:57 (MT)
Version: FINAL

Client Phone: 604-759-0860

Certificate of Analysis

Lab Work Order #: L2432329

Project P.O. #: NOT SUBMITTED
Job Reference: MINTO MINE - WRMP
C of C Numbers:
Legal Site Desc:

Comments: Please see PDF attachment for ALS Geochem data.

Heather McKenzie
Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID					
Grouping **Analyte**					

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Canada Ltd.
2103 Dollarton Hwy
North Vancouver BC V7H 0A7
Phone: +1 (604) 984 0221 Fax: +1 (604) 984 0218
www.alsglobal.com/geochemistry

To: **ALS ENVIRONMENTAL**
100 - 8081 LOUGHEED HWY.
BURNABY BC V5A 1W9

Finalized Date: 22-APR-2020
Account: APN

CERTIFICATE WH20073272

Project: L2432329

P.O. No.: L2432329

This report is for 1 Rock sample submitted to our lab in Whitehorse, YT, Canada on 26-MAR-2020.

The following have access to data associated with this certificate:

ALSE VANCOUVER WEBTRIEVE SOFTWARE DEVELOPMENT GROUP	ALSEV DATASUBLET	HEATHER MCKENZIE

SAMPLE PREPARATION

ALS CODE	DESCRIPTION
WEI-21	Received Sample Weight
DISP-01	Disposal of all sample fractions
SPL-21	Split sample - riffle splitter
PUL-31	Pulverize up to 250g 85% <75 um
PUL-QC	Pulverizing QC Test

ANALYTICAL PROCEDURES

ALS CODE	DESCRIPTION	
ME-MS41	Ultra Trace Aqua Regia ICP-MS	
S-GRA06	Sulfate Sulfur-carbonate leach	WST-SEQ
OA-VOL08	Basic Acid Base Accounting	
S-IR08	Total Sulphur (IR Spectroscopy)	LECO
OA-ELE07	Paste pH	
S-CAL06a	Sulfide Sulfur (calculated*)	
S-GRA06a	Sulfate Sulfur (HCl leachable)	WST-SEQ
C-GAS05	Inorganic Carbon (CO2)	

This is the Final Report and supersedes any preliminary report with this certificate number. Results apply to samples as submitted. All pages of this report have been checked and approved for release.

***** See Appendix Page for comments regarding this certificate *****

Signature:



Saa Traxler, General Manager, North Vancouver

ALS Canada Ltd.
2103 Dollarton Hwy
North Vancouver BC V7H 0A7
Phone: +1 (604) 984 0221 Fax: +1 (604) 984 0218
www.alsglobal.com/geochemistry

To: **ALS ENVIRONMENTAL**
100 - 8081 LOUGHEED HWY.
BURNABY BC V5A 1W9

Finalized Date: 22-APR-2020
Account: APN

Project: L2432329

CERTIFICATE OF ANALYSIS WH20073272

Sample Description	Method Analyte Units LOD	WEI-21 Recvd Wt. kg 0.02	OA-VOL08 FIZZ RAT Unity 1	OA-VOL08 MPA tCaCO3/1Kt 0.3	OA-VOL08 NNP tCaCO3/1Kt 1	OA-VOL08 NP tCaCO3/1Kt 1	OA-VOL08 Ratio (N Unity 0.01	OA-ELE07 pH Unity 0.1	S-IR08 S % 0.01	S-CAL06a S % 0.01	C-GAS05 C % 0.05	C-GAS05 CO2 % 0.2	S-GRA06a S % 0.01	ME-MS41 Ag ppm 0.01	ME-MS41 Al % 0.01	ME-MS41 As ppm 0.1
L2432329-001		1.96	2	2.8	44	47	16.71	8.4	0.09	0.08	0.42	1.5	0.01	0.25	1.16	1.5

***** See Appendix Page for comments regarding this certificate *****

ALS Canada Ltd.
2103 Dollarton Hwy
North Vancouver BC V7H 0A7
Phone: +1 (604) 984 0221 Fax: +1 (604) 984 0218
www.alsglobal.com/geochemistry

To: **ALS ENVIRONMENTAL**
100 - 8081 LOUGHEED HWY.
BURNABY BC V5A 1W9

Finalized Date: 22-APR-2020
Account: APN

Project: L2432329

CERTIFICATE OF ANALYSIS WH20073272

Sample Description	Method	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41
	Analyte	Au	B	Ba	Be	Bi	Ca	Cd	Ce	Co	Cr	Cs	Cu	Fe	Ga	Ge
	Units	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm
	LOD	0.02	10	10	0.05	0.01	0.01	0.01	0.02	0.1	1	0.05	0.2	0.01	0.05	0.05
L2432329-001		0.02	<10	200	0.41	0.08	1.61	0.09	22.0	5.6	4	0.32	742	2.35	6.54	0.06

***** See Appendix Page for comments regarding this certificate *****

ALS Canada Ltd.
2103 Dollarton Hwy
North Vancouver BC V7H 0A7
Phone: +1 (604) 984 0221 Fax: +1 (604) 984 0218
www.alsglobal.com/geochemistry

To: **ALS ENVIRONMENTAL**
100 - 8081 LOUGHEED HWY.
BURNABY BC V5A 1W9

Finalized Date: 22-APR-2020
Account: APN

Project: L2432329

CERTIFICATE OF ANALYSIS WH20073272

Sample Description	Method	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41
	Analyte	Hf	Hg	In	K	La	Li	Mg	Mn	Mo	Na	Nb	Ni	P	Pb	Rb
	Units	ppm	ppm	ppm	%	ppm	ppm	%	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm
	LOD	0.02	0.01	0.005	0.01	0.2	0.1	0.01	5	0.05	0.01	0.05	0.2	10	0.2	0.1
L2432329-001		0.06	0.03	0.031	0.30	12.0	7.1	0.68	546	4.18	0.07	0.12	1.9	730	5.0	15.4

***** See Appendix Page for comments regarding this certificate *****

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To: **ALS ENVIRONMENTAL**
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Finalized Date: 22-APR-2020
Account: APN

Project: L2432329

CERTIFICATE OF ANALYSIS WH20073272

Sample Description	Method	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41	ME-MS41
	Analyte	Re	S	Sb	Sc	Se	Sn	Sr	Ta	Te	Th	Ti	Tl	U	V	W
	Units	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm
	LOD	0.001	0.01	0.05	0.1	0.2	0.2	0.2	0.01	0.01	0.2	0.005	0.02	0.05	1	0.05
L2432329-001		0.012	0.09	0.18	3.8	0.7	0.5	95.6	<0.01	0.08	3.5	0.054	0.09	0.36	42	0.09

***** See Appendix Page for comments regarding this certificate *****

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To: **ALS ENVIRONMENTAL**
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BURNABY BC V5A 1W9

Finalized Date: 22-APR-2020
Account: APN

Project: L2432329

CERTIFICATE OF ANALYSIS WH20073272

Sample Description	Method Analyte Units LOD	ME-MS41 Y ppm 0.05	ME-MS41 Zn ppm 2	ME-MS41 Zr ppm 0.5	S-GRA06 S % 0.01
L2432329-001		7.14	75	1.3	0.01

***** See Appendix Page for comments regarding this certificate *****

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To: **ALS ENVIRONMENTAL**
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BURNABY BC V5A 1W9

Finalized Date: 22-APR-2020
Account: APN

Project: L2432329

CERTIFICATE OF ANALYSIS WH20073272

CERTIFICATE COMMENTS

ANALYTICAL COMMENTS

Applies to Method: Gold determinations by this method are semi-quantitative due to the small sample weight used (0.5g).
ME-MS41

LABORATORY ADDRESSES

Applies to Method: Processed at ALS Whitehorse located at 78 Mt. Sima Rd, Whitehorse, YT, Canada.

DISP-01	PUL-31	PUL-QC	SPL-21
WEI-21			

Applies to Method: Processed at ALS Vancouver located at 2103 Dollarton Hwy, North Vancouver, BC, Canada.

C-GAS05	ME-MS41	OA-ELE07	OA-VOL08
S-CAL06a	S-GRA06	S-GRA06a	S-IR08

ALS Minerals

Sample Submittal Form

L2432329-COFC

Company Name:	Minto Exploration Ltd
Submitted by:	Peter Pang
Telephone:	250-203-1850
Courier/Waybill:	
# Containers:	
Date Shipped:	
PO Number:	

Workorder No:
Quote:
Template:

Standard Project: Minto Mine - WRMP
Commodity: ☐ Ore ☑ Trace ☐ Potentially Hazardous Materials
Special Instructions:
Sample Type: ☑ Rock ☐ Pulp ☑ Percussion ☐ Soil ☐ Sediment ☐ Drill Core Other

Results to

Name:	Laura Battsion	☑ Invoice	
Email:	LauraB@mintomine.com	☑ Certificate	
Address:		☑ QC Certificate	
City:	Whitehorse	State: Yukon	☑ Data File
Country:	Canada	Zip:	☐ Webtrieve Only

Copy to

Name:	Peter Pang	☑ Webtrieve Only
Email:	PeterP@mintomine.com	☐ Certificate
		☑ Data File

Copy to

Name:	Danica Pascua	☑ Webtrieve Only
Email:	DanicaP@mintomine.com	☐ Certificate
		☑ Data File

Sample Return

Pulps	Rejects
☑ Return after analysis	☑ Return after analysis
☐ Return after 90 days	☐ Return after 45 days
☐ Discard	☐ Discard
☐ Paid Storage	☐ Paid Storage

Failure to indicate pulp & reject disposition will be considered as paid storage.

Return Address:
Minto Mine, c/o Smalls Expediting
25 Pilgram Pl Suite 2
Whitehorse, Yukon,

Attention: Laura Battison

Authorized By:
Name: Laura Battison (Please Print)
Signature:

*All shipments received are subject to inspection upon layout; all services are rendered in accordance with ALS Minerals Terms & Conditions (see the current Schedule of Services & Fees).

Samples ID's Start No.	Samples ID's Finish No.	Quantity	Sample Preparation Required (Prep Code)	Analytical (Elements or Method Code)	Check here for Rush Premium Service
MM170581		1		ME-MS41-AX	
		1		ACIDBASE-ACC04-AX	
		1		SULPHUR-S-GRA06-AX	☐
	Total Samples	1			

January 15, 2020

ALS Quote: Q78311
Created: 14-Jan-2020

Laura Battison
Minto Explorations Ltd.
Suite 2100- 510 West Georgia St
Vancouver, BC V6B 0M3

Dear: Laura Battison,

RE: Price Quotation for ABA Testing

We are pleased to present our technical and price quotation to carry out the work as outlined under the above referenced project.

Our price quotation and a list of ALS Environmental's unique technical and service advantages are attached.

Thank you for requesting our quotation. We look forward to the prospect of providing you with the quality service you require. Please call us at (604) 253-4188 or 1-800-668-9878 if you require any additional information.

Sincerely,

Heather McKenzie
Account Manager

L2432329-COFC

Quoted Parameters with Detection Limits

Parameter	Method Reference	Report D.L.	Units
Manganese (Mn)	Aqua Regia ICPMS	5.0	ppm
Mercury (Hg)	Aqua Regia ICPMS	0.010	ppm
Molybdenum (Mo)	Aqua Regia ICPMS	0.050	ppm
Nickel (Ni)	Aqua Regia ICPMS	0.20	ppm
Niobium (Nb)	Aqua Regia ICPMS	0.050	ppm
Phosphorus (P)	Aqua Regia ICPMS	10	ppm
Potassium (K)	Aqua Regia ICPMS	0.010	%
Rhenium (Re)	Aqua Regia ICPMS	0.0010	ppm
Rubidium (Rb)	Aqua Regia ICPMS	0.10	ppm
Scandium (Sc)	Aqua Regia ICPMS	0.10	ppm
Selenium (Se)	Aqua Regia ICPMS	0.20	ppm
Silver (Ag)	Aqua Regia ICPMS	0.010	ppm
Sodium (Na)	Aqua Regia ICPMS	0.010	%
Strontium (Sr)	Aqua Regia ICPMS	0.20	ppm
Sulfur (S)	Aqua Regia ICPMS	0.010	%
Tantalum (Ta)	Aqua Regia ICPMS	0.010	ppm
Tellurium (Te)	Aqua Regia ICPMS	0.010	ppm
Thallium (Tl)	Aqua Regia ICPMS	0.020	ppm
Thorium (Th)	Aqua Regia ICPMS	0.20	ppm
Tin (Sn)	Aqua Regia ICPMS	0.20	ppm
Titanium (Ti)	Aqua Regia ICPMS	0.0050	%
Tungsten (W)	Aqua Regia ICPMS	0.050	ppm
Uranium (U)	Aqua Regia ICPMS	0.050	ppm
Vanadium (V)	Aqua Regia ICPMS	1.0	ppm
Yttrium (Y)	Aqua Regia ICPMS	0.050	ppm
Zinc (Zn)	Aqua Regia ICPMS	2.0	ppm
Zirconium (Zr)	Aqua Regia ICPMS	0.50	ppm
Soil-Miscellaneous			
Carbon (C)	C-GAS05	0.050	%



L2432329-COFC

Minto Explorations Ltd.
ATTN: Laura Battison
Suite 2100- 510 West Georgia St
Vancouver BC V6B 0M3

Date Received: 05-MAY-20
Report Date: 02-JUL-20 17:22 (MT)
Version: FINAL

Client Phone: 604-759-0860

Certificate of Analysis

Lab Work Order #: L2444444

Project P.O. #: NOT SUBMITTED
Job Reference: MINTO MINE - WRMP
C of C Numbers:
Legal Site Desc:

Heather McKenzie
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2444444-1				
	Description	Percussion/Rock				
	Sampled Date					
	Sampled Time					
	Client ID	MM170694				
Grouping	**Analyte**					
SOIL						
Physical Tests	pH (Unity)	8.2				
Organic / Inorganic Carbon	Carbon (C) (%)	0.08				
Acid Base Accounting	FIZZ RATING (Unity)	1				
	MPA (tCaCO3/1Kt)	5.9				
	Neutralization Potential (NP) (tCaCO3/1Kt)	16				
	NNP (tCaCO3/1Kt)	10				
	Ratio (NP/MPA) (Unity)	2.69				
	Sulfate Sulfur (carbonate leach) (%)	0.17				
	Sulfate Sulfur (HCl leach) (%)	0.18				
	Sulfide Sulfur (T minus HCl leach) (%)	0.01				
	Total Sulfur (combustion) (%)	0.19				
Total Metals	Aluminum (Al) (%)	0.98				
	Antimony (Sb) (ppm)	<0.05				
	Arsenic (As) (ppm)	0.4				
	Barium (Ba) (ppm)	170				
	Beryllium (Be) (ppm)	0.21				
	Bismuth (Bi) (ppm)	0.03				
	Boron (B) (ppm)	<10				
	Cadmium (Cd) (ppm)	0.04				
	Calcium (Ca) (%)	0.87				
	Cerium (Ce) (ppm)	17.00				
	Cesium (Cs) (ppm)	0.25				
	Chromium (Cr) (ppm)	6				
	Cobalt (Co) (ppm)	4.6				
	Copper (Cu) (ppm)	187.0				
	Gallium (Ga) (ppm)	4.86				
	Germanium (Ge) (ppm)	0.07				
	Gold (Au) (ppm)	<0.02				
	Hafnium (Hf) (ppm)	0.07				
	Indium (In) (ppm)	0.016				
	Iron (Fe) (%)	2.02				
	Lanthanum (La) (ppm)	9.7				
	Lead (Pb) (ppm)	3.0				
	Lithium (Li) (ppm)	4.8				
	Magnesium (Mg) (%)	0.57				
	Manganese (Mn) (ppm)	460				

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2444444-1				
	Description	Percussion/Rock				
	Sampled Date					
	Sampled Time					
	Client ID	MM170694				
Grouping	**Analyte**					
SOIL						
Total Metals	Mercury (Hg) (ppm)	<0.01				
	Molybdenum (Mo) (ppm)	0.33				
	Nickel (Ni) (ppm)	1.9				
	Niobium (Nb) (ppm)	0.25				
	Phosphorus (P) (ppm)	640				
	Potassium (K) (%)	0.50				
	Rhenium (Re) (ppm)	<0.001				
	Rubidium (Rb) (ppm)	23.7				
	Scandium (Sc) (ppm)	3.2				
	Selenium (Se) (ppm)	0.2				
	Silver (Ag) (ppm)	0.12				
	Sodium (Na) (%)	0.09				
	Strontium (Sr) (ppm)	57.9				
	Sulfur (S) (%)	0.19				
	Tantalum (Ta) (ppm)	<0.01				
	Tellurium (Te) (ppm)	0.02				
	Thallium (Tl) (ppm)	0.11				
	Thorium (Th) (ppm)	1.8				
	Tin (Sn) (ppm)	0.4				
	Titanium (Ti) (%)	0.124				
	Tungsten (W) (ppm)	0.07				
	Uranium (U) (ppm)	0.22				
	Vanadium (V) (ppm)	45				
	Yttrium (Y) (ppm)	5.83				
	Zinc (Zn) (ppm)	58				
	Zirconium (Zr) (ppm)	1.0				
Permanent Gases	Carbon Dioxide (CO2) (%)	0.3				

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ABA-OA-VOL08-AX	Soil	Acid Base Accounting	OA-VOL08
CARBON-C-GAS05-AX	Soil	Carbon, TOC and CO2	C-GAS05
ME-MS41-AX	Soil	Aqua Regia ICPMS	Aqua Regia ICPMS

A prepared sample (0.50 g) is digested with aqua regia in a graphite heating block. After cooling, the resulting solution is diluted to with deionized water, mixed and analyzed by inductively coupled plasma-atomic emission spectrometry. Following this analysis, the results are reviewed for high concentrations of bismuth, mercury, molybdenum, silver and tungsten and diluted accordingly. Samples are then analysed by ICP-MS for the remaining suite of elements. The analytical results are corrected for inter-element spectral interferences.

PH-OA-ELE07-AX	Soil	pH	OA-ELE07
SULPHUR-S-CAL06A-AX	Soil	Sulfide Sulfur Calc from HCl Leach	ALS Minerals S-CAL06A

Sulfide Sulfur (as S) is calculated by subtracting the HCl Leachable Sulfate Sulfur (as S) from the Total Sulfur (as S) obtained from combustion.

SULPHUR-S-GRA06-AX	Soil	Sulfate Sulfur in Soil (Carbonate Leach)	ALS Minerals S-GRA06

A prepared sample is boiled with a sodium carbonate solution for 30 minutes. Any insoluble materials are removed by filtration and ferric iron is reduced to ferrous iron by the addition of hydroxylamine hydrochloride. The sulfate in the resulting filtrate is then precipitated with barium chloride in a dilute hydrochloric acid medium. The barium sulfate precipitate is filtered, ignited, weighed and the Sulfate Sulfur is calculated (as S).

SULPHUR-S-GRA06A-AX	Soil	Sulfate Sulfur in Soil (HCl Leach)	ALS Minerals S-GRA06A

A prepared sample is heated with dilute hydrochloric acid for 30 minutes. Silica and any acid-insoluble materials are removed by filtration and ferric iron is reduced to ferrous iron by the addition of hydroxylamine hydrochloride. The sulfate in the resulting filtrate is then precipitated with barium chloride in a dilute hydrochloric acid medium. The barium sulfate precipitate is filtered, ignited, weighed and the Sulfate Sulfur is calculated (as S).

SULPHUR-S-IR08-AX	Soil	Total Sulfur in Soil by Combustion	ALS Minerals S-IR08

The sample is heated to approximately 1350 °C in an induction furnace while passing a stream of oxygen through the sample. Sulfur dioxide released from the sample is measured by an IR detection system and the Total Sulfur result is provided.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
AX	ALS MINERALS - VANCOUVER, B.C., CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Minerals

L2444444-COFC

ubmittal Form

Company Name: Minto Exploration Ltd
Submitted by: Peter Pang
Telephone: 250-203-1850
Courier/Waybill:
Containers:
Date Shipped:
PO Number:

.ernal Use Only

Date Received:
Client Code:
Workorder No:
Quote:
Template:

Standard Project: Minto Mine - WRMP
Commodity:
☐ Ore ☑ Trace ☐ Potentially Hazardous Materials
Special Instructions:
Sample Type: ☑ Rock ☐ Pulp ☑ Percussion ☐ Soil ☐ Sediment ☐ Drill Core Other

Results to
Name: Laura Battsion
Email: LauraB@mintomine.com
Address:
City: Whitehorse State: Yukon
Country: Canada Zip:
☑ Invoice ☑ Certificate ☑ QC Certificate ☑ Data File ☐ Webtrieve Only

Copy to
Name: Peter Pang
Email: PeterP@mintomine.com
☑ Webtrieve Only ☐ Certificate ☑ Data File

Copy to
Name: Danica Pascua
Email: DanicaP@mintomine.com
☑ Webtrieve Only ☐ Certificate ☑ Data File

Sample Return

Pulps	Rejects
☑ Return after analysis	☑ Return after analysis
☐ Return after 90 days	☐ Return after 45 days
☐ Discard	☐ Discard
☐ Paid Storage	☐ Paid Storage

Failure to indicate pulp & reject disposition will be considered as paid storage.

Return Address:
Minto Mine, c/o Smalls Expediting
25 Pilgram Pl Suite 2
Whitehorse, Yukon,

Attention: Laura Battison

Authorized By:
Name: Laura Battison (Please Print)
Signature:

*All shipments received are subject to inspection upon layout, all services are rendered in accordance with ALS Minerals Terms & Conditions (see the current Schedule of Services & Fees).

Samples ID's Start No.	Samples ID's Finish No.	Quantity	Sample Preparation Required (Prep Code)	Analytical (Elements or Method Code)	Check here for Rush Premium Service
MM 170694		1		ME-MS41-AX	
		1		ACIDBASE-ACC04-AX	
		1		SULPHUR-S-GRA06-AX	☐
	Total Samples	1			

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **VA20A7615**	Page	: 1 of 5
Client	: **Minto Explorations Ltd.**	Laboratory	: Vancouver - Environmental
Contact	: Laura Battsion	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: 8081 Lougheed Highway Burnaby BC Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: Minto Mine - WRMP	Date Samples Received	: 03-Jun-2020 15:30
PO	: ----	Date Analysis Commenced	: 23-Jun-2020
C-O-C number	: ----	Issue Date	: 15-Jul-2020 17:10
Sampler	: ----		
Site	: ----		
Quote number	: Q78311		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Kaitlyn Gardner	Account Manager Assistant	Internal Subcontracting, North Vancouver, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
kg	kilograms
pH units	pH units
ppm	parts per million
tCaCO3/kt	tons CaCO3 per kiloton

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Analytical Results

Sub-Matrix: **Soil/Solid**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MM167820	MM167821	MM167215	----	----
					Client sampling date / time	[03-Jun-2020]	[03-Jun-2020]	[03-Jun-2020]	----	----
						VA20A7615-001	VA20A7615-002	VA20A7615-003	--------	--------
						Result	Result	Result	----	----
Acid Base Accounting										
carbon dioxide	124-38-9	C-GAS05	0.2	%		0.3	0.7	0.5	----	----
carbon, total [TC]	----	C-GAS05	0.05	%		0.07	0.18	0.14	----	----
fizz rating	----	OA-VOL08	1	-		1	1	1	----	----
maximum potential acidity [MPA]	----	OA-VOL08	0.3	tCaCO3/kt		8.4	5.6	2.2	----	----
net neutralization potential [NNP]	----	OA-VOL08	1	tCaCO3/kt		6	16	17	----	----
neutralization potential [NP]	----	OA-VOL08	1	tCaCO3/kt		14	22	19	----	----
neutralization potential ratio [NPR], (NP/MPA)	----	OA-VOL08	0.01	-		1.66	3.91	8.69	----	----
pH (1:1 soil:water)	----	OA-ELE07	0.10	pH units		8.40	8.20	8.10	----	----
sulfate (as S), carbonate leach	14808-79-8	S-GRA06	0.01	%		0.14	0.09	0.01	----	----
sulfate (as S), HCl leach	14808-79-8	S-GRA06A	0.01	%		0.21	0.14	0.04	----	----
sulfide (as S), total minus carbonate leach	18496-25-8	S-CAL06	0.01	%		0.13	0.09	0.06	----	----
sulfur, total	7704-34-9	S-IR08	0.01	%		0.27	0.18	0.07	----	----
weight, sample received	NA	WEI-21	0.02	kg		1.84	1.86	1.82	----	----
Metals										
aluminum	7429-90-5	ME-MS41	0.01	%		1.05	1.04	1.02	----	----
antimony	7440-36-0	ME-MS41	0.05	ppm		0.24	0.08	0.05	----	----
arsenic	7440-38-2	ME-MS41	0.1	ppm		0.5	1.6	1.1	----	----
barium	7440-39-3	ME-MS41	10	ppm		190	110	100	----	----
beryllium	7440-41-7	ME-MS41	0.05	ppm		0.19	0.31	0.30	----	----
bismuth	7440-69-9	ME-MS41	0.01	ppm		0.07	0.08	0.05	----	----
boron	7440-42-8	ME-MS41	10	ppm		<10	<10	<10	----	----
cadmium	7440-43-9	ME-MS41	0.01	ppm		0.26	0.08	0.21	----	----
calcium	7440-70-2	ME-MS41	0.01	%		0.92	1.37	0.97	----	----
cerium	7440-45-1	ME-MS41	0.02	ppm		26.5	17.45	24.8	----	----
cesium	7440-46-2	ME-MS41	0.05	ppm		0.41	0.14	0.25	----	----
chromium	7440-47-3	ME-MS41	1	ppm		5	5	5	----	----
cobalt	7440-48-4	ME-MS41	0.1	ppm		6.6	5.3	7.1	----	----
copper	7440-50-8	ME-MS41	0.2	ppm		489	274	323	----	----
gallium	7440-55-3	ME-MS41	0.05	ppm		5.32	5.35	5.49	----	----
germanium	7440-56-4	ME-MS41	0.05	ppm		0.09	0.08	0.08	----	----

Analytical Results

Sub-Matrix: **Soil/Solid**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MM167820	MM167821	MM167215	----	----
					Client sampling date / time	[03-Jun-2020]	[03-Jun-2020]	[03-Jun-2020]	----	----
						VA20A7615-001	VA20A7615-002	VA20A7615-003	--------	--------
						Result	Result	Result	----	----
Metals										
gold	7440-57-5	ME-MS41	0.02	ppm		<0.02	<0.02	<0.02	----	----
hafnium	7440-58-6	ME-MS41	0.02	ppm		0.07	0.05	0.07	----	----
indium	7440-74-6	ME-MS41	0.005	ppm		0.070	0.027	0.033	----	----
iron	7439-89-6	ME-MS41	0.01	%		2.34	2.10	2.35	----	----
lanthanum	7439-91-0	ME-MS41	0.2	ppm		14.9	9.4	13.8	----	----
lead	7439-92-1	ME-MS41	0.2	ppm		13.0	6.1	9.1	----	----
lithium	7439-93-2	ME-MS41	0.1	ppm		5.7	6.1	6.1	----	----
magnesium	7439-95-4	ME-MS41	0.01	%		0.65	0.60	0.65	----	----
manganese	7439-96-5	ME-MS41	5	ppm		447	474	644	----	----
mercury	7439-97-6	ME-MS41	0.01	ppm		0.01	0.01	0.02	----	----
molybdenum	7439-98-7	ME-MS41	0.05	ppm		8.73	0.24	1.39	----	----
nickel	7440-02-0	ME-MS41	0.2	ppm		1.5	1.9	1.7	----	----
niobium	7440-03-1	ME-MS41	0.05	ppm		0.29	0.19	0.18	----	----
phosphorus	7723-14-0	ME-MS41	10	ppm		830	630	730	----	----
potassium	7440-09-7	ME-MS41	0.01	%		0.68	0.21	0.33	----	----
rhenium	7440-15-5	ME-MS41	0.001	ppm		0.003	0.001	0.001	----	----
rubidium	7440-17-7	ME-MS41	0.1	ppm		38.4	10.3	19.9	----	----
scandium	7440-20-2	ME-MS41	0.1	ppm		2.9	2.9	2.6	----	----
selenium	7782-49-2	ME-MS41	0.2	ppm		0.4	0.3	0.3	----	----
silver	7440-22-4	ME-MS41	0.01	ppm		0.27	0.19	0.15	----	----
sodium	7440-23-5	ME-MS41	0.01	%		0.06	0.08	0.05	----	----
strontium	7440-24-6	ME-MS41	0.2	ppm		54.2	103.5	50.1	----	----
sulfur	7704-34-9	ME-MS41	0.01	%		0.31	0.21	0.09	----	----
tantalum	7440-25-7	ME-MS41	0.01	ppm		<0.01	<0.01	<0.01	----	----
tellurium	13494-80-9	ME-MS41	0.01	ppm		0.06	0.03	0.02	----	----
thallium	7440-28-0	ME-MS41	0.02	ppm		0.19	0.05	0.10	----	----
thorium	7440-29-1	ME-MS41	0.2	ppm		5.6	1.9	4.1	----	----
tin	7440-31-5	ME-MS41	0.2	ppm		0.7	0.4	0.4	----	----
titanium	7440-32-6	ME-MS41	0.005	%		0.145	0.088	0.097	----	----
tungsten	7440-33-7	ME-MS41	0.05	ppm		0.46	0.07	0.15	----	----
uranium	7440-61-1	ME-MS41	0.05	ppm		0.61	0.24	0.68	----	----
vanadium	7440-62-2	ME-MS41	1	ppm		57	41	47	----	----

Analytical Results

Sub-Matrix: **Soil/Solid**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MM167820	MM167821	MM167215	----	----
					Client sampling date / time	[03-Jun-2020]	[03-Jun-2020]	[03-Jun-2020]	----	----
						VA20A7615-001	VA20A7615-002	VA20A7615-003	--------	--------
						Result	Result	Result	----	----
Metals										
yttrium	7440-65-5	ME-MS41	0.05	ppm		5.12	5.68	5.00	----	----
zinc	7440-66-6	ME-MS41	2	ppm		129	73	145	----	----
zirconium	7440-67-7	ME-MS41	0.5	ppm		1.0	0.9	1.5	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000576**	Page	: 1 of 8
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Laura Battsion	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: ----	Date Samples Received	: 30-Jul-2020 14:50
PO	: ----	Date Analysis Commenced	: 31-Aug-2020
C-O-C number	: ----	Issue Date	: 25-Sep-2020 17:54
Sampler	: ----		
Site	: ----		
Quote number	: Q78311		
No. of samples received	: 10		
No. of samples analysed	: 10		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Kaitlyn Gardner	Account Manager Assistant	Internal Subcontracting, North Vancouver, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
kg	kilograms
pH units	pH units
ppm	parts per million
tCaCO3/kt	tons CaCO3 per kiloton

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Analytical Results

Sub-Matrix: **Soil/Solid**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MM 165902	MM 165903	MM 165904	MM 165905	MM 165906
					Client sampling date / time	[30-Jul-2020]	[30-Jul-2020]	[30-Jul-2020]	[30-Jul-2020]	[30-Jul-2020]
						WR2000576-001	WR2000576-002	WR2000576-003	WR2000576-004	WR2000576-005
						Result	Result	Result	Result	Result
Acid Base Accounting										
carbon dioxide	124-38-9	C-GAS05	0.2	%		1.0	0.6	0.6	0.6	0.5
carbon, total [TC]	----	C-GAS05	0.05	%		0.26	0.17	0.16	0.17	0.14
fizz rating	----	OA-VOL08	1	-		2	2	2	2	2
maximum potential acidity [MPA]	----	OA-VOL08	0.3	tCaCO3/kt		1.9	4.4	4.1	4.7	14.7
net neutralization potential [NNP]	----	OA-VOL08	1	tCaCO3/kt		34	22	20	21	9
neutralization potential [NP]	----	OA-VOL08	1	tCaCO3/kt		36	26	24	26	24
neutralization potential ratio [NPR], (NP/MPA)	----	OA-VOL08	0.01	-		19.20	5.94	5.91	5.55	1.63
pH (1:1 soil:water)	----	OA-ELE07	0.10	pH units		8.00	8.10	8.10	8.10	8.20
sulfate (as S), carbonate leach	14808-79-8	S-GRA06	0.01	%		0.03	0.03	0.11	0.13	0.32
sulfate (as S), HCl leach	14808-79-8	S-GRA06A	0.01	%		0.03	0.07	0.14	0.16	0.34
sulfur, total	7704-34-9	S-IR08	0.01	%		0.06	0.14	0.13	0.15	0.47
weight, sample received	NA	WEI-21	0.02	kg		1.30	1.30	1.32	1.30	1.32
Metals										
aluminum	7429-90-5	ME-MS41	0.01	%		1.10	1.16	0.99	1.08	1.23
antimony	7440-36-0	ME-MS41	0.05	ppm		0.12	0.09	0.05	<0.05	<0.05
arsenic	7440-38-2	ME-MS41	0.1	ppm		1.8	1.2	1.3	0.7	0.5
barium	7440-39-3	ME-MS41	10	ppm		160	150	100	90	170
beryllium	7440-41-7	ME-MS41	0.05	ppm		0.41	0.29	0.36	0.36	0.28
bismuth	7440-69-9	ME-MS41	0.01	ppm		0.06	0.12	0.10	0.03	0.02
boron	7440-42-8	ME-MS41	10	ppm		10	<10	10	<10	<10
cadmium	7440-43-9	ME-MS41	0.01	ppm		0.06	0.09	0.06	0.07	0.03
calcium	7440-70-2	ME-MS41	0.01	%		1.35	1.00	1.20	1.18	1.24
cerium	7440-45-1	ME-MS41	0.02	ppm		22.2	29.1	18.45	30.1	21.1
cesium	7440-46-2	ME-MS41	0.05	ppm		0.29	0.36	0.15	0.24	0.32
chromium	7440-47-3	ME-MS41	1	ppm		5	6	6	4	7
cobalt	7440-48-4	ME-MS41	0.1	ppm		5.4	6.5	4.7	5.5	6.4
copper	7440-50-8	ME-MS41	0.2	ppm		222	667	9.9	79.9	300
gallium	7440-55-3	ME-MS41	0.05	ppm		5.39	5.55	5.28	5.65	6.09
germanium	7440-56-4	ME-MS41	0.05	ppm		0.07	0.07	0.07	0.07	0.07
gold	7440-57-5	ME-MS41	0.02	ppm		<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: **Soil/Solid**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MM 165902	MM 165903	MM 165904	MM 165905	MM 165906
					Client sampling date / time	[30-Jul-2020]	[30-Jul-2020]	[30-Jul-2020]	[30-Jul-2020]	[30-Jul-2020]
						WR2000576-001	WR2000576-002	WR2000576-003	WR2000576-004	WR2000576-005
						Result	Result	Result	Result	Result
Metals										
hafnium	7440-58-6	ME-MS41	0.02	ppm		0.08	0.10	0.06	0.11	0.07
indium	7440-74-6	ME-MS41	0.005	ppm		0.022	0.047	0.015	0.026	0.042
iron	7439-89-6	ME-MS41	0.01	%		2.30	2.50	2.03	2.51	2.74
lanthanum	7439-91-0	ME-MS41	0.2	ppm		11.9	16.4	10.0	16.8	11.5
lead	7439-92-1	ME-MS41	0.2	ppm		5.6	3.3	6.8	5.1	3.4
lithium	7439-93-2	ME-MS41	0.1	ppm		5.9	5.3	5.0	5.5	5.8
magnesium	7439-95-4	ME-MS41	0.01	%		0.66	0.67	0.55	0.64	0.76
manganese	7439-96-5	ME-MS41	5	ppm		561	530	469	605	542
mercury	7439-97-6	ME-MS41	0.01	ppm		0.01	0.01	<0.01	<0.01	<0.01
molybdenum	7439-98-7	ME-MS41	0.05	ppm		3.09	2.98	0.53	1.35	0.55
nickel	7440-02-0	ME-MS41	0.2	ppm		2.1	2.0	1.7	1.5	1.9
niobium	7440-03-1	ME-MS41	0.05	ppm		0.17	0.25	0.18	0.20	0.22
phosphorus	7723-14-0	ME-MS41	10	ppm		720	800	600	840	730
potassium	7440-09-7	ME-MS41	0.01	%		0.26	0.56	0.23	0.34	0.56
rhenium	7440-15-5	ME-MS41	0.001	ppm		0.020	0.008	0.003	0.002	0.001
rubidium	7440-17-7	ME-MS41	0.1	ppm		13.5	31.4	11.5	20.1	26.8
scandium	7440-20-2	ME-MS41	0.1	ppm		3.4	3.4	2.9	3.3	3.5
selenium	7782-49-2	ME-MS41	0.2	ppm		0.3	0.7	<0.2	<0.2	0.2
silver	7440-22-4	ME-MS41	0.01	ppm		0.11	0.40	0.05	0.07	0.11
sodium	7440-23-5	ME-MS41	0.01	%		0.09	0.09	0.10	0.10	0.10
strontium	7440-24-6	ME-MS41	0.2	ppm		72.9	53.0	78.3	59.2	80.8
sulfur	7704-34-9	ME-MS41	0.01	%		0.07	0.15	0.15	0.17	0.50
tantalum	7440-25-7	ME-MS41	0.01	ppm		<0.01	<0.01	<0.01	<0.01	<0.01
tellurium	13494-80-9	ME-MS41	0.01	ppm		0.02	0.07	<0.01	<0.01	0.02
thallium	7440-28-0	ME-MS41	0.02	ppm		0.06	0.14	0.05	0.09	0.14
thorium	7440-29-1	ME-MS41	0.2	ppm		2.8	4.7	2.1	5.1	2.3
tin	7440-31-5	ME-MS41	0.2	ppm		0.4	0.5	0.3	0.5	0.7
titanium	7440-32-6	ME-MS41	0.005	%		0.085	0.125	0.076	0.095	0.128
tungsten	7440-33-7	ME-MS41	0.05	ppm		0.07	0.12	<0.05	<0.05	<0.05
uranium	7440-61-1	ME-MS41	0.05	ppm		0.41	0.60	0.32	1.60	0.30
vanadium	7440-62-2	ME-MS41	1	ppm		45	54	38	54	56
yttrium	7440-65-5	ME-MS41	0.05	ppm		6.95	7.00	5.81	7.04	6.25

Analytical Results

Sub-Matrix: **Soil/Solid**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MM 165902	MM 165903	MM 165904	MM 165905	MM 165906
					Client sampling date / time	[30-Jul-2020]	[30-Jul-2020]	[30-Jul-2020]	[30-Jul-2020]	[30-Jul-2020]
						WR2000576-001	WR2000576-002	WR2000576-003	WR2000576-004	WR2000576-005
						Result	Result	Result	Result	Result
Metals										
zinc	7440-66-6	ME-MS41	2	ppm		69	83	57	97	71
zirconium	7440-67-7	ME-MS41	0.5	ppm		1.5	1.9	1.1	1.8	1.1

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Soil/Solid**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MM 165907	MM 165908	MM 165909	MM 165910	MM 165911
					Client sampling date / time	[30-Jul-2020]	[30-Jul-2020]	[30-Jul-2020]	[30-Jul-2020]	[30-Jul-2020]
						WR2000576-006	WR2000576-007	WR2000576-008	WR2000576-009	WR2000576-010
						Result	Result	Result	Result	Result
Acid Base Accounting										
carbon dioxide	124-38-9	C-GAS05	0.2	%		0.6	0.5	0.5	1.1	0.4
carbon, total [TC]	----	C-GAS05	0.05	%		0.17	0.14	0.15	0.30	0.12
fizz rating	----	OA-VOL08	1	-		2	2	2	2	2
maximum potential acidity [MPA]	----	OA-VOL08	0.3	tCaCO3/kt		11.3	18.4	11.3	7.5	3.8
net neutralization potential [NNP]	----	OA-VOL08	1	tCaCO3/kt		14	5	14	27	22
neutralization potential [NP]	----	OA-VOL08	1	tCaCO3/kt		25	23	25	34	26
neutralization potential ratio [NPR], (NP/MPA)	----	OA-VOL08	0.01	-		2.22	1.25	2.22	4.53	6.93
pH (1:1 soil:water)	----	OA-ELE07	0.10	pH units		8.10	8.10	8.20	8.00	8.20
sulfate (as S), carbonate leach	14808-79-8	S-GRA06	0.01	%		0.26	0.27	0.25	0.19	0.10
sulfate (as S), HCl leach	14808-79-8	S-GRA06A	0.01	%		0.27	0.28	0.25	0.22	0.12
sulfur, total	7704-34-9	S-IR08	0.01	%		0.36	0.59	0.36	0.24	0.12
weight, sample received	NA	WEI-21	0.02	kg		1.30	1.30	1.28	1.30	1.32
Metals										
aluminum	7429-90-5	ME-MS41	0.01	%		1.19	1.06	1.12	1.05	1.10
antimony	7440-36-0	ME-MS41	0.05	ppm		<0.05	<0.05	<0.05	0.40	<0.05
arsenic	7440-38-2	ME-MS41	0.1	ppm		0.7	0.5	0.7	1.9	0.7
barium	7440-39-3	ME-MS41	10	ppm		140	130	190	230	130
beryllium	7440-41-7	ME-MS41	0.05	ppm		0.35	0.20	0.27	0.32	0.28
bismuth	7440-69-9	ME-MS41	0.01	ppm		0.15	0.14	0.33	0.12	0.01
boron	7440-42-8	ME-MS41	10	ppm		<10	<10	<10	10	<10
cadmium	7440-43-9	ME-MS41	0.01	ppm		0.09	0.19	0.13	0.11	0.04
calcium	7440-70-2	ME-MS41	0.01	%		1.31	1.06	1.26	1.56	1.02
cerium	7440-45-1	ME-MS41	0.02	ppm		24.9	17.90	19.10	20.1	24.5
cesium	7440-46-2	ME-MS41	0.05	ppm		0.27	0.29	0.22	0.32	0.22
chromium	7440-47-3	ME-MS41	1	ppm		6	6	6	7	5
cobalt	7440-48-4	ME-MS41	0.1	ppm		6.1	6.0	5.1	4.9	5.5
copper	7440-50-8	ME-MS41	0.2	ppm		1085	2670	2480	837	48.8
gallium	7440-55-3	ME-MS41	0.05	ppm		6.51	6.20	5.44	4.94	5.53
germanium	7440-56-4	ME-MS41	0.05	ppm		0.07	0.06	0.07	0.07	0.08
gold	7440-57-5	ME-MS41	0.02	ppm		0.03	0.08	0.09	0.02	<0.02
hafnium	7440-58-6	ME-MS41	0.02	ppm		0.06	0.04	0.06	0.05	0.10

Analytical Results

Sub-Matrix: **Soil/Solid**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MM 165907	MM 165908	MM 165909	MM 165910	MM 165911
					Client sampling date / time	[30-Jul-2020]	[30-Jul-2020]	[30-Jul-2020]	[30-Jul-2020]	[30-Jul-2020]
						WR2000576-006	WR2000576-007	WR2000576-008	WR2000576-009	WR2000576-010
						Result	Result	Result	Result	Result
Metals										
indium	7440-74-6	ME-MS41	0.005	ppm		0.028	0.048	0.027	0.024	0.020
iron	7439-89-6	ME-MS41	0.01	%		2.82	3.32	2.40	2.35	2.46
lanthanum	7439-91-0	ME-MS41	0.2	ppm		13.6	9.5	10.2	10.7	14.1
lead	7439-92-1	ME-MS41	0.2	ppm		4.6	2.6	3.3	6.5	3.0
lithium	7439-93-2	ME-MS41	0.1	ppm		6.7	5.5	6.1	5.5	5.7
magnesium	7439-95-4	ME-MS41	0.01	%		0.73	0.62	0.65	0.58	0.68
manganese	7439-96-5	ME-MS41	5	ppm		669	419	530	520	595
mercury	7439-97-6	ME-MS41	0.01	ppm		<0.01	0.01	0.07	0.01	<0.01
molybdenum	7439-98-7	ME-MS41	0.05	ppm		6.15	7.04	0.21	2.46	0.27
nickel	7440-02-0	ME-MS41	0.2	ppm		1.9	1.8	1.8	1.8	1.7
niobium	7440-03-1	ME-MS41	0.05	ppm		0.17	0.22	0.21	0.16	0.21
phosphorus	7723-14-0	ME-MS41	10	ppm		920	680	650	700	830
potassium	7440-09-7	ME-MS41	0.01	%		0.44	0.53	0.44	0.43	0.44
rhenium	7440-15-5	ME-MS41	0.001	ppm		0.008	0.004	0.001	0.004	0.001
rubidium	7440-17-7	ME-MS41	0.1	ppm		22.7	26.7	21.8	20.6	23.0
scandium	7440-20-2	ME-MS41	0.1	ppm		3.3	3.4	3.3	3.2	3.3
selenium	7782-49-2	ME-MS41	0.2	ppm		1.0	2.3	2.1	0.6	<0.2
silver	7440-22-4	ME-MS41	0.01	ppm		0.41	0.73	1.28	0.55	0.06
sodium	7440-23-5	ME-MS41	0.01	%		0.09	0.08	0.10	0.09	0.11
strontium	7440-24-6	ME-MS41	0.2	ppm		64.7	72.9	75.6	79.2	63.6
sulfur	7704-34-9	ME-MS41	0.01	%		0.39	0.63	0.40	0.27	0.13
tantalum	7440-25-7	ME-MS41	0.01	ppm		<0.01	<0.01	<0.01	<0.01	<0.01
tellurium	13494-80-9	ME-MS41	0.01	ppm		0.06	0.10	0.45	0.10	<0.01
thallium	7440-28-0	ME-MS41	0.02	ppm		0.11	0.16	0.10	0.10	0.09
thorium	7440-29-1	ME-MS41	0.2	ppm		3.6	3.3	1.8	2.4	3.9
tin	7440-31-5	ME-MS41	0.2	ppm		0.5	0.8	0.4	0.4	0.4
titanium	7440-32-6	ME-MS41	0.005	%		0.118	0.122	0.125	0.097	0.126
tungsten	7440-33-7	ME-MS41	0.05	ppm		0.05	<0.05	<0.05	0.12	<0.05
uranium	7440-61-1	ME-MS41	0.05	ppm		0.40	0.35	0.21	0.31	0.60
vanadium	7440-62-2	ME-MS41	1	ppm		57	59	49	48	55
yttrium	7440-65-5	ME-MS41	0.05	ppm		5.81	5.68	5.67	5.91	5.93
zinc	7440-66-6	ME-MS41	2	ppm		85	68	68	66	82

Analytical Results

Sub-Matrix: **Soil/Solid**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MM 165907	MM 165908	MM 165909	MM 165910	MM 165911
					Client sampling date / time	[30-Jul-2020]	[30-Jul-2020]	[30-Jul-2020]	[30-Jul-2020]	[30-Jul-2020]
						WR2000576-006	WR2000576-007	WR2000576-008	WR2000576-009	WR2000576-010
						Result	Result	Result	Result	Result
Metals										
zirconium	7440-67-7	ME-MS41	0.5	ppm		1.2	0.7	0.8	1.0	1.7

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Minerals — Sample Submittal Form

Company Name:	Minto Exploration Ltd
Submitted by:	Peter Pang
Telephone:	250-203-1850
Courier/Waybill:	
# Containers:	
Date Shipped:	
PO Number:	

Internal Use Only

Date Received:	July 30/20 @ 14:45
Client Code:	
Workorder No:	
Quote:	
Template:	

Environmental Division
Whitehorse
Work Order Reference
WR2000576

Telephone : +1 867 668 6689

Standard Project:	Minto Mine - WRMP
Commodity:	
Special Instructions:	

☐ Ore ☑ Trace ☐ Potentially

Sample Type: ☑ Rock ☐ Pulp ☐ Percussion ☐ Soil ☐ Sediment ☐ Drill Core Other

Results to

Name:	Laura Battsion
Email:	LauraB@mintomine.com
Address:	
City:	Whitehorse
State:	Yukon
Country:	Canada
Zip:	

☑ Invoice ☑ Certificate ☑ QC Certificate ☑ Data File ☐ Webtrieve Only

Copy to

Name:	Peter Pang
Email:	PeterP@mintomine.com

☑ Webtrieve Only ☐ Certificate ☑ Data File

Copy to

Name:	
Email:	DanicaP@mintomine.com

☐ Webtrieve Only ☐ Certificate ☐ Data File

Sample Return

Pulps	Rejects
☑ Return after analysis	☑ Return after analysis
☐ Return after 90 days	☐ Return after 45 days
☐ Discard	☐ Discard
☐ Paid Storage	☐ Paid Storage

Failure to indicate pulp & reject disposition will be considered as paid storage.

Return Address:
Minto Mine, c/o Smalls Expediting
25 Pilgram Pl Suite 2
Whitehorse, Yukon,

Attention: Laura Battison

Authorized By:
Name: Laura Battison (Please Print)
Signature:

*All shipments received are subject to inspection upon layout; all services are rendered in accordance with ALS Minerals Terms & Conditions (see the current Schedule of Services & Fees).

Samples ID's		Quantity	Sample Preparation Required (Prep Code)	Analytical (Elements or Method Code)	Check here for Rush Premium Service
Start No.	Finish No.				
MM 165902	MM 165911	10		ME-MS41-AX	
MM 165902	MM 165911	10		ACIDBASE-ACC04-AX	
MM 165902	MM 165911	10		SULPHUR-S-GRA06-AX	
	Total Samples	10			

CONTACT ALS TO CONFIRM AVAILABILITY

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000855**	Page	: 1 of 5
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine - WRMP	Date Samples Received	: 11-Sep-2020 12:00
PO	: ----	Date Analysis Commenced	: 28-Oct-2020
C-O-C number	: ----	Issue Date	: 30-Oct-2020 14:30
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 4		
No. of samples analysed	: 4		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Kaitlyn Gardner	Account Manager Assistant	Internal Subcontracting, North Vancouver, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
kg	kilograms
pH units	pH units
ppm	parts per million
tCaCO3/kt	tons CaCO3 per kiloton

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Analytical Results

Sub-Matrix: **Soil/Solid**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MM 165912	MM 165913	MM 165914	MM 165925	----
					Client sampling date / time	11-Sep-2020	11-Sep-2020	11-Sep-2020	11-Sep-2020	----
						WR2000855-001	WR2000855-002	WR2000855-003	WR2000855-004	--------
						Result	Result	Result	Result	----
Acid Base Accounting										
carbon dioxide	124-38-9	C-GAS05	0.2	%		0.9	0.8	1.0	0.4	----
carbon, total [TC]	----	C-GAS05	0.05	%		0.24	0.22	0.27	0.11	----
fizz rating	----	OA-VOL08	1	-		1	1	2	1	----
maximum potential acidity [MPA]	----	OA-VOL08	0.3	tCaCO3/kt		7.5	2.5	1.6	17.5	----
net neutralization potential [NNP]	----	OA-VOL08	1	tCaCO3/kt		17	23	31	-1	----
neutralization potential [NP]	----	OA-VOL08	1	tCaCO3/kt		24	25	33	17	----
neutralization potential ratio [NPR], (NP/MPA)	----	OA-VOL08	0.01	-		3.20	10.00	21.12	0.97	----
pH (1:1 soil:water)	----	OA-ELE07	0.10	pH units		7.80	7.80	8.40	8.10	----
sulfate (as S), HCl leach	14808-79-8	S-GRA06A	0.01	%		0.17	0.08	<0.01	0.30	----
sulfur, total	7704-34-9	S-IR08	0.01	%		0.24	0.08	0.05	0.56	----
weight, sample received	NA	WEI-21	0.02	kg		1.30	1.32	1.32	1.32	----
Metals										
aluminum	7429-90-5	ME-MS41	0.01	%		0.98	1.05	1.13	1.04	----
antimony	7440-36-0	ME-MS41	0.05	ppm		<0.05	<0.05	<0.05	<0.05	----
arsenic	7440-38-2	ME-MS41	0.1	ppm		1.2	1.0	1.1	0.3	----
barium	7440-39-3	ME-MS41	10	ppm		120	120	170	150	----
beryllium	7440-41-7	ME-MS41	0.05	ppm		0.33	0.42	0.40	0.17	----
bismuth	7440-69-9	ME-MS41	0.01	ppm		0.04	0.01	0.02	0.29	----
boron	7440-42-8	ME-MS41	10	ppm		10	10	10	<10	----
cadmium	7440-43-9	ME-MS41	0.01	ppm		0.06	0.03	0.10	0.31	----
calcium	7440-70-2	ME-MS41	0.01	%		1.34	1.34	1.33	1.02	----
cerium	7440-45-1	ME-MS41	0.02	ppm		21.3	19.65	21.6	27.3	----
cesium	7440-46-2	ME-MS41	0.05	ppm		0.20	0.16	0.19	0.49	----
chromium	7440-47-3	ME-MS41	1	ppm		8	6	9	9	----
cobalt	7440-48-4	ME-MS41	0.1	ppm		5.0	5.0	5.7	5.2	----
copper	7440-50-8	ME-MS41	0.2	ppm		618	59.5	331	2760	----
gallium	7440-55-3	ME-MS41	0.05	ppm		5.32	5.53	5.77	5.41	----
germanium	7440-56-4	ME-MS41	0.05	ppm		0.09	0.09	0.08	0.09	----
gold	7440-57-5	ME-MS41	0.02	ppm		<0.02	<0.02	<0.02	0.06	----
hafnium	7440-58-6	ME-MS41	0.02	ppm		0.04	0.05	0.07	0.05	----

Analytical Results

Sub-Matrix: **Soil/Solid**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MM 165912	MM 165913	MM 165914	MM 165925	----
					Client sampling date / time	11-Sep-2020	11-Sep-2020	11-Sep-2020	11-Sep-2020	----
						WR2000855-001	WR2000855-002	WR2000855-003	WR2000855-004	--------
						Result	Result	Result	Result	----
Metals										
indium	7440-74-6	ME-MS41	0.005	ppm		0.026	0.015	0.021	0.046	----
iron	7439-89-6	ME-MS41	0.01	%		2.04	1.93	2.14	2.31	----
lanthanum	7439-91-0	ME-MS41	0.2	ppm		11.6	10.5	11.6	14.0	----
lead	7439-92-1	ME-MS41	0.2	ppm		4.0	5.1	4.9	5.0	----
lithium	7439-93-2	ME-MS41	0.1	ppm		6.9	6.8	7.2	6.0	----
magnesium	7439-95-4	ME-MS41	0.01	%		0.56	0.58	0.63	0.59	----
manganese	7439-96-5	ME-MS41	5	ppm		453	451	461	393	----
mercury	7439-97-6	ME-MS41	0.01	ppm		0.01	<0.01	0.01	0.01	----
molybdenum	7439-98-7	ME-MS41	0.05	ppm		0.86	0.57	2.12	9.75	----
nickel	7440-02-0	ME-MS41	0.2	ppm		1.7	1.7	2.4	2.3	----
niobium	7440-03-1	ME-MS41	0.05	ppm		0.13	0.14	0.12	0.30	----
phosphorus	7723-14-0	ME-MS41	10	ppm		600	600	660	690	----
potassium	7440-09-7	ME-MS41	0.01	%		0.28	0.19	0.20	0.65	----
rhenium	7440-15-5	ME-MS41	0.001	ppm		0.001	<0.001	0.003	0.016	----
rubidium	7440-17-7	ME-MS41	0.1	ppm		14.0	9.3	8.9	34.1	----
scandium	7440-20-2	ME-MS41	0.1	ppm		3.2	3.4	3.3	2.9	----
selenium	7782-49-2	ME-MS41	0.2	ppm		0.7	<0.2	0.4	2.2	----
silver	7440-22-4	ME-MS41	0.01	ppm		0.24	0.04	0.15	1.03	----
sodium	7440-23-5	ME-MS41	0.01	%		0.06	0.06	0.08	0.07	----
strontium	7440-24-6	ME-MS41	0.2	ppm		88.6	76.1	99.4	77.3	----
sulfur	7704-34-9	ME-MS41	0.01	%		0.27	0.10	0.07	0.59	----
tantalum	7440-25-7	ME-MS41	0.01	ppm		<0.01	<0.01	<0.01	<0.01	----
tellurium	13494-80-9	ME-MS41	0.01	ppm		0.03	0.01	0.02	0.18	----
thallium	7440-28-0	ME-MS41	0.02	ppm		0.07	0.05	0.05	0.23	----
thorium	7440-29-1	ME-MS41	0.2	ppm		2.4	2.2	2.8	7.0	----
tin	7440-31-5	ME-MS41	0.2	ppm		0.4	0.4	0.4	0.6	----
titanium	7440-32-6	ME-MS41	0.005	%		0.075	0.076	0.063	0.123	----
tungsten	7440-33-7	ME-MS41	0.05	ppm		0.13	0.12	0.07	0.52	----
uranium	7440-61-1	ME-MS41	0.05	ppm		0.25	0.24	0.39	0.64	----
vanadium	7440-62-2	ME-MS41	1	ppm		38	36	38	48	----
yttrium	7440-65-5	ME-MS41	0.05	ppm		4.50	5.12	6.28	6.61	----
zinc	7440-66-6	ME-MS41	2	ppm		62	60	65	67	----

Analytical Results

Sub-Matrix: **Soil/Solid**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MM 165912	MM 165913	MM 165914	MM 165925	----
					Client sampling date / time	11-Sep-2020	11-Sep-2020	11-Sep-2020	11-Sep-2020	----
						WR2000855-001	WR2000855-002	WR2000855-003	WR2000855-004	--------
						Result	Result	Result	Result	----
Metals										
zirconium	7440-67-7	ME-MS41	0.5	ppm		0.9	0.9	1.4	1.1	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WR2000855**	Page	: 1 of 9
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine - WRMP	Date Samples Received	: 11-Sep-2020 12:00
PO	: ----	Issue Date	: 30-Oct-2020 14:30
C-O-C number	: ----		
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 4		
No. of samples analysed	: 4		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Acid Base Accounting : Acid Base Accounting										
LDPE bag MM 165912	OA-VOL08	11-Sep-2020	----	----	----		28-Oct-2020	----	----	
Acid Base Accounting : Acid Base Accounting										
LDPE bag MM 165913	OA-VOL08	11-Sep-2020	----	----	----		28-Oct-2020	----	----	
Acid Base Accounting : Acid Base Accounting										
LDPE bag MM 165914	OA-VOL08	11-Sep-2020	----	----	----		28-Oct-2020	----	----	
Acid Base Accounting : Acid Base Accounting										
LDPE bag MM 165925	OA-VOL08	11-Sep-2020	----	----	----		28-Oct-2020	----	----	
Acid Base Accounting : C by HClO4 digestion and titration										
LDPE bag MM 165912	C-GAS05	11-Sep-2020	----	----	----		28-Oct-2020	----	----	
Acid Base Accounting : C by HClO4 digestion and titration										
LDPE bag MM 165913	C-GAS05	11-Sep-2020	----	----	----		28-Oct-2020	----	----	
Acid Base Accounting : C by HClO4 digestion and titration										
LDPE bag MM 165914	C-GAS05	11-Sep-2020	----	----	----		28-Oct-2020	----	----	

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Acid Base Accounting : C by HClO4 digestion and titration										
LDPE bag MM 165925	C-GAS05	11-Sep-2020	----	----	----		28-Oct-2020	----	----	
Acid Base Accounting : Received Sample Weight										
LDPE bag MM 165912	WEI-21	11-Sep-2020	----	----	----		28-Oct-2020	180 days	47 days	✓
Acid Base Accounting : Received Sample Weight										
LDPE bag MM 165913	WEI-21	11-Sep-2020	----	----	----		28-Oct-2020	180 days	47 days	✓
Acid Base Accounting : Received Sample Weight										
LDPE bag MM 165914	WEI-21	11-Sep-2020	----	----	----		28-Oct-2020	180 days	47 days	✓
Acid Base Accounting : Received Sample Weight										
LDPE bag MM 165925	WEI-21	11-Sep-2020	----	----	----		28-Oct-2020	180 days	47 days	✓
Acid Base Accounting : Saturated Paste pH										
LDPE bag MM 165912	OA-ELE07	11-Sep-2020	----	----	----		28-Oct-2020	----	----	
Acid Base Accounting : Saturated Paste pH										
LDPE bag MM 165913	OA-ELE07	11-Sep-2020	----	----	----		28-Oct-2020	----	----	
Acid Base Accounting : Saturated Paste pH										
LDPE bag MM 165914	OA-ELE07	11-Sep-2020	----	----	----		28-Oct-2020	----	----	
Acid Base Accounting : Saturated Paste pH										
LDPE bag MM 165925	OA-ELE07	11-Sep-2020	----	----	----		28-Oct-2020	----	----	

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Acid Base Accounting : Sulfates by HCl Leaching and Gravimetry with Sulfide S Calc.										
LDPE bag MM 165912	S-GRA06A	11-Sep-2020	----	----	----		28-Oct-2020	----	----	
Acid Base Accounting : Sulfates by HCl Leaching and Gravimetry with Sulfide S Calc.										
LDPE bag MM 165913	S-GRA06A	11-Sep-2020	----	----	----		28-Oct-2020	----	----	
Acid Base Accounting : Sulfates by HCl Leaching and Gravimetry with Sulfide S Calc.										
LDPE bag MM 165914	S-GRA06A	11-Sep-2020	----	----	----		28-Oct-2020	----	----	
Acid Base Accounting : Sulfates by HCl Leaching and Gravimetry with Sulfide S Calc.										
LDPE bag MM 165925	S-GRA06A	11-Sep-2020	----	----	----		28-Oct-2020	----	----	
Acid Base Accounting : Total S by LECO and IR										
LDPE bag MM 165912	S-IR08	11-Sep-2020	----	----	----		28-Oct-2020	----	----	
Acid Base Accounting : Total S by LECO and IR										
LDPE bag MM 165913	S-IR08	11-Sep-2020	----	----	----		28-Oct-2020	----	----	
Acid Base Accounting : Total S by LECO and IR										
LDPE bag MM 165914	S-IR08	11-Sep-2020	----	----	----		28-Oct-2020	----	----	
Acid Base Accounting : Total S by LECO and IR										
LDPE bag MM 165925	S-IR08	11-Sep-2020	----	----	----		28-Oct-2020	----	----	
Metals : 51 Elements by Aqua Regia digestion and ICP-AES/MS										
LDPE bag MM 165912	ME-MS41	11-Sep-2020	----	----	----		28-Oct-2020	----	----	

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : 51 Elements by Aqua Regia digestion and ICP-AES/MS										
LDPE bag MM 165913	ME-MS41	11-Sep-2020	----	----	----		28-Oct-2020	----	----	
Metals : 51 Elements by Aqua Regia digestion and ICP-AES/MS										
LDPE bag MM 165914	ME-MS41	11-Sep-2020	----	----	----		28-Oct-2020	----	----	
Metals : 51 Elements by Aqua Regia digestion and ICP-AES/MS										
LDPE bag MM 165925	ME-MS41	11-Sep-2020	----	----	----		28-Oct-2020	----	----	

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

- **No Quality Control data available for this section.**

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
C by HClO4 digestion and titration	C-GAS05 ALS Minerals (Vancouver) - 2103 Dollarton Hwy North Vancouver British Columbia Canada V7H 0A7	Soil/Solid	ALS Minerals C-GAS05	Determine Total Inorganic Carbon (TIC) by using diluted perchloric acid to react with metal carbonate and yield carbon dioxide. Concentration of carbon dioxide is determined by colour titration. TOC is determined by this method and C-IR07 (TC).
51 Elements by Aqua Regia digestion and ICP-AES/MS	ME-MS41 ALS Minerals (Vancouver) - 2103 Dollarton Hwy North Vancouver British Columbia Canada V7H 0A7	Soil/Solid	ALS Minerals ME-MS41	A prepared sample is digested with aqua regia in a graphite heating block. After cooling, the resulting solution is diluted to with deionized water, mixed and analyzed by ICP-AES. Samples are then analyzed by ICP-MS for the remaining suite of elements.
Saturated Paste pH	OA-ELE07 ALS Minerals (Vancouver) - 2103 Dollarton Hwy North Vancouver British Columbia Canada V7H 0A7	Soil/Solid	ALS Minerals OA-ELE07	Sample mix with water in 1:1 ratio to make a paste, pH is then determined.
Acid Base Accounting	OA-VOL08 ALS Minerals (Vancouver) - 2103 Dollarton Hwy North Vancouver British Columbia Canada V7H 0A7	Soil/Solid	ALS Minerals OA-VOL08	Determine the acid generation power of a sample as tonne CaCO3 per kilo-tonne.
Sulfates by HCl Leaching and Gravimetry with Sulfide S Calc.	S-GRA06A ALS Minerals (Vancouver) - 2103 Dollarton Hwy North Vancouver British Columbia Canada V7H 0A7	Soil/Solid	ALS Minerals S-GRA06A	A prepared sample is heated with dilute HCl and then filtered. The sulfate in the filtrate is precipitated with BaCl2 in a dilute HCl. The BaSO4 precipitate is filtered, ignited, weighed and the Sulfate Sulfur is determined (as S). Sulfide sulfur is calculated by Total Sulfur from combustion minus Sulfate Sulfur from the HCl leach.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Total S by LECO and IR	S-IR08 ALS Minerals (Vancouver) - 2103 Dollarton Hwy North Vancouver British Columbia Canada V7H 0A7	Soil/Solid	ALS Minerals S-IR08	A prepared sample is heated to approximately 1350°C in an induction furnace with oxygen stream. Sulfur dioxide released from the sample are measured by IR (Leco analyzer) and the Total Sulfur result is provided.
Received Sample Weight	WEI-21 ALS Minerals (Vancouver) - 2103 Dollarton Hwy North Vancouver British Columbia Canada V7H 0A7	Soil/Solid	ALS Minerals WEI-21	Weigh out sample received.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **WR2000855**	Page	: 1 of 2
Client	: Minto Explorations Ltd.	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine - WRMP	Date Samples Received	: 11-Sep-2020 12:00
PO	: ----	Date Analysis Commenced	: 28-Oct-2020
C-O-C number	: ----	Issue Date	: 30-Oct-2020 14:30
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 4		
No. of samples analysed	: 4		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Kaitlyn Gardner	Account Manager Assistant	Internal Subcontracting, North Vancouver, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

ALS Minerals — Sample Submittal Form

Company Name:	Minto Exploration Ltd
Submitted by:	Peter Pang
Telephone:	250-203-1850
Courier/Waybill:	
# Containers:	
Date Shipped:	
PO Number:	

Internal Use Only

Date Received: Sept 11/20

Client Code:

Workorder No:

Quote:

Template:

Environmental Division
Whitehorse
Work Order Reference
WR2000855

Telephone : +1 867 668 6689

Standard Project: Minto Mine - WRMP

Commodity: ☐ Ore ☑ Trace ☐ Potentia

Special Instructions:

Sample Type: ☑ Rock ☐ Pulp ☑ Percussion ☐ Soil ☐ Sediment ☐ Drill Core Other

Results to

Name:	Laura Battsion	☑ Invoice	
Email:	LauraB@mintomine.com	☑ Certificate	
Address:		☑ QC Certificate	
City:	Whitehorse	State: Yukon	☑ Data File
Country:	Canada	Zip:	☐ Webtrieve Only

Copy to

Name:	Peter Pang	☑ Webtrieve Only
Email:	PeterP@mintomine.com	☐ Certificate
		☑ Data File

Copy to

Name:	Stuart Harris	☑ Webtrieve Only
Email:	StuartH@mintomine.com	☐ Certificate
		☑ Data File

Sample Return

Pulps	Rejects
☑ Return after analysis	☑ Return after analysis
☐ Return after 90 days	☐ Return after 45 days
☐ Discard	☐ Discard
☐ Paid Storage	☐ Paid Storage

Failure to indicate pulp & reject disposition will be considered as paid storage.

Return Address:
Minto Mine, c/o Smalls Expediting
25 Pilgram Pl Suite 2
Whitehorse, Yukon,

Attention: Laura Battison

Authorized By:

Name: Laura Battison (Please Print)

Signature:

*All shipments received are subject to inspection upon layout; all services are rendered in accordance with ALS Minerals Terms & Conditions (see the current Schedule of Services & Fees).

Samples ID's Start No.	Samples ID's Finish No.	Quantity	Sample Preparation Required (Prep Code)	Analytical (Elements or Method Code)	Check here for Rush Premium Service
MM 165912	MM 165914	4		ME-MS41-AX	
MM 165925		4		ACIDBASE-ACC04-AX	
		4		SULPHUR-S-GRA06-AX	■ CONTACT THE LAB TO CONFIRM AVAILABILITY
Total Samples		4			

JL Sep 12 2020 6°C (avg 3)
Ice pack 13:15p

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2001050**	Page	: 1 of 5
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Laura Battsion	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: ----	Date Samples Received	: 08-Oct-2020 10:00
PO	: ----	Date Analysis Commenced	: 01-Dec-2020
C-O-C number	: ----	Issue Date	: 02-Dec-2020 15:06
Sampler	: ----		
Site	: ----		
Quote number	: Q78311		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Kaitlyn Gardner	Account Manager Assistant	Internal Subcontracting, North Vancouver, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
kg	kilograms
pH units	pH units
ppm	parts per million
tCaCO3/kt	tons CaCO3 per kiloton

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Analytical Results

Sub-Matrix: **Soil/Solid**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MM 162519	MM 162520	MM 162521	----	----
					Client sampling date / time	[08-Oct-2020]	[08-Oct-2020]	[08-Oct-2020]	----	----
						WR2001050-001	WR2001050-002	WR2001050-003	--------	--------
						Result	Result	Result	----	----
Acid Base Accounting										
carbon dioxide	124-38-9	C-GAS05	0.2	%		1.0	0.6	0.6	----	----
carbon, total [TC]	----	C-GAS05	0.05	%		0.27	0.17	0.17	----	----
fizz rating	----	OA-VOL08	1	-		2	2	2	----	----
maximum potential acidity [MPA]	----	OA-VOL08	0.3	tCaCO3/kt		0.9	1.3	4.7	----	----
net neutralization potential [NNP]	----	OA-VOL08	1	tCaCO3/kt		34	31	18	----	----
neutralization potential [NP]	----	OA-VOL08	1	tCaCO3/kt		35	32	23	----	----
neutralization potential ratio [NPR], (NP/MPA)	----	OA-VOL08	0.01	-		37.33	25.60	4.91	----	----
pH (1:1 soil:water)	----	OA-ELE07	0.10	pH units		8.20	8.50	8.90	----	----
sulfate (as S), HCl leach	14808-79-8	S-GRA06A	0.01	%		0.02	<0.01	<0.01	----	----
sulfide (as S), total minus HCl leach	18496-25-8	S-CAL06a	0.01	%		0.01	0.04	0.15	----	----
sulfur, total	7704-34-9	S-IR08	0.01	%		0.03	0.04	0.15	----	----
weight, sample received	NA	WEI-21	0.02	kg		1.50	1.34	1.32	----	----
Metals										
aluminum	7429-90-5	ME-MS41	0.01	%		1.35	1.33	1.20	----	----
antimony	7440-36-0	ME-MS41	0.05	ppm		<0.05	<0.05	<0.05	----	----
arsenic	7440-38-2	ME-MS41	0.1	ppm		1.3	0.7	0.5	----	----
barium	7440-39-3	ME-MS41	10	ppm		700	190	220	----	----
beryllium	7440-41-7	ME-MS41	0.05	ppm		0.40	0.41	0.25	----	----
bismuth	7440-69-9	ME-MS41	0.01	ppm		0.01	0.02	0.39	----	----
boron	7440-42-8	ME-MS41	10	ppm		<10	<10	<10	----	----
cadmium	7440-43-9	ME-MS41	0.01	ppm		0.04	0.07	0.23	----	----
calcium	7440-70-2	ME-MS41	0.01	%		1.68	1.34	0.76	----	----
cerium	7440-45-1	ME-MS41	0.02	ppm		22.1	21.2	26.1	----	----
cesium	7440-46-2	ME-MS41	0.05	ppm		0.18	0.17	0.30	----	----
chromium	7440-47-3	ME-MS41	1	ppm		6	14	9	----	----
cobalt	7440-48-4	ME-MS41	0.1	ppm		5.8	6.2	5.4	----	----
copper	7440-50-8	ME-MS41	0.2	ppm		19.7	221	2710	----	----
gallium	7440-55-3	ME-MS41	0.05	ppm		6.66	6.55	5.80	----	----
germanium	7440-56-4	ME-MS41	0.05	ppm		0.09	0.10	0.08	----	----
gold	7440-57-5	ME-MS41	0.02	ppm		<0.02	<0.02	0.22	----	----

Analytical Results

Sub-Matrix: **Soil/Solid**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MM 162519	MM 162520	MM 162521	----	----
					Client sampling date / time	[08-Oct-2020]	[08-Oct-2020]	[08-Oct-2020]	----	----
						WR2001050-001	WR2001050-002	WR2001050-003	--------	--------
						Result	Result	Result	----	----
Metals										
hafnium	7440-58-6	ME-MS41	0.02	ppm		0.06	0.08	0.05	----	----
indium	7440-74-6	ME-MS41	0.005	ppm		0.020	0.021	0.032	----	----
iron	7439-89-6	ME-MS41	0.01	%		2.33	2.45	2.71	----	----
lanthanum	7439-91-0	ME-MS41	0.2	ppm		11.8	11.6	14.6	----	----
lead	7439-92-1	ME-MS41	0.2	ppm		5.9	4.9	4.3	----	----
lithium	7439-93-2	ME-MS41	0.1	ppm		7.6	6.6	5.2	----	----
magnesium	7439-95-4	ME-MS41	0.01	%		0.70	0.72	0.65	----	----
manganese	7439-96-5	ME-MS41	5	ppm		569	530	498	----	----
mercury	7439-97-6	ME-MS41	0.01	ppm		<0.01	0.01	0.01	----	----
molybdenum	7439-98-7	ME-MS41	0.05	ppm		0.17	0.87	2.06	----	----
nickel	7440-02-0	ME-MS41	0.2	ppm		1.9	4.7	1.7	----	----
niobium	7440-03-1	ME-MS41	0.05	ppm		0.20	0.18	0.18	----	----
phosphorus	7723-14-0	ME-MS41	10	ppm		710	760	690	----	----
potassium	7440-09-7	ME-MS41	0.01	%		0.24	0.27	0.61	----	----
rhenium	7440-15-5	ME-MS41	0.001	ppm		<0.001	<0.001	0.005	----	----
rubidium	7440-17-7	ME-MS41	0.1	ppm		10.1	10.9	29.0	----	----
scandium	7440-20-2	ME-MS41	0.1	ppm		3.8	3.9	2.9	----	----
selenium	7782-49-2	ME-MS41	0.2	ppm		0.4	0.6	1.8	----	----
silver	7440-22-4	ME-MS41	0.01	ppm		0.02	0.11	1.33	----	----
sodium	7440-23-5	ME-MS41	0.01	%		0.08	0.08	0.08	----	----
strontium	7440-24-6	ME-MS41	0.2	ppm		101.0	75.3	40.1	----	----
sulfur	7704-34-9	ME-MS41	0.01	%		0.05	0.05	0.19	----	----
tantalum	7440-25-7	ME-MS41	0.01	ppm		<0.01	<0.01	<0.01	----	----
tellurium	13494-80-9	ME-MS41	0.01	ppm		0.02	0.03	0.27	----	----
thallium	7440-28-0	ME-MS41	0.02	ppm		0.06	0.07	0.17	----	----
thorium	7440-29-1	ME-MS41	0.2	ppm		2.2	2.3	3.9	----	----
tin	7440-31-5	ME-MS41	0.2	ppm		0.5	0.5	0.6	----	----
titanium	7440-32-6	ME-MS41	0.005	%		0.097	0.097	0.120	----	----
tungsten	7440-33-7	ME-MS41	0.05	ppm		<0.05	<0.05	<0.05	----	----
uranium	7440-61-1	ME-MS41	0.05	ppm		0.31	0.33	0.34	----	----
vanadium	7440-62-2	ME-MS41	1	ppm		44	50	56	----	----
yttrium	7440-65-5	ME-MS41	0.05	ppm		7.08	6.34	5.12	----	----

Analytical Results

Sub-Matrix: **Soil/Solid**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MM 162519	MM 162520	MM 162521	----	----
					Client sampling date / time	[08-Oct-2020]	[08-Oct-2020]	[08-Oct-2020]	----	----
						WR2001050-001	WR2001050-002	WR2001050-003	--------	--------
						Result	Result	Result	----	----
Metals										
zinc	7440-66-6	ME-MS41	2	ppm		70	68	74	----	----
zirconium	7440-67-7	ME-MS41	0.5	ppm		1.2	1.3	0.8	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Minerals — Sample Submittal Form

Company Name:	Minto Exploration Ltd
Submitted by:	Peter Pang
Telephone:	604-424-8084
Courier/Waybill:	
# Containers:	
Date Shipped:	
PO Number:	

Internal Use Only

Date Received:	oct 8/20
Client Code:	
Workorder No:	
Quote:	
Template:	

Environmental Division Whitehorse
Work Order Reference
WR2001050

Telephone : +1 867 668 6689

Standard Project:	Minto Mine - WRMP
Commodity:	☐ Ore ☑ Trace ☐ Potentially
Special Instructions:	

Sample Type: ☑ Rock ☐ Pulp ☑ Percussion ☐ Soil ☐ Sediment ☐ Drill Core Other

Results to

Name:	Laura Battsion		☑ Invoice
Email:	LauraB@mintomine.com		☑ Certificate
Address:			☑ QC Certificate
City:	Whitehorse	State: Yukon	☑ Data File
Country:	Canada	Zip:	☐ Webtrieve Only

Copy to

Name:	Peter Pang	☑ Webtrieve Only
Email:	PeterP@mintomine.com	☐ Certificate
		☑ Data File

Copy to

Name:	Stuart Harris	☑ Webtrieve Only
Email:	StuartH@mintomine.com	☐ Certificate
		☑ Data File

Sample Return

Pulps	Rejects
☑ Return after analysis	☑ Return after analysis
☐ Return after 90 days	☐ Return after 45 days
☐ Discard	☐ Discard
☐ Paid Storage	☐ Paid Storage

Failure to indicate pulp & reject disposition will be considered as paid storage.

Return Address:
Minto Mine, c/o Smalls Expediting
25 Pilgram Pl Suite 2
Whitehorse, Yukon,

Attention: Laura Battison

Authorized By:
Name: Laura Battison (Please Print)
Signature:

*All shipments received are subject to inspection upon layout, all services are rendered in accordance with ALS Minerals Terms & Conditions (see the current Schedule of Services & Fees).

Samples ID's Start No.	Samples ID's Finish No.	Quantity	Sample Preparation Required (Prep Code)	Analytical (Elements or Method Code)	Check here for Rush Premium Service
MM 162519	MM 162521	3		ME-MS41-AX	
		3		ACIDBASE-ACC04-AX	
		3		SULPHUR-S-GRA06-AX	☐ CONTACT THE LAB TO CONFIRM AVAILABILITY
	Total Samples	3			

5.5C 1235pm DG 10/9

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2001081**	Page	: 1 of 5
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 14-Oct-2020 15:00
PO	: TBD	Date Analysis Commenced	: 29-Nov-2020
C-O-C number	: 2020-05	Issue Date	: 15-Dec-2020 15:59
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Erin Gatdula	Account Manager Assistant	Internal Subcontracting, North Vancouver, British Columbia
Kaitlyn Gardner	Account Manager Assistant	Internal Subcontracting, North Vancouver, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
kg	kilograms
pH units	pH units
ppm	parts per million
tCaCO3/kt	tons CaCO3 per kiloton

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Analytical Results

Sub-Matrix: **Soil/Solid**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	SEPT TAL 2020	----	----	----	----
					Client sampling date / time	08-Oct-2020	----	----	----	----
						WR2001081-001	--------	--------	--------	--------
						Result	----	----	----	----
Acid Base Accounting										
carbon dioxide	124-38-9	C-GAS05	0.2	%		0.8	----	----	----	----
fizz rating	----	OA-VOL08	1	-		2	----	----	----	----
maximum potential acidity [MPA]	----	OA-VOL08	0.3	tCaCO3/kt		12.8	----	----	----	----
net neutralization potential [NNP]	----	OA-VOL08	1	tCaCO3/kt		15	----	----	----	----
neutralization potential [NP]	----	OA-VOL08	1	tCaCO3/kt		28	----	----	----	----
neutralization potential ratio [NPR], (NP/MPA)	----	OA-VOL08	0.01	-		2.19	----	----	----	----
pH (1:1 soil:water)	----	OA-ELE07	0.10	pH units		8.00	----	----	----	----
sulfate (as S), carbonate leach	14808-79-8	S-GRA06	0.01	%		0.26	----	----	----	----
sulfate (as S), HCl leach	14808-79-8	S-GRA06A	0.01	%		0.34	----	----	----	----
sulfur, total	7704-34-9	S-IR08	0.01	%		0.41	----	----	----	----
weight, sample received	NA	WEI-21	0.02	kg		1.30	----	----	----	----
Metals										
aluminum	7429-90-5	ME-MS41	0.01	%		1.23	----	----	----	----
antimony	7440-36-0	ME-MS41	0.05	ppm		<0.05	----	----	----	----
arsenic	7440-38-2	ME-MS41	0.1	ppm		0.8	----	----	----	----
barium	7440-39-3	ME-MS41	10	ppm		200	----	----	----	----
beryllium	7440-41-7	ME-MS41	0.05	ppm		0.24	----	----	----	----
bismuth	7440-69-9	ME-MS41	0.01	ppm		0.09	----	----	----	----
boron	7440-42-8	ME-MS41	10	ppm		<10	----	----	----	----
cadmium	7440-43-9	ME-MS41	0.01	ppm		0.21	----	----	----	----
calcium	7440-70-2	ME-MS41	0.01	%		1.36	----	----	----	----
cerium	7440-45-1	ME-MS41	0.02	ppm		17.45	----	----	----	----
cesium	7440-46-2	ME-MS41	0.05	ppm		0.43	----	----	----	----
chromium	7440-47-3	ME-MS41	1	ppm		6	----	----	----	----
cobalt	7440-48-4	ME-MS41	0.1	ppm		7.1	----	----	----	----
copper	7440-50-8	ME-MS41	0.2	ppm		624	----	----	----	----
gallium	7440-55-3	ME-MS41	0.05	ppm		8.44	----	----	----	----
germanium	7440-56-4	ME-MS41	0.05	ppm		0.07	----	----	----	----
gold	7440-57-5	ME-MS41	0.02	ppm		0.13	----	----	----	----
hafnium	7440-58-6	ME-MS41	0.02	ppm		0.04	----	----	----	----

Analytical Results

Sub-Matrix: **Soil/Solid**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	SEPT TAL 2020	----	----	----	----
					Client sampling date / time	08-Oct-2020	----	----	----	----
						WR2001081-001	--------	--------	--------	--------
						Result	----	----	----	----
Metals										
indium	7440-74-6	ME-MS41	0.005	ppm		0.053	----	----	----	----
iron	7439-89-6	ME-MS41	0.01	%		3.47	----	----	----	----
lanthanum	7439-91-0	ME-MS41	0.2	ppm		10.1	----	----	----	----
lead	7439-92-1	ME-MS41	0.2	ppm		2.6	----	----	----	----
lithium	7439-93-2	ME-MS41	0.1	ppm		6.5	----	----	----	----
magnesium	7439-95-4	ME-MS41	0.01	%		0.73	----	----	----	----
manganese	7439-96-5	ME-MS41	5	ppm		659	----	----	----	----
mercury	7439-97-6	ME-MS41	0.01	ppm		0.02	----	----	----	----
molybdenum	7439-98-7	ME-MS41	0.05	ppm		1.20	----	----	----	----
nickel	7440-02-0	ME-MS41	0.2	ppm		2.7	----	----	----	----
niobium	7440-03-1	ME-MS41	0.05	ppm		0.22	----	----	----	----
phosphorus	7723-14-0	ME-MS41	10	ppm		670	----	----	----	----
potassium	7440-09-7	ME-MS41	0.01	%		0.57	----	----	----	----
rhenium	7440-15-5	ME-MS41	0.001	ppm		0.003	----	----	----	----
rubidium	7440-17-7	ME-MS41	0.1	ppm		32.6	----	----	----	----
scandium	7440-20-2	ME-MS41	0.1	ppm		3.1	----	----	----	----
selenium	7782-49-2	ME-MS41	0.2	ppm		0.5	----	----	----	----
silver	7440-22-4	ME-MS41	0.01	ppm		0.39	----	----	----	----
sodium	7440-23-5	ME-MS41	0.01	%		0.06	----	----	----	----
strontium	7440-24-6	ME-MS41	0.2	ppm		107.5	----	----	----	----
sulfur	7704-34-9	ME-MS41	0.01	%		0.43	----	----	----	----
tantalum	7440-25-7	ME-MS41	0.01	ppm		<0.01	----	----	----	----
tellurium	13494-80-9	ME-MS41	0.01	ppm		0.13	----	----	----	----
thallium	7440-28-0	ME-MS41	0.02	ppm		0.23	----	----	----	----
thorium	7440-29-1	ME-MS41	0.2	ppm		3.1	----	----	----	----
tin	7440-31-5	ME-MS41	0.2	ppm		0.8	----	----	----	----
titanium	7440-32-6	ME-MS41	0.005	%		0.121	----	----	----	----
tungsten	7440-33-7	ME-MS41	0.05	ppm		0.08	----	----	----	----
uranium	7440-61-1	ME-MS41	0.05	ppm		0.34	----	----	----	----
vanadium	7440-62-2	ME-MS41	1	ppm		62	----	----	----	----
yttrium	7440-65-5	ME-MS41	0.05	ppm		4.07	----	----	----	----
zinc	7440-66-6	ME-MS41	2	ppm		115	----	----	----	----

Analytical Results

Sub-Matrix: **Soil/Solid** (Matrix: **Soil/Solid**)					Client sample ID	**SEPT TAL 2020**	**----**	**----**	**----**	**----**
					Client sampling date / time	08-Oct-2020	----	----	----	----
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*		**WR2001081-001**	**--------**	**--------**	**--------**	**--------**
						Result	----	----	----	----
Metals										
zirconium	7440-67-7	ME-MS41	0.5	ppm		0.8	----	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WR2001081**	Page	: 1 of 7
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 14-Oct-2020 15:00
PO	: TBD	Issue Date	: 15-Dec-2020 15:59
C-O-C number	: 2020-05		
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Acid Base Accounting : Acid Base Accounting										
Glass soil jar/Teflon lined cap										
SEPT TAL 2020	OA-VOL08	08-Oct-2020	----	----	----		29-Nov-2020	----	----	
Acid Base Accounting : C by HClO4 digestion and titration										
Glass soil jar/Teflon lined cap										
SEPT TAL 2020	C-GAS05	08-Oct-2020	----	----	----		29-Nov-2020	----	----	
Acid Base Accounting : Received Sample Weight										
Glass soil jar/Teflon lined cap										
SEPT TAL 2020	WEI-21	08-Oct-2020	----	----	----		29-Nov-2020	180 days	52 days	✓
Acid Base Accounting : Saturated Paste pH										
Glass soil jar/Teflon lined cap										
SEPT TAL 2020	OA-ELE07	08-Oct-2020	----	----	----		29-Nov-2020	----	----	
Acid Base Accounting : Sulfates by HCl Leaching and Gravimetry with Sulfide S Calc.										
Glass soil jar/Teflon lined cap										
SEPT TAL 2020	S-GRA06A	08-Oct-2020	----	----	----		29-Nov-2020	----	----	
Acid Base Accounting : Sulfates by NaCO3 Leaching and Gravimetry with Sulfide S Calc.										
Glass soil jar/Teflon lined cap										
SEPT TAL 2020	S-GRA06	08-Oct-2020	----	----	----		29-Nov-2020	----	----	
Acid Base Accounting : Total S by LECO and IR										
Glass soil jar/Teflon lined cap										
SEPT TAL 2020	S-IR08	08-Oct-2020	----	----	----		29-Nov-2020	----	----	

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : 51 Elements by Aqua Regia digestion and ICP-AES/MS										
Glass soil jar/Teflon lined cap										
SEPT TAL 2020	ME-MS41	08-Oct-2020	----	----	----		10-Dec-2020	----	----	

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

- **No Quality Control data available for this section.**

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
C by HClO4 digestion and titration	C-GAS05 ALS Minerals (Vancouver) - 2103 Dollarton Hwy North Vancouver British Columbia Canada V7H 0A7	Soil/Solid	ALS Minerals C-GAS05	Determine Total Inorganic Carbon (TIC) by using diluted perchloric acid to react with metal carbonate and yield carbon dioxide. Concentration of carbon dioxide is determined by colour titration. TOC is determined by this method and C-IR07 (TC).
51 Elements by Aqua Regia digestion and ICP-AES/MS	ME-MS41 ALS Minerals (Vancouver) - 2103 Dollarton Hwy North Vancouver British Columbia Canada V7H 0A7	Soil/Solid	ALS Minerals ME-MS41	A prepared sample is digested with aqua regia in a graphite heating block. After cooling, the resulting solution is diluted to with deionized water, mixed and analyzed by ICP-AES. Samples are then analyzed by ICP-MS for the remaining suite of elements.
Saturated Paste pH	OA-ELE07 ALS Minerals (Vancouver) - 2103 Dollarton Hwy North Vancouver British Columbia Canada V7H 0A7	Soil/Solid	ALS Minerals OA-ELE07	Sample mix with water in 1:1 ratio to make a paste, pH is then determined.
Acid Base Accounting	OA-VOL08 ALS Minerals (Vancouver) - 2103 Dollarton Hwy North Vancouver British Columbia Canada V7H 0A7	Soil/Solid	ALS Minerals OA-VOL08	Determine the acid generation power of a sample as tonne CaCO3 per kilo-tonne.
Sulfates by NaCO3 Leaching and Gravimetry with Sulfide S Calc.	S-GRA06 ALS Minerals (Vancouver) - 2103 Dollarton Hwy North Vancouver British Columbia Canada V7H 0A7	Soil/Solid	ALS Minerals S-GRA06	A preppared sample is heated with diluted Na□CO□ and then filtered. The sulfate in the filtrate is precipitated with BaCl2 in a dilute HCl. The BaSO4 precipitate is filtered, ignited, weighed and the Sulfate Sulfur is determined (as S). Sulfide Sulfur (as S) is calculated by Total Sulfur from combustion minus Sulfate Sulfur from the Na□CO□ leach.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Sulfates by HCl Leaching and Gravimetry with Sulfide S Calc.	S-GRA06A ALS Minerals (Vancouver) - 2103 Dollarton Hwy North Vancouver British Columbia Canada V7H 0A7	Soil/Solid	ALS Minerals S-GRA06A	A prepared sample is heated with dilute HCl and then filtered. The sulfate in the filtrate is precipitated with $BaCl_2$ in a dilute HCl. The $BaSO_4$ precipitate is filtered, ignited, weighed and the Sulfate Sulfur is determined (as S). Sulfide sulfur is calculated by Total Sulfur from combustion minus Sulfate Sulfur from the HCl leach.
Total S by LECO and IR	S-IR08 ALS Minerals (Vancouver) - 2103 Dollarton Hwy North Vancouver British Columbia Canada V7H 0A7	Soil/Solid	ALS Minerals S-IR08	A prepared sample is heated to approximately 1350°C in an induction furnace with oxygen stream. Sulfur dioxide released from the sample are measured by IR (Leco analyzer) and the Total Sulfur result is provided.
Received Sample Weight	WEI-21 ALS Minerals (Vancouver) - 2103 Dollarton Hwy North Vancouver British Columbia Canada V7H 0A7	Soil/Solid	ALS Minerals WEI-21	Weigh out sample received.

QUALITY CONTROL REPORT

Work Order	: **WR2001081**	Page	: 1 of 2
Client	: Minto Explorations Ltd.	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 14-Oct-2020 15:00
PO	: TBD	Date Analysis Commenced	: 29-Nov-2020
C-O-C number	: 2020-05	Issue Date	: 15-Dec-2020 15:59
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Erin Gatdula	Account Manager Assistant	Internal Subcontracting, North Vancouver, British Columbia
Kaitlyn Gardner	Account Manager Assistant	Internal Subcontracting, North Vancouver, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 2020 - 05

Page of

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Ruth Cayetano

Report Format / Distribution	
Select Report Format:	☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	minto_environment@mintomine.com
Email 2	
Email 3	

Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	ap@mintomine.com
Email 2	

Project Information	
ALS Account # / Quote #:	
Job #:	
PO / AFE:	TBD
LSD:	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only)	ALS Contact:	Sampler:

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐

EMERGENCY: 1 Business day [E1] ☐ | Same Day, Weekend or Statutory holiday [E0] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the ser

Analy

Indicate Filtered (F), Preserved (P) or Filt

Environmental Division Whitehorse

Work Order Reference WR2001081

Telephone : +1 867 668 6689

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals- Aqua regia disgestion (ICP)	Paste pH	% Inorganic Carbonate	Total Corbon/Sukphur (Leco)	AP - determination by % sulphide sulphur	Modified NP - (MEND 1991)	
				Composite	R	R	R	R	R	R	
	SEPT TAL 2020	08-OCT-20		TAILS	X	X	X	X	X	X	

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☑ NO	
Are samples for human drinking water use? ☐ YES ☑ NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
1.3°					

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: JOEY	Date: Oct. 09/20	Time:	Received by:	Date: OCT 14/20	Time: 1500	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

OCTOBER 2019 FRONT

Appendix O – 2020 Leach Pad Sampling Program Report

Minto Mine

Leach Pad Sampling Summary Report

2018 – 2020

Prepared by:
Minto Explorations Ltd.
Minto Mine
February 2020

1 Introduction

This report presents a summary of monitoring activities conducted by Minto Explorations Ltd. (Minto) at the two leach pads which were constructed from August 2017 to Match 2018. Leachate monitoring and sampling was conducted from May to October 2020.

The objective of the monitoring and sampling program is to geochemically characterize the waste and leachate being generated at the leach pads.

1.1 Background

The Geochemical Monitoring Program, is a requirement outlined in Minto's Water Use Licence QZ14-031, which outlines the requirement for geochemical characterization of waste, including leachate quality as presented in Section 5.1.5, Article 94and summarized as follows:

> *"The Licensee shall update the Geochemical Monitoring Program to include a monitoring and geochemical characterization program that will produce detailed metals leaching*
> *characterization from the low-grade ore and oxide ore."*

The monitoring and sampling program satisfies this condition and is included in the Environmental Monitoring, Surveillance, and Reporting Plan (EMSRP). The plan included construction of the leach pads in the summer of 2017 and subsequent sampling of the leachate for one year, starting in September 2017. Minto conducted previous monitoring and sampling from March 2018 to October 2019.

2 Construction Activities

Details of the Construction Activities are included in Appendix LPS-A.

3 Sampling Methodology

Samples were collected from the Leach pads beginning in May 2018, and continued through 2018, 2019 and 2020 during unfrozen seasons. It should be noted that this is

longer than the 12-month sampling requirement identified in the EMSRP. Water quality parameters chosen for analysis were the same as those used for groundwater monitoring at Minto.

A detailed SOP for Leach Pad sample collection is included in Appendix LPS-B.

4 Sampling results and analysis

The following Table 4.1 outlines the sampling effort and success for the Leach Pads from May 2018 to September 2020.

Table 4-1: Leach Pad Sampling Effort, 2018-2020

Month	Leach Pad 1 Samples	Leach Pad 2 Samples
2018-May	1	1
2018-Jun	2	2
2018-Jul	2	2
2018-Aug	1	1
2018-Sep	2	2
2018-Oct	1	1
2018-Nov[1]	0	0
2019-Mar	1	1
2019-Apr[2]	0	0
2019-May	1	1
2019-Jun	2	2
2019-Jul	1	1
2019-Aug	1	1
2019-Sep	1	1
2019-Oct	1	1
2019-Nov[1]	0	0
2020-Apr[1]	0	0
2020-May	1	1
2020-Jun	1	1
2020-Jul	1	1
2020-Aug	2	2

2020-Sep	1	1
2020-Oct[1]	0	0

[1] Leach Pad Frozen

[2] Leach Pads Dry - Not enough water for a sample.

Table 4.2 presents the raw data from Leach Pad samples collected from May 2018 – September 2020.

Table 4-2: Leach Pad Sample Results, May 2018- September 2020

Leach Pad Sampling Results, May 2018 - September 2020																	
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	pH units
Station	Date	Ag-D	Al-D	As-D	Cd-D	Cr-D	Cu-D	Fe-D	Mo-D	Ni-D	N-NH3	N-NO2	N-NO3	Pb-D	Se-D	Zr-D	pH-L
LP1	26-May-18	<0.000010	0.0129	0.00042	0.000121	<0.00010	0.0118	<0.010	0.00595	<0.00050	<0.0050	0.0559	1.80	<0.000050	0.00204	<0.00030	7.91
LP1	26-May-18	<0.000010	0.0119	0.00043	0.000115	<0.00010	0.0116	<0.010	0.00511	<0.00050	<0.0050	0.0560	1.80	<0.000050	0.00165	<0.00030	7.94
LP1	9-Jun-18	<0.000020	0.0029	0.00045	0.000368	<0.00020	0.0360	<0.020	0.0380	<0.0010	1.28	4.77	130	0.00012	0.462	<0.00030	7.77
LP1	9-Jun-18	<0.000020	0.0024	0.00044	0.000358	<0.00020	0.0351	<0.020	0.0380	<0.0010	1.31	4.63	127	<0.00010	0.465	<0.00030	7.75
LP1	19-Jun-18	<0.000020	0.0024	0.00020	0.000121	<0.00020	0.0239	<0.020	0.0328	<0.0010	0.346	0.977	26.2	0.00015	0.127	<0.00030	7.85
LP1	19-Jun-18	<0.000020	0.0020	<0.00020	0.000129	<0.00020	0.0244	<0.020	0.0326	<0.0010	0.347	0.957	25.9	0.00016	0.127	<0.00030	7.86
LP1	9-Jul-18	<0.000010	0.0068	0.00013	0.0000441	<0.00010	0.0141	<0.010	0.0176	<0.00050	0.0464	0.116	6.52	0.000221	0.0340	<0.00030	7.89
LP1	21-Jul-18	<0.000010	0.0036	0.00019	0.0000499	<0.00010	0.0148	<0.010	0.0180	<0.00050	0.0115	0.0467	11.1	0.000350	0.0501	<0.00030	7.99
LP1	21-Jul-18	<0.000010	0.0041	0.00021	0.0000402	<0.00010	0.0148	<0.010	0.0183	<0.00050	0.0121	0.0471	11.0	0.000350	0.0489	<0.00030	7.97
LP1	20-Aug-18	<0.000010	0.0017	0.00026	0.000136	<0.00010	0.0451	<0.010	0.0464	<0.00050	<0.0050	0.0097	41.4	0.000352	0.140	<0.00030	7.94
LP1	6-Sep-18	<0.000010	0.0010	0.00029	0.000154	<0.00010	0.0449	<0.010	0.0453	<0.00050	<0.0050	0.0053	46.4	0.000157	0.152	<0.00030	7.93
LP1	6-Sep-18	<0.000010	0.0011	0.00032	0.000152	<0.00010	0.0438	<0.010	0.0452	<0.00050	<0.0050	<0.0050	46.3	0.000148	0.155	<0.00030	7.93
LP1	28-Sep-18	<0.000010	<0.0010	0.00028	0.000160	<0.00010	0.0454	<0.010	0.0428	<0.00050	0.0119	<0.010	52.2	<0.000050	0.167	<0.00030	7.78
LP1	8-Oct-18	<0.000020	0.0051	0.00072	0.000296	<0.00020	0.0899	<0.020	0.109	<0.0010	0.0140	0.022	134	<0.00010	0.454	<0.00030	8.04
LP1	31-Mar-19	<0.000010	0.0012	0.00035	<0.00014	0.00013	0.0710	<0.010	0.0465	<0.00050	0.0078	<0.010	50.5	<0.000050	0.186	<0.00030	7.79
LP1	31-Mar-19	<0.000010	0.0042	0.00043	0.000170	<0.00010	0.0792	<0.010	0.0564	<0.00050	<0.0050	<0.010	54.9	<0.000050	0.213	<0.00030	7.80
LP1	20-May-19	<0.000010	0.0029	0.00027	<0.000085	<0.00010	0.0254	<0.010	0.0325	<0.00050	<0.0050	0.0061	38.3	0.000377	0.127	<0.00030	7.88
LP1	20-May-19	<0.000010	0.0026	0.00032	<0.000085	<0.00010	0.0244	<0.010	0.0345	<0.00050	<0.0050	0.0080	43.8	0.000333	0.124	<0.00030	7.99
LP1	4-Jun-19	<0.000010	0.0044	0.00026	<0.00017	<0.00010	0.0364	0.012	0.0312	<0.00050	<0.0050	0.010	59.6	<0.000050	0.225	<0.00030	7.85
LP1	24-Jun-19	<0.000010	0.0022	0.00020	<0.00011	<0.00010	0.0325	<0.010	0.0288	<0.00050	<0.0050	<0.010	30.2	0.000199	0.131	<0.00030	7.80
LP1	15-Jul-19	<0.000010	0.0039	0.00035	<0.000030	0.00020	0.0353	<0.010	0.0420	<0.00050	0.0130	0.114	45.0	<0.000050	0.183	<0.00030	7.66
LP1	15-Jul-19	<0.000010	0.0041	0.00032	<0.000035	<0.00010	0.0352	<0.010	0.0455	<0.00050	0.0152	0.113	44.7	0.000055	0.193	<0.00030	7.74
LP1	8-Aug-19	<0.000020	0.0027	0.00081	0.000402	<0.00020	0.0643	<0.020	0.0391	<0.0010	2.16	0.889	106	0.00021	0.112	<0.00040	7.96
LP1	8-Sep-19	<0.000010	0.0014	0.00029	<0.000090	<0.00010	0.0288	<0.010	0.0489	<0.00050	0.0067	0.0237	33.7	0.000061	0.155	<0.00030	7.93
LP1	8-Sep-19	<0.000010	0.0012	0.00024	<0.000090	<0.00010	0.0298	<0.010	0.0479	<0.00050	<0.0050	0.032	34.7	<0.000050	0.143	<0.00030	7.92
LP1	7-Oct-19	<0.000020	<0.0020	0.00033	0.000131	<0.00020	0.0410	<0.020	0.0750	<0.0010	<0.0050	<0.020	46.5	<0.00010	0.231	<0.00040	8.04
LP1	7-Oct-19	<0.000020	<0.0020	0.00133	0.000603	<0.00020	0.0830	<0.020	0.0562	<0.0010	0.158	0.115	155	<0.00010	0.265	<0.00040	7.99
LP1	7-May-20	<0.000010	0.0098	0.00018	0.0000817	<0.00010	0.0318	<0.010	0.0253	<0.00050	0.0970	0.0092	18.4	0.000358	0.0738	<0.00020	7.70
LP1	1-Jun-20	<0.000020	0.0036	0.00040	<0.0000450	<0.00020	0.0222	<0.020	0.0453	<0.00100	0.0084	0.0377	33.1	<0.000100	0.248	<0.00040	7.42
LP1	1-Jun-20	<0.000020	0.0077	0.00037	<0.0000450	<0.00020	0.0228	<0.020	0.0460	<0.00100	<0.0050	0.0338	33.5	<0.000100	0.246	<0.00040	7.46
LP1	8-Jul-20	<0.000010	0.0040	0.00059	0.000198	<0.00010	0.0536	<0.010	0.0318	<0.00050	0.0292	0.0058	10.7	<0.000050	0.0784	<0.00020	7.90
LP1	2-Aug-20	<0.000010	0.0031	0.00068	0.0000962	<0.00010	0.0456	<0.010	0.0383	<0.00050	0.0067	<0.0050	5.44	0.000051	0.0850	<0.00020	8.01
LP1	30-Aug-20	<0.000010	0.0871	0.00058	0.000101	<0.00010	0.0540	0.154	0.0396	<0.00050	<0.0050	<0.0050	3.53	0.000057	0.0640	<0.00020	7.98
LP1	30-Aug-20	0.000011	0.0065	0.00057	0.000101	<0.00010	0.0489	0.034	0.0403	<0.00050	<0.0050	<0.0050	3.54	<0.000050	0.0660	<0.00020	7.98

LP1	19-Sep-20	<0.000010	0.0021	0.00021	<0.000110	<0.00010	0.0296	<0.010	0.0509	<0.00050	<0.0050	<0.0050	3.04	<0.000050	0.0539	<0.00020	8.01
LP1	19-Sep-20	<0.000010	0.0011	0.00024	<0.000115	<0.00010	0.0300	<0.010	0.0518	<0.00050	0.0400	0.0062	2.97	<0.000050	0.0538	<0.00020	8.02
LP2	26-May-18	0.000085	0.0051	0.00088	0.000153	<0.00050	0.0959	<0.050	0.0925	<0.0025	<0.0050	13.3	959	0.00404	0.181	<0.00030	7.89
LP2	9-Jun-18	0.000015	0.0041	0.00044	0.0000875	<0.00010	0.0219	<0.010	0.0176	<0.00050	1.25	1.61	118	<0.000050	0.0283	<0.00030	7.68
LP2	19-Jun-18	<0.000010	0.0092	0.00032	0.0000507	<0.00010	0.0113	<0.010	0.0122	<0.00050	5.51	1.19	90.2	<0.000050	0.0198	<0.00030	7.74
LP2	9-Jul-18	<0.000010	0.0065	0.00029	<0.000055	<0.00010	0.0288	<0.010	0.0674	<0.00050	14.5	1.04	27.9	0.000271	0.133	<0.00030	8.07
LP2	9-Jul-18	<0.000010	0.0103	0.00031	<0.000055	<0.00010	0.0300	<0.010	0.0695	<0.00050	11.9	1.03	27.5	0.000311	0.133	<0.00030	8.08
LP2	21-Jul-18	<0.000010	0.0056	0.00038	<0.000050	<0.00020	0.0487	<0.010	0.0765	<0.00050	10.8	1.06	30.7	0.00107	0.159	<0.00030	8.12
LP2	20-Aug-18	<0.000010	0.0027	0.00037	0.000129	<0.00010	0.0743	<0.010	0.0513	<0.00050	18.3	0.697	52.4	0.000445	0.179	<0.00030	7.95
LP2	20-Aug-18	<0.000010	0.0028	0.00040	0.000155	<0.00010	0.0759	<0.010	0.0527	<0.00050	17.3	0.705	53.2	0.000513	0.181	<0.00030	7.92
LP2	6-Sep-18	<0.000010	0.0037	0.00049	0.000180	0.00021	0.0839	<0.010	0.0441	<0.00050	15.2	0.172	67.5	0.000191	0.159	<0.00030	7.95
LP2	28-Sep-18	<0.000010	0.0021	0.00049	0.000226	<0.00010	0.0969	<0.010	0.0376	<0.00050	12.5	0.114	81.2	0.000376	0.153	<0.00030	7.86
LP2	28-Sep-18	<0.000010	0.0012	0.00047	0.000256	0.00012	0.0948	<0.010	0.0381	<0.00050	10.8	0.112	81.8	0.000350	0.154	<0.00030	7.82
LP2	8-Oct-18	<0.000020	0.0043	0.00098	0.000418	<0.00020	0.147	<0.020	0.0741	<0.0010	20.7	0.096	182	0.00052	0.326	<0.00030	8.01
LP2	8-Oct-18	<0.000020	0.0327	0.00104	0.000430	<0.00020	0.148	<0.020	0.0746	<0.0010	19.1	0.088	172	0.00055	0.319	<0.00030	8.04
LP2	31-Mar-19	<0.000010	0.0022	0.00034	0.000126	0.00019	0.0221	<0.010	0.0193	<0.00050	1.07	0.0120	25.7	<0.000050	0.0350	<0.00030	7.77
LP2	20-May-19	<0.000010	0.0018	0.00032	0.000229	<0.00010	0.0736	<0.010	0.0299	<0.00050	5.44	0.797	52.7	0.000172	0.145	<0.00030	8.03
LP2	4-Jun-19	<0.000010	0.0024	0.00021	0.000106	<0.00010	0.0181	<0.010	0.00998	<0.00050	1.29	0.392	24.7	<0.000050	0.0643	<0.00030	7.58
LP2	4-Jun-19	<0.000010	0.0045	0.00020	0.000103	<0.00010	0.0190	<0.010	0.0101	<0.00050	1.38	0.385	24.6	<0.000050	0.0651	<0.00030	7.59
LP2	24-Jun-19	<0.000010	0.0030	0.00040	0.000146	<0.00010	0.0561	<0.010	0.0321	<0.00050	4.90	0.585	33.5	0.000711	0.0860	<0.00030	7.92
LP2	24-Jun-19	<0.000010	0.0025	0.00041	0.000132	<0.00010	0.0555	<0.010	0.0327	<0.00050	4.85	0.587	33.4	0.000704	0.0867	<0.00030	8.12
LP2	15-Jul-19	0.000016	0.0042	0.00052	0.0000820	<0.00010	0.0316	<0.010	0.0415	<0.00050	2.91	0.421	49.3	0.000119	0.104	<0.00030	8.06
LP2	8-Aug-19	<0.000010	0.0029	0.00054	<0.00010	<0.00010	0.0655	<0.010	0.0551	<0.00050	0.0087	0.023	43.5	<0.000050	0.204	<0.00030	8.05
LP2	8-Aug-19	<0.000010	0.0029	0.00053	<0.00010	<0.00010	0.0653	<0.010	0.0556	<0.00050	0.0080	0.025	44.6	<0.000050	0.203	<0.00030	8.08
LP2	8-Sep-19	<0.000020	<0.0020	0.00089	0.000361	<0.00020	0.0619	<0.020	0.0367	<0.0010	0.0676	0.177	89.7	0.00035	0.152	<0.00040	7.95
LP2	7-Oct-19	<0.000020	0.0027	0.00145	0.000643	<0.00020	0.0848	<0.020	0.0570	<0.0010	0.157	0.105	151	<0.00010	0.262	<0.00040	7.98
LP2	7-May-20	<0.000010	0.0021	0.00013	0.0000620	<0.00010	0.00910	<0.010	0.00582	<0.00050	0.0234	0.0058	9.07	<0.000050	0.0239	<0.00020	7.31
LP2	7-May-20	<0.000010	0.0107	0.00023	0.0000867	<0.00010	0.0188	<0.010	0.00909	<0.00050	0.0250	<0.0050	12.9	<0.000050	0.0384	<0.00020	7.39
LP2	1-Jun-20	<0.000010	0.0042	0.00032	0.0000542	<0.00010	0.0209	<0.010	0.0142	<0.00050	0.0529	0.0184	4.53	0.000057	0.0719	<0.00020	7.24
LP2	8-Jul-20	<0.000010	0.0047	0.00027	0.000120	<0.00010	0.0313	<0.010	0.0366	<0.00050	0.0077	0.0107	16.1	<0.000050	0.128	<0.00020	7.92
LP2	8-Jul-20	<0.000010	0.0048	0.00025	0.000101	<0.00010	0.0292	<0.010	0.0374	<0.00050	<0.0050	0.0088	16.1	<0.000050	0.119	<0.00020	7.95
LP2	2-Aug-20	<0.000010	0.0023	0.00024	0.0000921	<0.00010	0.0297	<0.010	0.0540	<0.00050	0.0091	<0.0050	7.51	<0.000050	0.0854	<0.00020	7.91
LP2	2-Aug-20	<0.000010	0.0037	0.00066	0.0000915	<0.00010	0.0456	<0.010	0.0387	<0.00050	0.0060	0.0103	5.38	0.000074	0.0842	<0.00020	8.00
LP2	30-Aug-20	<0.000010	0.0031	0.00025	0.0000994	<0.00010	0.0291	0.029	0.0594	<0.00050	0.0057	<0.0050	3.84	<0.000050	0.0562	<0.00020	7.86
LP2	19-Sep-20	<0.000010	0.0034	0.00056	<0.000125	<0.00010	0.0467	<0.010	0.0371	<0.00050	<0.0050	0.0090	4.19	0.000054	0.0695	<0.00020	8.07

5 Results Presentation and Discussion

The data presented in Table 4.2 above has been presented in the following figures for ease of interpretation, along with comments regarding apparent trends. Green dotted lines represent Minto's Effluent Release Limits, while blue dotted lines represent the trend line.

5.1 pH

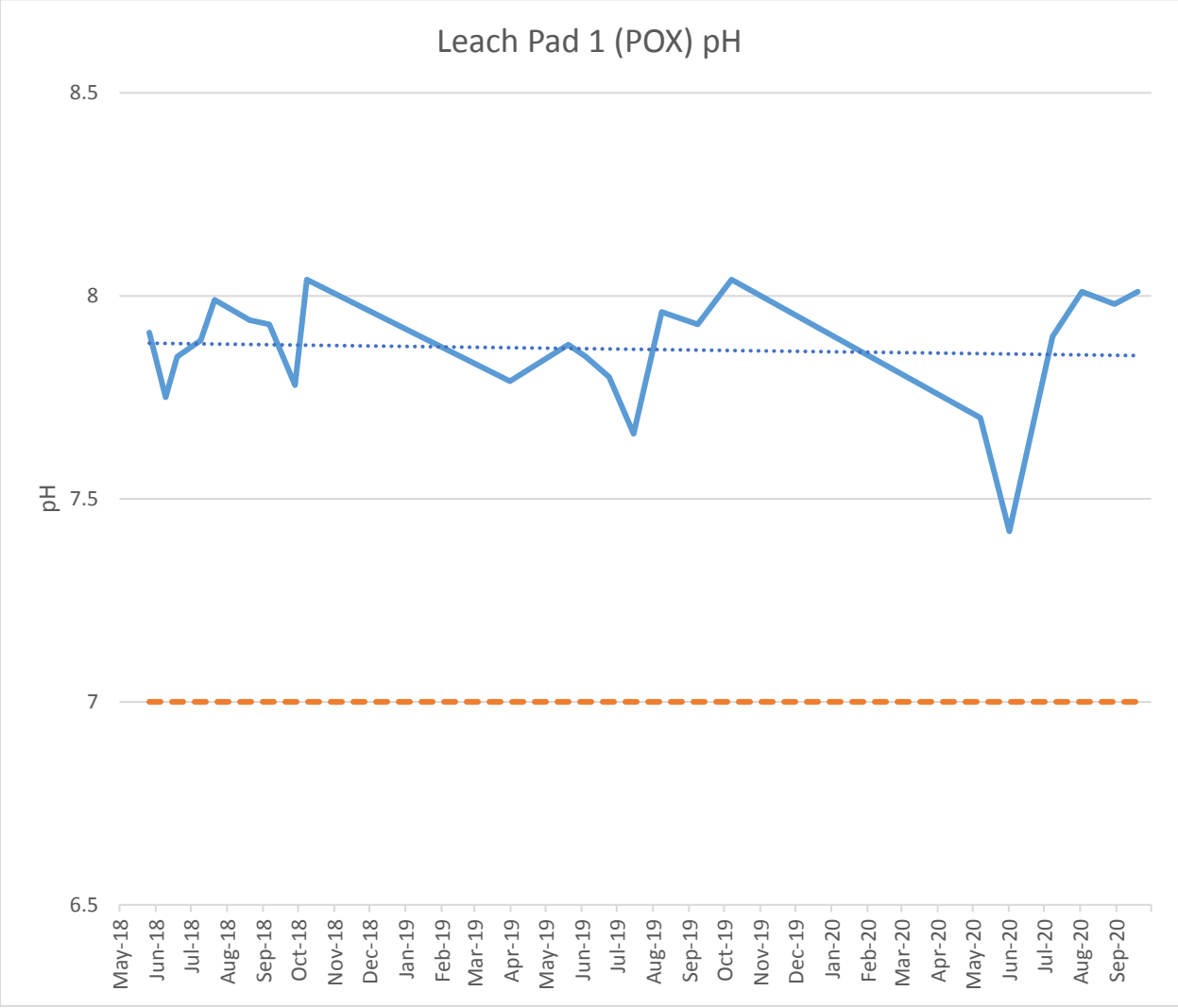


Figure 5-1: Leach Pad 1 pH

(Orange dotted line represents neutral pH)

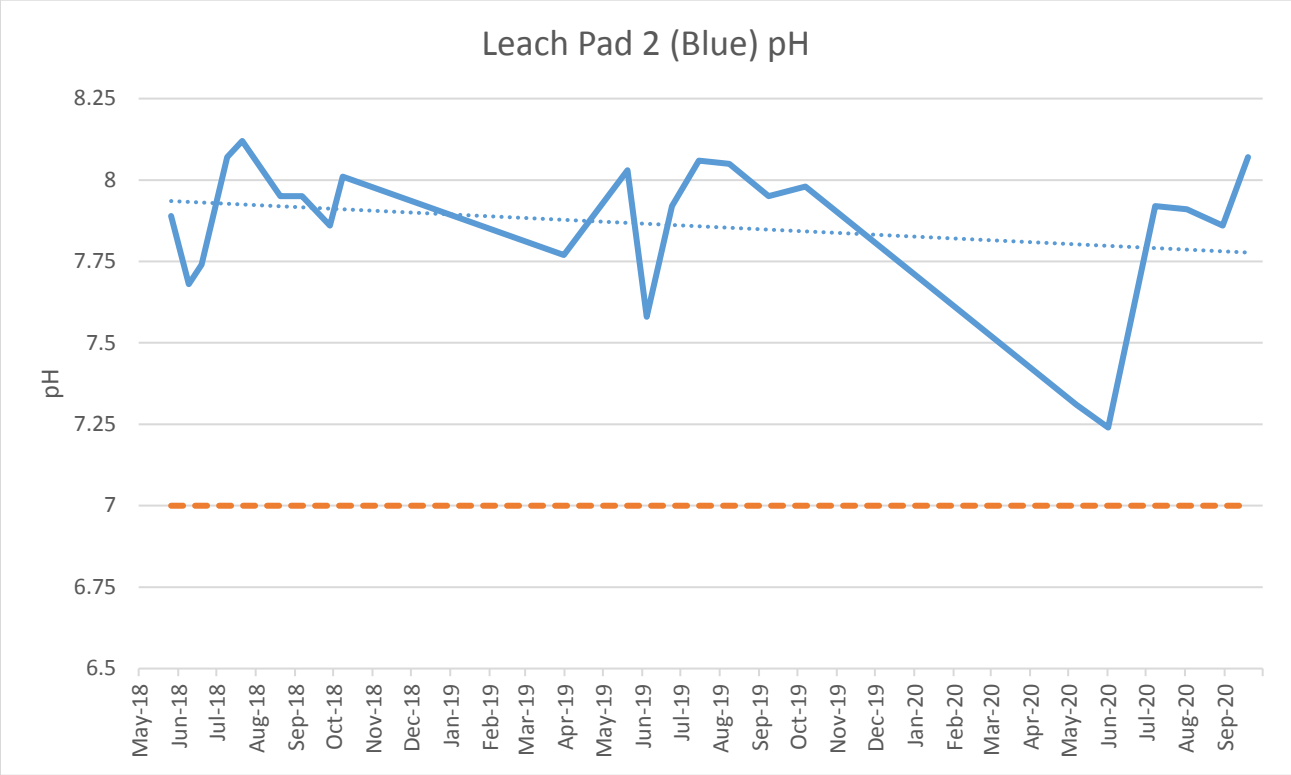


Figure 5-2: Leach Pad 2 pH

(Orange dotted line represents neutral pH)

The pH of leachate from both leach pads ranged from 7.24 to 8.07 which suggest the results are currently non-acid generating. These trends also suggest a stable neutralizing potential.

A total of 16 rock samples were collected from the leach pads while they were constructed which were analyzed for percent copper and silver (concentrations in grams/tonne), percent carbon, percent sulfur, neutralizing potential, and acid generating potential.

The results of these samples are presented in table 5-1, below.

Results indicate that the PO_X material, sourced from the "Top of the World PO_X pile, are non-acid generating with an Average NP:AP of over the cut-off value of 3.0 (Mean of 5.41). The Blue Ore pile, is considered potentially acid generating with an average

NP:AP below the 3.0 cut-off (mean of 1.50). The Blue Ore pile, currently, is not acid generating.

Table 5-1: Rock Samples from Leach Pad Construction

Sample ID	HOLE ID	Cu %	Ag (g/tonne)		% C(Tot)		% S(Tot)	NP	AP	NP/AP
Leach Pad #1 (POX)										
LP1-1	MM168851	0.124	<1		0.059		0.015	4.91	0.47	10.48
LP1-2	MM168852	1.045			0.077		0.044	6.41	1.38	4.66
LP1-3	MM168853	0.705			0.057		0.017	4.75	0.53	8.94
LP1-4	MM168854	0.417	<1		0.046		0.034	3.83	1.06	3.61
LP1-5	MM168855	0.371	<1		0.044		0.032	3.67	1.00	3.67
LP1-6	MM168856	0.509			0.049		0.022	4.08	0.69	5.94
LP1-7	MM168857	0.62			0.057		0.026	4.75	0.81	5.84
LP1-8	MM168858	0.366	<1		0.03		0.018	2.50	0.56	4.44
LP1-9	MM168859	0.547			0.074		0.058	6.16	1.81	3.40
LP1-10	MM168860	0.291	<1		0.051		0.013	4.25	0.41	10.46
LP1-11	MM168861	0.247	<1		0.099		0.031	8.25	0.97	8.51
LP1-12	MM168862	0.243	<1		0.03		0.018	2.50	0.56	4.44
LP1-13	MM168863	0.364	<1		0.068		0.074	5.66	2.31	**2.45**
LP1-14	MM168864	0.572			0.044		0.032	3.67	1.00	3.67
LP1-15	MM168865	0.469	<1		0.055		0.041	4.58	1.28	3.58
LP1-16	MM168866	0.556			0.066		0.071	5.50	2.22	**2.48**
LEACH PAD 1	**Average Cu %**	**0.465**		**Average % C(tot)**	**0.0566**	**Average %S(Tot)**	**0.0341**	**Average NP:AP**		**5.41**
Leach Pad #2 (Blue Ore)										
LP2-1	MM168867	0.305	<1		0.194		0.349	16.16	10.91	**1.48**
LP2-2	MM168868	0.378	<1		0.164		0.541	13.66	16.91	**0.81**

LP2-3	MM168869	0.358	<1		0.139		0.693	11.58	21.66	**0.53**
LP2-4	MM168870	0.56			0.333		0.778	27.74	24.31	**1.14**
LP2-5	MM168871	0.645			0.214		0.86	17.83	26.88	**0.66**
LP2-6	MM168872	0.581			0.477		0.778	39.73	24.31	**1.63**
LP2-7	MM168873	0.426	<1		0.454		0.643	37.82	20.09	**1.88**
LP2-8	MM168874	0.325	<1		0.215		0.399	17.91	12.47	**1.44**
LP2-9	MM168875	0.517			0.282		0.65	23.49	20.31	**1.16**
LP2-10	MM168876	0.385	<1		0.221		0.525	18.41	16.41	**1.12**
LP2-11	MM168877	0.764			0.862		0.939	71.80	29.34	**2.45**
LP2-12	MM168878	0.442	<1		0.657		0.511	54.73	15.97	3.43
LP2-13	MM168879	0.895			0.667		1.125	55.56	35.16	**1.58**
LP2-14	MM168880	0.401	<1		0.214		0.527	17.83	16.47	**1.08**
LP2-15	MM168881	0.645			0.64		0.711	53.31	22.22	**2.40**
LP2-16	MM168882	0.301	<1		0.159		0.341	13.24	10.66	**1.24**
LEACH PAD 2	**Average Cu %**	**0.496**		**Average % C(tot)**	**0.368**		**0.648**	**Average NP:AP**		**1.50**

5.2 Dissolved Copper

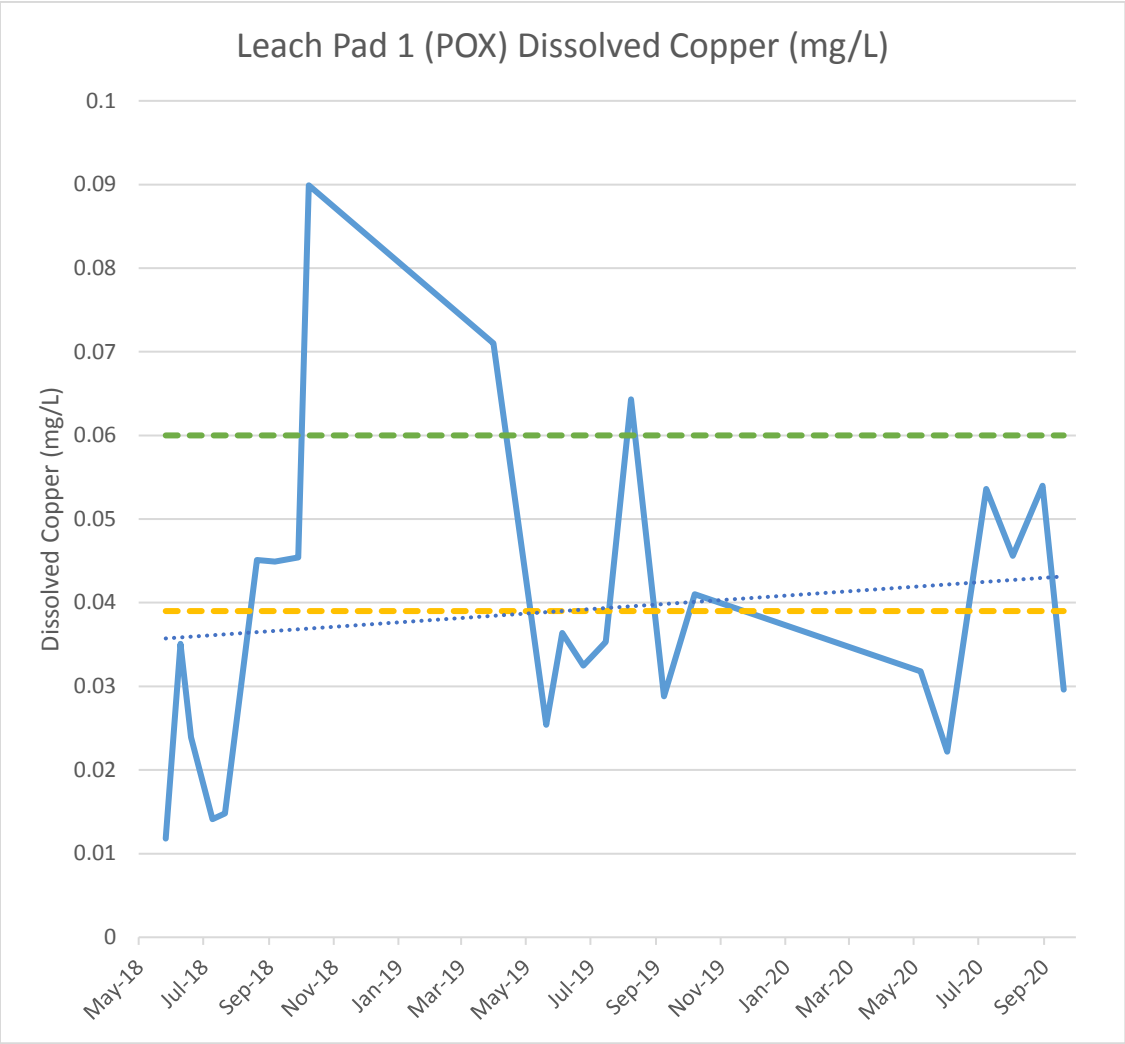


Figure 5-3: Leach Pad 1 Dissolved Copper

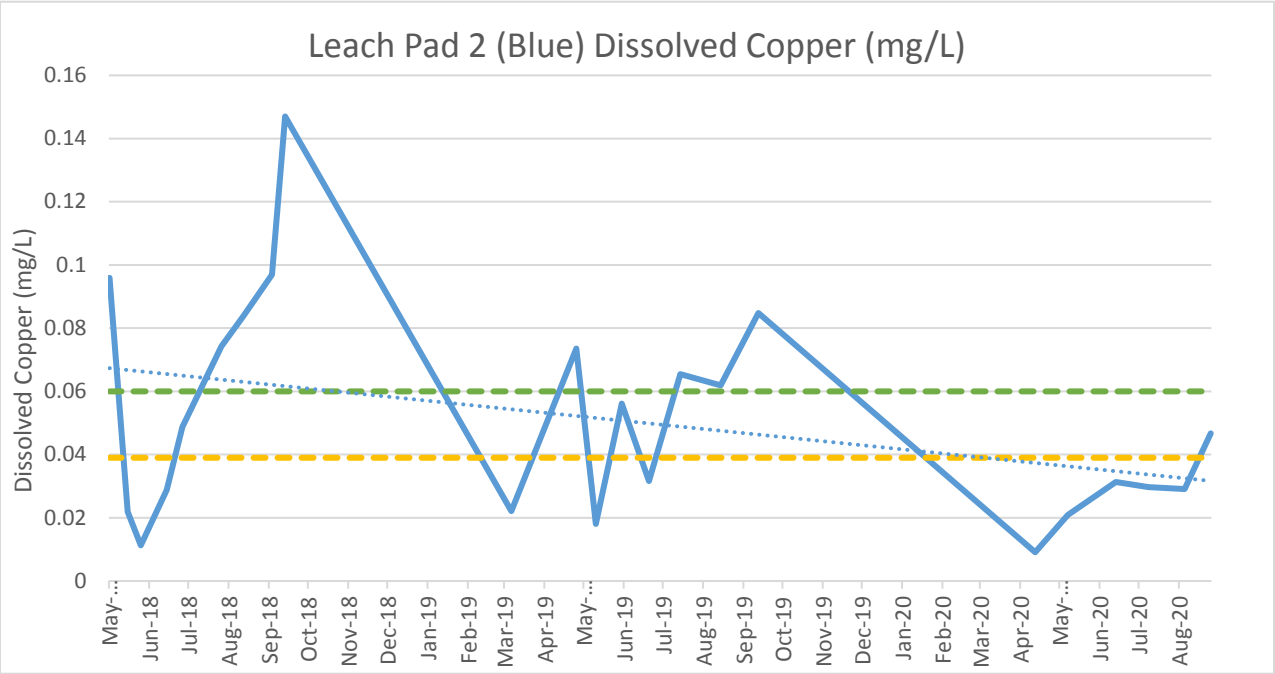


Figure 5-4: Leach Pad 2 Dissolved Copper

5.3 Nitrite

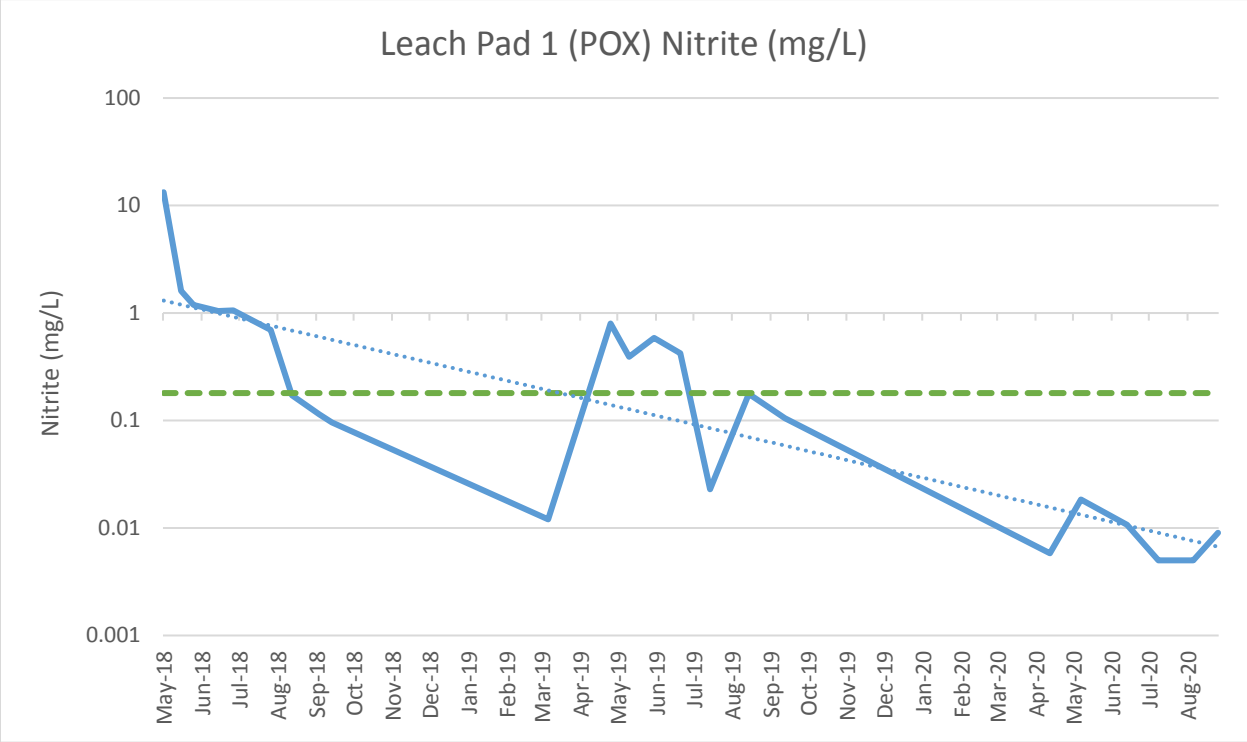


Figure 5-5: Leach Pad 1 Nitrite

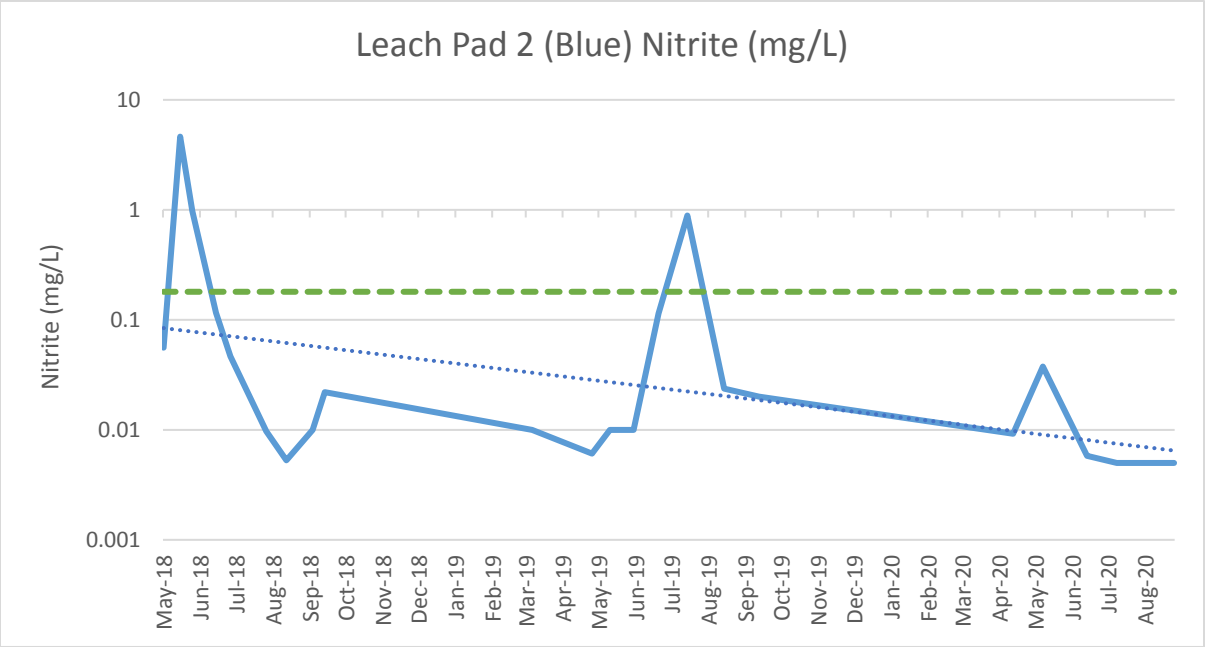


Figure 5-6: Leach Pad 2 Nitrite

5.4 Nitrate

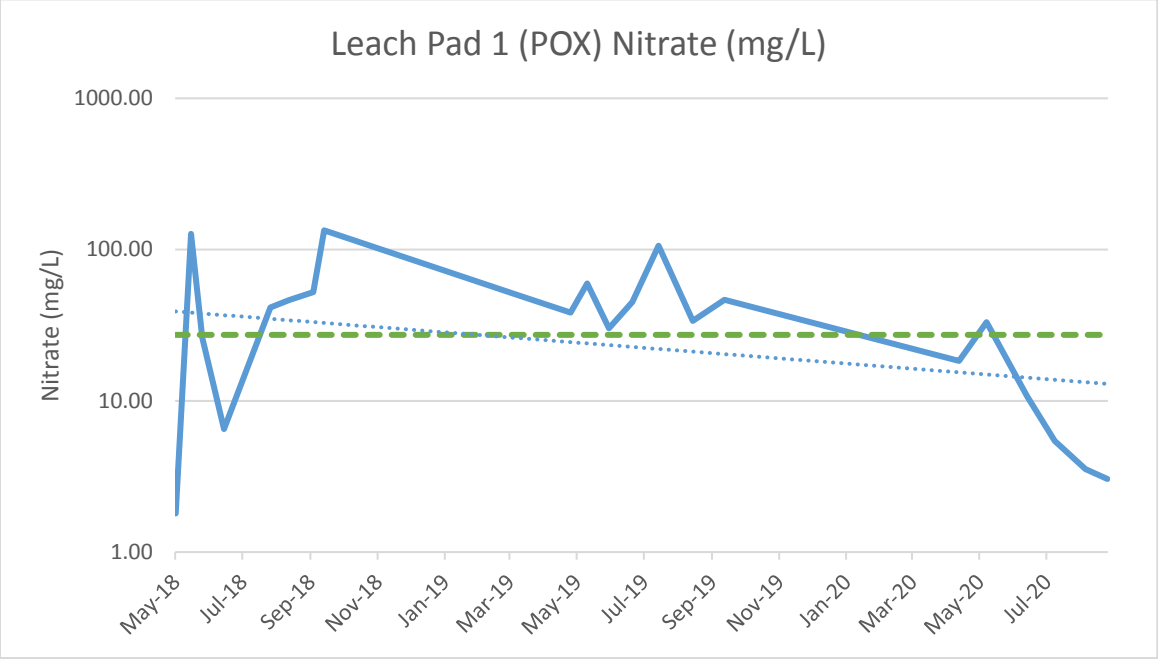


Figure 5-7: Leach Pad 1 Nitrate

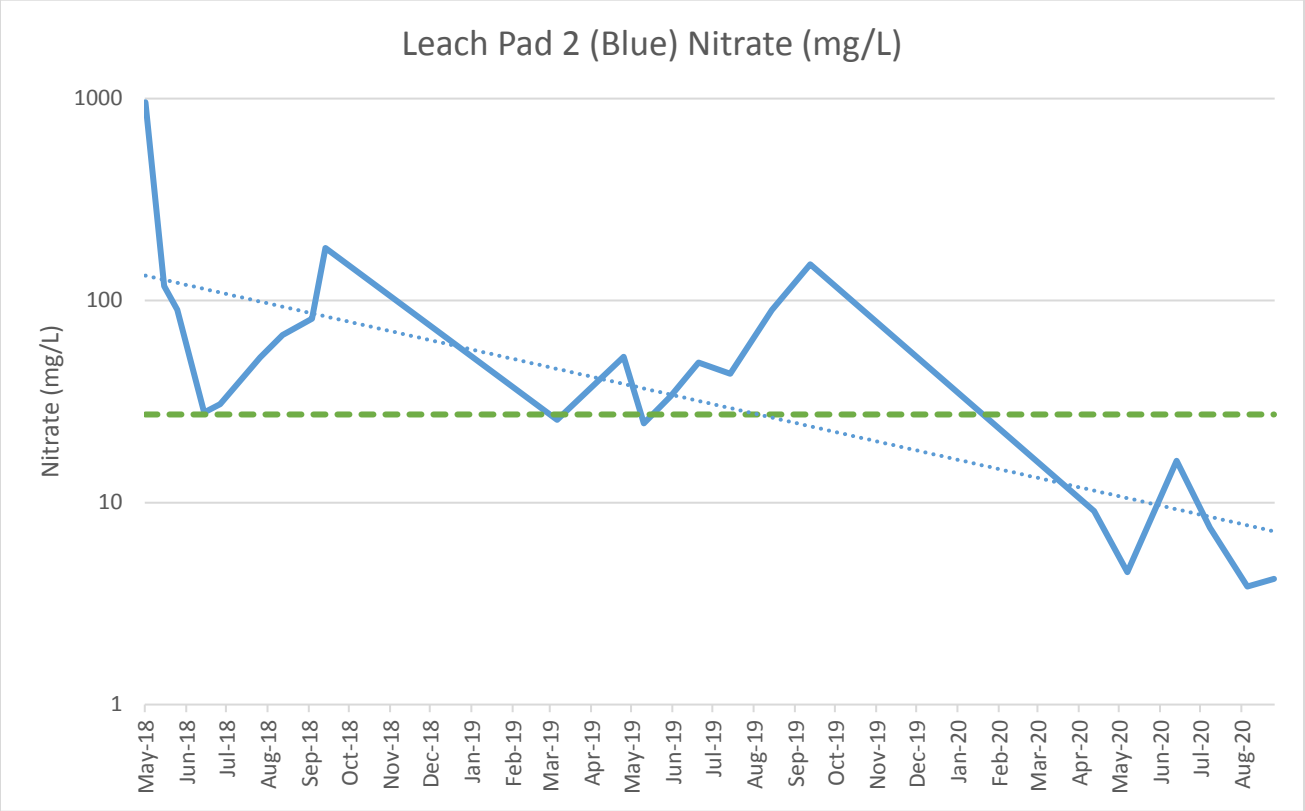


Figure 5-8: Leach Pad 2 Nitrate

5.5 Ammonia

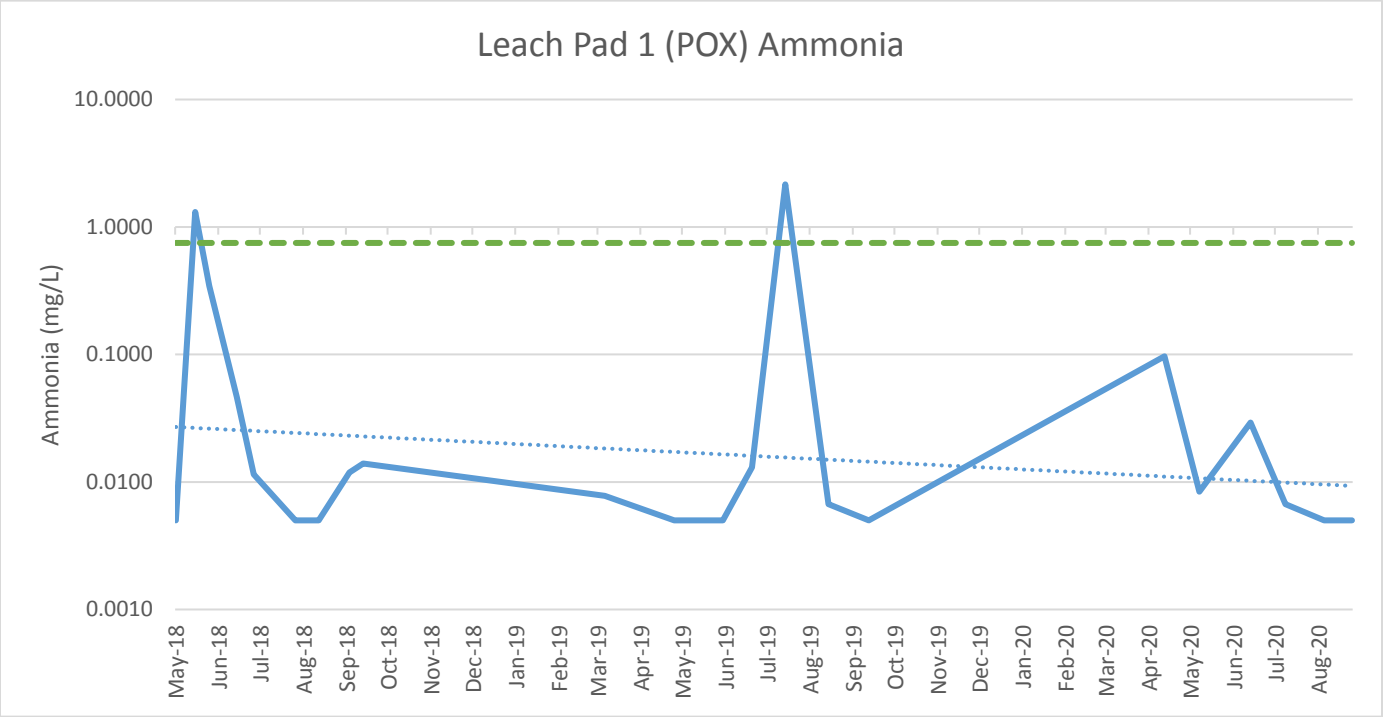


Figure 5-9: Leach Pad 1 Ammonia

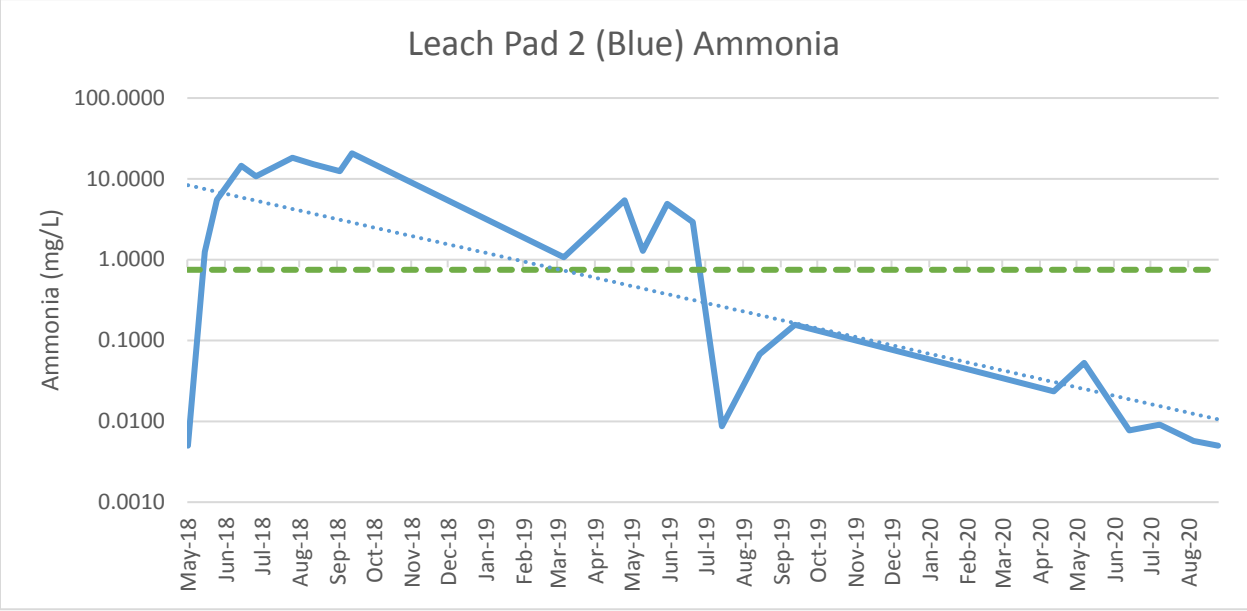


Figure 5-10: Leach Pad 2 Ammonia

5.6 Dissolved Selenium

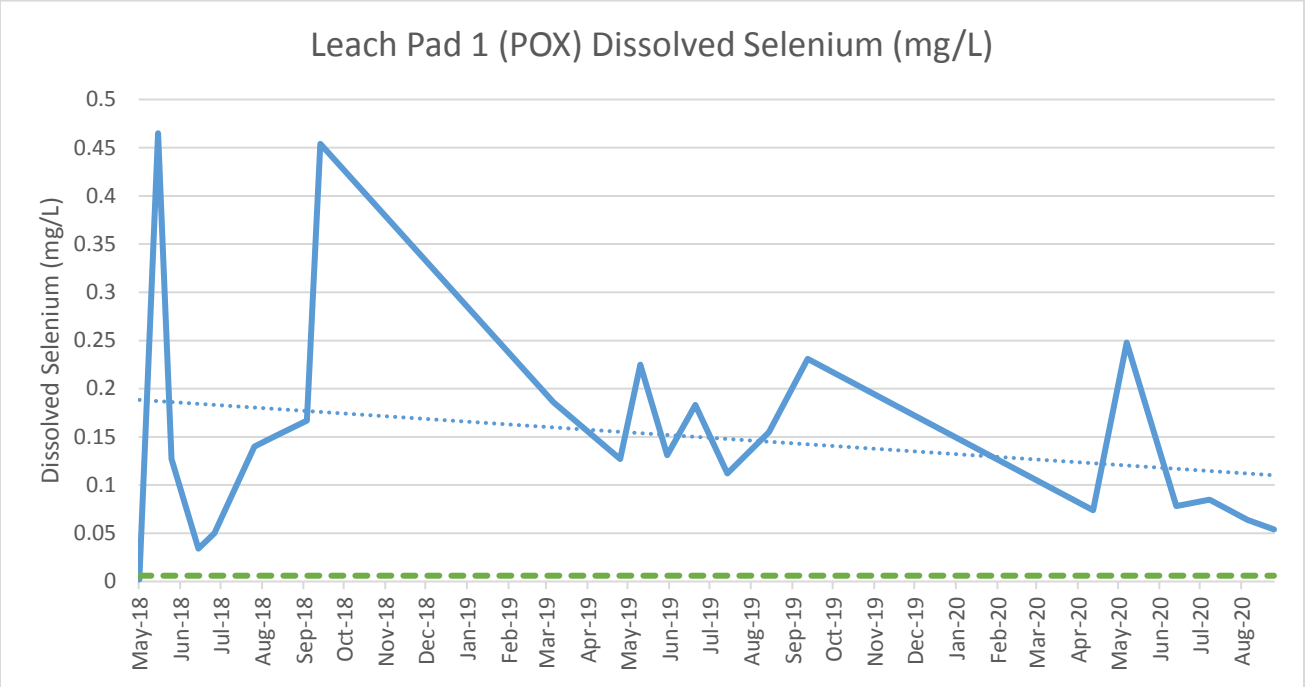


Figure 5-11: Leach Pad 1 Dissolved Selenium

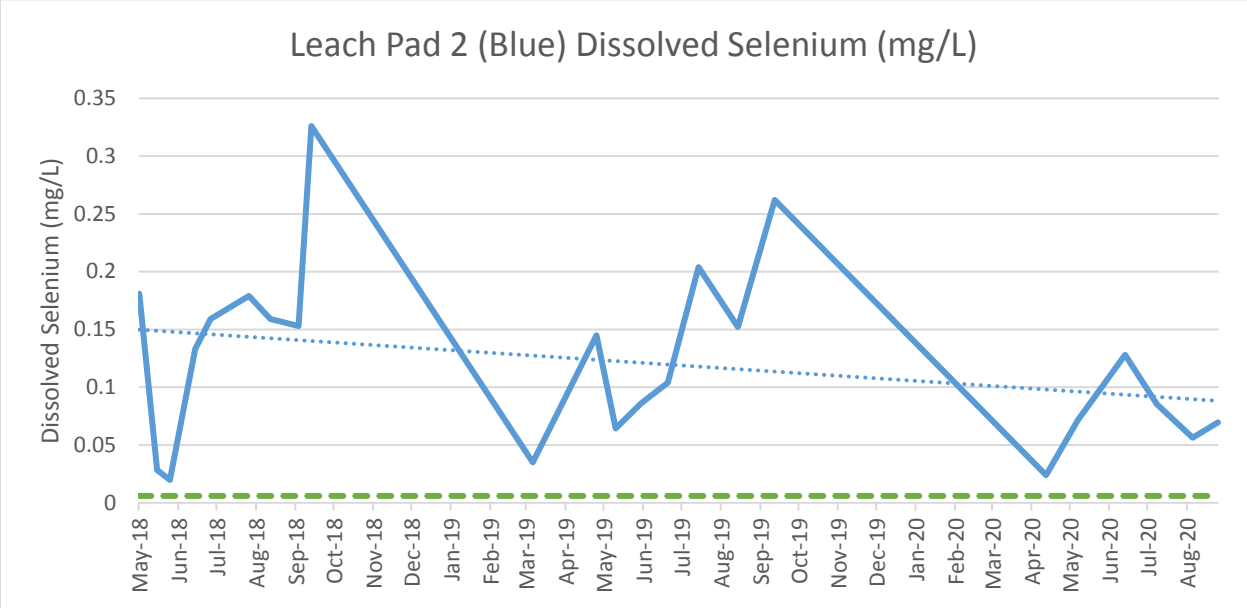


Figure 5-12: Leach Pad 2 Dissolved Selenium

5.7 Dissolved Zinc

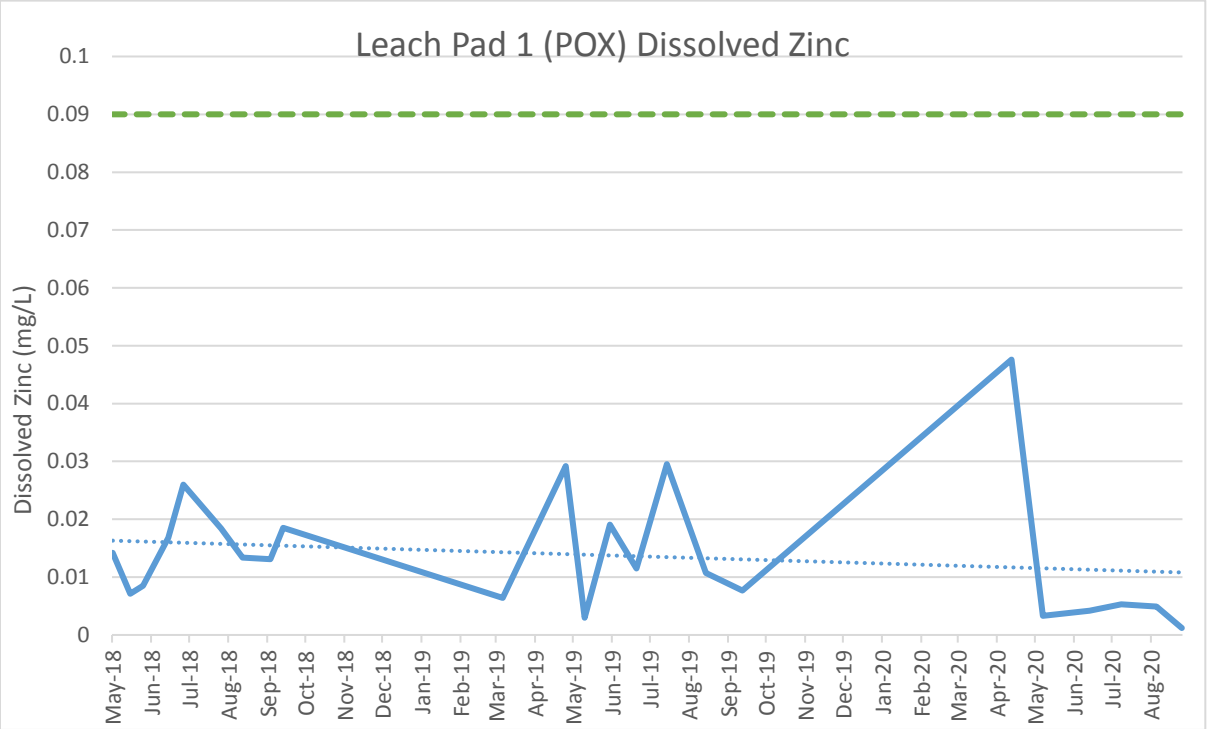


Figure 5-13: Leach Pad 1 Dissolved Zinc

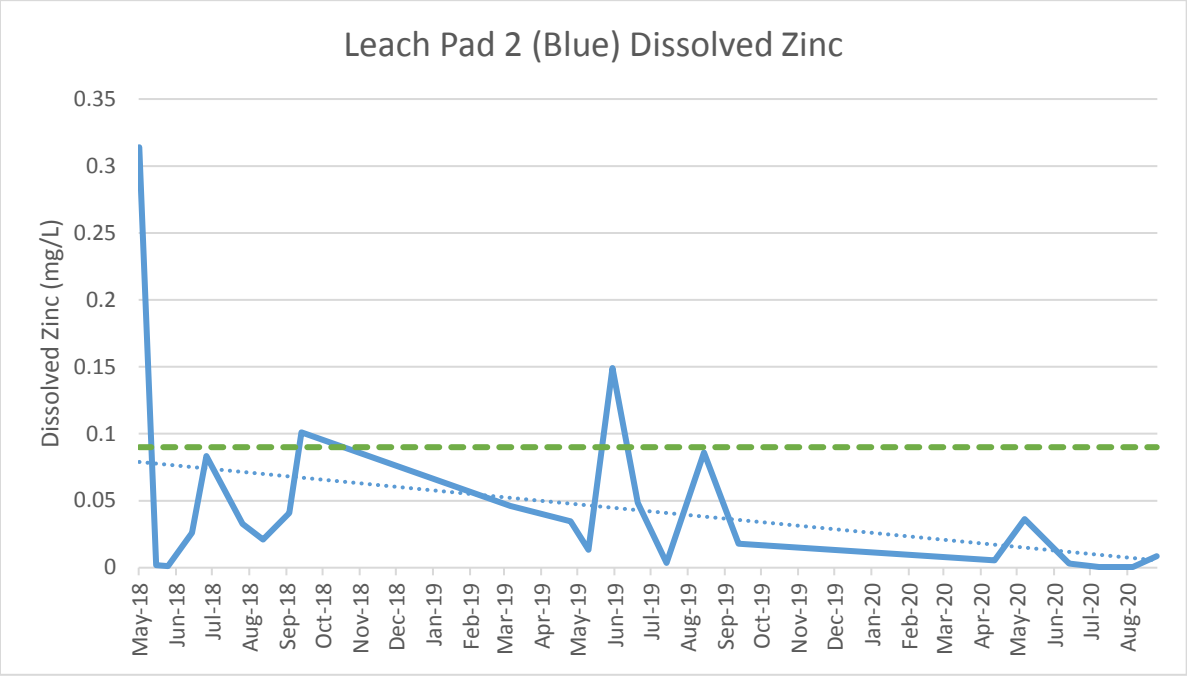


Figure 5-14: Leach Pad 2 Dissolved Zinc

6 Conclusions and Recommendations

Overall, with the exception of selenium, the measured parameters are at, near, or below the effluent release limits from both leachate sources. The selenium concentrations over the effluent release limits may indicate that the leachate from PO_X material contained the on surface could have a slight influence runoff waters reporting to the pits. Selenium concentrations may be the only parameter of concern.

The blue ore pile's NP:AP indicates this material requires milling or aqueous disposal within the pits.

Data from the leach pad trials has been shared with SRK for addition to the water balance. Further testing and analysis is recommended for another two years, to monitor the selenium concentrations.

Appendix LPS A – Leach Pad Construction Report



Metals Leaching Characterization
Leach Pads
Record of Construction

Prepared by:
Minto Explorations Ltd.
Minto Mine
May, 2018

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1 Introduction 1
2 Construction Activities 1
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2.2 Liner Placement 2
2.3 Pad Filling 2
3 Conclusion 12
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1 Introduction

The following report presents a record of construction for the Leach Pads, constructed from August 2017 to March 2018. The Geochemical Monitoring Program detailed in the Water Use Licence QZ14-031 includes as one of the conditions the requirement for geochemical characterization of waste, including leachate quality (Section 5.1.5, Article 94):

> *The Licensee shall update the Geochemical Monitoring Program to include a monitoring and geochemical characterization program that will produce detailed metals leaching characterization from the low-grade ore and oxide ore.*

Implementation of a monitoring program that satisfies this condition was included in the Environmental Monitoring, Surveillance, and Reporting Plan (EMSRP). The plan included construction of the leach pads in the summer of 2017 and sampling of the leachate for one year, starting in September 2017.

2 Construction Activities

The Design drawings for the construction of the Leach Pads were provided by SRK in late July, and construction began in August and September, proceeding intermittently due to high competitive demand for the necessary equipment during aggressive production mining activity in the Area 2 Phase 4 Pit.

2.1 Work Site Preparation

Work site preparation began with the initial excavation of the ground surface for the placement of residuum for the base construction and shaping, and was undertaken in August of 2017. Construction of outfall channels and the placement of 100 mm HDPE leachate collection pipes in the bottom of the pads was completed prior to the placement and shaping of residuum base material to the design dimensions from the design drawings provided by SRK (See Figure 1).

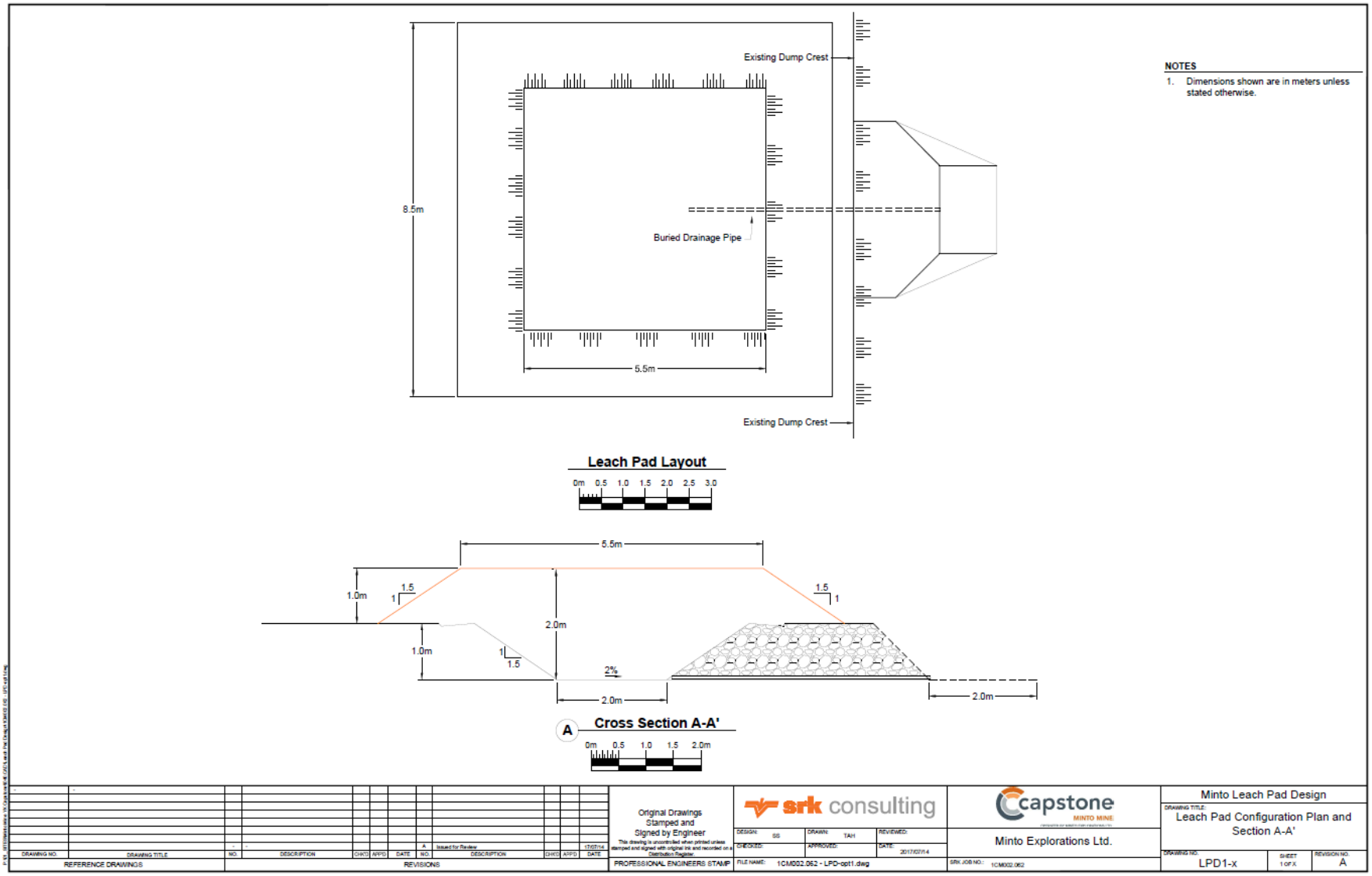


Figure 1: Leach Pad Design Drawing



Photo 1: Pad #2 under construction using Residuum. Pad 1 in Foreground – looking southeast

The initial Shaping of Pad #1 was completed in it's entirety before Pad #2 construction began. Placement of Residuum and shaping of the berms prior to liner installation was completed on October 6th (See Photos 1&2).



Photo 2: Leach Pad #1 residuum placement completed. Pipe in bottom visible



Photo 3: Outfall for leachate collection pipe placement

2.2 Liner Placement

A 4.0 mm Bituminous Geomebrane Liner (BGM Liner) was selected for the Leach Pads due to relative ease of installation, requiring no specialized tools or skills to weld the seams. A liner installation plan was supplied by SRK (See Figure 2), however it was not deemed practical for field installation due to the difficulty in installing the largest piece of liner by hand due to it's weight, as well as the number of seams requiring sealing and the propensity for smaller liner pieces to shift and move while being walked on. Each liner was installed in 5 pieces; one for the bottom, and one for each of the sides. All liner pieces overlapped the next piece by at least 150 mm as per the manufacturers recommendations. The installed liners are shown in Photos 4, 5, and 6.

All seams were welded using a "tiger torch", with pressure applied to the seams ensuring full bonding of both layers. Quality Control was completed during seam welding on at least 10% of each seam and in random locations following completion of each weld. Particular attention was paid to areas where three layers converged, ensuring a strong, water tight bond between all layers.

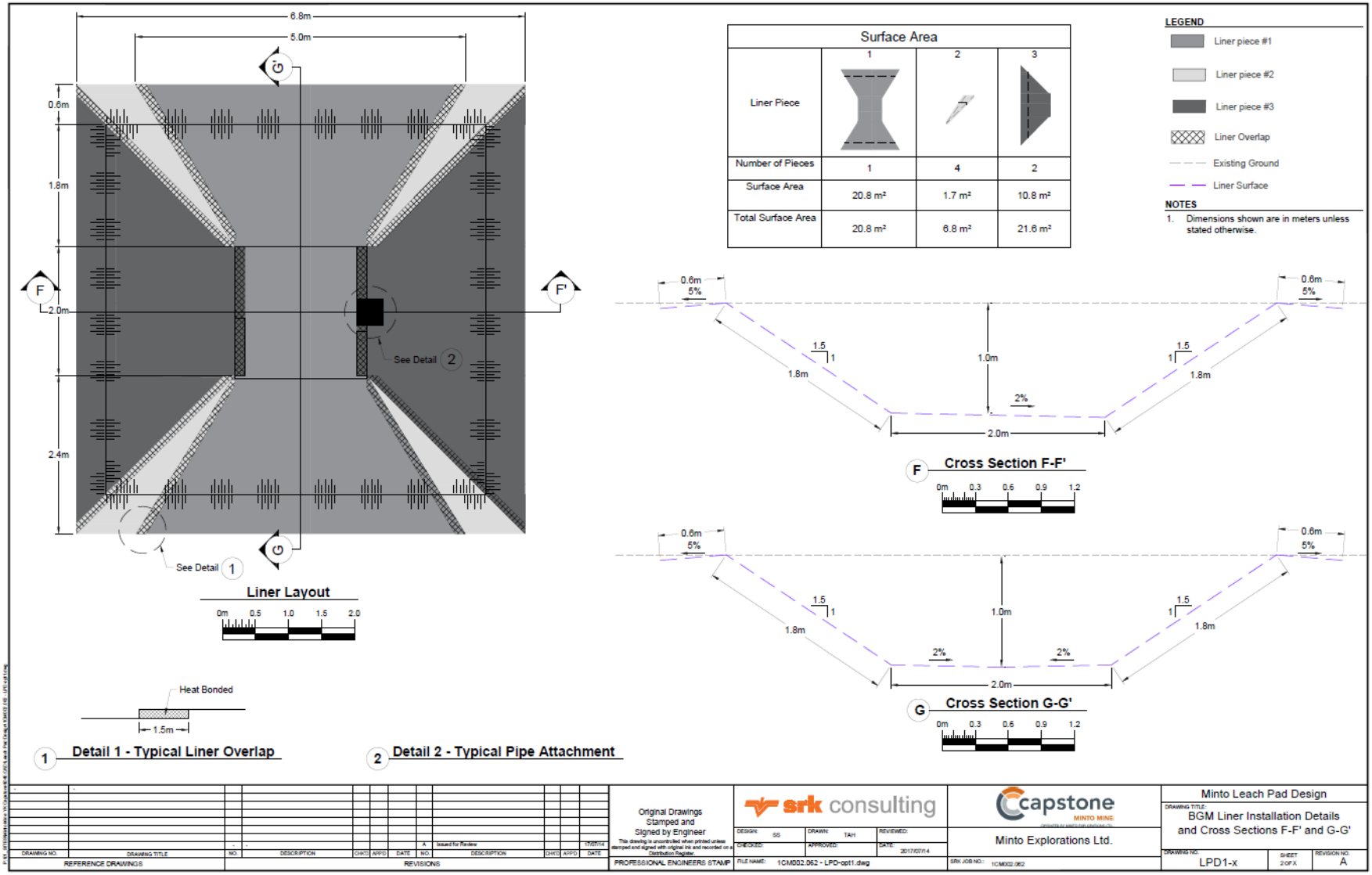


Figure 2: Liner Installation Design Drawings

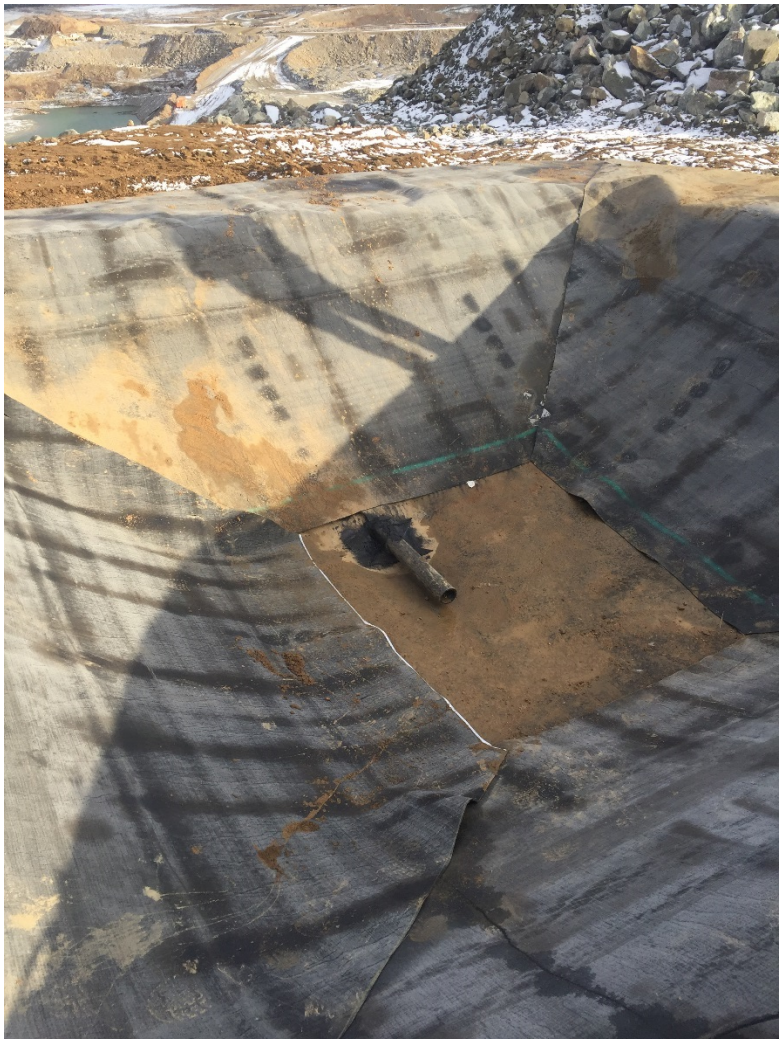


Photo 4: BGM liner install: bottom not yet sealed



Photo 5: Leachate collection pipe boot seal detail

2.3 Pad Filling

The Leach pads were designed to be filled with a nominal depth of 2.0 meters of ore. Pad #1 was to be filled with Partially Oxidized Ore (POX), and Pad #2 was to be filled with Low Grade Sulphide (Blue) Ore. SRK provided fill design plans (See Figure 3), and these were roughly adhered to in the field resulting in a nominal depth of 2.5 meters of POX on Pad #1, and a nominal depth of 2.1 meters of Blue Ore on Pad #2. The final measured volume of material placed on Pad 1 was 143 m3, and on Pad 2 was 126 m3. Because placement of both materials occurred during the winter, the pads had to be cleared of snow before the ore could be placed. This activity and the completed placement of ore can be seen in Photos 6 -8.

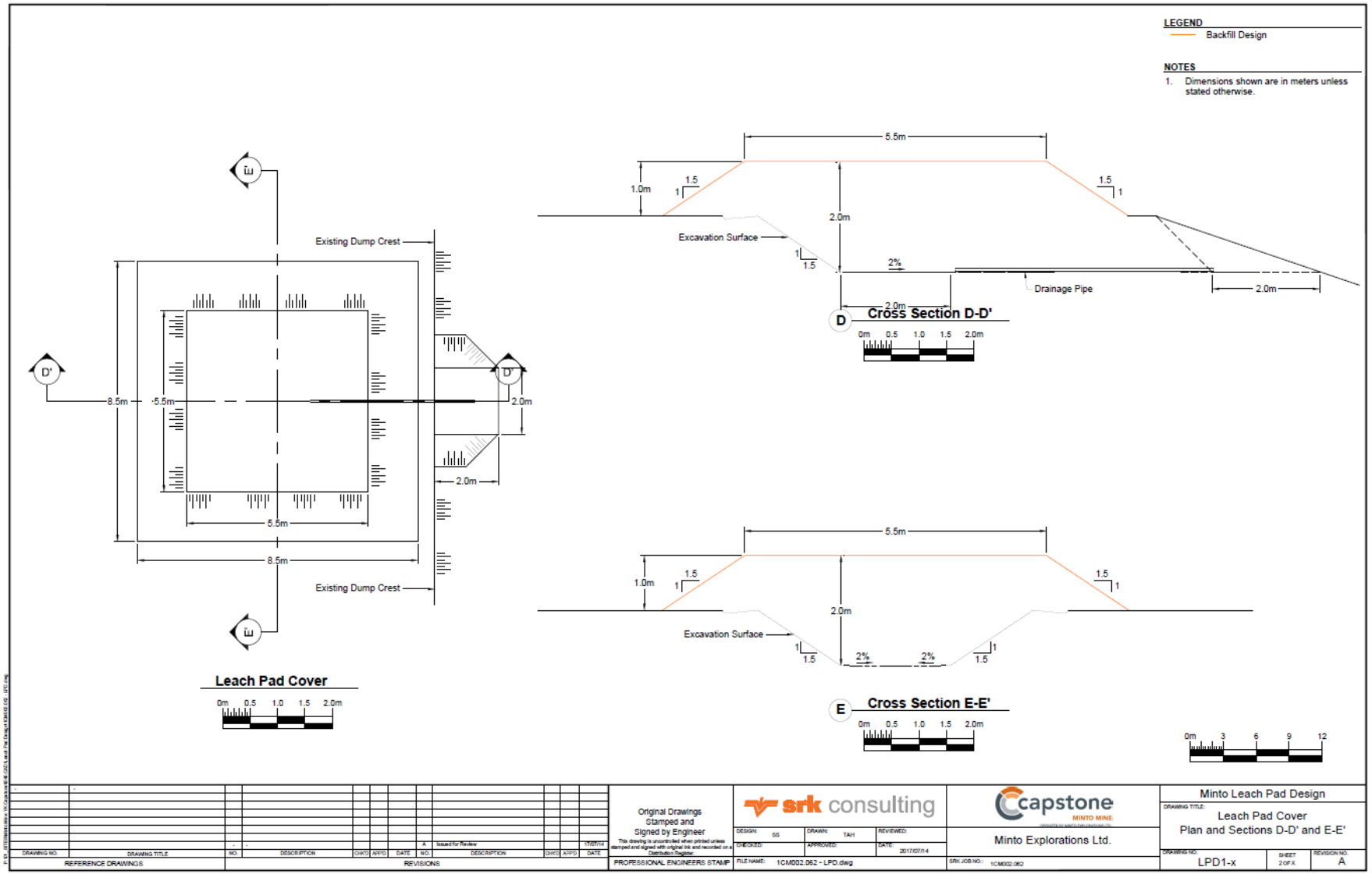


Figure 3: Leachate Pad Cover/Fill Design



Photo 6: Leach Pad #1 snow clearing prior to POX placement



Photo 7: Leach Pad #1 filled with POX



Photo 8: Leach Pads #1 and #2 Completed (Spring 2018 photo)

Figure 4 shows Survey scans of the completed Leach Pads before and after placement of materials in plan view. Figure 5 shows a cross-section of each leach pad as-constructed in the field.

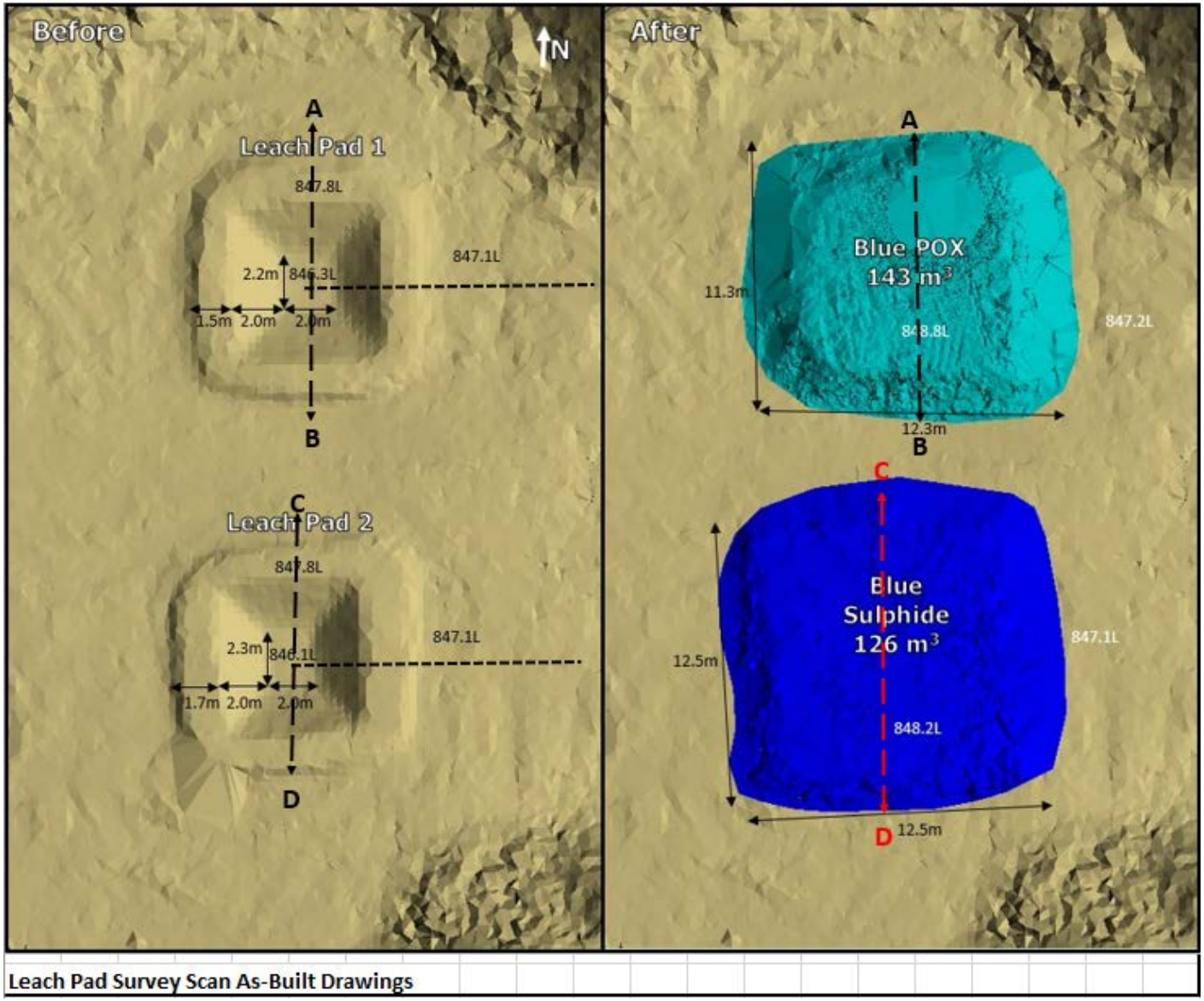


Figure 4 – Plan View of Pads before and after material placement

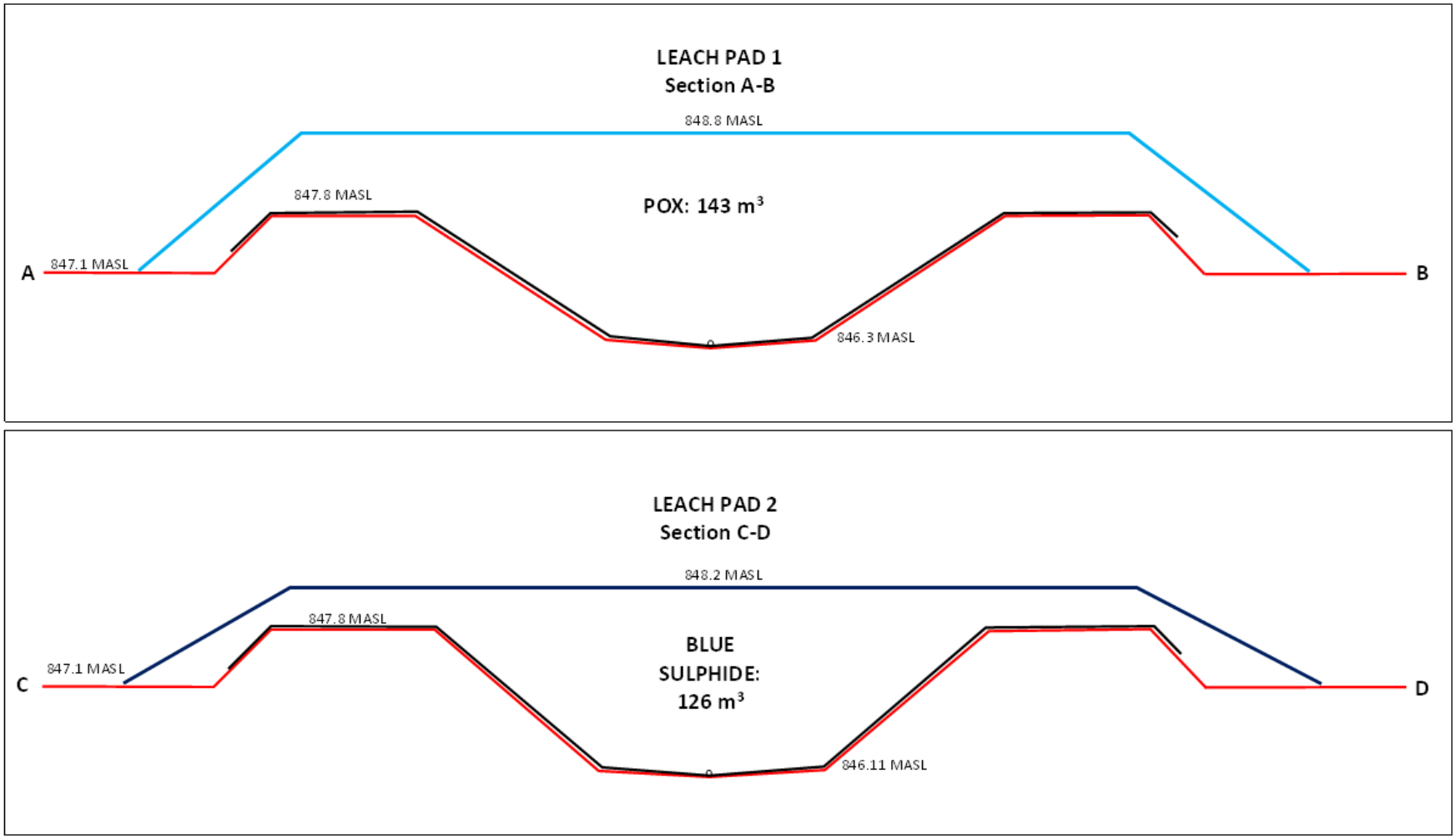


Figure 5: Cross Sections A-B and C-D of Pads 1 and 2.

3 Conclusion

This report has been prepared to satisfy the as-built construction report for the metals leaching characterization test pads as per Article 34 of Water Licence QZ14-031.

Prepared By:

_____
Todd Swenson, EP

Environmental Professional

Date: May 22, 2018

Reviewed by:

_____
Kevin Cymbalisty, P.Eng

Mine Manager

Date: May 28, 2018

4 References

Environmental Moitoring, Sampling, and Reporting Plan (EMSRP). Minto Explorations, July 2016.

SRK Consulting (Canada) Inc. 2017. Proposal for Installation of Lysimeters and Construction of Leach Pads. Proposal prepared for Minto Explorations Ltd., SRK Project Number 1CM002.P13. June 9, 2017.

SRK Consulting (Canada) Inc. 2017. Leach Pad Construction Drawings. Memo prepared for Minto Explorations Ltd., SRK Project Number 1CM002.062. July 14, 2017.

Appendix LPS B – Sampling Methodology

Background

The collection of leachate samples from two Leach Characterization Testing Pads (Leach Pads) at Minto Mine (Minto) was first required by the approved 2017-02 EMSRP. Leach Pad 1 is filled with POX material. Leach Pad 2 is filled with blue ore. Water quality samples are required monthly from both leach pads.

Field staff are responsible for coordinating all sampling events in accordance with the requirements of the current EMSRP, including sampling locations, sampling frequency, and parameter requirements.

All sampling and documentation must be conducted in accordance with the Surface WQ Sampling SOP and the QA/QC protocols.

Preparation for Leach Pad sampling must also include provision for quality control samples. Due to the short term of this sampling project, a duplicate sample will be collected from one of the Leach Pads each month.

Safety Precautions

It is particularly important for employees to be aware they are working in proximity to a sheer rock face. It is important they remain aware of where they are, stay as far away from the cliff face as possible, and remain conscious of their footing when approaching the sampling sites.

Leach Pad water quality sampling and related tasks can be carried out by an employee working alone.

Equipment

- Sample bottles, labels, and seepage WQ field forms
- pH Pen
- Nitrile gloves
- Syringes and filters
- Sample preservatives
- Cooler and sufficient ice packs

Procedure

1. Clearly label all sample bottles with station name (LP1 or LP2), date, time (24-hour clock). See Figure 1 below for the location of the leach pads.
2. Put on clean nitrile gloves prior to collecting the sample.
3. For each leach pad, shown in Figure 1, collect a WQ sample as listed in Table 1 and send to ALS Environmental labs.

Table 1: Leach Pad WQ Sample Requirements

Analysis Name	Parameters (not inclusive)	Bottle	Filter	Preservative
Physical Parameters (General)	pH, Conductivity, TSS, TDS, Alkalinity, Anions	500 mL (Plastic)	Not required	Not required
Dissolved Metals	Metals	125 mL (Plastic)	Required	Required
Ammonia/Phosphorus	P, NH_3	125 mL (Glass)	Not Required	Required

4. All bottles will be triple-rinsed.
    a. Ensure that samples requiring filtering are rinsed with filtered water only.
5. Collect water directly from the sampling bucket using a syringe.
6. Use new syringes and filters for every station
7. Filter and add preservatives to the required samples as soon as possible after sample collection and filtering, at the sampling location.
8. **COLLECT A DUPLICATE sample from one of the Leach Pads every sampling event.**
    a. If sufficient water is available, collect the duplicate from Pad #1 on odd numbered months, and from Pad #2 on even numbered months.
    b. Alternatively collect the duplicate from whichever pad collection sump (bucket) has the most water present.
9. Field measurements can be made either in situ (in the water bucket) or using a sub-sample taken in a separate container which is discarded once the measurements are recorded.

a. Sub-samples are not used for further chemical analyses, and must be taken after the sample collection has been completed.

b. Instrumentation must display stable in-situ parameters before field staff record parameters.

10. Once Sampling is complete, the buckets should be tipped over and drained, allowing for new leachate to enter the bucket for the next sampling session, and ensuring the same leachate water is not being sampled twice.

11. Complete the seepage field form at the station, including

    a. Station Name (LP1 or LP2)

    b. Date and time of sample collection;

    c. Weather at time of sample collection;

    d. Field measurements of pH, conductivity, temperature;

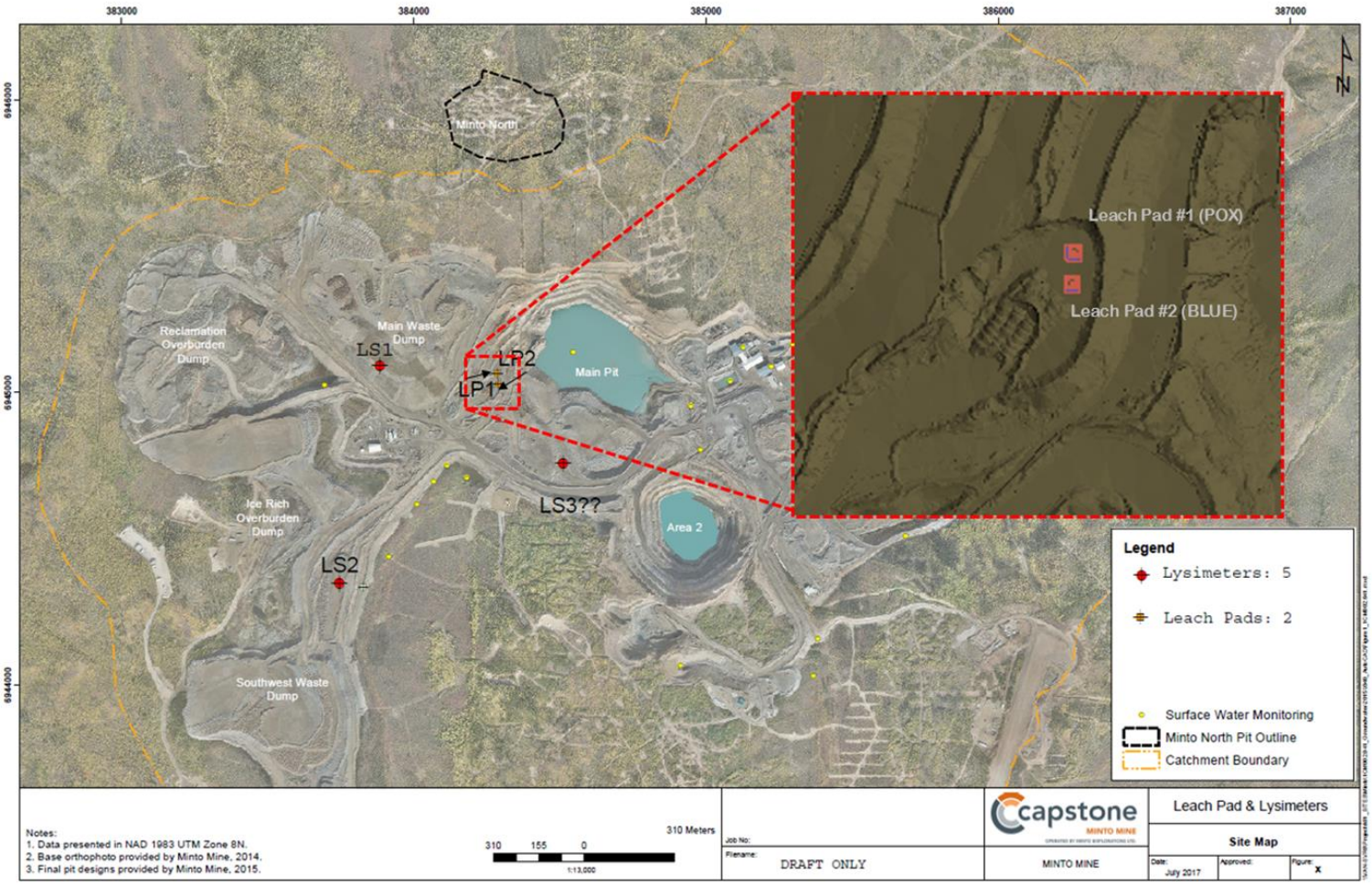
    e. Water colour, turbidity, and presence of any precipitates or mineral staining; and

    f. Record the quantity of filters used and the colour of the sediment contained, photograph the filters.

12. Enter the sample data into the water quality tracking sheet (WQTS) and file the field form.

13. Ship the samples to ALS Environmental at the earliest opportunity, as per the regular shipping process.

Figure 1: Leach Pad Location



Appendix P – Leach Pad Sampling Program Results

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000213**	Page	: 1 of 6
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 12-May-2020 13:30
PO	: 282817 (WUL)	Date Analysis Commenced	: 14-May-2020
C-O-C number	: 2020-05-12C	Issue Date	: 27-May-2020 16:11
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 5		
No. of samples analysed	: 5		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Bruna Botti	Analyst	Inorganics - Water Quality, Burnaby, British Columbia
Cindy Tang	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Clarie Tejano		Metals, Burnaby, British Columbia
Evan Ben-Oliel	Metal Analyst	Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Inorganics - Water Quality, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Shaneel Dayal	Metal Analyst	Metals, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Qualifiers

Qualifier	*Description*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LP2	LP1	DUP	W15	W35
					Client sampling date / time	07-May-2020 12:00	07-May-2020 12:20	07-May-2020	11-May-2020 10:40	11-May-2020 11:25
						WR2000213-001	WR2000213-002	WR2000213-003	WR2000213-004	WR2000213-005
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		13.5	36.0	15.9	74.8	43.9
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		13.5	36.0	15.9	74.8	43.9
conductivity	----	E100	2.0	µS/cm		711	801	809	361	155
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		394	412	528	178	75.0
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		----	----	----	186	80.8
pH	----	E108	0.10	pH units		7.31	7.70	7.39	7.77	7.56
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		506	574	610	264	129
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	4.4	<3.0	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0234	0.0970	0.0250	0.0204	0.0218
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.14	2.41	<0.50 DLDS	0.90	0.72
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		9.07	18.4	12.9	6.17	1.56
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		9.08	18.4	12.9	6.21	1.56
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0058	0.0092	<0.0050 DLDS	0.0449	0.0068
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		307	292	345	74.3	20.9
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		----	----	----	36.1	34.4
Ion Balance										
anion sum	----	EC101	0.10	meq/L		7.31	8.18	8.43	3.51	1.44
cation sum	----	EC101	0.10	meq/L		8.17	9.12	11.0	3.91	1.71
ion balance (cation-anion difference)	----	EC101	0.010	%		5.56	5.43	13.2	5.39	8.57
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		----	----	----	0.143	0.0740
antimony, total	7440-36-0	E420	0.00010	mg/L		----	----	----	<0.00010	<0.00010
arsenic, total	7440-38-2	E420	0.00010	mg/L		----	----	----	0.00041	0.00036
barium, total	7440-39-3	E420	0.00010	mg/L		----	----	----	0.0607	0.0412
beryllium, total	7440-41-7	E420	0.000020	mg/L		----	----	----	<0.000020	<0.000020

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LP2	LP1	DUP	W15	W35
					Client sampling date / time	07-May-2020 12:00	07-May-2020 12:20	07-May-2020	11-May-2020 10:40	11-May-2020 11:25
						WR2000213-001	WR2000213-002	WR2000213-003	WR2000213-004	WR2000213-005
						Result	Result	Result	Result	Result
Total Metals										
bismuth, total	7440-69-9	E420	0.000050	mg/L		----	----	----	<0.000050	<0.000050
boron, total	7440-42-8	E420	0.010	mg/L		----	----	----	<0.010	<0.010
cadmium, total	7440-43-9	E420	0.0000050	mg/L		----	----	----	0.0000152	0.0000137
calcium, total	7440-70-2	E420	0.050	mg/L		----	----	----	53.1	22.8
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		----	----	----	0.00043	0.00044
cobalt, total	7440-48-4	E420	0.00010	mg/L		----	----	----	0.00046	<0.00010
copper, total	7440-50-8	E420	0.00050	mg/L		----	----	----	0.0351	0.0297
iron, total	7439-89-6	E420	0.010	mg/L		----	----	----	0.337	0.145
lead, total	7439-92-1	E420	0.000050	mg/L		----	----	----	0.000067	0.000059
lithium, total	7439-93-2	E420	0.0010	mg/L		----	----	----	0.0013	<0.0010
magnesium, total	7439-95-4	E420	0.100	mg/L		----	----	----	12.9	5.82
manganese, total	7439-96-5	E420	0.00010	mg/L		----	----	----	0.186	0.00875
mercury, total	7439-97-6	E508	0.0000050	mg/L		----	----	----	<0.0000050	<0.0000050
molybdenum, total	7439-98-7	E420	0.000050	mg/L		----	----	----	0.00293	0.000746
nickel, total	7440-02-0	E420	0.00050	mg/L		----	----	----	0.00102	0.00202
phosphorus, total	7723-14-0	E420	0.050	mg/L		----	----	----	<0.050	<0.050
potassium, total	7440-09-7	E420	0.100	mg/L		----	----	----	2.48	1.03
selenium, total	7782-49-2	E420	0.000050	mg/L		----	----	----	0.00454	0.000281
silicon, total	7440-21-3	E420	0.10	mg/L		----	----	----	3.34	3.30
silver, total	7440-22-4	E420	0.000010	mg/L		----	----	----	0.000016	0.000012
sodium, total	7440-23-5	E420	0.050	mg/L		----	----	----	5.86	4.12
strontium, total	7440-24-6	E420	0.00020	mg/L		----	----	----	0.538	0.172
sulfur, total	7704-34-9	E420	0.50	mg/L		----	----	----	27.1	7.70
thallium, total	7440-28-0	E420	0.000010	mg/L		----	----	----	<0.000010	<0.000010
tin, total	7440-31-5	E420	0.00010	mg/L		----	----	----	<0.00010	<0.00010
titanium, total	7440-32-6	E420	0.00030	mg/L		----	----	----	0.00534	0.00210
uranium, total	7440-61-1	E420	0.000010	mg/L		----	----	----	0.000852	0.000099
vanadium, total	7440-62-2	E420	0.00050	mg/L		----	----	----	0.00089	0.00055
zinc, total	7440-66-6	E420	0.0030	mg/L		----	----	----	<0.0030	0.0030
zirconium, total	7440-67-7	E420	0.00020	mg/L		----	----	----	0.00040	0.00041
Dissolved Metals										

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LP2	LP1	DUP	W15	W35
					Client sampling date / time	07-May-2020 12:00	07-May-2020 12:20	07-May-2020	11-May-2020 10:40	11-May-2020 11:25
						WR2000213-001	WR2000213-002	WR2000213-003	WR2000213-004	WR2000213-005
						Result	Result	Result	Result	Result
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0021	0.0098	0.0107	0.0934	0.0420
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	0.00020	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00013	0.00018	0.00023	0.00033	0.00030
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0103	0.0179	0.0112	0.0582	0.0394
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	0.000021
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.062	0.080	0.110	<0.010	<0.010
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000620	0.0000817	0.0000867	0.0000105	0.0000087
calcium, dissolved	7440-70-2	E421	0.050	mg/L		115	121	140	50.5	21.5
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00036	0.00034
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00043	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00910	0.0318	0.0188	0.0299	0.0249
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	<0.010	<0.010	0.218	0.098
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	0.000358	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0059	0.0036	0.0099	0.0011	<0.0010
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		26.0	26.5	43.4	12.6	5.19
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0783	0.0208	0.134	0.174	0.00640
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00582	0.0253	0.00909	0.00286	0.000696
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	0.00079	0.00115
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		2.96	7.53	4.40	2.51	1.00
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.0239	0.0738	0.0384	0.00476	0.000334
silicon, dissolved	7440-21-3	E421	0.050	mg/L		0.679	2.18	0.959	3.06	2.95
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		4.96	15.3	8.00	6.05	4.05
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		3.24	1.20	4.07	0.557	0.165
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		109	108	146	25.0	6.63
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	0.00041	<0.00030	0.00190	0.00077

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LP2	LP1	DUP	W15	W35
					Client sampling date / time	07-May-2020 12:00	07-May-2020 12:20	07-May-2020	11-May-2020 10:40	11-May-2020 11:25
						WR2000213-001	WR2000213-002	WR2000213-003	WR2000213-004	WR2000213-005
						Result	Result	Result	Result	Result
Dissolved Metals										
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000125	0.000722	0.000227	0.000832	0.000093
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	0.00063	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0054	0.0476	0.0078	0.0010	<0.0010
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	0.00043	0.00043
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000263**	Page	: 1 of 6
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: ----	Date Samples Received	: 02-Jun-2020 14:40
PO	: 232824	Date Analysis Commenced	: 04-Jun-2020
C-O-C number	: 2020-06-02 C	Issue Date	: 16-Jun-2020 14:12
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 9		
No. of samples analysed	: 9		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Clarie Tejano		Metals, Burnaby, British Columbia
Dee Lee	Analsyt	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Inorganics - Water Quality, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Workorder Comments

Water sample SS22 for mercury analysis was not submitted in glass or PTFE container with HCl preservative. Results may be biased low.

Qualifiers

Qualifier	*Description*
DLA	*Detection Limit adjusted for required dilution.*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	SS51	SS52	SS44	SS22	SS13
					Client sampling date / time	30-May-2020 14:50	30-May-2020 15:05	30-May-2020 15:25	30-May-2020 15:35	30-May-2020 16:00
						WR2000263-001	WR2000263-002	WR2000263-003	WR2000263-004	WR2000263-005
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		91.3	137	146	257	264
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		91.3	137	146	257	264
conductivity	----	E100	2.0	µS/cm		414	491	469	823	989
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		209	259	229	434	543
pH	----	E108	0.10	pH units		7.25	7.48	7.55	7.71	7.90
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		268	320	300	565	698
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		51.3	3.5	6.9	120	<3.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0209	0.0526	0.0676	0.0059	0.0696
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.56	1.09	1.04	0.60	2.16
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.0142	1.38	0.0276	<0.0050	20.0
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		<0.0500	1.44	<0.0500	<0.0500	20.1
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0027	0.0527	0.0013	0.0018	0.0926
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		112	118	108	214	209
Ion Balance										
anion sum	----	EC101	0.10	meq/L		4.18	5.32	5.19	9.62	11.1
cation sum	----	EC101	0.10	meq/L		4.76	5.69	5.23	9.69	11.8
ion balance (cation-anion difference)	----	EC101	0.010	%		6.49	3.36	0.384	0.362	3.06
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0106	0.0070	0.0085	0.0106	0.0017
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00077	0.00032	0.00032	0.00041	0.00031
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0749	0.0746	0.0566	0.0769	0.0652
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	0.026
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000576	0.0000059	0.0000212	0.000131	0.000107

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	SS51	SS52	SS44	SS22	SS13
					Client sampling date / time	30-May-2020 14:50	30-May-2020 15:05	30-May-2020 15:25	30-May-2020 15:35	30-May-2020 16:00
						WR2000263-001	WR2000263-002	WR2000263-003	WR2000263-004	WR2000263-005
						Result	Result	Result	Result	Result
Dissolved Metals										
calcium, dissolved	7440-70-2	E421	0.050	mg/L		56.0	71.2	56.3	121	160
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00032	<0.00010	<0.00010	<0.00010	<0.00010
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00069	0.00038	0.00011	0.00013	0.00073
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.0111	0.00814	0.00458	0.137	0.219
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.803	0.048	0.066	0.019	0.010
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		<0.0010	0.0015	0.0027	0.0041	0.0041
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		16.9	19.7	21.5	32.0	35.0
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.355	0.247	0.302	0.192	0.619
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00159	0.00165	0.00106	0.00190	0.0180
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00078	<0.00050	<0.00050	<0.00050	0.00060
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		0.088	0.053	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		2.57	3.56	3.70	7.52	12.5
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.00112	0.00206	0.00202	0.000684	0.0162
silicon, dissolved	7440-21-3	E421	0.050	mg/L		4.90	3.22	3.26	6.02	5.91
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	0.000027	0.000035
sodium, dissolved	7440-23-5	E421	0.050	mg/L		10.4	9.46	12.2	18.6	15.0
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.507	0.614	0.815	2.75	3.00
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		43.2	44.0	39.0	78.2	76.2
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		0.00084	<0.00030	0.00037	0.00164	<0.00030
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000061	0.000172	0.000059	0.000214	0.00446
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00067	<0.00050	<0.00050	<0.00050	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0020	<0.0010	<0.0010	0.0028	0.0049
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	DUP	LP1	LP2	DUP	----
					Client sampling date / time	30-May-2020	01-Jun-2020 14:00	01-Jun-2020 14:20	01-Jun-2020	----
						WR2000263-006	WR2000263-007	WR2000263-008	WR2000263-009	--------
						Result	Result	Result	Result	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		263	45.0	41.7	44.8	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		263	45.0	41.7	44.8	----
conductivity	----	E100	2.0	µS/cm		991	2270	661	2300	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		538	1340	346	1340	----
pH	----	E108	0.10	pH units		7.88	7.42	7.24	7.46	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		696	1970	443	1980	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	<3.0	<3.0	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0694	0.0084	0.0529	<0.0050	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		2.17	5.07	0.33	5.04	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		20.0	33.1	4.53	33.5	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		20.1	33.2	4.55	33.6	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0909	0.0377	0.0184	0.0338	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		210	1240	271	1250	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		11.1	29.2	6.80	29.5	----
cation sum	----	EC101	0.10	meq/L		11.8	28.8	7.40	28.6	----
ion balance (cation-anion difference)	----	EC101	0.010	%		3.06	0.690	4.22	1.55	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0012	0.0036	0.0042	0.0077	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	0.00027	0.00016	0.00026	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00030	0.00040	0.00032	0.00037	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0659	0.0235	0.0175	0.0237	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000040 DLA	<0.000020	<0.000040 DLA	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000100 DLA	<0.000050	<0.000100 DLA	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.026	0.055	0.089	0.055	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000931	<0.0000450 DLM	0.0000542	<0.0000450 DLM	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		158	408	69.4	406	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	DUP	LP1	LP2	DUP	----
					Client sampling date / time	30-May-2020	01-Jun-2020 14:00	01-Jun-2020 14:20	01-Jun-2020	----
						WR2000263-006	WR2000263-007	WR2000263-008	WR2000263-009	--------
						Result	Result	Result	Result	----
Dissolved Metals										
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00020 DLA	<0.00010	<0.00020 DLA	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00073	<0.00020 DLA	<0.00010	<0.00020 DLA	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.225	0.0222	0.0209	0.0228	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.010	<0.020 DLA	<0.010	<0.020 DLA	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000100 DLA	0.000057	<0.000100 DLA	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0041	0.0050	0.0094	0.0049	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		34.7	79.6	41.8	78.8	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.607	0.00204	0.0404	0.00246	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.0179	0.0453	0.0142	0.0460	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00060	<0.00100 DLA	<0.00050	<0.00100 DLA	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.100 DLA	<0.050	<0.100 DLA	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		12.6	13.1	4.63	13.1	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.0159	0.248	0.0719	0.246	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		5.85	5.76	1.09	5.58	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		0.000035	<0.000020 DLA	<0.000010	<0.000020 DLA	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		14.8	35.5	8.29	35.2	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		3.03	3.75	2.05	3.79	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		75.2	477	102	476	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000020 DLA	<0.000010	<0.000020 DLA	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00020 DLA	<0.00010	<0.00020 DLA	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00060 DLA	<0.00030	<0.00060 DLA	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00443	0.00276	0.000128	0.00269	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00100 DLA	<0.00050	<0.00100 DLA	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0049	0.0033	0.0362	0.0065	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00040 DLA	<0.00020	<0.00040 DLA	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000484**	Page	: 1 of 4
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 14-Jul-2020 14:20
PO	: 232824 (Seepage)	Date Analysis Commenced	: 15-Jul-2020
C-O-C number	: 2020-07-14 C	Issue Date	: 23-Jul-2020 11:36
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Bruna Botti	Analyst	Inorganics - Water Quality, Burnaby, British Columbia
Ilnaz Badbezanchi	Team Leader - Metals preparation	Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Kinny Wu	Laboratory Analyst	Metals, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Inorganics - Water Quality, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Woochan Song	Lab Assistant	Metals, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LP1	LP2	Dup	----	----
					Client sampling date / time	08-Jul-2020 15:35	08-Jul-2020 15:50	08-Jul-2020	----	----
						WR2000484-001	WR2000484-002	WR2000484-003	--------	--------
						Result	Result	Result	----	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		64.2	65.3	65.6	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	----	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		64.2	65.3	65.6	----	----
conductivity	----	E100	2.0	µS/cm		1180	1400	1400	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		637	786	792	----	----
pH	----	E108	0.10	pH units		7.90	7.92	7.95	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		856	1090	1100	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		3.6	6.0	3.8	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0292	0.0077	<0.0050	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.82	2.55	2.60	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		10.7	16.1	16.1	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		10.7	16.1	16.1	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0058	0.0107	0.0088	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		522	642	642	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		12.9	15.9	15.9	----	----
cation sum	----	EC101	0.10	meq/L		13.9	17.1	17.2	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		3.73	3.64	3.93	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0040	0.0047	0.0048	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		0.00012	0.00038	0.00038	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00059	0.00027	0.00025	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0205	0.0212	0.0201	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.362	0.131	0.132	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.000198	0.000120	0.000101	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		131	240	248	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LP1	LP2	Dup	----	----
					Client sampling date / time	08-Jul-2020 15:35	08-Jul-2020 15:50	08-Jul-2020	----	----
						WR2000484-001	WR2000484-002	WR2000484-003	--------	--------
						Result	Result	Result	----	----
Dissolved Metals										
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00023	<0.00010	<0.00010	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.0536	0.0313	0.0292	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	<0.010	<0.010	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0250	0.0057	0.0058	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		75.1	45.3	41.7	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.230	0.0262	0.0246	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.0318	0.0366	0.0374	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		12.4	12.3	11.8	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.0784	0.128	0.119	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		3.06	5.40	5.03	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		19.1	25.7	24.2	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		4.14	2.08	2.14	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		201	252	234	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000151	0.00124	0.00128	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0042	0.0030	0.0043	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000610**	Page	: 1 of 4
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 04-Aug-2020 14:50
PO	: 232818 (GW)	Date Analysis Commenced	: 07-Aug-2020
C-O-C number	: 2020-08-04 L	Issue Date	: 12-Aug-2020 16:00
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Bruna Botti	Analyst	Inorganics - Water Quality, Burnaby, British Columbia
Clarie Tejano		Metals, Burnaby, British Columbia
Cristina Alexandre	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics - Water Quality, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

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Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Qualifiers

Qualifier	*Description*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LP1	LP2	Dup	----	----
					Client sampling date / time	02-Aug-2020 14:15	02-Aug-2020 14:40	02-Aug-2020	----	----
						WR2000610-001	WR2000610-002	WR2000610-003	--------	--------
						Result	Result	Result	----	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		70.1	57.9	70.2	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	----	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		70.1	57.9	70.2	----	----
conductivity	----	E100	2.0	µS/cm		853	1110	853	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		403	529	402	----	----
pH	----	E108	0.10	pH units		8.01	7.91	8.00	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		594	830	591	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		4.3	<3.0	4.3	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0067	0.0091	0.0060	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.78	1.68	0.74	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		5.44	7.51	5.38	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		5.44	7.51	5.39	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0050 DLDS	<0.0050 DLDS	0.0103	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		367	521	364	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		9.45	12.6	9.38	----	----
cation sum	----	EC101	0.10	meq/L		8.87	11.8	8.87	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		3.16	3.28	2.79	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0031	0.0023	0.0037	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		0.00013	<0.00010	0.00014	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00068	0.00024	0.00066	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0237	0.0236	0.0239	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.270	0.104	0.272	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000962	0.0000921	0.0000915	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LP1	LP2	Dup	----	----
					Client sampling date / time	02-Aug-2020 14:15	02-Aug-2020 14:40	02-Aug-2020	----	----
						WR2000610-001	WR2000610-002	WR2000610-003	--------	--------
						Result	Result	Result	----	----
Dissolved Metals										
calcium, dissolved	7440-70-2	E421	0.050	mg/L		81.5	160	81.4	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00011	<0.00010	0.00012	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.0456	0.0297	0.0456	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	<0.010	<0.010	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		0.000051	<0.000050	0.000074	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0201	0.0043	0.0198	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		48.4	31.5	48.4	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.103	0.00437	0.104	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.0383	0.0540	0.0387	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		9.72	10.8	9.68	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.0850	0.0854	0.0842	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		2.80	5.79	2.79	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		13.2	21.2	13.3	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		2.76	1.57	2.77	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		126	188	125	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000061	0.000714	0.000060	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0053	<0.0010	0.0061	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000802**	Page	: 1 of 4
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: ----	Date Samples Received	: 01-Sep-2020 14:25
PO	: 232818	Date Analysis Commenced	: 03-Sep-2020
C-O-C number	: 2020-09-01 D	Issue Date	: 10-Sep-2020 15:00
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Bruna Botti	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Clarie Tejano		Metals, Burnaby, British Columbia
Ian Cronshaw	Analyst	Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Qualifiers

Qualifier	*Description*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LP1	LP2	DUP	----	----
					Client sampling date / time	30-Aug-2020 15:25	30-Aug-2020 15:50	30-Aug-2020	----	----
						WR2000802-001	WR2000802-002	WR2000802-003	--------	--------
						Result	Result	Result	----	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		75.2	61.1	72.8	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	----	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		75.2	61.1	72.8	----	----
conductivity	----	E100	2.0	µS/cm		731	881	731	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		392	457	370	----	----
pH	----	E108	0.10	pH units		7.98	7.86	7.98	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		512	657	501	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	3.3	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		<0.0050	0.0057	<0.0050	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.55	1.16	0.55	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		3.53	3.84	3.54	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		3.53	3.84	3.54	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0050 DLDS	<0.0050 DLDS	<0.0050 DLDS	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		292	391	293	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		7.86	9.68	7.83	----	----
cation sum	----	EC101	0.10	meq/L		8.66	10.2	8.17	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		4.84	2.62	2.12	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0871	0.0031	0.0065	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		0.00013	<0.00010	0.00014	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00058	0.00025	0.00057	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0290	0.0244	0.0260	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.209	0.083	0.205	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.000101	0.0000994	0.000101	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

					Client sample ID	LP1	LP2	DUP	----	----
					Client sampling date / time	30-Aug-2020 15:25	30-Aug-2020 15:50	30-Aug-2020	----	----
Analyte	CAS Number	Method	LOR	Unit		WR2000802-001	WR2000802-002	WR2000802-003	--------	--------
						Result	Result	Result	----	----
Dissolved Metals										
calcium, dissolved	7440-70-2	E421	0.050	mg/L		80.2	140	71.8	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00014	<0.00010	<0.00010	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.0540	0.0291	0.0489	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.154	0.029	0.034	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		0.000057	<0.000050	<0.000050	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0184	0.0038	0.0173	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		46.7	26.0	46.2	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0792	0.00312	0.0756	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.0396	0.0594	0.0403	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		10.4	10.2	9.71	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.0640	0.0562	0.0660	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		2.86	5.61	2.79	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	0.000011	----	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		12.2	18.8	12.2	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		2.44	1.33	2.42	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		91.0	126	94.6	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	0.00037	<0.00010	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		0.00801	<0.00030	<0.00030	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000045	0.000532	0.000036	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00050	<0.00050	<0.00050	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0049	<0.0010	0.0052	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WR2000802**	Page	: 1 of 11
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: ----	Date Samples Received	: 01-Sep-2020 14:25
PO	: 232818	Issue Date	: 10-Sep-2020 15:00
C-O-C number	: 2020-09-01 D		
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
DUP	E298	30-Aug-2020	----	----	----		09-Sep-2020	28 days	9 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
LP1	E298	30-Aug-2020	----	----	----		09-Sep-2020	28 days	9 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
LP2	E298	30-Aug-2020	----	----	----		09-Sep-2020	28 days	9 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
DUP	E235.Cl-L	30-Aug-2020	----	----	----		03-Sep-2020	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
LP1	E235.Cl-L	30-Aug-2020	----	----	----		03-Sep-2020	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
LP2	E235.Cl-L	30-Aug-2020	----	----	----		03-Sep-2020	28 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE										
DUP	E235.NO3-L	30-Aug-2020	----	----	----		03-Sep-2020	3 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE LP1	E235.NO3-L	30-Aug-2020	----	----	----		03-Sep-2020	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE LP2	E235.NO3-L	30-Aug-2020	----	----	----		03-Sep-2020	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE DUP	E235.NO2-L	30-Aug-2020	----	----	----		03-Sep-2020	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE LP1	E235.NO2-L	30-Aug-2020	----	----	----		03-Sep-2020	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE LP2	E235.NO2-L	30-Aug-2020	----	----	----		03-Sep-2020	3 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE DUP	E235.SO4	30-Aug-2020	----	----	----		03-Sep-2020	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE LP1	E235.SO4	30-Aug-2020	----	----	----		03-Sep-2020	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE LP2	E235.SO4	30-Aug-2020	----	----	----		03-Sep-2020	28 days	3 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) DUP	E421.Cr-L	30-Aug-2020	04-Sep-2020	180 days	4 days	✓	06-Sep-2020	175 days	1 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) LP1	E421.Cr-L	30-Aug-2020	04-Sep-2020	180 days	4 days	✓	06-Sep-2020	175 days	1 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) LP2	E421.Cr-L	30-Aug-2020	04-Sep-2020	180 days	4 days	✓	06-Sep-2020	175 days	1 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) DUP	E509	30-Aug-2020	04-Sep-2020	28 days	4 days	✓	04-Sep-2020	23 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) LP1	E509	30-Aug-2020	04-Sep-2020	28 days	4 days	✓	04-Sep-2020	23 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) LP2	E509	30-Aug-2020	04-Sep-2020	28 days	4 days	✓	04-Sep-2020	23 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) DUP	E421	30-Aug-2020	04-Sep-2020	180 days	4 days	✓	06-Sep-2020	175 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) LP1	E421	30-Aug-2020	04-Sep-2020	180 days	4 days	✓	06-Sep-2020	175 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) LP2	E421	30-Aug-2020	04-Sep-2020	180 days	4 days	✓	06-Sep-2020	175 days	1 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE DUP	E290	30-Aug-2020	----	----	----		03-Sep-2020	14 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE LP1	E290	30-Aug-2020	----	----	----		03-Sep-2020	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE LP2	E290	30-Aug-2020	----	----	----		03-Sep-2020	14 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE DUP	E100	30-Aug-2020	----	----	----		03-Sep-2020	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE LP1	E100	30-Aug-2020	----	----	----		03-Sep-2020	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE LP2	E100	30-Aug-2020	----	----	----		03-Sep-2020	28 days	3 days	✓
Physical Tests : pH by Meter										
HDPE LP1	E108	30-Aug-2020	----	----	----		03-Sep-2020	0.25 hrs	93 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE LP2	E108	30-Aug-2020	----	----	----		03-Sep-2020	0.25 hrs	93 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE DUP	E108	30-Aug-2020	----	----	----		03-Sep-2020	0.25 hrs	94 hrs	× EHTR-FM
Physical Tests : TSS by Gravimetry										
HDPE DUP	E160-H	30-Aug-2020	----	----	----		04-Sep-2020	7 days	4 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TSS by Gravimetry										
HDPE LP1	E160-H	30-Aug-2020	----	----	----		04-Sep-2020	7 days	4 days	✓
Physical Tests : TSS by Gravimetry										
HDPE LP2	E160-H	30-Aug-2020	----	----	----		04-Sep-2020	7 days	4 days	✓

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	80822	1	18	5.5	5.0	✓
Ammonia by Fluorescence	E298	82903	1	16	6.2	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	80818	1	11	9.0	5.0	✓
Conductivity in Water	E100	80823	1	8	12.5	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	81735	1	15	6.6	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	81570	1	16	6.2	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	81734	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	80819	1	15	6.6	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	80820	1	8	12.5	5.0	✓
pH by Meter	E108	80824	1	8	12.5	5.0	✓
Sulfate in Water by IC	E235.SO4	80821	1	8	12.5	5.0	✓
TSS by Gravimetry	E160-H	81550	1	20	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	80822	1	18	5.5	5.0	✓
Ammonia by Fluorescence	E298	82903	1	16	6.2	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	80818	1	11	9.0	5.0	✓
Conductivity in Water	E100	80823	1	8	12.5	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	81735	1	15	6.6	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	81570	1	16	6.2	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	81734	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	80819	1	15	6.6	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	80820	1	8	12.5	5.0	✓
pH by Meter	E108	80824	1	8	12.5	5.0	✓
Sulfate in Water by IC	E235.SO4	80821	1	8	12.5	5.0	✓
TSS by Gravimetry	E160-H	81550	1	20	5.0	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	80822	1	18	5.5	5.0	✓
Ammonia by Fluorescence	E298	82903	1	16	6.2	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	80818	1	11	9.0	5.0	✓
Conductivity in Water	E100	80823	1	8	12.5	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	81735	1	15	6.6	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	81570	1	16	6.2	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	81734	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	80819	1	15	6.6	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	80820	1	8	12.5	5.0	✓
Sulfate in Water by IC	E235.SO4	80821	1	8	12.5	5.0	✓
TSS by Gravimetry	E160-H	81550	1	20	5.0	5.0	✓

Matrix: **Water**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	82903	1	16	6.2	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	80818	1	11	9.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	81735	1	15	6.6	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	81570	1	16	6.2	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	81734	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	80819	1	15	6.6	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	80820	1	8	12.5	5.0	✓
Sulfate in Water by IC	E235.SO4	80821	1	8	12.5	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
TSS by Gravimetry	E160-H Vancouver - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
Chloride in Water by IC (Low Level)	E235.Cl-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Vancouver - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Ion Balance using Dissolved Metals	EC101 Vancouver - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
TDS in Water (Calculation)	EC103 Vancouver - Environmental	Water	APHA 1030E (mod)	Total Dissolved Solids is calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present.
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N Vancouver - Environmental	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

QUALITY CONTROL REPORT

Work Order	: **WR2000802**	Page	: 1 of 10
Client	: Minto Explorations Ltd.	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: ----	Date Samples Received	: 01-Sep-2020 14:25
PO	: 232818	Date Analysis Commenced	: 03-Sep-2020
C-O-C number	: 2020-09-01 D	Issue Date	: 10-Sep-2020 15:00
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Bruna Botti	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Clarie Tejano		Metals, Burnaby, British Columbia
Ian Cronshaw	Analyst	Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 80822)											
WR2000800-002	Anonymous	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	121	122	0.739%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	121	122	0.739%	20%	----
Physical Tests (QC Lot: 80823)											
WR2000800-002	Anonymous	conductivity	----	E100	2.0	µS/cm	231	231	0.00%	10%	----
Physical Tests (QC Lot: 80824)											
WR2000800-002	Anonymous	pH	----	E108	0.10	pH units	8.01	8.04	0.374%	4%	----
Physical Tests (QC Lot: 81550)											
VA20B4309-004	Anonymous	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	4.7	3.3	1.4	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 80818)											
WR2000800-002	Anonymous	chloride	16887-00-6	E235.Cl-L	0.10	mg/L	0.22	0.22	0.0002	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 80819)											
WR2000800-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.0555	0.0541	2.60%	20%	----
Anions and Nutrients (QC Lot: 80820)											
WR2000800-002	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 80821)											
WR2000800-002	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	7.49	7.46	0.415%	20%	----
Anions and Nutrients (QC Lot: 82903)											
KS2001621-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	1.00	mg/L	9.74	10.4	6.15%	20%	----
Dissolved Metals (QC Lot: 81570)											
VA20B4380-018	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 81734)											
VA20B4256-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0020	mg/L	0.0896	0.0854	4.85%	20%	----
		antimony, dissolved	7440-36-0	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00020	mg/L	0.0106	0.0105	0.206%	20%	----
		barium, dissolved	7440-39-3	E421	0.00020	mg/L	0.207	0.198	4.26%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000200	mg/L	<0.000200	<0.000200	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.020	mg/L	0.024	0.024	0.0001	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 81734) - continued											
VA20B4256-001	Anonymous	cadmium, dissolved	7440-43-9	E421	0.0000100	mg/L	0.0000124	<0.0000100	0.0000024	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.100	mg/L	168	161	4.18%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.00020	mg/L	0.0191	0.0186	2.76%	20%	----
		copper, dissolved	7440-50-8	E421	0.00040	mg/L	<0.00040	0.00042	0.00002	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.020	mg/L	142	138	2.76%	20%	----
		lead, dissolved	7439-92-1	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0020	mg/L	<0.0020	<0.0020	0	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.0100	mg/L	35.8	36.7	2.45%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00020	mg/L	11.5	11.7	1.60%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000100	mg/L	0.00106	0.000961	9.67%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00100	mg/L	0.00923	0.00891	0.00031	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.100	mg/L	<0.100	<0.100	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.100	mg/L	6.11	5.90	3.50%	20%	----
		selenium, dissolved	7782-49-2	E421	0.000100	mg/L	0.000753	0.000804	0.000051	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.100	mg/L	9.57	9.34	2.46%	20%	----
		sodium, dissolved	7440-23-5	E421	0.100	mg/L	41.3	41.7	0.830%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00040	mg/L	1.04	0.984	5.59%	20%	----
		sulfur, dissolved	7704-34-9	E421	1.00	mg/L	<1.00	<1.00	0	Diff <2x LOR	----
		thallium, dissolved	7440-28-0	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00060	mg/L	0.00350	0.00341	0.00009	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000020	mg/L	0.000182	0.000181	0.0000004	Diff <2x LOR	----
		vanadium, dissolved	7440-62-2	E421	0.00100	mg/L	0.00513	0.00507	0.00006	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0020	mg/L	0.0066	0.0063	0.0003	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00040	mg/L	0.00178	0.00166	0.00012	Diff <2x LOR	----
Dissolved Metals (QC Lot: 81735)											
VA20B4256-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00020	mg/L	0.00142	0.00143	0.000008	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 80822)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 80823)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 81550)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Anions and Nutrients (QCLot: 80818)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 80819)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 80820)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 80821)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 82903)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Dissolved Metals (QCLot: 81570)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 81734)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 81734) - continued						
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----
Dissolved Metals (QCLot: 81735)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 80822)									
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	229 mg/L	89.1	75.0	125	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	99.0	85.0	115	----
Physical Tests (QCLot: 80823)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	105	90.0	110	----
Physical Tests (QCLot: 80824)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 81550)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	87.5	85.0	115	----
Anions and Nutrients (QCLot: 80818)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 80819)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 80820)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	99.8	90.0	110	----
Anions and Nutrients (QCLot: 80821)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 82903)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.12 mg/L	105	85.0	115	----
Dissolved Metals (QCLot: 81570)									
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	91.4	80.0	120	----
Dissolved Metals (QCLot: 81734)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	101	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	99.0	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	94.0	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	97.7	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	106	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	93.6	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	101	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	101	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	97.1	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	97.1	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 81734) - continued									
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	101	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	101	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	97.1	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	98.4	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	105	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	97.3	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	99.8	70.0	130	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	105	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	97.9	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	97.4	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	106	80.0	120	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	99.8	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	102	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	87.6	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	105	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	100	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	92.8	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	100	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	99.4	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	99.5	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	96.0	80.0	120	----
Dissolved Metals (QCLot: 81735)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	98.6	80.0	120	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 80818)										
WR2000800-004	Anonymous	chloride	16887-00-6	E235.Cl-L	101 mg/L	100 mg/L	101	75.0	125	----
Anions and Nutrients (QCLot: 80819)										
WR2000800-004	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.52 mg/L	2.5 mg/L	101	75.0	125	----
Anions and Nutrients (QCLot: 80820)										
WR2000800-004	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.497 mg/L	0.5 mg/L	99.4	75.0	125	----
Anions and Nutrients (QCLot: 80821)										
WR2000800-004	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	101 mg/L	100 mg/L	101	75.0	125	----
Anions and Nutrients (QCLot: 82903)										
KS2001621-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	1.89 mg/L	2 mg/L	94.7	75.0	125	----
Dissolved Metals (QCLot: 81570)										
WR2000797-001	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000965 mg/L	0.0001 mg/L	96.5	70.0	130	----
Dissolved Metals (QCLot: 81734)										
VA20B4256-002	Anonymous	aluminum, dissolved	7429-90-5	E421	0.911 mg/L	1 mg/L	91.1	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0928 mg/L	0.1 mg/L	92.8	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0869 mg/L	0.1 mg/L	86.9	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.1 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.191 mg/L	0.2 mg/L	95.7	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.0450 mg/L	0.05 mg/L	90.1	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.489 mg/L	0.5 mg/L	97.7	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.0186 mg/L	0.02 mg/L	93.1	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	20 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0816 mg/L	0.1 mg/L	81.6	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0873 mg/L	0.1 mg/L	87.3	70.0	130	----
		iron, dissolved	7439-89-6	E421	ND mg/L	10 mg/L	ND	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0905 mg/L	0.1 mg/L	90.5	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.470 mg/L	0.5 mg/L	94.0	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	ND mg/L	0.1 mg/L	ND	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0999 mg/L	0.1 mg/L	99.9	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.175 mg/L	0.2 mg/L	87.7	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 81734) - continued										
VA20B4256-002	Anonymous	phosphorus, dissolved	7723-14-0	E421	47.9 mg/L	50 mg/L	95.8	70.0	130	----
		potassium, dissolved	7440-09-7	E421	20.6 mg/L	20 mg/L	103	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.192 mg/L	0.2 mg/L	96.2	70.0	130	----
		silicon, dissolved	7440-21-3	E421	44.0 mg/L	50 mg/L	88.0	70.0	130	----
		sodium, dissolved	7440-23-5	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.1 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	96.4 mg/L	100 mg/L	96.4	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.0181 mg/L	0.02 mg/L	90.3	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0940 mg/L	0.1 mg/L	94.0	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.178 mg/L	0.2 mg/L	89.1	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.0180 mg/L	0.02 mg/L	90.2	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.464 mg/L	0.5 mg/L	92.9	70.0	130	----
		zinc, dissolved	7440-66-6	E421	1.80 mg/L	2 mg/L	89.9	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.192 mg/L	0.2 mg/L	95.8	70.0	130	----
Dissolved Metals (QCLot: 81735)										
VA20B4256-002	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.180 mg/L	0.2 mg/L	89.9	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number: 2020-09-01 D

1 of 1

Environmental Division Whitehorse
Work Order Reference
WR2000802

Telephone : +1 867 668 6689

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Ruth Cayetano

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax mintoenvironment@mintomine.com
Email 2
Email 3

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax ap@mintomine.com
Email 2

Select Service Level Below - Please confirm all E&P TA

Regular [R] ☑ Standard TAT if r

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐ — EMERGENCY

Date and Time Required for all E&P TAT

For tests that can not be performed according to the

Project Information

ALS Account # / Quote #:
Job #:
PO / AFE: 232818 (GW)
LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: | PO#
Major/Minor Code: | Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only)

ALS Contact: | **Sampler:**

Indicate Filtered (F), Preserved (P) or

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals(TM)	Disolved Metals (DM)	Total Mercury, Hardness	Dissolved Mercury	Ammonia (Total Nutrients)	Dissolved Organic Carbon (DOC)	pH, Cond., TSS, TDS, Alkalinity, Anions	Dissolved Bromide (Br-D)	Number of Containers
					P	F/P	P	F/P	P	F/P			
	LP1 ✓	30-Aug-20	15:25	Water		R		R	R		R		4
	LP2 ✓	30-Aug-20	15:50	Water		R		R	R		R		4
	DUP ✓	30-Aug-20		Water		R		R	R		R		4

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO
Are samples for human drinking water use? ☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ | SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ | Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
6	5				

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Ian Smith	Date: 2020-09-01	Time:	Received by:	Date: SEPT 1/20	Time: 14:25	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2000921**	Page	: 1 of 4
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 22-Sep-2020 14:47
PO	: 232818	Date Analysis Commenced	: 24-Sep-2020
C-O-C number	: 2020-09-22 C	Issue Date	: 08-Oct-2020 15:42
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Annabelle Prasad	Analyst	Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Qualifiers

Qualifier	*Description*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LP1	LP2	DUP	----	----
					Client sampling date / time	19-Sep-2020 16:05	19-Sep-2020 16:25	19-Sep-2020	----	----
						WR2000921-001	WR2000921-002	WR2000921-003	--------	--------
						Result	Result	Result	----	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		63.0	71.4	63.2	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	----	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		63.0	71.4	63.2	----	----
conductivity	----	E100	2.0	µS/cm		796	764	823	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		435	436	442	----	----
pH	----	E108	0.10	pH units		8.01	8.07	8.02	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		643	588	639	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	<3.0	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		<0.0050	<0.0050	0.0400	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		1.31	0.69	1.28	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		3.04	4.19	2.97	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		3.05	4.20	2.98	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0050 DLDS	0.0090	0.0062	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		391	356	384	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		9.65	9.15	9.51	----	----
cation sum	----	EC101	0.10	meq/L		9.74	9.49	9.90	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		0.464	1.82	2.01	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0021	0.0034	0.0011	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	0.00016	<0.00010	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00021	0.00056	0.00024	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0222	0.0257	0.0226	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.081	0.212	0.084	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.000110 DLM	<0.000125 DLM	<0.000115 DLM	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	LP1	LP2	DUP	----	----
					Client sampling date / time	19-Sep-2020 16:05	19-Sep-2020 16:25	19-Sep-2020	----	----
						WR2000921-001	WR2000921-002	WR2000921-003	--------	--------
						Result	Result	Result	----	----
Dissolved Metals										
calcium, dissolved	7440-70-2	E421	0.050	mg/L		133	89.8	136	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.0296	0.0467	0.0300	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	<0.010	<0.010	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	0.000054	<0.000050	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0037	0.0178	0.0036	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		24.9	51.4	25.1	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.00299	0.0741	0.00298	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.0509	0.0371	0.0518	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		8.64	8.72	9.18	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.0539	0.0695	0.0538	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		5.20	2.52	5.08	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L		18.9	12.7	19.0	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		1.24	2.87	1.26	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		129	115	127	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000504	0.000067	0.000502	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0012	0.0086	<0.0010	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WR2000921**	Page	: 1 of 10
Client	: **Minto Explorations Ltd.**	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 22-Sep-2020 14:47
PO	: 232818	Issue Date	: 08-Oct-2020 15:42
C-O-C number	: 2020-09-22 C		
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
DUP	E298	19-Sep-2020	----	----	----		29-Sep-2020	28 days	9 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
LP1	E298	19-Sep-2020	----	----	----		29-Sep-2020	28 days	9 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
LP2	E298	19-Sep-2020	----	----	----		29-Sep-2020	28 days	9 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
DUP	E235.Cl-L	19-Sep-2020	----	----	----		24-Sep-2020	28 days	4 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
LP1	E235.Cl-L	19-Sep-2020	----	----	----		24-Sep-2020	28 days	4 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
LP2	E235.Cl-L	19-Sep-2020	----	----	----		24-Sep-2020	28 days	4 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE										
DUP	E235.NO3-L	19-Sep-2020	----	----	----		24-Sep-2020	3 days	4 days	× EHTL

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE LP1	E235.NO3-L	19-Sep-2020	----	----	----		24-Sep-2020	3 days	4 days	× EHTL
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE LP2	E235.NO3-L	19-Sep-2020	----	----	----		24-Sep-2020	3 days	4 days	× EHTL
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE DUP	E235.NO2-L	19-Sep-2020	----	----	----		24-Sep-2020	3 days	4 days	× EHTL
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE LP1	E235.NO2-L	19-Sep-2020	----	----	----		24-Sep-2020	3 days	4 days	× EHTL
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE LP2	E235.NO2-L	19-Sep-2020	----	----	----		24-Sep-2020	3 days	4 days	× EHTL
Anions and Nutrients : Sulfate in Water by IC										
HDPE DUP	E235.SO4	19-Sep-2020	----	----	----		24-Sep-2020	28 days	4 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE LP1	E235.SO4	19-Sep-2020	----	----	----		24-Sep-2020	28 days	4 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE LP2	E235.SO4	19-Sep-2020	----	----	----		24-Sep-2020	28 days	4 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) DUP	E421.Cr-L	19-Sep-2020	24-Sep-2020	180 days	5 days	✓	26-Sep-2020	174 days	1 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) LP1	E421.Cr-L	19-Sep-2020	24-Sep-2020	180 days	5 days	✓	26-Sep-2020	174 days	1 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) LP2	E421.Cr-L	19-Sep-2020	24-Sep-2020	180 days	5 days	✓	26-Sep-2020	174 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) DUP	E421	19-Sep-2020	24-Sep-2020	180 days	5 days	✓	26-Sep-2020	174 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) LP1	E421	19-Sep-2020	24-Sep-2020	180 days	5 days	✓	26-Sep-2020	174 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) LP2	E421	19-Sep-2020	24-Sep-2020	180 days	5 days	✓	26-Sep-2020	174 days	1 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE DUP	E290	19-Sep-2020	----	----	----		24-Sep-2020	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE LP1	E290	19-Sep-2020	----	----	----		24-Sep-2020	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE LP2	E290	19-Sep-2020	----	----	----		24-Sep-2020	14 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE DUP	E100	19-Sep-2020	----	----	----		24-Sep-2020	28 days	4 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Conductivity in Water										
HDPE LP1	E100	19-Sep-2020	----	----	----		24-Sep-2020	28 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE LP2	E100	19-Sep-2020	----	----	----		24-Sep-2020	28 days	4 days	✓
Physical Tests : pH by Meter										
HDPE LP2	E108	19-Sep-2020	----	----	----		24-Sep-2020	0.25 hrs	116 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE LP1	E108	19-Sep-2020	----	----	----		24-Sep-2020	0.25 hrs	117 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE DUP	E108	19-Sep-2020	----	----	----		24-Sep-2020	0.25 hrs	118 hrs	× EHTR-FM
Physical Tests : TSS by Gravimetry										
HDPE LP1	E160-H	19-Sep-2020	----	----	----		25-Sep-2020	7 days	5 days	✓
Physical Tests : TSS by Gravimetry										
HDPE LP2	E160-H	19-Sep-2020	----	----	----		25-Sep-2020	7 days	5 days	✓
Physical Tests : TSS by Gravimetry										
HDPE DUP	E160-H	19-Sep-2020	----	----	----		25-Sep-2020	7 days	6 days	✓

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	90933	1	14	7.1	5.0	✓
Ammonia by Fluorescence	E298	92794	1	17	5.8	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	90930	1	14	7.1	5.0	✓
Conductivity in Water	E100	90932	1	14	7.1	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	91587	1	16	6.2	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	91588	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	90928	1	14	7.1	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	90929	1	14	7.1	5.0	✓
pH by Meter	E108	90931	1	14	7.1	5.0	✓
Sulfate in Water by IC	E235.SO4	90927	1	14	7.1	5.0	✓
TSS by Gravimetry	E160-H	92248	1	20	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	90933	1	14	7.1	5.0	✓
Ammonia by Fluorescence	E298	92794	1	17	5.8	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	90930	1	14	7.1	5.0	✓
Conductivity in Water	E100	90932	1	14	7.1	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	91587	1	16	6.2	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	91588	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	90928	1	14	7.1	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	90929	1	14	7.1	5.0	✓
pH by Meter	E108	90931	1	14	7.1	5.0	✓
Sulfate in Water by IC	E235.SO4	90927	1	14	7.1	5.0	✓
TSS by Gravimetry	E160-H	92248	1	20	5.0	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	90933	1	14	7.1	5.0	✓
Ammonia by Fluorescence	E298	92794	1	17	5.8	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	90930	1	14	7.1	5.0	✓
Conductivity in Water	E100	90932	1	14	7.1	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	91587	1	16	6.2	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	91588	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	90928	1	14	7.1	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	90929	1	14	7.1	5.0	✓
Sulfate in Water by IC	E235.SO4	90927	1	14	7.1	5.0	✓
TSS by Gravimetry	E160-H	92248	1	20	5.0	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	92794	1	17	5.8	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	90930	1	14	7.1	5.0	✓

Matrix: **Water**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Matrix Spikes (MS) - Continued							
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	91587	1	16	6.2	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	91588	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	90928	1	14	7.1	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	90929	1	14	7.1	5.0	✓
Sulfate in Water by IC	E235.SO4	90927	1	14	7.1	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
TSS by Gravimetry	E160-H Vancouver - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
Chloride in Water by IC (Low Level)	E235.Cl-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Vancouver - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Ion Balance using Dissolved Metals	EC101 Vancouver - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
TDS in Water (Calculation)	EC103 Vancouver - Environmental	Water	APHA 1030E (mod)	Total Dissolved Solids is calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present.
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N Vancouver - Environmental	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.

QUALITY CONTROL REPORT

Work Order	: **WR2000921**	Page	: 1 of 10
Client	: Minto Explorations Ltd.	Laboratory	: Whitehorse - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: 4838 Richard Rd. SW, Suite 300 Calgary AB Canada T3E 6L1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Minto Mine Monitoring	Date Samples Received	: 22-Sep-2020 14:47
PO	: 232818	Date Analysis Commenced	: 24-Sep-2020
C-O-C number	: 2020-09-22 C	Issue Date	: 08-Oct-2020 15:42
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Annabelle Prasad	Analyst	Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 90931)											
WR2000921-001	LP1	pH	----	E108	0.10	pH units	8.01	8.01	0.00%	4%	----
Physical Tests (QC Lot: 90932)											
WR2000921-001	LP1	conductivity	----	E100	2.0	µS/cm	796	797	0.126%	10%	----
Physical Tests (QC Lot: 90933)											
WR2000921-001	LP1	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	63.0	63.6	0.948%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	63.0	63.6	0.948%	20%	----
Physical Tests (QC Lot: 92248)											
VA20B5846-001	Anonymous	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	<3.0	<3.0	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 90927)											
WR2000921-001	LP1	sulfate (as SO4)	14808-79-8	E235.SO4	1.50	mg/L	391	381	2.48%	20%	----
Anions and Nutrients (QC Lot: 90928)											
WR2000921-001	LP1	nitrate (as N)	14797-55-8	E235.NO3-L	0.0250	mg/L	3.04	2.96	2.72%	20%	----
Anions and Nutrients (QC Lot: 90929)											
WR2000921-001	LP1	nitrite (as N)	14797-65-0	E235.NO2-L	0.0050	mg/L	<0.0050	0.0063	0.0013	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 90930)											
WR2000921-001	LP1	chloride	16887-00-6	E235.Cl-L	0.50	mg/L	1.31	1.30	0.02	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 92794)											
WR2000907-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0833	0.0825	0.941%	20%	----
Dissolved Metals (QC Lot: 91587)											
VA20B6010-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 91588)											
VA20B6010-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0039	0.0038	0.000008	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00024	0.00022	0.00002	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.194	0.199	2.74%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 91588) - continued											
VA20B6010-001	Anonymous	cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	0.0000162	0.0000112	0.0000050	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	50.0	48.8	2.48%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	0.00017	0.00016	0.00002	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	0.084	0.083	0.001	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	0.000252	0.000291	0.000039	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0039	0.0038	0.00004	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	9.92	9.38	5.66%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.448	0.451	0.714%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00164	0.00170	3.61%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	0.607	0.600	1.26%	20%	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	2.38	2.32	2.60%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E421	0.050	mg/L	2.78	2.71	2.78%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.173	0.166	4.25%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	8.10	7.78	3.98%	20%	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	0.000021	0.000020	0.0000008	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.000503	0.000504	0.103%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0024	0.0024	0.00001	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 90932)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 90933)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 92248)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Anions and Nutrients (QCLot: 90927)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 90928)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 90929)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 90930)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 92794)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Dissolved Metals (QCLot: 91587)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 91588)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 91588) - continued						
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 90931)									
pH	----	E108	----	pH units	7 pH units	99.8	98.0	102	----
Physical Tests (QCLot: 90932)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	101	90.0	110	----
Physical Tests (QCLot: 90933)									
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	229 mg/L	100	75.0	125	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	99.3	85.0	115	----
Physical Tests (QCLot: 92248)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	89.7	85.0	115	----
Anions and Nutrients (QCLot: 90927)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	100.0	90.0	110	----
Anions and Nutrients (QCLot: 90928)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	99.3	90.0	110	----
Anions and Nutrients (QCLot: 90929)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	99.8	90.0	110	----
Anions and Nutrients (QCLot: 90930)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	98.6	90.0	110	----
Anions and Nutrients (QCLot: 92794)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.12 mg/L	99.8	85.0	115	----
Dissolved Metals (QCLot: 91587)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	103	80.0	120	----
Dissolved Metals (QCLot: 91588)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	101	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	96.8	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	101	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	95.7	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	108	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	88.3	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	96.8	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	97.2	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	100	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	102	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 91588) - continued									
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	101	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	97.9	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	98.3	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	102	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	108	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	97.7	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	102	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	115	70.0	130	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	100	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	101	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	99.7	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	99.8	80.0	120	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	106	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	103	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	98.0	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	99.7	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	94.6	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	103	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	102	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	103	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	106	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	94.0	80.0	120	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 90927)										
WR2000921-002	LP2	sulfate (as SO4)	14808-79-8	E235.SO4	484 mg/L	500 mg/L	96.8	75.0	125	----
Anions and Nutrients (QCLot: 90928)										
WR2000921-002	LP2	nitrate (as N)	14797-55-8	E235.NO3-L	12.2 mg/L	12.5 mg/L	97.7	75.0	125	----
Anions and Nutrients (QCLot: 90929)										
WR2000921-002	LP2	nitrite (as N)	14797-65-0	E235.NO2-L	2.45 mg/L	2.5 mg/L	98.0	75.0	125	----
Anions and Nutrients (QCLot: 90930)										
WR2000921-002	LP2	chloride	16887-00-6	E235.Cl-L	491 mg/L	500 mg/L	98.3	75.0	125	----
Anions and Nutrients (QCLot: 92794)										
WR2000907-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	2.05 mg/L	2 mg/L	103	75.0	125	----
Dissolved Metals (QCLot: 91587)										
VA20B6010-002	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.0443 mg/L	0.04 mg/L	111	70.0	130	----
Dissolved Metals (QCLot: 91588)										
VA20B6010-002	Anonymous	aluminum, dissolved	7429-90-5	E421	0.218 mg/L	0.2 mg/L	109	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0220 mg/L	0.02 mg/L	110	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0224 mg/L	0.02 mg/L	112	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0444 mg/L	0.04 mg/L	111	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00977 mg/L	0.01 mg/L	97.7	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.097 mg/L	0.1 mg/L	97.2	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00430 mg/L	0.004 mg/L	108	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0214 mg/L	0.02 mg/L	107	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0212 mg/L	0.02 mg/L	106	70.0	130	----
		iron, dissolved	7439-89-6	E421	2.13 mg/L	2 mg/L	106	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0203 mg/L	0.02 mg/L	102	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.115 mg/L	0.1 mg/L	115	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0205 mg/L	0.02 mg/L	102	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0425 mg/L	0.04 mg/L	106	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 91588) - continued										
VA20B6010-002	Anonymous	phosphorus, dissolved	7723-14-0	E421	12.0 mg/L	10 mg/L	120	70.0	130	----
		potassium, dissolved	7440-09-7	E421	4.48 mg/L	4 mg/L	112	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0454 mg/L	0.04 mg/L	113	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.89 mg/L	10 mg/L	98.9	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00432 mg/L	0.004 mg/L	108	70.0	130	----
		sodium, dissolved	17341-25-2	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	22.0 mg/L	20 mg/L	110	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00396 mg/L	0.004 mg/L	99.1	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0210 mg/L	0.02 mg/L	105	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0457 mg/L	0.04 mg/L	114	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00422 mg/L	0.004 mg/L	106	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.114 mg/L	0.1 mg/L	114	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.453 mg/L	0.4 mg/L	113	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0421 mg/L	0.04 mg/L	105	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number: 2020-09-22 C

Environmental Division
Whitehorse
Work Order Reference
WR2000921

Telephone : +1 867 668 6689

Report To	Contact and company name below will appear on the final report
Company:	Minto Explorations Ltd.
Contact:	Minto Environment - Coordinator
Phone:	1-604-759-4659
	Company address below will appear on the final report
Street:	2100-510 West Georgia St.
City/Province:	Vancouver, British Columbia
Postal Code:	V6B 0M3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Minto Explorations Ltd.
Contact:	Ruth Cayetano

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: mintoenvironment@mintomine.com
Email 2:
Email 3:

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: ap@mintomine.com
Email 2:

Project Information

ALS Account # / Quote #:	
Job #:	
PO / AFE:	232818 (GW)
LSD:	

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only)

ALS Contact: **Sampler:**

Select Service Level Below - Please confirm all E&P TATs v

Regular [R] ☑ Standard TAT if recei

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐ — EMERGENCY

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service

Analysis

Indicate Filtered (F), Preserved (P) or Filtered

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals(TM)	Disolved Metals (DM)	Total Mercury, Hardness	Dissolved Mercury	Ammonia (Total Nutrients)	Dissolved Organic Carbon (DOC)	pH, Cond., TSS, TDS, Alkalinity, Anions	Dissolved Bromide (Br-D)						Number of Containers
					P	F/P	P	F/P	P	F/P								
	LP1	19-Sep-20	16:05	Water		R			R		R							3 ✓
	LP2	19-Sep-20	16:25	Water		R			R		R							3 ✓
	DUP	19-Sep-20		Water		R			R		R							3 ✓

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?
☐ YES ☑ NO

Are samples for human drinking water use?
☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C						FINAL COOLER TEMPERATURES °C		
1°	4	4	4	4	4			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Chris Wall	Date: 2020-09-22	Time:	Received by:	Date: Sept 22/20	Time: 14:47	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Appendix Q – Wildlife and Hazing Tracking Report

Date	Time	Type of animal	Number of animals	Location	Description: Size/Color/Markings and Additional Notes	Was the animal hazed?
29-Jan-20	13:00	Porcupine	1	Fresh Air Raise	Adult, Healthy	No
15-Mar-20	13:00	Wolf	1	Access Road KM 24-25	Black	No
20-Apr-20	15:45	Black Bear	1	Dyno Yard, near office	Young, light brown	Yes
4-May-20	15:30	Black Bear	1	Access Road above WSP	Young, light brown	No
5-May-20	14:00	Black Bear	1	MWD into the bush	Dark fur, Healthy	No
5-May-20	19:30	Black Bear	1	Ridge above Camp	Dark fur, Healthy	Yes
6-May-20	12:45	Black Bear	1	UG shop laydown	Young, dark fur	No
7-May-20	16:00	Black Bear	1	Fuel Farm to ERT	Light brown	No
8-May-20	12:30	Black Bear	1	Mine tech past ERT to bush	Light brown	Yes
9-May-20	21:30	Black Bear	1	Camp parking lot to DSTF	Dark fur, Healthy	No
11-May-20	7:50	Black Bear	1	Airport road	Dark fur, Healthy	No
11-May-20		Black Bear	1	Warehouse yard up through camp past ERT	Dark fur, Healthy	Yes
13-May-20	6:50	Black Bear	1	Below Airstrip Propane Farm	Light brown, Healthy	Yes
14-May-20	6:30	Black Bear	1	Road/Field East of Cobalt Parking.	Dark fur, Healthy	Yes
14-May-20	8:30	Black Bear	1	W35 Sump Area	Dark fur, Healthy	Yes
18-May-20	23:00	Black Bear	1	Near Dyno Yard	Thin	No
20-May-20	9:45	Black Bear	1	Near Main Pit	Dark fur, Healthy	Yes
20-May-20	10:30	Black Bear	1	Behind Underground Shop	Light brown, Healthy	Yes
20-May-20	11:30	Black Bear	1	On Dry Stack	Dark fur, Healthy	No
21-May-20	9:50	Black Bear	1	By W35	Light brown, Healthy	No
21-May-20	11:30	Lynx	1	Drill road behind core shack	Small, young	No
21-May-20	1:55	Black Bear	1	Haul Road between Main Pit and A2P	Dark fur, Healthy	No
24-May-20	12:55	Black Bear	1	Near Yellow Stockpile	Dark fur, Healthy	No
25-May-20	9:30	Black Bear	2	Near Airport road	Light Brown, healthy/Dark Fur, healthy	No
25-May-20	12:30	Black Bear	1	Near Kode Crusher	Light fur	Yes
26-May-20	8:30	Black Bear	1	Behind U/G Shop	Dark fur, healthy	No
26-May-20	2:00	Black bear	1	Fuel Farm to ERT	Light fur	No
19-May-20	5:00	Black Bear	1	Haul Road at airpot interection	medium sized black healthy	Yes
8-Jun-20	9:00	fox	1	Mill	skinny, it came close, tame	No
12-Jun-20	8:30	Porcupine	1	Propane farm	large, light blond/grayish	Yes
12-Jun-20	9:00	fox	1	Hall road	Black and orange, skinny	No
1-Jun-20	2:00	Fox	1	Kode		No
7-Jun-20	10:00	Fox		Mine Rescue/ERT building North side	Light brown	No
8-Jun-20	18:00	Black Bear	3	WSP	Mother very black, cubs dark brown	No
20-Jun-20	1:40	Black Bear	1	Road to Dump	Black with a dark dirty brown face	no
22-Jun-20	9:00	Grizzly bear	1	Trail to W1 from KM11		No
24-Jun-20	16:30	Black Bear	1	CWTS	Light brown	Yes
10-Jul-20	2:00	Grizzlies	2	fighting over territory KM10	both medium sized very healthy looking	No
11-Jul-20	3:30	deer	1	U/G Fuel Farm	large healthy looking	Yes
13-Jul-20	11:00	bear	2	Access Road, KM 4	mother and cub, both very black. Cub very small, born this year.	No

17-Jul-20	15:00	deer	2	MWD, off Minto North Road	doe and fawn	No
20-Jul-20	8:30	bear	2	Acces Road, KM 3	mother and cub, same from June 8th but only saw one cub	Yes
21-Jul-20		Grizzly bear	1	W6 access trail	Younger male	No
23-Jul-20	15:00	bear	2	DSTF	mother and cub	No
24-Jul-20	16:00	bear	?	W3	Bear vocalized while remaining in bush, When DA shouted to alert the bear to his position the vocalization/ barking continued	Yes
27-Jul-20	18:10	Black Bear	2	ERT building	mother and cub	No
9-Jul-20	9:30	Deer	1	Selkirk		No
17-Jul-20	9:00	Fox	1	Back Of Kitchen	Mangy Looking	No
24-Aug-20	8:15	Black Bear	1	Hill Behind Selkirk Tower		No
21-Sep-20	14:50	Black Bear	1	W17	Dark fur- healthy	No
1-Oct-20	7:30	Porcupine	1	In WTP discharge pipe @ W17	Just small enough to fit in an 18-20" pipe	No
2-Oct-20	18:30	Black Bear	2	CWTS area	Mother and cub	No
4-Oct-20	14:45	Black Bear	1	Warehouse yard up through camp past ERT	Dark fur, Healthy	Yes
1-Nov-20	8:30	Fox	1	SWA in WMA	Red coat, healthy	Yes
6-Dec-20	5:15	Lynx	1	Selkirk, near east emergency exits		No

Appendix R – 2020 Minto Reclamation Research Report

MINTO 2020 RECLAMATION RESEARCH

BENCH-SCALE IN SITU PIT LAKE TREATMENT TRIALS AND DEMONSTRATION-SCALE CWTS

December 2020

Document #:
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Prepared for:

MINTO EXPLORATIONS, MINTO MINE

104-411 Downey Road
Saskatoon, SK S7N 4L8
O. (306) 978-3111
www.ensero.com

December 21, 2020

Minto Explorations, Minto Mine
attn.: Todd Swenson and Journey Paulus

Dear Todd Swenson and Journey Paulus:

Regarding: Minto 2020 Reclamation Research

Please find the enclosed Minto 2020 Reclamation Research Report which reports the findings of the Phase 1 bench-scale *in situ* pit lake treatment trials and 2020 research associated with the demonstration-scale constructed wetland treatment system.

Sincerely,
Ensero Solutions



Rachel Martz
Environmental Manager

DISTRIBUTION LIST

# of copies	Company/Agency name
1	Minto Explorations, Minto Mine

ENSERO SOLUTIONS

Report prepared by:

Rachelle Kleinberger
Scientist

Report prepared by:

Rachel Martz
Environmental Manager

Report reviewed by:

Vanessa Friesen
Technical Lead Biological Treatment
Vice President Operations Canada

Report reviewed by:

Andrew Gault
Practice Lead - Geochemistry

EXECUTIVE SUMMARY

The Minto Mine (the "Mine"), owned and operated by Minto Explorations Ltd., is a copper mine located 240 km northwest of Whitehorse on the west side of the Yukon River. A Reclamation and Closure Plan (RCP) is required for the Minto Mine under both the Water Use License (QZ14-031) and the Quartz Mining License (QML-0001). As a part of the RCP, the Mine has retained Ensero Solutions (Ensero, formerly Contango Strategies and Alexco Environmental Group) to conduct research associated with a Constructed Wetland Treatment System (CWTS) and *in situ* pit lake treatment for water treatment. Additional details of the reclamation research plan can be found in Section 2.2 of the RCP.

The *in situ* pit lake treatment research is being completed in phases, with the first phase comprising an off-site bench-scale trial to determine the effectiveness of different organic carbon amendments (glycerol, ethanol, molasses) to treat constituents of concern (COCs) in the Main Pit water currently (nitrite, nitrate, copper, selenium, and ammonia) at the Minto Mine. These trials are intended to investigate the feasibility of *in situ* pit lake treatment during closure and operations for the Site. Near quantitative removal of nitrate and nitrite (>99.9%) to below both the effluent quality standard (EQS) and Minto Creek water quality objective (WQO) for all three soluble carbon sources tested was observed. While marked ammonia removal was not expected in these experiments, considerable ammonia removal was observed such that 51% to 74% of the cumulative ammonia added to the trials was removed at the end of the experiment. Removal of copper (89% to 98%), selenium (61% to 74%), and other chalcophile metals (cadmium, molybdenum, zinc) at the end of the experiment was observed below the WQO for the three soluble carbon dosed trials. Leaching of constituents from the woodchips and/or waste rock and tailings was assessed. Leachable constituents were not concerning as they were either in low concentrations, were removed through treatment, or in the case of iron and manganese can be managed via passive aeration and/or filtration in downstream waterbodies. The bench-scale pit lake data overall indicate that carbon amendment to the Main Pit would likely result in marked decreases in COCs.

A phased approach is also being used to guide the site-specific design and implementation of a CWTS at closure for the Minto Mine. The phased approach was initiated with a site assessment in 2013 followed by pilot-scale testing to confirm and provide proof-of-concept before constructing the on-site demonstration-scale CWTS at Minto in 2014. Commissioning and testing of the on-site demonstration-scale CWTS occurred between 2015 and 2019. Testing in 2019 showed that high nitrate concentrations resulted in slower treatment of certain COCs such as selenium. In 2020, a small test program was performed to evaluate a forebay with organics (straw) upstream of the demonstration-scale CWTS to decrease nitrate loads. The nitrate concentrations going to the demonstration-scale CWTS in 2020 were higher than previously observed. Treatment of cadmium, copper, and zinc were similar to previous years of operations, whereas treatment of selenium and molybdenum continued to show impacts due to the higher nitrate concentrations. Pilot-scale CWTS trials have demonstrated improved selenium removal in the low nitrate testing scenario. Nitrate concentrations are expected to decrease through closure, and opportunities such as *in situ* pit lake treatment could markedly decrease nitrate concentrations prior to the CWTS in closure. The continued reclamation research program may therefore include a test program which incorporates treated pit water into the CWTS to evaluate a treatment train combining these two technologies.

Given the success of the bench-scale *in situ* pit lake treatment (Phase 1), progression to Phase 2 studies is recommended, either through on-site limnocorral tests or full pit lake treatment. Targeted ammonia treatment

through a separate oxidizing system may be needed during operations to achieve ammonia concentrations below the EQS.

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1 INTRODUCTION

The Minto Mine (the "Mine"), owned and operated by Minto Explorations Ltd., is a copper mine located 240 km northwest of Whitehorse on the west side of the Yukon River. A Reclamation and Closure Plan (RCP) is required for the Minto Mine under both the Water Use License (QZ14-031) and the Quartz Mining License (QML-0001). As a part of the RCP, the Mine has retained Ensero Solutions (Ensero, formerly Contango Strategies an AEG Company) to conduct research associated with a Constructed Wetland Treatment System (CWTS) and *in situ* pit lake treatment for water treatment. Additional details of the reclamation research plan can be found in Section 2.2 of the RCP. The CWTS is the primary technology selected for Minto in closure, with secondary contingency measures including *in situ* pit lake treatment. This report summarizes the RRP research results from 2020 for the CWTS and *in situ* pit lake treatment technologies.

The *in situ* pit lake treatment research has been proposed in phases, with the first phase comprising an off-site bench-scale trial, followed by on-site trials planned within the Main Pit at the Minto Mine. This report summarizes the off-site bench-scale experiments for *in situ* pit lake treatment evaluation that were performed in 2020 to evaluate treatment opportunities during closure and operations for the Site (Section 2).

The CWTS research to date includes a demonstration-scale system that was constructed at the Minto Mine in 2014, based on the design that was evaluated through pilot-scale testing (Contango, 2014). Two series were constructed in parallel, each with two cells planted with local *Carex aquatilis* (*C. aquatilis*) and moss (Contango, 2015). This report provides an update on the demonstration-scale CWTS activities in 2020 where a simple test program was initiated to evaluate the use of a forebay with straw for the CWTS (Section 3).

2 PIT LAKE TREATMENT RESEARCH

2.1 BACKGROUND

The treatment of flooded pits (and underground mine workings) via semi-passive methods has garnered increased attention in recent years as a viable tool for both the closure of mine sites and for the management of contaminant loads to downstream conventional treatment operations. *In situ* pit lake treatment is a biological-based technology that relies on stimulation of indigenous microorganisms that are ubiquitous in the environment. This approach has been applied for treatment of mine pit lakes to remove a broad array of constituents. The amendment of soluble organic carbon to the pit lake creates sulphate-reducing conditions via the stimulation of naturally occurring sulphide-producing bacteria. Under such conditions, chalcophile elements (e.g., cadmium, copper, lead, molybdenum, and zinc) will precipitate as sulphide minerals and be removed via sedimentation. Other constituents such as nitrite, nitrate, and selenium are also treated under such reducing conditions, through denitrification and selenium reduction, respectively.

2.1.1 Carbon Amendment of Pit Lakes

The use of soluble organic carbon injections to significantly lower contaminant concentrations in pit lakes, underground mine workings, and shallow groundwater has been described in detail in numerous reports at locations across North America (e.g., Lindsay, 2009; Murphy et al., 2008; Houston et al., 2005; Addison et al., 2005; Harrington, 2002; Harrington et al., 1999, 2004, 2009, 2015; ITRC, 2010; Morie et al., 2004; Paulson et al., 2004; Saunders et al., 2004) including northern Canada (Gault et al., 2018). In particular, *in situ* treatment has been successfully implemented at numerous flooded open pits (Harrington, 2002; Harrington et al., 2004, 2009; ITRC, 2010; Paulson et al., 2004). Here, *in situ* treatment uses the flooded open pit (or a portion thereof) as the reaction vessel for biologically reductive processes, treating water directly at the source of contamination. *In situ* treatment is performed through injection or placement of reagents into the flooded pit (e.g., organic carbon and nutrients) with pumping to circulate the reagents through the desired water volume. This results in the formation of a reductive zone within the flooded pit, creating the conditions necessary for microbial denitrification and dissimilatory sulphate reduction conducted by denitrifying or sulphide producing bacteria (SPB), respectively. Denitrifying bacteria facilitate the transfer of electrons from the organic carbon supplied to the system (e.g., alcohol, molasses) to nitrate and nitrite, resulting in nitrogen gas. Similarly, SPB facilitate the transfer of electrons from the organic carbon to reduce sulphate to sulphide. The sulphide then binds to the dissolved fraction of chalcophile metals and metalloids such as cadmium, copper, molybdenum, and zinc, removing them from solution via precipitation as insoluble metal sulphide phases. Under such reducing conditions, elements such as selenium are largely transformed to less soluble forms (e.g., elemental selenium phases). Such phases form particulates that settle to the base of the pit and will become buried over time as sediment naturally accumulates. The stability of these phases become enhanced by burial, or co-deposition of bulk iron sulphide phases in the sediment.

In situ treatment systems require minimal construction and have low capital and operational costs. Treatment occurs quickly (within months) and is suitable for batch or periodic treatment of large volumes of mine-impacted water and high concentrations of metals. Treatment effects continue year-round and associated maintenance is minimal; however, periodic addition of reagents (e.g., alcohol, molasses) may be needed to sustain treatment.

By treating water at the source in the flooded pit, potential contaminants of concern are retained in the pit lake sediment rather than being exposed to the surface environment. *In situ* treatment also provides an ancillary benefit of improving groundwater and seepage chemistry in the receiving environment should the flooded pit be a major source of such loading. Pit walls or waste materials placed in the pit can be stabilized by the creation of saturated biochemically reducing conditions where oxidative leaching is avoided or minimized.

2.1.2 Technology Suitability for Cold Climate

The Minto Mine site is in the Yukon; therefore, any proposed *in situ* pit lake technology must take into consideration the cold climate challenges associated with this location and allow for continued treatment over the cold winter months.

Longer-term data are available for organic carbon injections to pit lakes, where treatment has extended over winter (e.g., Sweetwater and Barite Hill pit lakes; Paulson et al., 2004; Harrington et al., 2009; Park et al., 2009), and in some instances many years after the last carbon injection event (e.g., Sweetwater; Paulson et al., 2004). It is important to note that both the Anchor Hill and Sweetwater pit lake locations experience cold winters, with the Sweetwater pit lake frozen/ice covered from early December until March. The pit lakes both freeze over during winter, but this has not impeded the target constituent removal obtained by *in situ* treatment. Indeed, the ice cover may be viewed as beneficial in that it acts as a barrier to the mixing and diffusion of oxygen from the atmosphere into the lake. As such, carbon additions at both Anchor Hill and Sweetwater pit lakes were typically performed in the late summer or fall to prolong the period that the lake would remain reducing and therefore maximize removal of target constituents. Furthermore, the water temperature of the flooded mine workings at the Silver King mine (Keno Hill, central Yukon) typically varies between 2 and 5°C year-round and has demonstrated prolonged *in situ* treatment (cadmium and zinc; ≥75% removal over long term; Gault et al., 2018). This indicates that treatment of cold waters is feasible using this technology, likely due to the presence of psychrophilic (i.e., adapted to cold conditions) bacteria in the mine workings, which are also expected to be present in the flooded pits of the Minto Mine site.

2.1.3 Treatment Process

The pilot-scale *in situ* treatment test work outlined herein has been designed to treat constituents of concern (COCs) that are transformed or insoluble under sulphate-reducing conditions, specifically nitrate/nitrite, cadmium, copper, molybdenum, selenium, and zinc. The *in situ* treatment is designed to stimulate microbes in the system that naturally occur in/on the water, rock, and soil in the system through addition of organic carbon. The microbes oxidize the reduced carbon "food" source (e.g., ethanol, glycerol) and transfer the electrons released to a terminal electron acceptor (TEA). The TEAs are generally used in the order most energetically favorable (i.e., most energy generated) by microbes. Of the major TEAs typically present in mine-impacted surface waters and soils/sediments, dissolved oxygen (DO) is utilised first followed by nitrate (NO_3), then selenate (Se(VI)), manganate (Mn(IV)), ferric iron (Fe(III)), uranyl (U(VI)), and sulphate (SO_4) (Borch et al., 2010), creating a "redox (reduction-oxidation) ladder" (Figure 2-1). The order of TEA utilization can also be influenced by pH and TEA concentration.

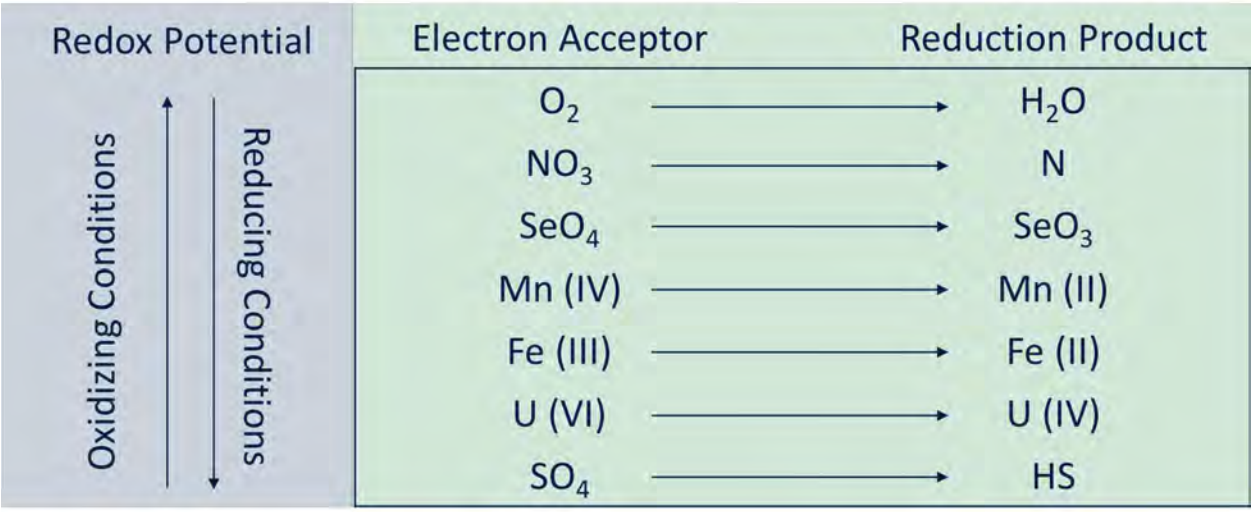


Figure 2-1 Redox Potential and Terminal Electron Acceptors

Summarized based on theoretical redox ladder (Borch et al., 2010)

TEAs are monitored through the *in situ* pilot-scale trials in order to evaluate conditions that are established in the systems. The theoretical order of TEA consumption is not absolute, but it is a useful to guide treatment design and performance evaluation. The *in situ* pilot-scale trials have been designed to target sulphate-reducing conditions, to remove TEAs above sulphate in the redox ladder (e.g., nitrate, selenium; Figure 2-1).

Parameters such as dissolved iron and dissolved manganese can provide insight into the conditions in the pit lake trials, with increased concentrations of these parameters showing targeted reducing conditions have been achieved based on the theoretical redox ladder (Borch et al., 2010). TEA consumption can be influenced by numerous factors including the overall concentrations of reduced and oxidized TEA species, spatial distribution of organic electron donors and TEAs, and the abundance and diversity of TEA-metabolizing microbial populations. The specific mechanisms for treatment of the COCs are described in Section 2.1.4.

2.1.4 Treatment Mechanisms

2.1.4.1 Denitrifying Bacteria

Nitrate is typically more desired as an electron acceptor by microbes over selenium and sulphate, so microbes therefore tend to preferentially reduce nitrate (Borch et al., 2010; Tan et al., 2016). Nitrate and nitrite can be removed from water through the denitrification activity of different types of microbes, including nitrate-reducing bacteria which can reduce nitrate (NO_3) to nitrite (NO_2), and other denitrifying organisms that are capable of fully reducing nitrate to nitric oxide (NO), nitrous oxide (N_2O), and subsequently to dinitrogen gas (N_2), which is the most abundant gas in air.

2.1.4.2 Selenium-reducing Bacteria

The targeted selenium treatment pathway is the reduction of selenate (Se(VI)) and selenite (Se(IV)) to insoluble elemental selenium (Se(0)). There are several different types of selenate- and selenite-reducing bacteria that can reduce these soluble forms of selenium to insoluble elemental selenium (e.g., Gonzalez-Gil et al., 2016; Nancharaiah and Lens, 2015; Sharma et al., 2015).

2.1.4.3 Sulphide-producing Bacteria

Sulphate-reducing conditions are encountered when the above processes have advanced such that the TEAs higher than sulphate on the redox ladder have either been consumed. Under such conditions, sulphate is reduced by bacteria to form sulphide, which may then react with chalcophile elements to form insoluble sulphide minerals. The insoluble sulphide minerals then precipitate from the water column as authigenic precipitates prior to settling on the pit lake bottom. Sulphide production is carried out by sulphide-producing bacteria (SPB) through the reduction of sulphur-containing compounds.

2.2 OBJECTIVES

The first phase of the test work, reported herein, consisted of an off-site bench-scale trial to determine the effectiveness of different organic carbon amendments (glycerol, ethanol, molasses) to treat COCs in the Main Pit water at the Minto Mine (sample station W12). The primary COC in the Main Pit currently is nitrite, although nitrate, ammonia, copper, and selenium are also considered COCs for the Site. The trials were also used to assess the carbon dosing requirements (frequency and amounts) and examine constituent leaching from submerged waste rock and tailings during *in situ* treatment. Data from these laboratory-based experiments will be used to guide the second phase, which is expected to consist of field-based trials within the Main Pit. These trials are intended to investigate the feasibility of *in situ* pit lake treatment during closure and operations for the Site.

2.3 METHODS

2.3.1 Bench-scale trial set-up

Four trials were set up in 100 L barrels to test three different liquid carbon sources. Three of the trials were amended with soluble carbon (glycerol, ethanol, or molasses) while one trial was not dosed with liquid carbon to serve as a control (Table 2-1). Each trial contained 67.5 L of water, 7 L of waste rock, and 15.5 L of tailings sourced from the Main Pit (station W12), where waste rock and tailings were excavated from below the water line. All three components were delivered to Ensero's facilities in Saskatoon from the Minto Mine. In addition, 4.5 L of woodchips were added to each of the trials to provide a (slow-release) source of carbon, an anchor upon which beneficial microbes can colonize, and a barrier to reduce interaction with atmospheric oxygen. The woodchips were a mixture of pine and spruce and were sourced locally in the Saskatoon area from Saskatoon Woodchips. Spruce woodchips were preferred since previous work indicated they have a lower metal leaching potential (Janin, 2014); however, only a pine and spruce woodchip mixture was available at the time of the experiment setup. The trials were operated at 10°C in a temperature-controlled facility.

Table 2-1 Phase 1 Trials

Trial	Soluble Carbon Amendment (mL)	Temperature (°C)	Woodchip Volume (L)	Water Volume (L)	Waste Rock Volume (L)	Tailings Volume (L)
E1	Ethanol (9.4)	~10°C	4.5	67.5	7	15.5
G2	Glycerol (10.1)	~10°C	4.5	67.5	7	15.5
M3	Molasses (15.9)	~10°C	4.5	67.5	7	15.5
C4	Control (none)	~10°C	4.5	67.5	7	15.5

Prior to shipment of the water from the mine site, samples were taken for alkalinity, dissolved organic carbon (DOC), nitrogen species (ammonia, nitrate, and nitrite), total and dissolved metals, and sulphate. Upon arrival of the water at Ensero on June 30, 2020, (6 days from initial sampling), samples were sent to ALS for DOC, dissolved metals, nitrogen species (ammonia, nitrate, and nitrite), and sulphate to confirm the initial water chemistry post-shipment and assess potential changes in nitrogen species during shipment. There were no significant changes to the nitrogen species concentrations during transit, therefore ammonia, nitrite, or nitrate were not added at the start of the trials.

After the trials were assembled (combining waste rock, tailings, and water), the water was sampled from each trial for DOC. Following sample collection, soluble carbon and woodchips were added to each of the trials and a DOC sample was collected immediately upon addition. The soluble carbon added to each trial was calculated based on the carbon required to reduce the main terminal electron acceptors in the water column such as dissolved oxygen (including additional carbon to compensate for atmospheric re-oxygenation in the short-term), nitrate, nitrite, and 50 mg/L of sulphate to provide sulphide for precipitation of chalcophile metals (e.g., copper, cadmium, zinc). The estimated reducible iron and manganese present in the waste rock and tailings was also included in the carbon dosing calculation. An additional 10 mg/L of carbon, in the form of molasses, was also added at the start of the trials to stimulate microbial growth.

Barrels remained sealed with a lid and metal ring for the duration of the trials. To keep the trials as free from oxygen as possible, water quality sampling was performed through a bung cap in the lid.

2.3.2 Nitrogen Species Dosing

All trials were dosed with ammonia, nitrate, and nitrite stock solutions at Weeks 2, 4, and 6 for a total of three top-up events. The target ammonia, nitrate, and nitrite concentrations for each top-up were 1.6, 9.1, and 2.2 mg/L as N, respectively. The cumulative nitrogen species added over the three top-up events (4.8, 27.3, and 6.6 mg/L as N for ammonia, nitrate, and nitrite, respectively) was based on the 90th percentile ammonia-N, nitrate-N, and nitrite-N concentrations at station W12 when mining was ongoing (i.e., 2016 to 2018 and 2020). This approach mimics nitrogen species addition to the lake water as runoff from waste rock piles and the highwall, while the use of the 90th percentile concentration provides some conservatism to the approach. Ammonia, nitrate, and nitrite were added using ammonium chloride, calcium nitrate tetrahydrate, and sodium nitrite, respectively.

2.3.3 Routine Water Sampling/Schedule

Water quality sampling was conducted at the start of trials following carbon addition. Trials were sampled weekly for nitrogen species (ammonia, nitrate, and nitrite) and additional samples were collected bi-weekly for DOC, dissolved metals, sulphate, and sulphide for 13 weeks. Samples were collected in sample bottles appropriate for each analysis parameter, as provided by ALS (Saskatoon, SK). Sample collectors wore new, clean nitrile gloves when collecting samples. Bottles were capped immediately after filling. Samples were filtered and/or preserved according to the analytical service provider's instructions (ALS).

Water was sampled through a bung cap in the lid of the barrel in efforts to introduce the least amount of air as possible to the trials. Water was collected at approximately mid-way down the water column into sampling containers using a peristaltic pump and tubing.

In situ dissolved oxygen (DO), temperature, pH, conductivity, and oxidation-reduction potential (ORP) were measured following the collection of routine water samples. Measurements were conducted with a YSI Professional Plus handheld unit calibrated according to the manufacturer's instructions. *In situ* parameters were measured mid-way down the water column through the bung cap of each barrel.

Water was not topped up during the trials, since a minimal volume of water was taken at each sampling event. Over the duration of the bench-scale test work, approximately 6.5% of the total water volume was removed for analysis during the 13 weeks of testing. Trials were taken down following receival of week 13 ALS results on November 17, 2020.

A sample of the W12 water that was left over following the experiment setup and stored at room temperature was also sampled at week 13. This provided a second control comparator for conditions in the absence of any soluble carbon or woodchip amendment.

2.3.4 Woodchip Trial

A small trial consisting of 1 L of woodchips and 15 L of W12 water was created to inform on whether the woodchips added as a source of organic carbon would cause any leaching of metals into the trials. The water was sampled prior to addition of woodchips, 24 hours post addition, and 6 days after addition for dissolved organic carbon, dissolved metals, and nitrogen species.

2.4 PIT LAKE RESULTS

2.4.1 Constituent Leaching from Woodchips

Woodchips were added to each of the trials to provide a slow-release source of carbon and an anchor upon which beneficial microbes can colonize. Leaching of parameters from the woodchips was assessed (Section 2.3.4) since the potential for substantial constituent leaching could increase treatment demands within the bench-scale experiments or in future applications in the Main Pit (Janin 2014). Parameters showing marked changes in dissolved concentration compared to the initial W12 water (i.e., >25% relative percent difference) are presented in Table 2-2 along with the percent change in concentrations over time. Positive

percent changes indicate an increase in concentration over time and were observed for barium, cadmium, manganese, potassium, rubidium, and zinc (Table 2-2). Where concentration increases were observed, the day 1 and day 6 concentrations were similar. This indicates that most constituent release occurred within the first 24 hours of the experiment and suggests that marked longer-term leaching is not expected. In most cases the absolute concentrations observed were low and all were below water quality guidelines. Cadmium and zinc released by the woodchips is expected to be removed under the sulphate-reducing conditions produced following soluble carbon addition.

Negative percent changes in concentration indicate a decrease in dissolved concentration over time. This was observed for ammonia, copper, lithium, nitrate, nitrite (by day 6), and tungsten. Removal of the nitrogen species likely resulted from some microbial activity stimulated by the DOC released by the woodchips. Since sulphate-reducing conditions were not observed in this experiment, the copper removal is likely due to sorption on the woodchips.

Table 2-2 Parameters leached or treated during woodchip leaching experiment

Parameter	Initial Concentration (mg/L)	Day 1 Concentration (mg/L)	Day 6 Concentration (mg/L)	Day 1 Change [1]	Day 6 Change [1]
Ammonia (as N)	1.4	0.85	0.050	-41%	-97%
Dissolved Barium	0.065	0.13	0.16	102%	143%
Dissolved Cadmium	0.000094	0.00018	0.00017	86%	78%
Dissolved Copper	0.086	0.053	0.033	-38%	-62%
Dissolved Lithium	0.0069	0.0050	0.0051	-28%	-26%
Dissolved Manganese	0.25	0.52	0.65	112%	162%
Nitrate (as N)	6.8	3.3	0.10	-52%	-99%
Nitrite (as N)	3.7	6.1	0.050	63%	-99%
Dissolved Potassium	14.2	18.9	20.1	33%	42%
Dissolved Rubidium	0.013	0.018	0.019	37%	46%
Dissolved Tungsten	0.0010	0.00073	0.00070	-28%	-31%
Dissolved Zinc	0.0099	0.036	0.038	265%	284%

[1] Negative percent change in concentration indicate a decrease in concentration (green) whereas a positive percent change indicates an increase in concentration (red) from the initial concentration.

2.4.2 Pit Lake Treatment Trials

Concentration changes during the 13 week trials are discussed for both COCs and parameters that provide additional information regarding the chemical reactions occurring in the experiment. Where a parameter has an effluent quality standard (EQS) and Minto Creek water quality objective (WQO) as defined in water licence QZ14-031, these are also displayed for reference purposes.

2.4.2.1 Explanatory Parameters

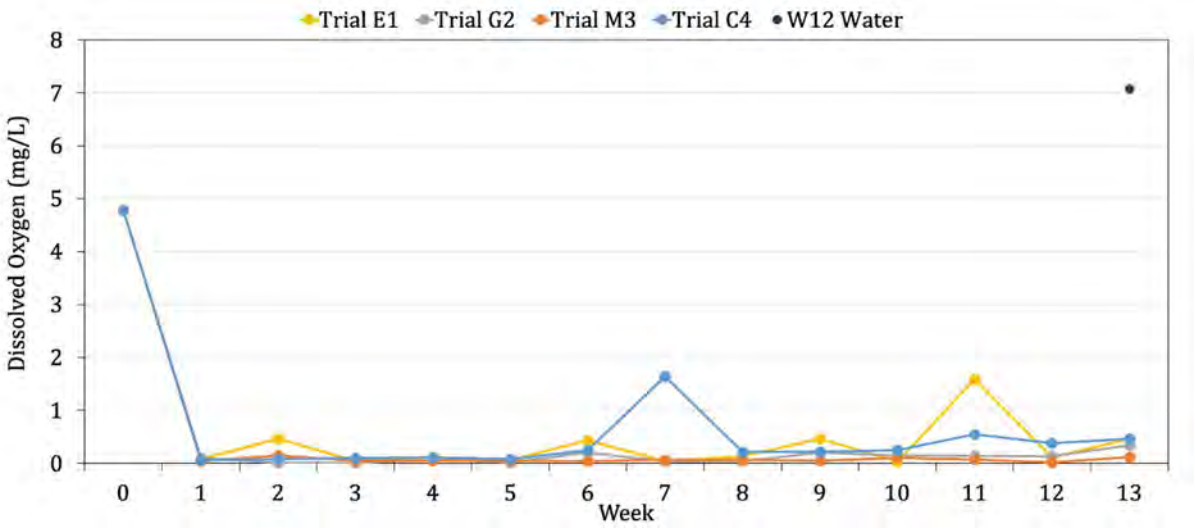
Explanatory parameters such as DO, ORP, DOC, and pH describe conditions of the environment and provide indirect information on the chemical reactions taking place. These parameters, when in specific ranges, can be used to predict and/or promote certain reactions in the aquatic environment.

In the Phase 1 bench-scale trials, reducing conditions are targeted to promote the reduction of nitrate, nitrite, sulphate, and selenium. Chalcophile metal COCs (e.g. cadmium, copper, molybdenum, zinc) are also treated under sulphate-reducing conditions through reaction with dissolved sulphide and subsequent precipitation as metal sulphide minerals. Reducing conditions are indicated by low DO concentrations (typically less than 1 mg/L) and depressed ORP values (Christensen et al., 2000). At the start of the experiment, the water sourced from W12 was characterized as aerobic (oxidizing) (DO greater than 1 mg/L and ORP greater than +50 mV). DO concentrations in all trials declined well below 1 mg/L by the first sampling event (week 1; Figure 2-2). Reducing conditions were achieved for all trials by the second sampling event (week 2), with DO concentrations and ORP ranging from 0.04 to 0.09 mg/L (Figure 2-2) and -276 to +33 mV (Figure 2-3), respectively. Trials dosed with molasses or glycerol (Trial M3 or G2, respectively) were the most reducing at week 2 and remained more reducing than other trials for most of the experiment. Strongly reducing conditions were maintained throughout the 13 weeks for the molasses Trial M3, whereas the glycerol Trial G2 maintained reducing conditions until week 12.

All trials, including the control Trial C4 had elevated initial DOC concentrations of about 35 to 52 mg/L (week 0 in Figure 2-4) as the W12 water received from site likely contained residual glycerol (although rinsed out before collection of W12 water, the tote used to ship the main pit water previously contained glycerol). The woodchips also provided carbon as seen by the small increase in DOC concentration in the control Trial C4 at week 0 post carbon addition and the approximate 20 mg/L plateau in DOC concentrations from week 6 until the end of the experiment. DOC concentrations in the molasses dosed Trial M3 also plateaued at week 6 at about 40 mg/L. Trials E1 and G2 fully consumed soluble DOC by week 8, matching the DOC concentration of the control. W12 water showed oxidizing conditions compared to the control Trial C4 by the end of the experiment (DO and ORP were about 7 mg/L and 144 mV in W12 water, respectively; Figure 2-2 and Figure 2-3), confirming that the woodchips supplied some additional DOC to the trials as intended. Some of the initial 38.4 mg/L of DOC in the W12 water was consumed, however after 13 weeks, 12.2 mg/L of DOC remained. The DOC in the original W12 water was slowly consumed by microbes and not capable of reducing DO compared to the control Trial C4.

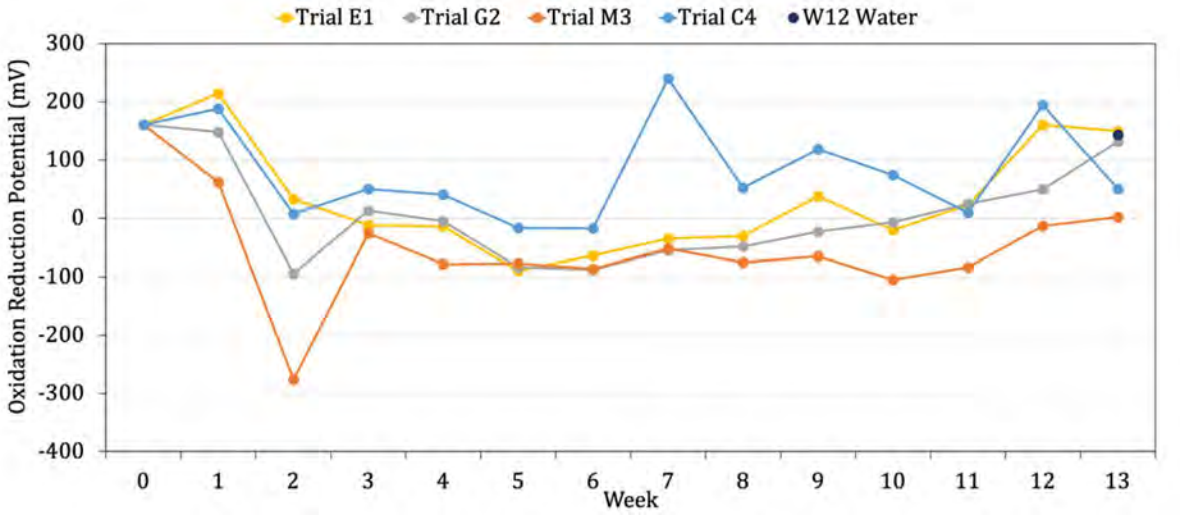
The pH declined in all trials by week 2, followed by an increase back to circumneutral pH, in particular for Trials M3 and G2 (Figure 2-5). This decline is likely due to the formation of organic acids (e.g., acetate) during the oxidation of molasses and glycerol. Acidity from the formation of these intermediate organic acids was adequately buffered by the alkalinity formed as a by-product of the mineralization of organic carbon by

sulphate-reducing bacteria. Furthermore, minimal pH decrease is expected in the field following carbon addition since it would take place over a number of weeks allowing the system to adequately buffer the effects of any intermediate organic acid production, versus the pulse addition used in the pilot-scale trials.



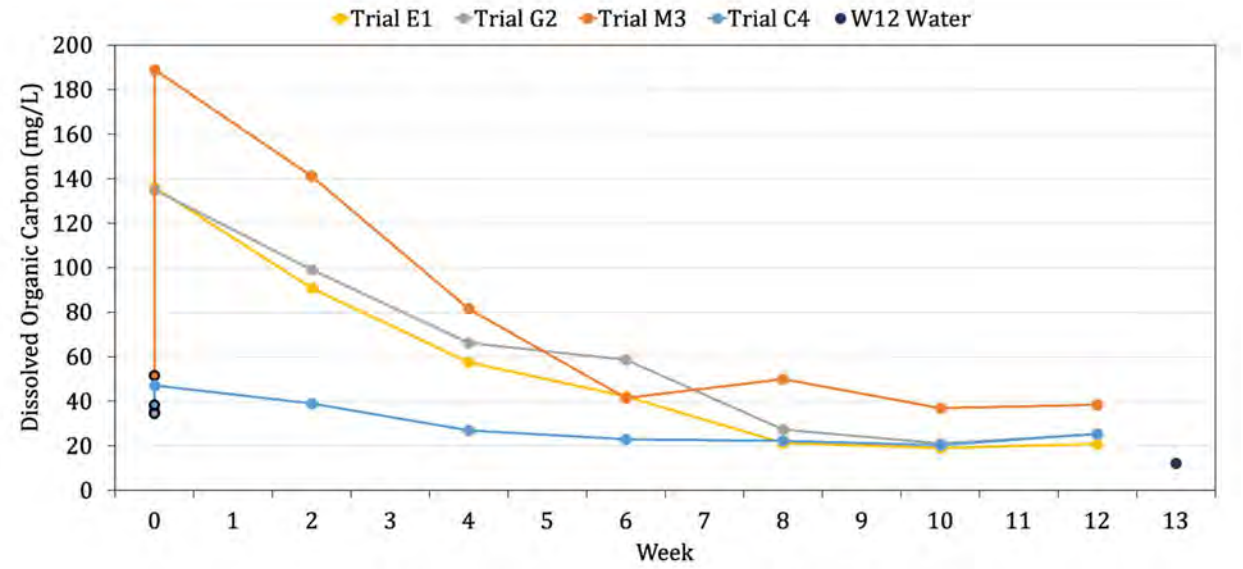
Trials E1, G2 and M3 are ethanol, glycerol and molasses dosed trials, respectively. Trial C4 is the control trial. W12 water was sampled at week 13 and is the same W12 water used to set up the experiment but stored at room temperature without any soluble carbon or woodchips addition.

Figure 2-2 Dissolved Oxygen Concentrations in the Bench-scale Trials from Weeks 0 to 13



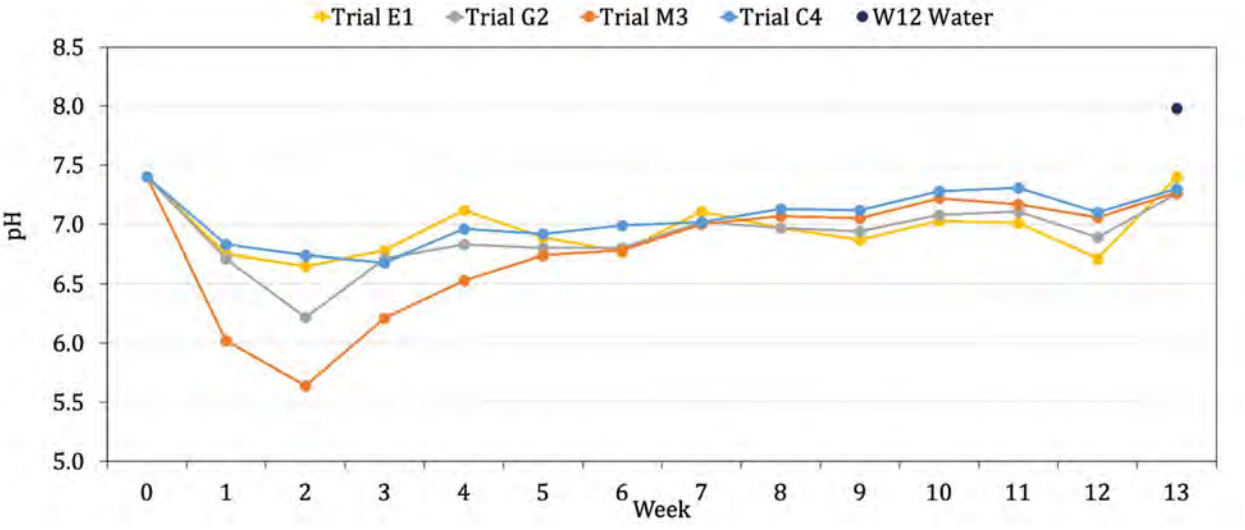
Trials E1, G2 and M3 are ethanol, glycerol and molasses dosed trials, respectively. Trial C4 is the control trial. W12 water was sampled at week 13 and is the same W12 water used to set up the experiment but stored at room temperature without any soluble carbon or woodchips addition.

Figure 2-3 Oxidation Reduction Potential in the Bench-scale Trials from Weeks 0 to 13



Trials E1, G2 and M3 are ethanol, glycerol and molasses dosed trials, respectively. Trial C4 is the control trial. W12 water was sampled at week 13 and is the same W12 water used to set up the experiment but stored at room temperature without any soluble carbon or woodchips addition. Data at Week 0 outlined in black indicate baseline DOC concentrations prior to the addition of soluble carbon and woodchips.

Figure 2-4 Dissolved Organic Carbon Concentrations in the Bench-scale Trials from Weeks 0 to 13



Trials E1, G2 and M3 are ethanol, glycerol and molasses dosed trials, respectively. Trial C4 is the control trial. W12 water was sampled at week 13 and is the same W12 water used to set up the experiment but stored at room temperature without any soluble carbon or woodchips addition.

Figure 2-5 pH in the Bench-scale Trials from Weeks 0 to 13

2.4.2.1.1 Manganese and Iron

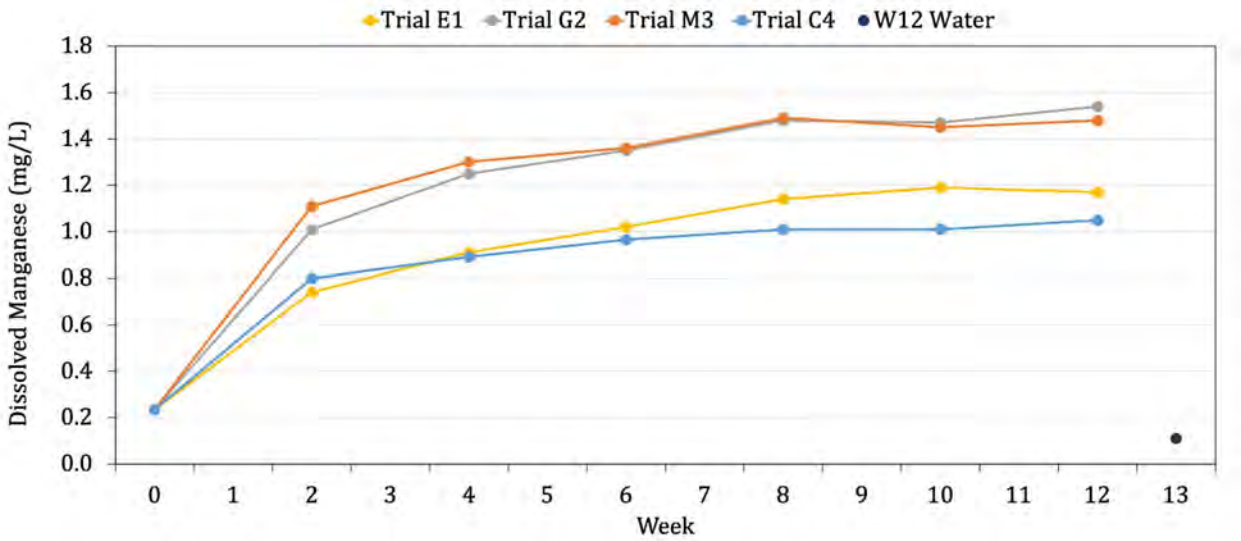
Manganese and iron are important indicators of microbial activity and of the achievement of reducing conditions, shown by increases in dissolved manganese and ferrous iron concentrations (Londry, 2013). As manganese and iron are held in the substrate (i.e., waste rock, tailings) as (hydr)oxides, the development of more reducing conditions typically results in their transient release as the host phases are dissolved under manganese- and iron- reducing conditions.

Dissolved manganese concentrations increased by week 2 in all trials and slowly continued to increase until the end of the experiment (Figure 2-6). Trials M3 and G2 had the highest dissolved manganese concentrations by the end of the experiment of about 1.5 mg/L. The woodchip leaching trials resulted in an increase in manganese concentration of approximately 0.4 mg/L over one week (Table 2-2). The manganese concentration in the control Trial C4 increase by approximately 0.5 mg/L over the first two weeks of the experiment, likely due to leaching from the woodchips, and by approximately 0.8 mg/L by week 12. The additional manganese release observed in later weeks may be due to some partial manganese reduction fuelled by the DOC released by the woodchips. Nevertheless, it is likely that approximately one third of the manganese concentration observed at the end of the soluble carbon amended trials is derived from the woodchips rather than from reductive mobilization of the waste rock and/or tailings. It should be noted that manganese does not have an EQS or WQO defined in QZ14-031.

Dissolved iron concentrations in the trials are presented in Figure 2-7. Dissolved iron increased in concentration by week 2 and peaked by week 4 for trials dosed with soluble carbon (Trials E1, G2 and M3) (Figure 2-7). Concentrations subsequently decreased in these trials through the remainder of the 13 weeks and were below the EQS and WQO by weeks 6 and 10, respectively. Dissolved iron in the control Trial C4 remained near the detection limit for most of the trial with marginal increases observed at week 2 and 4.

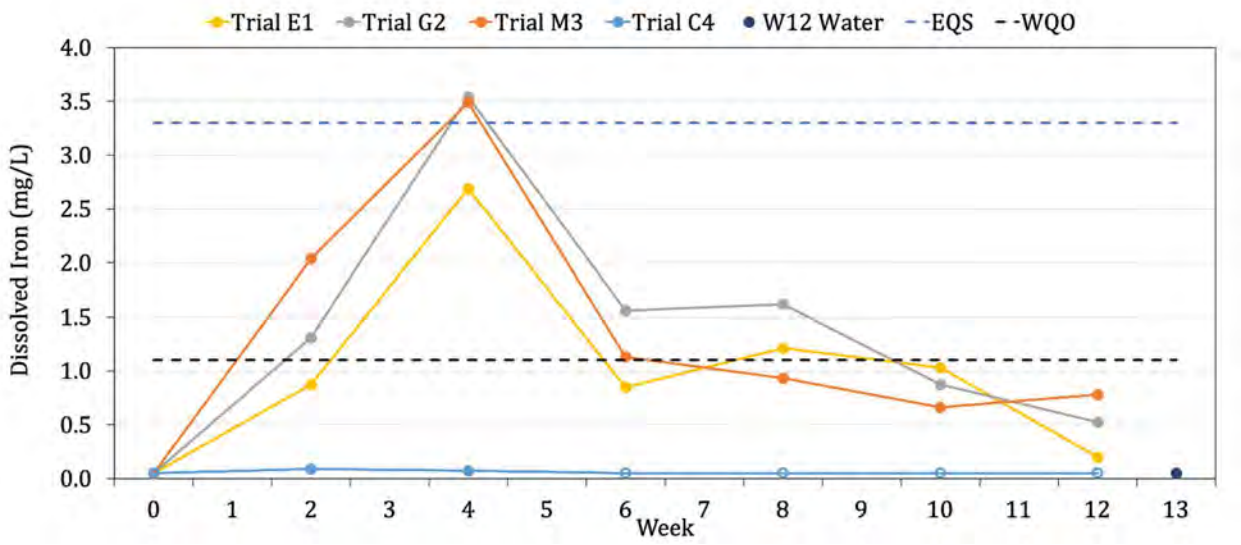
The dissolved manganese and iron mobilization confirm the reducing conditions observed through DO and ORP (Section 2.4.2), and coincide with the majority of DOC being consumed by week 4 in the liquid carbon dosed trials and the lower amount of DOC provided by the control Trial C4 (Figure 2-4). The changes in dissolved iron concentrations in the soluble carbon dosed trials are explained by conversion of insoluble iron (hydr)oxides to soluble ferrous iron as the trials became reducing and then precipitation of reduced iron into sulphide minerals. This is supported by the black coloration to the water of the carbon amended trials observed when dismantling the experiments, suggestive of iron sulphides. The low and unchanged concentration of dissolved iron throughout the experiment in the control Trial C4 is likely because iron-reducing conditions were not achieved. Dissolved manganese and iron did not increase in W12 water after 13 weeks because the water was oxidizing and there was no substrate to leach significant amounts of iron or manganese.

Dissolved iron and manganese are susceptible to oxidation and precipitation under oxidizing conditions at circumneutral pH. As such, elevated iron and manganese concentrations can be managed via passive aeration and/or filtration in downstream waterbodies (e.g., the water storage pond or constructed wetland treatment system).



Trials E1, G2 and M3 are ethanol, glycerol and molasses dosed trials, respectively. Trial C4 is the control trial. W12 water was sampled at week 13 and is the same W12 water used to set up the experiment but stored at room temperature without any soluble carbon or woodchips addition. Manganese does not have an EQS or WQO defined in QZ14-031.

Figure 2-6 Dissolved Manganese Concentrations in the Bench-scale Trials from Weeks 0 to 13



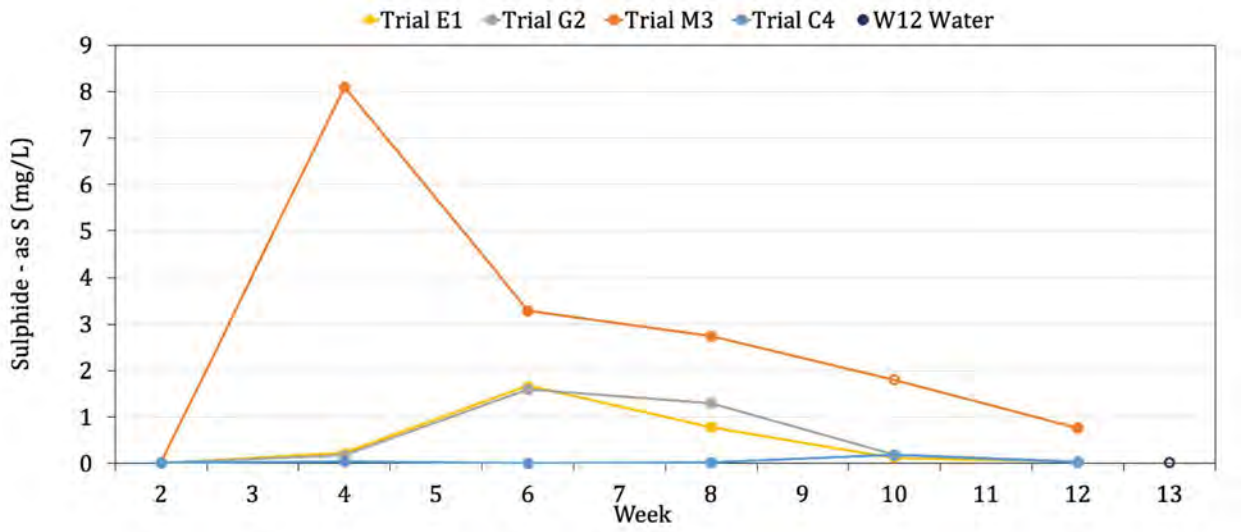
Trials E1, G2 and M3 are ethanol, glycerol and molasses dosed trials, respectively. Trial C4 is the control trial. W12 water was sampled at week 13 and is the same W12 water used to set up the experiment but stored at room temperature without any soluble carbon or woodchips addition. Open circles indicate concentrations were below detection (<0.05 mg/L).

Figure 2-7 Dissolved Iron Concentrations in the Bench-scale Trials from Weeks 0 to 13

2.4.2.1.2 Sulphide

The sulphide concentrations in the water are an important marker to identify chalcophile metals removal (e.g. cadmium, copper, molybdenum, zinc), which is driven by sulphide mineral precipitation. The molasses

Trial M3 produced the highest sulphide concentrations, which peaked at 8.1 mg/L (as S) by week 4 before being slowly consumed, likely by precipitation with iron and chalcophile metals (Figure 2-8). Sulphide production coincided with the majority of DOC consumption at week 4 and the low ORP measured through the experiment (Section 2.4.2). Trials E1 and G2 produced sulphide by week 6, which was partly consumed by iron or re-oxidized to sulphate by week 10. Sulphide production in Trials E1 and G2 coincided with a decrease in dissolved iron (indicating iron sulphide formation) and strongly reducing conditions similar to the molasses Trial M3 (Section 2.4.2). The control Trial C4 produced minimal sulphide as sulphate reducing conditions were not achieved. No sulphide was observed in the W12 water at week 13 because the water was oxidizing.



Trials E1, G2 and M3 are ethanol, glycerol and molasses dosed trials, respectively. Trial C4 is the control trial. W12 water was sampled at week 13 and is the same W12 water used to set up the experiment but stored at room temperature without any soluble carbon or woodchips addition. Open circles indicate concentrations were below detection (<0.018 to <1.8 mg/L).

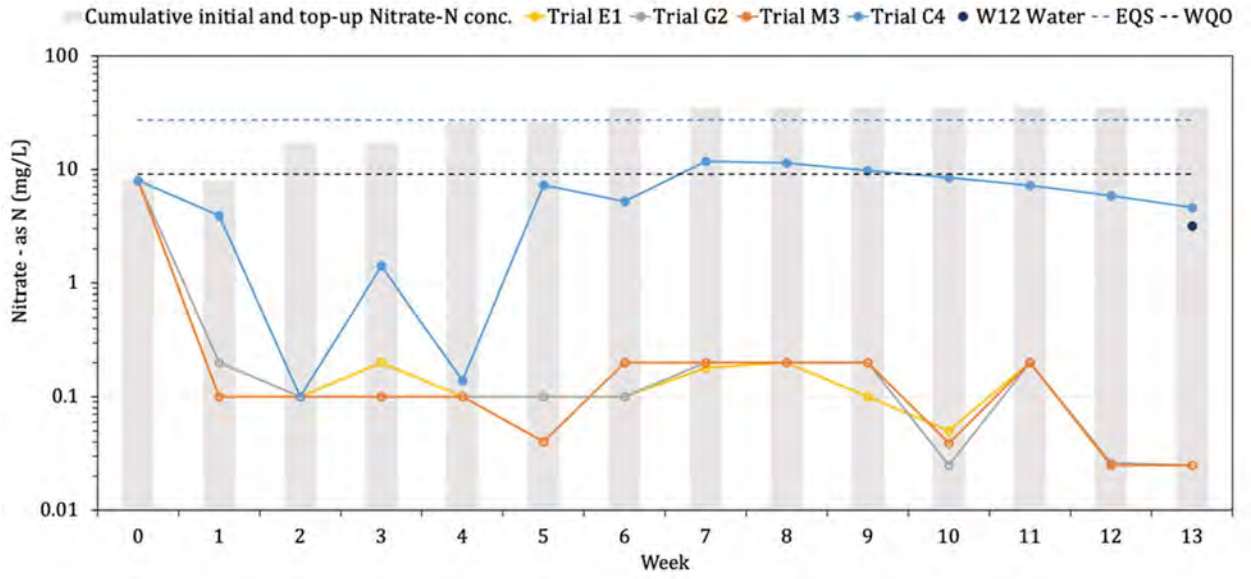
Figure 2-8 Sulphide Concentrations in the Bench-scale Trials from Week 2 to 13

2.4.2.2 Nitrite and Nitrate Removal

An important aspect of this work was to evaluate nitrogen species treatment in the Main Pit. It is recognized that during operations and into early post-closure, nitrogen species will be continually supplied to the pit water as waste rock deposited both within the pit and in subaerial piles located within the pit catchment is flushed, releasing nitrogen present from blast residues. To approximate this, nitrogen species in all four trials were topped up at weeks 2, 4, and 6 following the initial carbon amendment at week 0. The cumulative nitrogen species concentration added over these three top-up events was equivalent to the 90th percentile concentration present in the Min Pit between 2016 and 2018, and 2020 (i.e., during operations, when nitrogen species concentrations were elevated), and therefore presents a conservative basis for evaluating nitrogen removal through the trials.

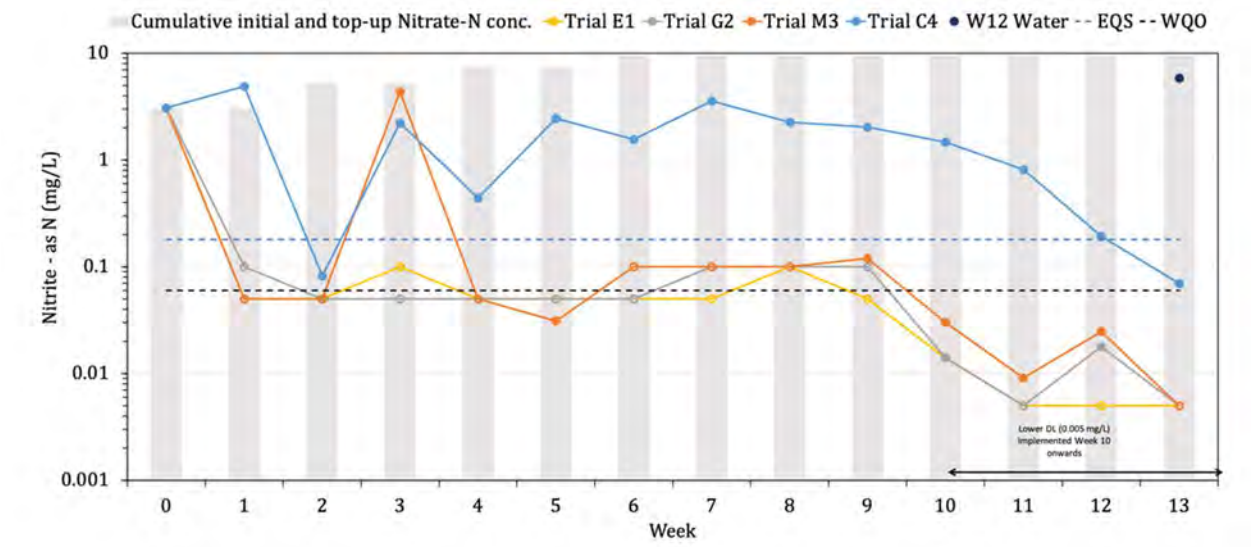
Changes in nitrate and nitrite concentrations for each trial are displayed in Figure 2-9 and Figure 2-10, respectively. The water licence QZ14-031 EQS and Minto Creek WQO for both nitrogen species are also displayed for reference purposes. Rapid removal of both nitrate and nitrite was observed in all three trials dosed with soluble organic carbon (i.e., Trials E1, G2, and M3) such that the concentrations of both nitrogen species were below detection at the week 1 sampling event (Figure 2-9 and Figure 2-10). Slower removal was observed in the control Trial C4 due to the lower DOC content of this trial (supplied by the woodchips and residual DOC from the W12 water received). Nitrate and nitrite concentrations rebounded in the control Trial C4, but remained below detection or below the water quality objective (WQO) by week 13 for the three carbon amended trials (Trials E1, G2, and M3) despite the addition of nitrate and nitrite top ups at weeks 2, 4, and 6 (Figure 2-9 and Figure 2-10). Note that elevated detection limits were encountered for nitrite-N (0.1 mg/L) for some sampling events; a lower detection limit (0.005 mg/L) was implemented as of week 10 which demonstrated that treated nitrite concentrations were well below the WQO and commonly below detection (Figure 2-10). All carbon amended trials (Trials E1, G2, and M3) removed nitrate and nitrite to a similar extent.

There was only slight treatment of nitrate (decreased by 4.8 mg/L-N) in the unamended W12 water sample that was stored at room temperature. This was likely due to some partial denitrification driven by the residual DOC present in this sample and some reduction of nitrate to nitrite, as evidence by the 2.8 mg/L increase in nitrite-N concentration. However concentrations of nitrate and nitrite were much higher in sample W12 at week 13 compared to the three carbon amended trials (Trials E1, G2, and M3), which were below detection.



Trials E1, G2 and M3 are ethanol, glycerol and molasses dosed trials, respectively. Trial C4 is the control trial. W12 water was sampled at week 13 and is the same W12 water used to set up the experiment but stored at room temperature without any soluble carbon or woodchips addition. Open circles indicate concentrations were below detection (<0.025 to <0.2 mg/L).

Figure 2-9 Nitrate Concentrations in the Bench-scale Trials from Weeks 0 to 13 (Note Log Scale)



Trials E1, G2 and M3 are ethanol, glycerol and molasses dosed trials, respectively. Trial C4 is the control trial. W12 water was sampled at week 13 and is the same W12 water used to set up the experiment but stored at room temperature without any soluble carbon or woodchips addition. Open circles indicate concentrations were below detection (<0.005 to <0.1 mg/L).

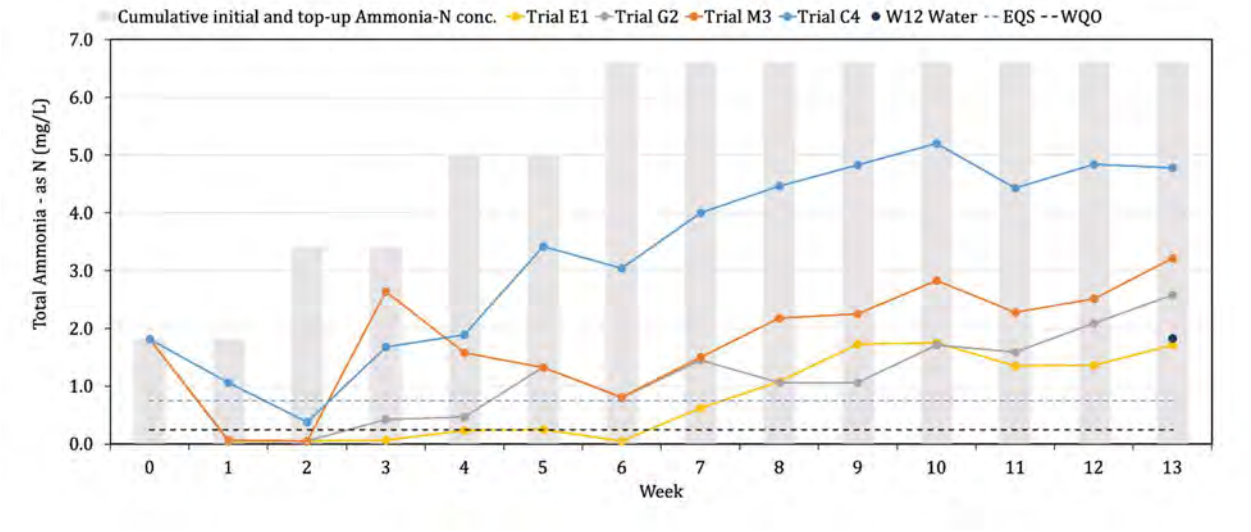
Figure 2-10 Nitrite Concentrations in the Bench-scale Trials from Weeks 0 to 13 (Note Log Scale)

2.4.2.3 Ammonia Removal

Removal of ammonia occurred over the first few weeks for all four trials to below the EQS (Figure 2-11). Marked ammonia removal was not expected in these experiments as the primary route of removal is likely via microbial assimilation rather than the denitrification pathway for nitrate and nitrite. Nevertheless, considerable ammonia removal was observed in the trials amended with soluble organic carbon, notably in the ethanol (Trial E1) and glycerol (Trial G2) spiked experiments (Figure 2-11). Treatment to below the WQO (0.25 mg/L) was observed at weeks 1 and 2 for all three carbon amended trials prior to the ammonia top up events, which resulted in increased ammonia concentrations above both the WQO and EQS as the trials progressed (Figure 2-11). In addition to assimilation of ammonia during microbial growth, anaerobic ammonia oxidizing microbes may also have facilitated the ammonia removal observed; however, microbiological analyses were outside the scope of this bench scale study.

No significant change in the ammonia concentration of the W12 water was observed at the end of the 13 week experiment.

Although significant ammonia removal was observed in the soluble carbon amended trials, further actions may be necessary in order to achieve concentrations below the EQS.

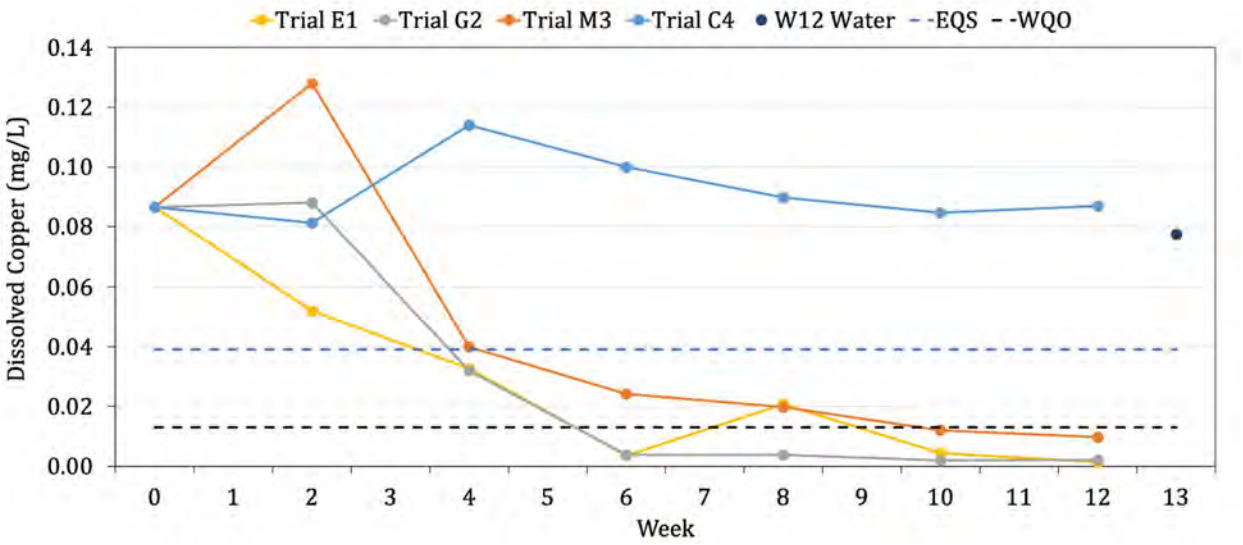


Trials E1, G2 and M3 are ethanol, glycerol and molasses dosed trials, respectively. Trial C4 is the control trial. W12 water was sampled at week 13 and is the same W12 water used to set up the experiment but stored at room temperature without any soluble carbon or woodchips addition. Open circles indicate concentrations were below detection (<0.05 mg/L).

Figure 2-11 Ammonia Concentrations in the Bench-scale Trials from Weeks 0 to 13

2.4.2.4 Copper Removal

Copper concentrations increased initially in the molasses amended Trial M3 (Figure 2-12). The peak observed at week 2 in this trial is likely related to the lowest pH observed at this stage across all trials (pH 5.6; Figure 2-5), which may have facilitated copper leaching from the waste rock and/or tailings. Strongly reducing conditions (i.e., sulphate-reducing) in the three carbon amended trials were established by weeks 4 to 6, combined with a return to circumneutral pH. This coincided with a marked decline in dissolved copper concentrations such that concentrations were below the EQS (0.039 mg/L for DOC<10 mg/L at station W2) by week 6 (Figure 2-12). Copper concentrations in the glycerol Trial G2 were also lower than the WQO (0.013 mg/L for DOC<10 mg/L at station W2) for week 6 onwards. The dissolved copper concentration in the ethanol Trial E1 were below the WQO for weeks 6, 10, and 12, whereas dissolved copper levels in the molasses Trial M3 declined more slowly and were below the WQO for the final two sampling events (weeks 10 and 12) (Figure 2-12). By contrast, no copper removal was observed in the control, Trial C4, reflecting the lack of sulphate-reducing conditions in this experiment. This also suggests that sorption of copper on woodchips is minimal in these larger water volume experiments (and higher water to woodchip ratio) compared to the smaller woodchip leaching experiment (Section 2.4.1).

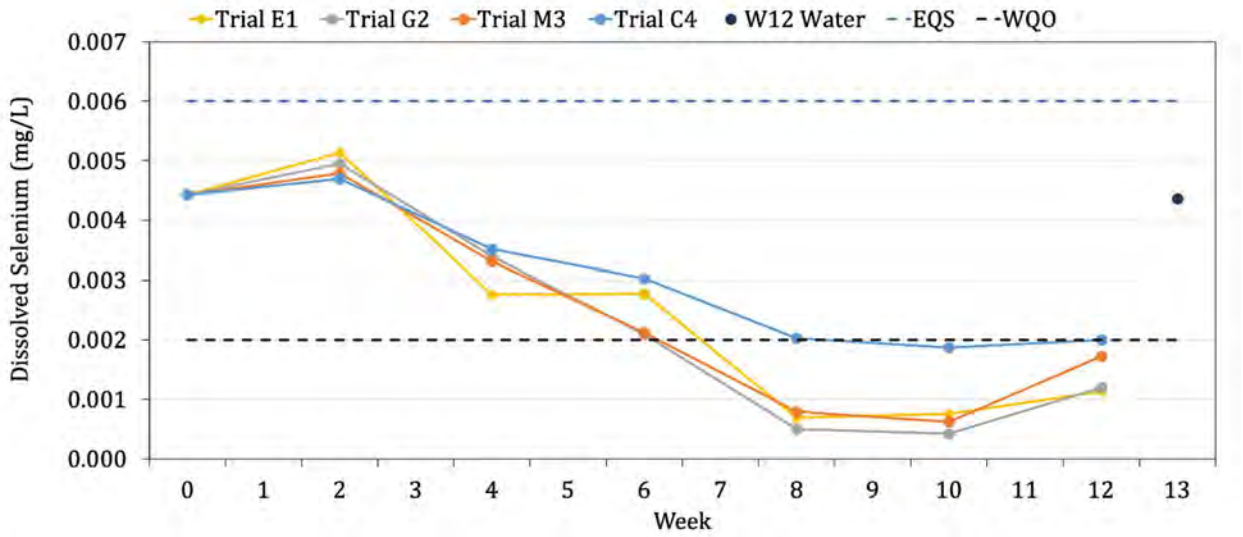


Trials E1, G2 and M3 are ethanol, glycerol and molasses dosed trials, respectively. Trial C4 is the control trial. W12 water was sampled at week 13 and is the same W12 water used to set up the experiment but stored at room temperature without any soluble carbon or woodchips addition. The EQS and WQO are determined based on the DOC measured at station W2; the lowest EQS and WQO (i.e., DOC <10 mg/L at station W2) are displayed for comparitive purposes.

Figure 2-12 Dissolved Copper Concentrations in the Bench-scale Trials from Weeks 0 to 13

2.4.2.5 Selenium Removal

Selenium concentrations declined over time for all four trials, with the largest decrease observed for the liquid carbon spiked trials (Figure 2-13). By week 8, selenium concentrations were below the WQO (0.002 mg/L) for all three carbon amended trials, with the glycerol amended experiment (Trial G2) showing the lowest selenium concentrations at weeks 8 (0.0005 mg/L) and 10 (0.00042 mg/L). All carbon amended trials (Trials E1, G2, and M3) treated well below the selenium concentrations in the oxidizing W12 water by the end of the experiment. The selenium, removal observed is likely due to reduction of selenate and/or selenite to elemental selenium [Se(0)] and subsequent removal of the insoluble Se(0) from the water column. Given that selenate reduction is situated close to the redox potential of nitrate and manganese reduction in the "redox ladder" (Figure 2-1), and that reduction of both nitrate and manganese was inferred to occur in Control C4, the selenium treatment noted in Trial C4 is also likely also due to reductive precipitation to Se(0).



Trials E1, G2 and M3 are ethanol, glycerol and molasses dosed trials, respectively. Trial C4 is the control trial. W12 water was sampled at week 13 and is the same W12 water used to set up the experiment but stored at room temperature without any soluble carbon or woodchips addition.

Figure 2-13 Dissolved Selenium Concentrations in the Bench-scale Trials from Weeks 0 to 13

2.4.2.6 Other Constituents of Interest

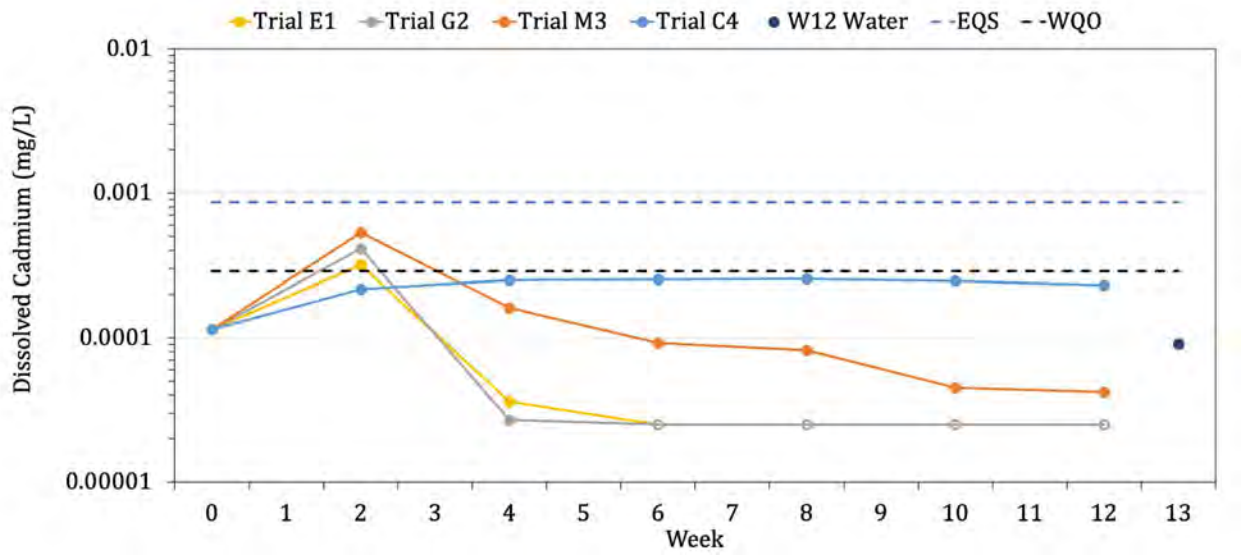
Treatment was also observed for the other chalcophile metals such as cadmium, molybdenum, and zinc, which have defined EQS and WQOs. Dissolved cadmium concentrations initially increased, perhaps due to leaching of cadmium from the woodchips as observed in the leaching experiment (Section 2.4.2); however, release from the tailings and/or waste rock added to the trials cannot be excluded given the pH was lowest for Trials G2 and M3 at week 2. The maximum cadmium concentrations stayed below the EQS (Figure 2-14). Trials E1 and G2 treated cadmium to the detection limit (<0.000025 mg/L) by week 6 to the end of the experiment as strong sulphate-reducing conditions were formed. The molasses dosed Trial M3 treated cadmium to a lesser extent and the control Trial C4 showed no cadmium removal.

Dissolved molybdenum concentrations declined fastest in the molasses Trial M3, in which treated concentrations broadly stabilized after week 4 ranging between 0.0036 and 0.0063 mg/L compared to an initial concentration of 0.027 mg/L (Figure 2-15). Molybdenum concentrations declined more slowly in the glycerol Trial G2, requiring 12 weeks to reach similar concentrations (0.0049 mg/L) to Trial M3. The ethanol Trial E1 treated molybdenum to a lesser degree compared to Trials M3 and G2, whereas the control Trial C4 showed no treatment. Concentrations of molybdenum were below the WQO for the whole experiment.

Dissolved zinc concentrations initially increased above both the WQO (0.03 mg/L) and EQS (0.09 mg/L) in the molasses Trial M3 and above the WQO in the glycerol Trial G2 at week 2 (Figure 2-16). This may be due to leaching from the woodchips and/or substrate, although no marked increase was observed in the control or ethanol dosed trials. The low pH observed at week 2 for these trials likely also resulted in some zinc leaching from the waste rock and/or tailings. Regardless, zinc concentrations declined by week 4 and showed removal in the soluble carbon dosed trials over the course of the experiment. Trials G2 and E1 treated zinc to below or near the detection limit (0.005 mg/L) from week 6 until the end of the experiment. The molasses Trial M3 showed more moderate zinc removal compared to the ethanol or glycerol amended trials with concentrations slightly below the W12 water at the end of the experiment (Figure 2-16). The control Trial C4 showed no removal with similar zinc concentrations observed throughout the trial.

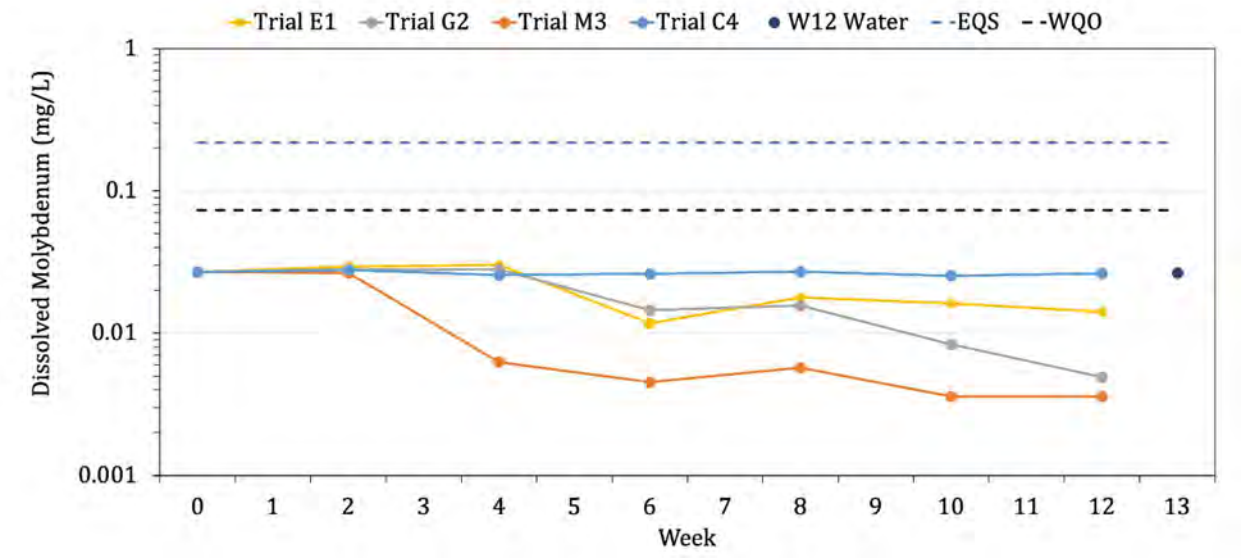
While arsenic is not a COC at the Minto Mine Site, it was evaluated since the observed mobilization of dissolved iron (Section 2.4.2.1.1), likely via reductive dissolution of iron (hydr)oxides in the waste rock and tailings, has potential for concomitant release of arsenic. No release of significant concentrations of arsenic were observed during the experiment (Figure 2-17).

Cobalt and phosphorus showed some leaching during the early weeks of the bench-scale experiment (Figure 2-18and Figure 2-19), likely from the waste rock and/or tailings, as there was no leaching of these parameters in the woodchip leaching experiment. Nevertheless, both elements were treated to the detection limit of (<0.0005 and <0.25 mg/L, respectively) by week 10 or sooner in Trials E1 and G2. Cobalt and phosphorus do not have an EQS or WQO under in water licence QZ14-031.



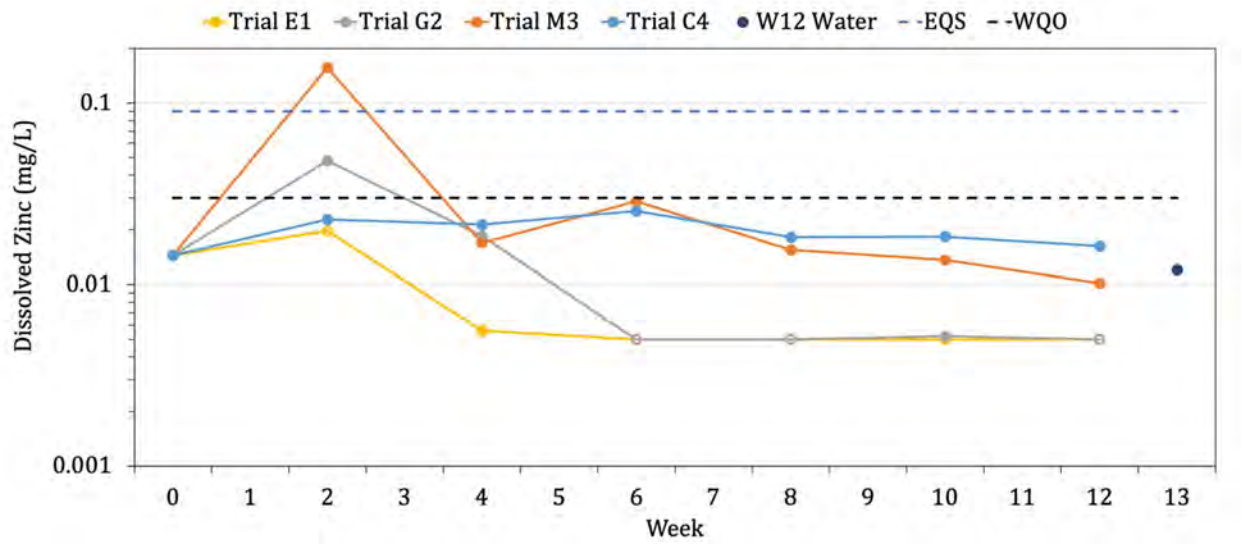
Trials E1, G2 and M3 are ethanol, glycerol and molasses dosed trials, respectively. Trial C4 is the control trial. W12 water was sampled at week 13 and is the same W12 water used to set up the experiment but stored at room temperature without any soluble carbon or woodchips addition. Open circles indicate concentrations were below detection (<0.000025 mg/L). The EQS and WQO are hardness dependent. The first quartile hardness (152 mg/L) for station W2 (AEG, 2018) was used to calculate the EQS and WQO, which are displayed for comparitive purposes

Figure 2-14 Dissolved Cadmium Concentrations in the Bench-scale Trials from Weeks 0 to 13 (Note Log Scale)



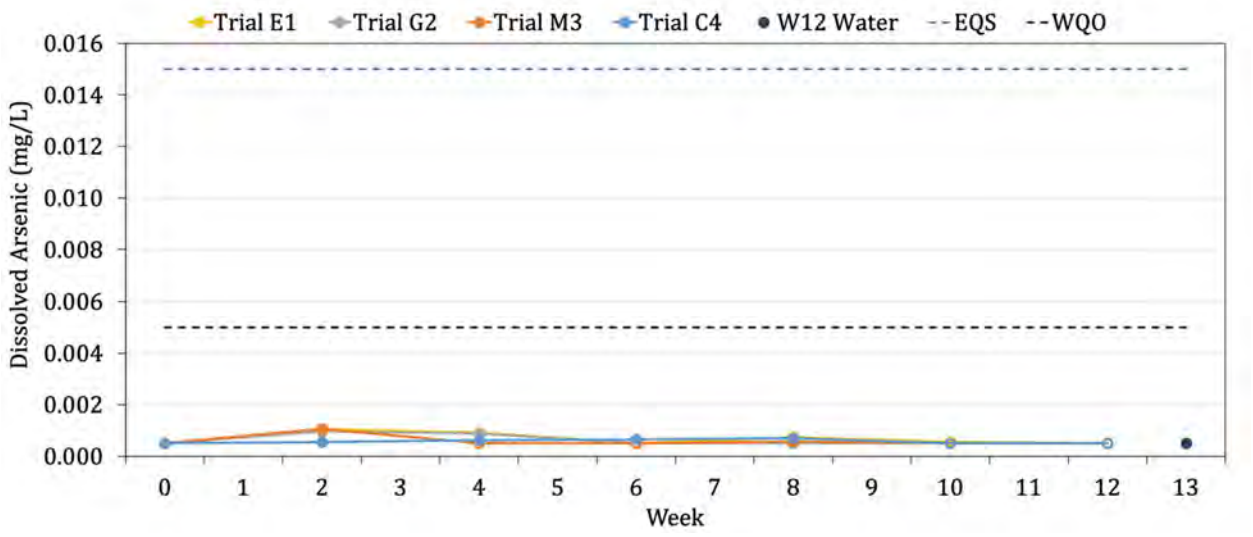
Trials E1, G2 and M3 are ethanol, glycerol and molasses dosed trials, respectively. Trial C4 is the control trial. W12 water was sampled at week 13 and is the same W12 water used to set up the experiment but stored at room temperature without any soluble carbon or woodchips addition.

Figure 2-15 Dissolved Molybdenum Concentrations in the Bench-scale Trials from Weeks 0 to 13 (Note Log Scale)



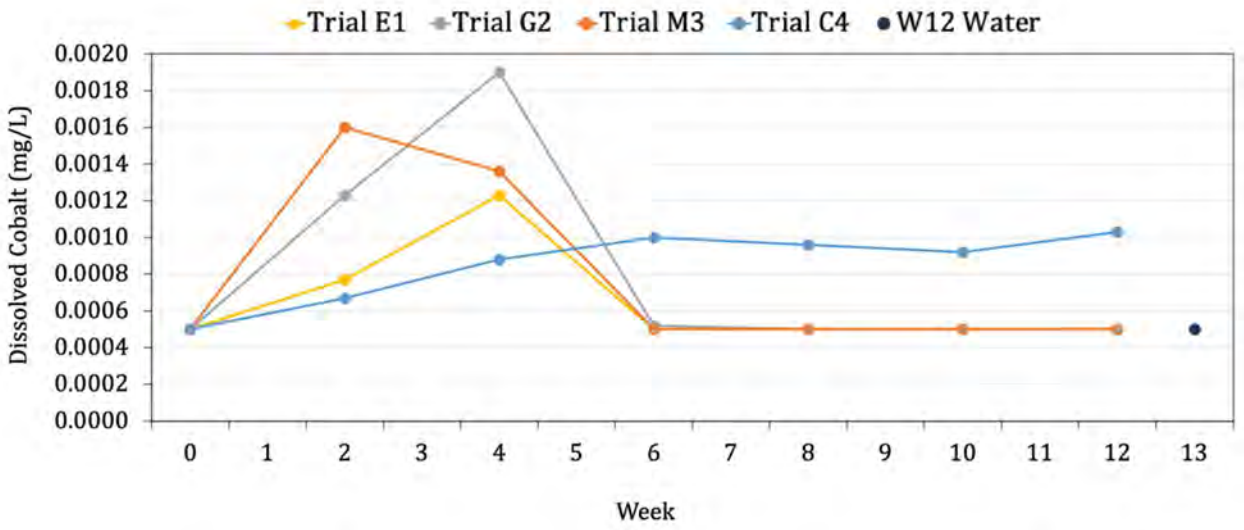
Trials E1, G2 and M3 are ethanol, glycerol and molasses dosed trials, respectively. Trial C4 is the control trial. W12 water was sampled at week 13 and is the same W12 water used to set up the experiment but stored at room temperature without any soluble carbon or woodchips addition. Open circles indicate concentrations were below detection (<0.005 mg/L).

Figure 2-16 Dissolved Zinc Concentrations in the Bench-scale Trials from Weeks 0 to 13 (Note Log Scale)



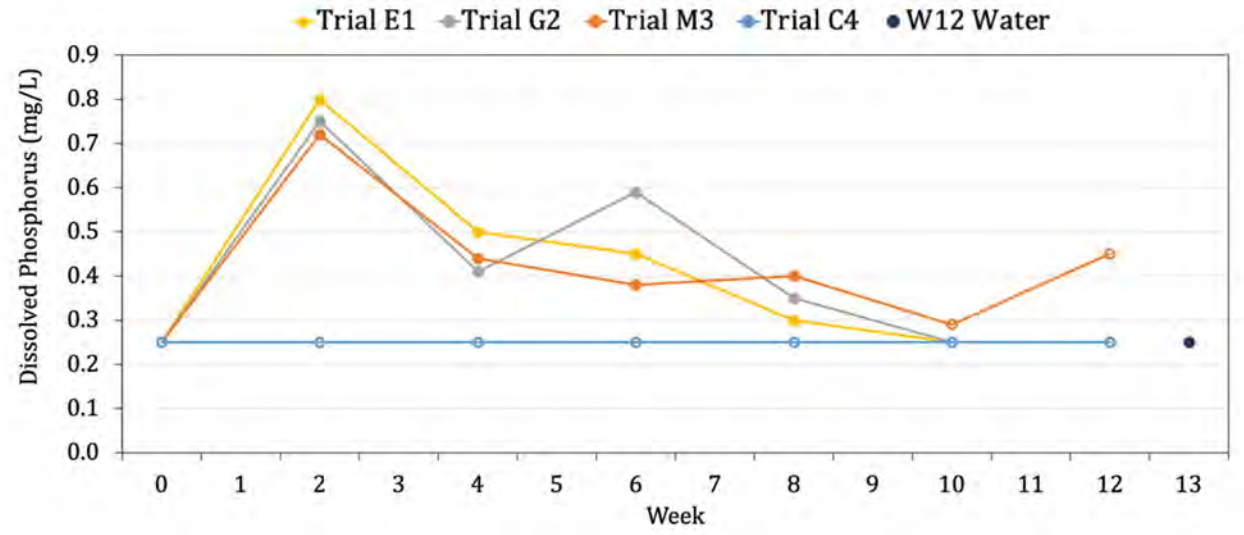
Trials E1, G2 and M3 are ethanol, glycerol and molasses dosed trials, respectively. Trial C4 is the control trial. W12 water was sampled at week 13 and is the same W12 water used to set up the experiment but stored at room temperature without any soluble carbon or woodchips addition. Open circles indicate concentrations were below detection (<0.0005 mg/L).

Figure 2-17 Dissolved Arsenic Concentrations in the Bench-scale Trials from Weeks 0 to 13



Trials E1, G2 and M3 are ethanol, glycerol and molasses dosed trials, respectively. Trial C4 is the control trial. W12 water was sampled at week 13 and is the same W12 water used to set up the experiment but stored at room temperature without any soluble carbon or woodchips addition. Cobalt does not have an EQS or WQO defined in QZ14-031. Open circles indicate concentrations were below detection (<0.0005 mg/L).

Figure 2-18 Dissolved Cobalt Concentrations in the Bench-scale Trials from Weeks 0 to 13



Trials E1, G2 and M3 are ethanol, glycerol and molasses dosed trials, respectively. Trial C4 is the control trial. W12 water was sampled at week 13 and is the same W12 water used to set up the experiment but stored at room temperature without any soluble carbon or woodchips addition. Phosphorous does not have an EQS or WQO defined in QZ14-031. Open circles indicate concentrations were below detection (<0.25 mg/L).

Figure 2-19 Dissolved Phosphorus Concentrations in the Bench-scale Trials from Weeks 0 to 13

2.5 PIT LAKE TREATMENT SUMMARY

2.5.1 Constituent Removal

The maximum constituent removal observed during the trials and the removal maintained at the end of the experiment is summarized in Table 2-3. The Phase 1 trial demonstrated:

- Near quantitative removal of nitrate and nitrite (>99.9%) to below both EQS and WQO for all three soluble carbon sources tested;
- Copper treatment for all three soluble carbon types to below both the EQS and WQO with 89% (molasses) to 98% removal (ethanol & glycerol) observed at the end of the three month experiment;
- Sustained selenium removal of 61% (molasses) to 74% (ethanol and glycerol) at the end of the experiment, below both the EQS and WQO;
- Removal of other chalcophile metals (cadmium, molybdenum, zinc) due to precipitation as metal sulphide minerals; and
- Marked ammonia removal was not expected in these experiments as the primary route of removal is likely via microbial assimilation rather than the denitrification pathway for nitrate and nitrite; nevertheless, considerable ammonia removal was observed such that 51% to 74% of the cumulative ammonia added to the trials was removed at the end of the experiment;
- Glycerol and ethanol generally exhibited superior COC removal compared to molasses.

Table 2-3 Percent Removal of Constituents of Concern

Constituent	Percent Removal[1]							
	Trial E1		Trial G2		Trial M3		Trial C4	
	Max[2]	Week 12/13[3]	Max[2]	Week 12/13[3]	Max[2]	Week 12/13[3]	Max[2]	Week 12/13[3]
Ammonia (as N)	99%	74%	97%	61%	97%	51%	79%	28%
Nitrate (as N)	99.9%	99.9%	99.9%	99.9%	99.9%	99.9%	99.2%	87%
Nitrite (as N)	99.9%	99.9%	99.9%	99.9%	99.9%	99.9%	99.3%	99.3%
Dissolved Copper	98%	98%	98%	98%	89%	89%	6%	-1%
Dissolved Selenium	84%	74%	91%	73%	86%	61%	58%	55%
Dissolved Cadmium	78%	78%	78%	78%	63%	63%	0%	-103%
Dissolved Molybdenum	56%	47%	82%	82%	87%	87%	6%	1%
Dissolved Zinc	65%	65%	65%	65%	29%	29%	0%	-13%

[1] Percent removal for each Trial calculated against Week 0 Concentrations for dissolved Cd, Cu, Mo, Se and Zn and the cumulative N-species added for ammonia, nitrate and nitrite. Negative percent removals indicate concentration was greater than at week 0.
[2] Maximum observed COC removal throughout trial.
[3] COC removal at end of experiment (week 12 for dissolved Cd, Cu, Mo, Se and Zn or week 13 for ammonia, nitrate and nitrite).

2.5.2 Constituent Release During Trials

Strongly reducing conditions were achieved within a few weeks of soluble carbon amendment. In addition to the COC removal indicated, mobilization of dissolved iron and manganese was also observed due to reductive dissolution of iron and manganese phases in waste rock, tailings and/or leaching from the woodchips (manganese). Iron concentrations declined as iron was subsequently sequestered by iron sulphide formation under sulphate-reducing conditions; however, dissolved manganese concentrations remained elevated. Both iron and manganese are susceptible to oxidative precipitation under circumneutral to mildly alkaline pH conditions and can be managed via passive aeration and/or filtration in downstream waterbodies (e.g., the water storage pond or constructed wetland treatment system) should in pit treatment be envisaged for the Main Pit or Area 2 Pit in operations or post-closure. Despite the release of iron under the reducing conditions observed in the trials, no solubilization of arsenic occurred, suggesting arsenic mobilization is of limited concern for this setting.

Barium, cadmium, manganese, potassium, rubidium, and zinc were observed to be released to solution during the first 24 hours of the woodchip leaching experiment. In general, the concentrations leached were not considerable and in the case of cadmium and zinc, were effectively treated under the sulphate-reducing conditions that following soluble organic carbon amendment.

Although significant ammonia removal was observed in the soluble carbon amended trials, further actions may be necessary in order to achieve concentrations below the EQS.

3 DEMONSTRATION-SCALE CONSTRUCTED WETLAND TREATMENT SYSTEM 2020 RESEARCH

3.1 BACKGROUND AND METHODS

Details regarding construction, commissioning, and operations of the demonstration-scale CWTS leading up to and including 2019 can be found in previous annual reports (Contango, 2015, 2016, 2017a, 2017b, 2019, 2020). Treatment processes and a comprehensive overview of the results from the demonstration-scale CWTS operations (2017-2019) can be found in the Minto Demonstration-scale 2019 Update Report (Contango, 2020).

A small test program was performed in 2020 on the demonstration-scale CWTS. The action plan for operating and testing the demonstration-scale CWTS in 2020 included:

- Addition of a tote to the inflow of the CWTS as a forebay where a carbon source (straw) was added. This was done to evaluate options to decrease nitrate concentrations during early closure where higher nitrate loads may be present. Higher nitrate loads can interfere with COC treatment such as selenium and molybdenum. This test work was paired with bench-scale pit lake treatment trials to evaluation nitrate removal in the pit lakes, as described in Section 2.

- Testing of the straw at the beginning and end of the operating season to evaluate decomposition rates.

- Operating the CWTS at a hydraulic retention time (HRT) that mimics the full-scale system (1.2 to 2.5 days retention).

- Periodic monitoring of the CWTS performance, including *in situ* YSI and soil redox, as well as analytical testing with ALS including but not limited to total and dissolved metals, nitrate, nitrite, sulphate, dissolved organic carbon (DOC). A total of 5 timepoints were evaluated.

3.2 RESEARCH RESULTS

3.2.1 Forebay Straw Addition and Decomposition

The quantity of straw to be added to the forebays was estimated based on the anticipated nitrate load according to concentrations observed in 2019 (~7 mg/L). Based on the tote size available, ~35-40% of the estimated amount of straw was added. In 2020, the average nitrate concentration was unexpectedly roughly double (16 mg/L) the concentrations in 2019 (i.e., higher electron demand). The 2020 nitrate concentrations were similar to nitrate concentrations predicted during the later part of Post Closure 1 (2018 water quality predictions; SRK, 2018).

The rate at which straw decomposes in the wetland was evaluated. The straw in the forebay decomposed 6-32% (average 17%) after 91 days, with the majority of the straw decomposition occurring within the first 30 days. This decomposition rate is slower than *C. aquatilis* (as anticipated) which decomposed on average 48% in 82 days (Contango, 2020).

3.2.2 Performance Monitoring

Explanatory parameters were measured in the wetland through 2020. Dissolved oxygen and oxidation-reduction potential were higher in 2020 than 2019, while soil redox was similar to 2019 measurements. The less reducing conditions in the water column are likely due to the higher nitrate load in 2020 compared to 2019. However, the soil redox conditions were maintained with the higher nitrate load indicating stability of these conditions in the CWTS. Soil redox probes were also evaluated to validate measurements and confirm probes (installed in 2014) were functioning properly. All probes but one were identified as functional after six years of operation. Excess DOC was not observed in the CWTS, with concentrations similar from the Feed through the CWTS.

Monopotassium phosphate was also added to the CWTS in 2020 to evaluate consumption through the wetland. The CWTS was dosed to a targeted concentration of 0.7 to 0.9 mg/L as P. After 24 hours at an HRT of 1.2 days, the concentrations at the midpoint and outflow of the CWTS were similar to levels historically observed in the CWTS (and stayed as such for the remainder of the season), supporting that phosphorous was readily consumed in the wetland. The treatment of COCs remained similar after monopotassium phosphate was added as a fertilizer.

3.2.2.1 Constituent Removal

Although nitrate is not a primary constituent for CWTS treatment at the Mine, removal was evaluated as it can impact treatment of other COCs as described in Section 3.1. Nitrate concentrations in 2020 were higher than any previous year of operation of the demonstration-scale CWTS (~10-22 mg/L). Nitrate treatment improved through the season, while at the beginning of the season concentrations were generally unchanged or showed little treatment (Figure 3-1). The nitrate concentrations that were removed in the CWTS are in line with what would be expected based on the straw that was added and the decomposition rate that was determined through the season.

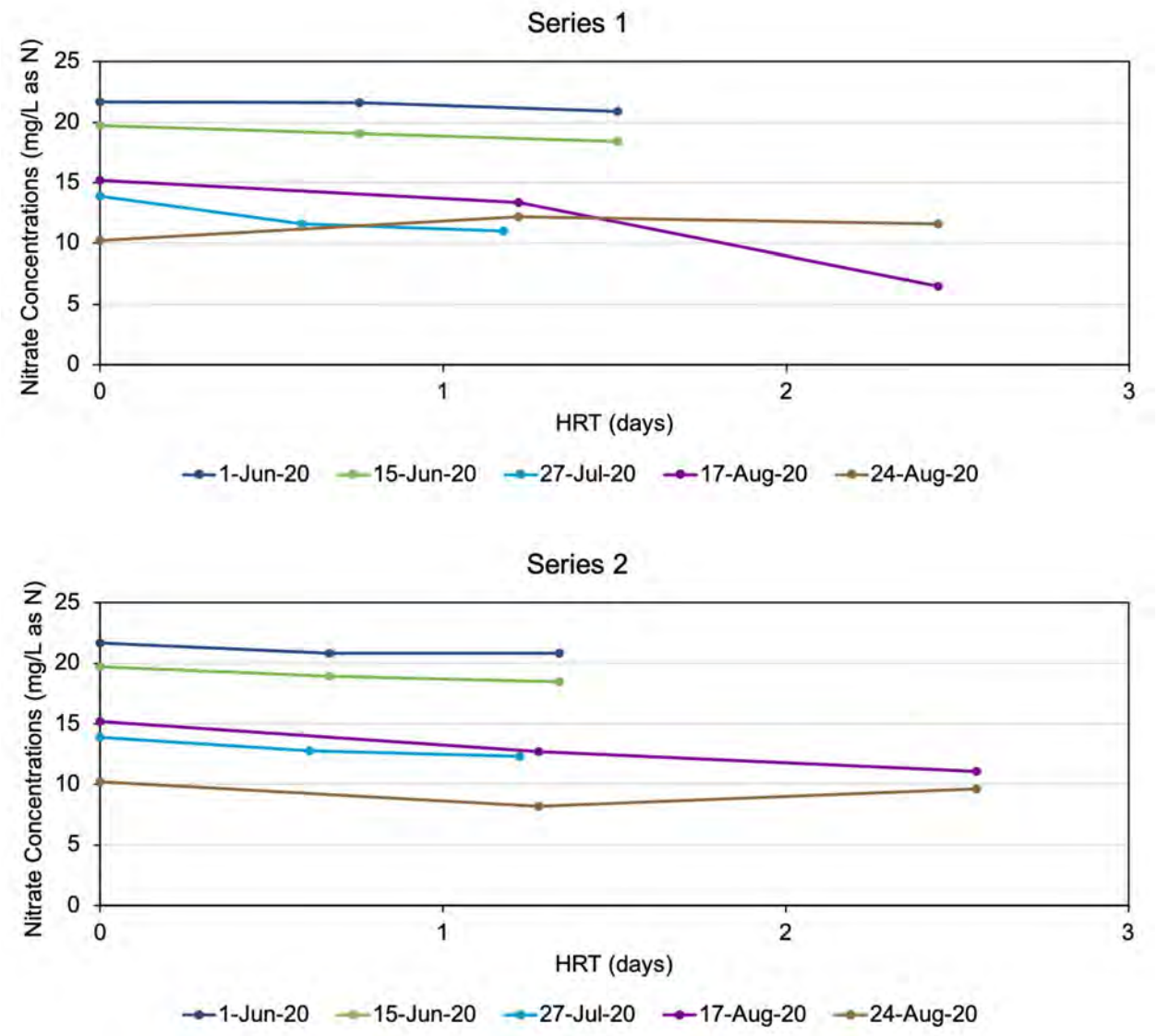


Figure 3-1 Nitrate concentrations (mg/L as N) over the 2020 CWTS operational period for Series 1 (top) and Series 2 (bottom)

Dissolved copper and cadmium removal rate coefficients (RRC) in 2020 were similar to 2019 (Table 3-1). Dissolved copper was treated in the CWTS to similar outflow concentrations as in 2019 from an average Feed concentration of 0.036 mg/L to an average outflow concentration of 0.019 mg/L. Dissolved cadmium was generally treated from an average Feed concentration of 0.000030 mg/L, near or to a raised detection limit by the outflow of the CWTS (0.000010-0.000015 mg/L).

The dissolved zinc RRC in 2020 was lower than the 2019 RRC but similar to those presented in 2017 and 2018 (Table 3-1). While dissolved zinc was not treated quite as low in 2020 at the lower flow rate tested (targeting a 2.5 day HRT), outflow concentrations were still low overall through the treatment season. The average dissolved zinc Feed concentration in 2020 was 0.012 mg/L and treated to an average outflow concentration of 0.0046 mg/L.

As anticipated with the higher nitrate concentrations going to the CWTS in 2020, the treatment of molybdenum and selenium was impacted and therefore the RRCs for selenium and molybdenum were lower than 2019 (Table 3-1). Dissolved selenium in the Feed of the CWTS was also higher in 2020 (0.0078 mg/L) compared to 2019. There was little to no selenium treatment in early 2020, however, as nitrate treatment improved over time, so did selenium treatment with an average outflow concentration of 0.0060 mg/L observed. Molybdenum concentrations in the Feed of the CWTS were low overall, although higher in 2020 (0.011 mg/L) compared to 2019. There was little to no treatment of molybdenum throughout 2020, similar to what was observed in 2019.

Rapid and significant removal of nitrate and nitrite was observed in the bench-scale pit lake treatment trials (Section 2.4.2.2). Similarly, improved selenium removal was observed in pilot-scale CWTS trials in the low nitrate test scenario (Contango, 2014). A promising option for treatment of water in early closure when higher nitrate concentrations are predicted to occur may therefore include a treatment train where pit lake treatment is performed to remove nitrate, followed by the CWTS for further COC removal. Design considerations and/or the need for a forebay in the full-scale CWTS may also be revisited in the future.

Table 3-1 Removal rate coefficients (k*day^{-1}) for dissolved COC during the 2017-2020 demonstration-scale CWTS operational periods compared to pilots-scale CWTS

COC	Minto Pilot[1]	Other Yukon Cu Pilot	Demonstration-Scale CWTS						
			2017	**2018**		**2019**		**2020**	
	Total COC		**Avg Series 1&2**	**Series 1**	**Series 2**	**Series 1**	**Series 2**	**Series 1**	**Series 2**
First order removal rate coefficients unless noted otherwise									
Cd	1.14	0.50	>0.52[2]	>0.42[2]	>0.41[2]	0.54	0.66	0.58	0.77
Cu	1.17	0.50	>0.31[3]	>0.22[3]	>0.35[3]	0.52	0.57	0.49	0.42
Mo (Zero)	0.101 (First)	N/A	0.0006	0.0011	0.0010	0.0005[6]	0.0003[6]	0.0002[6]	0.0003[6]
Se	0.0018 (Zero)	0.46	0.32	-[4]	0.29	0.20[5]	0.23[5]	0.09[8]	0.08[8]
Zn[7]	1.14	0.48	>0.51[2]	0.57	0.45	1.04	1.08	0.44	0.58
Nitrate	0.56	N/A	0.59	-[4]	0.57	0.33	0.41	0.13[8]	0.07[8]

RRC – removal rate coefficient; N/A – RRC is not available.

[1] Values calculated from total concentration data in Contango, 2014 for C. aquatilis + moss design with low nitrogen scenario (0.86 mg/L nitrate as N). These RRC are therefore included for reference purposes only and are not directly comparable to other RRC reported here.

[2] Data for Cd or Zn had most sample points at the detection limit in 2017/2018, resulting in insufficient resolution and artificially low RRC for cadmium and zinc in 2017 and cadmium in 2018.

[3] RRCs for copper in demonstration-scale CWTS are artificially low due to copper leaching from soils used in construction of the system.

[4] RRC was not calculated for NO_3 and Se in Series 1 as described in Contango, 2019.

[5] RRC for selenium based on total concentrations instead of dissolved in 2019 as described in Appendix A of Contango, 2020.

[6] Mo concentration at outflow of B cell was typically within 20% method error of inflow in 2019 and 2020. RRC have been estimated here, with instances of no treatment included as 0.

[7] Dissolved Zn concentrations used for RRC calculations in 2019 do not include data of low feed concentrations from August 21-September 5, 2019 and August 24, 2020 as treatment is difficult to observe when feed concentrations are so low.

[8] Average of all 2020 sampling events. RRC improved overtime as nitrate treatment improved.

4 RECOMMENDATIONS

4.1 PIT LAKE TREATMENT

The bench-scale pit lake treatment data overall indicate that carbon amendment to the Main Pit would likely result in marked decreases in nitrogen species, copper, and selenium concentrations to levels that would meet the EQS, and likely the WQO. Treatment of other chalcophile metals such as cadmium, molybdenum, and zinc would also occur.

Given the success of Phase 1, progression to Phase 2 studies is recommended, either through on-site limnocorral tests or full pit lake treatment if desired. Glycerol may be preferred as a carbon source for Phase 2 based on the extent of COC treatment and lack of flammability issues that ethanol has for large-scale storage and handling. Targeted ammonia treatment through a separate oxidizing system or commingling with "clean" water may be needed during operations to achieve ammonia concentrations below the EQS.

4.2 DEMONSTRATION-SCALE CWTS TREATMENT

The removal rate coefficients evaluated to date in the demonstration-scale system have been in the presence of higher nitrate concentrations. Nitrate concentrations are expected to decrease substantially over 18 years after closure. While nitrate is not a primary constituent for CWTS treatment at the Mine, removal is targeted to subsequently achieve treatment of constituents such as selenium. Pending on-site *in situ* pit lake treatment trials (Phase 2) in 2021, further research of a CWTS treatment train option could be explored where treated pit lake water (low nitrate concentrations) would report to the demonstration-scale CWTS to further demonstrate CWTS performance under low nitrate conditions.

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APPENDIX A

PHASE 1 BENCH-SCALE *IN SITU* PIT LAKE TREATMENT INTERNAL TESTING PARAMETERS

Table A5-1 Phase 1 Bench-scale *in Situ* Pit Lake Treatment Internal Testing Parameters

Sample Point	Date	Conductivity (µS/cm)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	pH (pH units)	Specific Conductivity (µS/cm)	Temperature (°C)
W12 Water	30-Jun-20	1587	84.7	7.9	165.4	7.74	1824	18.2
W12 Water	7-Aug-20	1665	56.4	4.78	160.6	7.40	1759	22.2
Trial C4	13-Aug-20	1224	0.5	0.06	188.3	6.83	1703	10.3
Trial E1	13-Aug-20	1208	0.7	0.08	214.2	6.75	1671	10.5
Trial G2	13-Aug-20	1220	0.9	0.09	148.1	6.71	1678	10.9
Trial M3	13-Aug-20	1227	0.4	0.04	61.9	6.02	1699	10.4
Trial C4	20-Aug-20	1237	0.7	0.08	7.3	6.74	1701	10.7
Trial E1	20-Aug-20	1244	4.2	0.46	33.1	6.65	1694	11.1
Trial G2	20-Aug-20	1250	0.1	0.01	-95.0	6.22	1714	10.8
Trial M3	20-Aug-20	1262	1.4	0.15	-276.2	5.64	1741	10.6
Trial C4	27-Aug-20	1273	1.0	0.10	50.5	6.68	1761	10.5
Trial E1	27-Aug-20	1282	0.4	0.04	-11.6	6.78	1751	11.0
Trial G2	27-Aug-20	1282	0.1	0.01	13.0	6.71	1767	10.7
Trial M3	27-Aug-20	1307	0.4	0.05	-25.7	6.21	1813	10.4
Trial C4	3-Sep-20	1270	1.2	0.11	40.7	6.96	1746	10.8
Trial E1	3-Sep-20	1277	1.2	0.12	-14.1	7.12	1745	11.0
Trial G2	3-Sep-20	1288	0.6	0.06	-5.2	6.83	1761	10.9
Trial M3	3-Sep-20	1306	0.6	0.05	-78.2	6.53	1788	10.8
Trial E1	10-Sep-20	1374	0.6	0.06	-90.1	6.89	1881	10.9
Trial G2	10-Sep-20	1393	0.2	0.02	-83.8	6.80	1916	10.7
Trial M3	10-Sep-20	1395	0.4	0.05	-77.6	6.74	1931	10.4
Trial C4	10-Sep-20	1384	0.7	0.08	-16.6	6.92	1926	10.3
Trial E1	17-Sep-20	1306	3.9	0.43	-63.4	6.77	1800	10.6
Trial G2	17-Sep-20	1331	1.8	0.20	-88.1	6.80	1828	10.8
Trial M3	17-Sep-20	1340	0.3	0.04	-86.5	6.78	1846	10.7
Trial C4	17-Sep-20	1334	2.3	0.25	-17.5	6.99	1842	10.5
Trial C4	24-Sep-20	1437	14.7	1.64	239.8	7.02	1995	10.4
Trial E1	24-Sep-20	1399	0.4	0.04	-34.7	7.11	1927	10.6
Trial G2	24-Sep-20	1427	0.3	0.03	-54.8	7.02	1958	10.8
Trial M3	24-Sep-20	1429	0.6	0.06	-52.2	7.00	1978	10.5
Trial C4	1-Oct-20	1492	2.1	0.21	52.3	7.13	2056	10.7
Trial E1	1-Oct-20	1440	1.1	0.13	-30.6	6.97	1992	10.5
Trial G2	1-Oct-20	1449	0.3	0.04	-48.1	6.97	1992	10.5
Trial M3	1-Oct-20	1461	0.7	0.06	-75.3	7.07	2026	10.4

Sample Point	Date	Conductivity (µS/cm)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	pH (pH units)	Specific Conductivity (µS/cm)	Temperature (°C)
Trial C4	8-Oct-20	1443	2.0	0.22	118.9	7.12	2004	10.3
Trial E1	8-Oct-20	1417	4.1	0.46	37.5	6.87	1960	10.5
Trial G2	8-Oct-20	1433	1.9	0.20	-22.7	6.94	1974	10.6
Trial M3	8-Oct-20	1442	0.4	0.05	-65.0	7.05	2000	10.4
Trial E1	15-Oct-20	1420	0.2	0.03	-19.8	7.03	1958	10.6
Trial G2	15-Oct-20	1438	1.4	0.15	-6.9	7.08	1974	10.8
Trial M3	15-Oct-20	1443	0.9	0.10	-105.3	7.22	1992	10.6
Trial C4	15-Oct-20	1452	2.3	0.25	74.1	7.28	2007	10.6
Trial E1	22-Oct-20	1696	14.5	1.59	22.4	7.01	2327	10.8
Trial G2	22-Oct-20	1704	1.3	0.14	25.0	7.11	2340	10.8
Trial M3	22-Oct-20	1713	0.6	0.07	-83.6	7.17	2368	10.5
Trial C4	22-Oct-20	1714	5.0	0.55	9.5	7.31	2367	10.6
Trial E1	29-Oct-20	1405	1.0	0.11	161.0	6.71	1929	10.8
Trial G2	29-Oct-20	1424	1.2	0.13	49.8	6.89	1954	10.8
Trial M3	29-Oct-20	1429	0.2	0.02	-13.4	7.06	1973	10.6
Trial C4	29-Oct-20	1435	3.4	0.38	194.7	7.10	1972	10.7
Trial C4	5-Nov-20	1420	3.9	0.46	50.3	7.30	1962	10.6
Trial E1	5-Nov-20	1407	4.2	0.46	149.7	7.40	1931	10.8
Trial G2	5-Nov-20	1427	3.1	0.34	131.7	7.26	1956	10.9
Trial M3	5-Nov-20	1421	1.2	0.12	2.2	7.27	1966	10.5
W12 Water	5-Nov-20	1701	82.1	7.08	143.6	7.98	1793	22.3

APPENDIX B

PHASE 1 BENCH-SCALE *IN SITU* PIT LAKE TREATMENT CERTIFICATES OF ANALYSIS

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **VA20A9533**	Page	: 1 of 6
Client	: **Minto Explorations Ltd.**	Laboratory	: Vancouver - Environmental
Contact	: Minto Environment - Coordinator	Account Manager	: Heather McKenzie
Address	: Suite 2100- 510 West Georgia St Vancouver BC Canada V6B 0M3	Address	: 8081 Lougheed Highway Burnaby BC Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: Minto Mine Monitoring	Date Samples Received	: 01-Jul-2020 13:25
PO	: 225937	Date Analysis Commenced	: 03-Jul-2020
C-O-C number	: 2020-06-30 C	Issue Date	: 13-Jul-2020 16:26
Sampler	: ----		
Site	: ----		
Quote number	: Q54721-Standing Offer		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Clarie Tejano		Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Inorganics - Water Quality, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
%	percent
meq/L	milliequivalents per litre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W12	----	----	----	----
					Client sampling date / time	24-Jun-2020 07:00	----	----	----	----
						VA20A9533-001	--------	--------	--------	--------
						Result	----	----	----	----
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		155	----	----	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	----	----	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	----	----	----	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	----	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		155	----	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		960	----	----	----	----
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		940	----	----	----	----
pH	----	E108	0.10	pH units		7.92	----	----	----	----
solids, total dissolved [TDS], calculated	----	EC103	1.0	mg/L		1620	----	----	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		1.81	----	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		31.4	----	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		10.5	----	----	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0500	mg/L		11.5	----	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		1.04	----	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		836	----	----	----	----
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		160	----	----	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		22.2	----	----	----	----
cation sum	----	EC101	0.10	meq/L		22.7	----	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		1.11	----	----	----	----
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		1.05	----	----	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L		0.00032	----	----	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00139	----	----	----	----
barium, total	7440-39-3	E420	0.00010	mg/L		0.0832	----	----	----	----
beryllium, total	7440-41-7	E420	0.000020	mg/L		0.000041	----	----	----	----
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	----	----	----	----
boron, total	7440-42-8	E420	0.010	mg/L		0.180	----	----	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W12	----	----	----	----
					Client sampling date / time	24-Jun-2020 07:00	----	----	----	----
						VA20A9533-001	--------	--------	--------	--------
						Result	----	----	----	----
Total Metals										
cadmium, total	7440-43-9	E420	0.0000050	mg/L		0.000125	----	----	----	----
calcium, total	7440-70-2	E420	0.050	mg/L		300	----	----	----	----
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00055	----	----	----	----
cobalt, total	7440-48-4	E420	0.00010	mg/L		0.00088	----	----	----	----
copper, total	7440-50-8	E420	0.00050	mg/L		0.276	----	----	----	----
iron, total	7439-89-6	E420	0.010	mg/L		2.01	----	----	----	----
lead, total	7439-92-1	E420	0.000050	mg/L		0.00215	----	----	----	----
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0088	----	----	----	----
magnesium, total	7439-95-4	E420	0.100	mg/L		46.0	----	----	----	----
manganese, total	7439-96-5	E420	0.00010	mg/L		0.335	----	----	----	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.0270	----	----	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00289	----	----	----	----
phosphorus, total	7723-14-0	E420	0.050	mg/L		0.119	----	----	----	----
potassium, total	7440-09-7	E420	0.100	mg/L		16.4	----	----	----	----
selenium, total	7782-49-2	E420	0.000050	mg/L		0.00629	----	----	----	----
silicon, total	7440-21-3	E420	0.10	mg/L		7.22	----	----	----	----
silver, total	7440-22-4	E420	0.000010	mg/L		0.000063	----	----	----	----
sodium, total	7440-23-5	E420	0.050	mg/L		72.8	----	----	----	----
strontium, total	7440-24-6	E420	0.00020	mg/L		4.46	----	----	----	----
sulfur, total	7704-34-9	E420	0.50	mg/L		335	----	----	----	----
thallium, total	7440-28-0	E420	0.000010	mg/L		0.000018	----	----	----	----
tin, total	7440-31-5	E420	0.00010	mg/L		0.00011	----	----	----	----
titanium, total	7440-32-6	E420	0.00030	mg/L		0.0822	----	----	----	----
uranium, total	7440-61-1	E420	0.000010	mg/L		0.00452	----	----	----	----
vanadium, total	7440-62-2	E420	0.00050	mg/L		0.00452	----	----	----	----
zinc, total	7440-66-6	E420	0.0030	mg/L		0.0163	----	----	----	----
zirconium, total	7440-67-7	E420	0.00020	mg/L		<0.00020	----	----	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0045	----	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		0.00028	----	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00040	----	----	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	W12	----	----	----	----
					Client sampling date / time	24-Jun-2020 07:00	----	----	----	----
						VA20A9533-001	--------	--------	--------	--------
						Result	----	----	----	----
Dissolved Metals										
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0626	----	----	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	----	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	----	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.152	----	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.000111	----	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		307	----	----	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	----	----	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00024	----	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.0963	----	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.023	----	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		0.000338	----	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0077	----	----	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		47.1	----	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.255	----	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.0256	----	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00251	----	----	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	----	----	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		17.0	----	----	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.00541	----	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		4.31	----	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		0.000010	----	----	----	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		68.4	----	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		4.52	----	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		290	----	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	----	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	----	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		0.00033	----	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00461	----	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	----	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0049	----	----	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	----	----	----	----

Analytical Results

Sub-Matrix: **Water** (Matrix: **Water**)					Client sample ID	**W12**	**----**	**----**	**----**	**----**
					Client sampling date / time	24-Jun-2020 07:00	----	----	----	----
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*		**VA20A9533-001**	**--------**	**--------**	**--------**	**--------**
						Result	----	----	----	----
Dissolved Metals										
dissolved metals filtration location	----	EP421	-	-		Field	----	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

Ensero Technologies Inc.
ATTN: Rachel Martz
104- 411 Downey Road
Saskatoon SK S7N 4L8

Date Received: 30- JUN- 20
Report Date: 08- JUL- 20 14:04 (MT)
Version: FINAL

Client Phone: 306- 978- 3111

Certificate of Analysis

Lab Work Order #: L2468045
Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers:
Legal Site Desc:

Brian Morgan, B.Sc. Hons.
Client Services Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2468045-1 W12 WATER							
Sampled By: CLIENT on 30-JUN-20 @ 11:15							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	1.81	DLHC	0.25	mg/L		07-JUL-20	R5145180
Dissolved Organic Carbon	55.5		1.0	mg/L		06-JUL-20	R5144460
Nitrate (as N)	10.9	DLDS	0.10	mg/L		01-JUL-20	R5139560
Nitrite (as N)	1.07	DLDS	0.050	mg/L		01-JUL-20	R5139560
Sulfate (SO4)	854	DLDS	1.5	mg/L		01-JUL-20	R5139560
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					06-JUL-20	R5142801
Aluminum (Al)-Dissolved	0.0074	DLDS	0.0040	mg/L		06-JUL-20	R5144546
Antimony (Sb)-Dissolved	0.00039	DLDS	0.00020	mg/L		06-JUL-20	R5144546
Arsenic (As)-Dissolved	0.00038	DLDS	0.00020	mg/L		06-JUL-20	R5144546
Barium (Ba)-Dissolved	0.0631	DLDS	0.00020	mg/L		06-JUL-20	R5144546
Beryllium (Be)-Dissolved	<0.00020	DLDS	0.00020	mg/L		06-JUL-20	R5144546
Bismuth (Bi)-Dissolved	<0.00010	DLDS	0.00010	mg/L		06-JUL-20	R5144546
Boron (B)-Dissolved	0.168	DLDS	0.020	mg/L		06-JUL-20	R5144546
Cadmium (Cd)-Dissolved	0.000103	DLDS	0.000010	mg/L		06-JUL-20	R5144546
Calcium (Ca)-Dissolved	276	DLDS	0.10	mg/L		06-JUL-20	R5144546
Cesium (Cs)-Dissolved	0.000038	DLDS	0.000020	mg/L		06-JUL-20	R5144546
Chromium (Cr)-Dissolved	<0.00020	DLDS	0.00020	mg/L		06-JUL-20	R5144546
Cobalt (Co)-Dissolved	0.00025	DLDS	0.00020	mg/L		06-JUL-20	R5144546
Copper (Cu)-Dissolved	0.0940	DLDS	0.00040	mg/L		06-JUL-20	R5144546
Iron (Fe)-Dissolved	<0.020	DLDS	0.020	mg/L		06-JUL-20	R5144546
Lead (Pb)-Dissolved	0.00033	DLDS	0.00010	mg/L		06-JUL-20	R5144546
Lithium (Li)-Dissolved	0.0072	DLDS	0.0020	mg/L		06-JUL-20	R5144546
Magnesium (Mg)-Dissolved	42.6	DLDS	0.010	mg/L		06-JUL-20	R5144546
Manganese (Mn)-Dissolved	0.239	DLDS	0.00020	mg/L		06-JUL-20	R5144546
Molybdenum (Mo)-Dissolved	0.0259	DLDS	0.00010	mg/L		06-JUL-20	R5144546
Nickel (Ni)-Dissolved	0.0032	DLDS	0.0010	mg/L		06-JUL-20	R5144546
Phosphorus (P)-Dissolved	<0.10	DLDS	0.10	mg/L		06-JUL-20	R5144546
Potassium (K)-Dissolved	14.6	DLDS	0.10	mg/L		06-JUL-20	R5144546
Rubidium (Rb)-Dissolved	0.0125	DLDS	0.00040	mg/L		06-JUL-20	R5144546
Selenium (Se)-Dissolved	0.00491	DLDS	0.00010	mg/L		06-JUL-20	R5144546
Silicon (Si)-Dissolved	4.12	DLDS	0.10	mg/L		06-JUL-20	R5144546
Silver (Ag)-Dissolved	<0.000020	DLDS	0.000020	mg/L		06-JUL-20	R5144546
Sodium (Na)-Dissolved	59.2	DLDS	0.10	mg/L		06-JUL-20	R5144546
Strontium (Sr)-Dissolved	4.12	DLDS	0.00040	mg/L		06-JUL-20	R5144546
Sulfur (S)-Dissolved	287	DLDS	1.0	mg/L		06-JUL-20	R5144546
Tellurium (Te)-Dissolved	<0.00040	DLDS	0.00040	mg/L		06-JUL-20	R5144546
Thallium (Tl)-Dissolved	<0.000020	DLDS	0.000020	mg/L		06-JUL-20	R5144546
Thorium (Th)-Dissolved	<0.00020	DLDS	0.00020	mg/L		06-JUL-20	R5144546
Tin (Sn)-Dissolved	<0.00020	DLDS	0.00020	mg/L		06-JUL-20	R5144546
Titanium (Ti)-Dissolved	<0.00060	DLDS	0.00060	mg/L		06-JUL-20	R5144546
Tungsten (W)-Dissolved	0.00109	DLDS	0.00020	mg/L		06-JUL-20	R5144546
Uranium (U)-Dissolved	0.00462	DLDS	0.000020	mg/L		06-JUL-20	R5144546
Vanadium (V)-Dissolved	<0.0010	DLDS	0.0010	mg/L		06-JUL-20	R5144546
Zinc (Zn)-Dissolved	0.0122	DLDS	0.0020	mg/L		06-JUL-20	R5144546
Zirconium (Zr)-Dissolved	<0.00040	DLDS	0.00040	mg/L		06-JUL-20	R5144546

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-DIS-ORG-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
Filtered (0.45 um) sample is acidified and purged to remove inorganic carbon, then injected into a heated reaction chamber where organic carbon is oxidized to CO2 which is then transported in the carrier gas stream and measured via a non-dispersive infrared analyzer.			
MET-D-CCMS-SK	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B / EPA 6020A
This procedure involves preliminary filtration through a 0.45 um filter followed by instrumental analysis using collision cell inductively coupled plasma - mass spectrometry (modifed from EPA Method 6020A).			
NH3-F-CL	Water	Ammonia by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-IC-N-SK	Water	Nitrite in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-IC-N-SK	Water	Nitrate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SO4-IC-N-SK	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: Ensero Technologies Inc.
104-411 Downey Road
Saskatoon SK S7N 4L8
Contact: Rachel Martz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-CL	Water							
Batch R5144460								
WG3356992-2 LCS								
Dissolved Organic Carbon			86.6		%		80-120	06-JUL-20
WG3356992-1 MB								
Dissolved Organic Carbon			<1.0		mg/L		1	06-JUL-20
MET-D-CCMS-SK	Water							
Batch R5144546								
WG3355079-3 CRM		**TMRM_20**						
Aluminum (Al)-Dissolved			106.7		%		80-120	06-JUL-20
Antimony (Sb)-Dissolved			97.5		%		80-120	06-JUL-20
Arsenic (As)-Dissolved			100.5		%		80-120	06-JUL-20
Barium (Ba)-Dissolved			104.2		%		80-120	06-JUL-20
Beryllium (Be)-Dissolved			104.7		%		80-120	06-JUL-20
Bismuth (Bi)-Dissolved			100.8		%		80-120	06-JUL-20
Boron (B)-Dissolved			95.9		%		80-120	06-JUL-20
Cadmium (Cd)-Dissolved			94.3		%		80-120	06-JUL-20
Calcium (Ca)-Dissolved			103.8		%		80-120	06-JUL-20
Cesium (Cs)-Dissolved			103.1		%		80-120	06-JUL-20
Chromium (Cr)-Dissolved			99.9		%		80-120	06-JUL-20
Cobalt (Co)-Dissolved			98.4		%		80-120	06-JUL-20
Copper (Cu)-Dissolved			98.6		%		80-120	06-JUL-20
Iron (Fe)-Dissolved			103.6		%		80-120	06-JUL-20
Lead (Pb)-Dissolved			100.3		%		80-120	06-JUL-20
Lithium (Li)-Dissolved			107.2		%		80-120	06-JUL-20
Magnesium (Mg)-Dissolved			109.0		%		80-120	06-JUL-20
Manganese (Mn)-Dissolved			99.5		%		80-120	06-JUL-20
Molybdenum (Mo)-Dissolved			100.1		%		80-120	06-JUL-20
Nickel (Ni)-Dissolved			98.0		%		80-120	06-JUL-20
Phosphorus (P)-Dissolved			104.6		%		70-130	06-JUL-20
Potassium (K)-Dissolved			94.6		%		80-120	06-JUL-20
Rubidium (Rb)-Dissolved			101.9		%		80-120	06-JUL-20
Selenium (Se)-Dissolved			97.0		%		80-120	06-JUL-20
Silicon (Si)-Dissolved			101.4		%		60-140	06-JUL-20
Silver (Ag)-Dissolved			98.0		%		80-120	06-JUL-20
Sodium (Na)-Dissolved			109.7		%		80-120	06-JUL-20
Strontium (Sr)-Dissolved			102.9		%		80-120	06-JUL-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch R5144546								
WG3355079-3 CRM		**TMRM_20**						
Sulfur (S)-Dissolved			89.9		%		80-120	06-JUL-20
Tellurium (Te)-Dissolved			100.7		%		80-120	06-JUL-20
Thallium (Tl)-Dissolved			99.4		%		80-120	06-JUL-20
Thorium (Th)-Dissolved			97.2		%		80-120	06-JUL-20
Tin (Sn)-Dissolved			98.8		%		80-120	06-JUL-20
Titanium (Ti)-Dissolved			97.7		%		80-120	06-JUL-20
Tungsten (W)-Dissolved			99.6		%		80-120	06-JUL-20
Uranium (U)-Dissolved			97.1		%		80-120	06-JUL-20
Vanadium (V)-Dissolved			102.1		%		80-120	06-JUL-20
Zinc (Zn)-Dissolved			97.7		%		80-120	06-JUL-20
Zirconium (Zr)-Dissolved			105.4		%		80-120	06-JUL-20
WG3355079-1 MB								
Aluminum (Al)-Dissolved			<0.0020		mg/L		0.002	06-JUL-20
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	06-JUL-20
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	06-JUL-20
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	06-JUL-20
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	06-JUL-20
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	06-JUL-20
Boron (B)-Dissolved			<0.010		mg/L		0.01	06-JUL-20
Cadmium (Cd)-Dissolved			<0.000005C		mg/L		0.000005	06-JUL-20
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	06-JUL-20
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	06-JUL-20
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	06-JUL-20
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	06-JUL-20
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	06-JUL-20
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	06-JUL-20
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	06-JUL-20
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	06-JUL-20
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	06-JUL-20
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	06-JUL-20
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	06-JUL-20
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	06-JUL-20
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	06-JUL-20
Potassium (K)-Dissolved			<0.050		mg/L		0.05	06-JUL-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch R5144546								
WG3355079-1 MB								
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	06-JUL-20
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	06-JUL-20
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	06-JUL-20
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	06-JUL-20
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	06-JUL-20
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	06-JUL-20
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	06-JUL-20
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	06-JUL-20
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	06-JUL-20
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	06-JUL-20
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	06-JUL-20
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	06-JUL-20
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	06-JUL-20
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	06-JUL-20
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	06-JUL-20
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	06-JUL-20
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	06-JUL-20
NH3-F-CL	Water							
Batch R5145180								
WG3357347-42 LCS								
Ammonia, Total (as N)			103.1		%		85-115	07-JUL-20
WG3357347-41 MB								
Ammonia, Total (as N)			<0.050		mg/L		0.05	07-JUL-20
NO2-IC-N-SK	Water							
Batch R5139560								
WG3353405-3 LCS								
Nitrite (as N)			99.9		%		90-110	01-JUL-20
WG3353405-2 MB								
Nitrite (as N)			<0.010		mg/L		0.01	01-JUL-20
NO3-IC-N-SK	Water							
Batch R5139560								
WG3353405-3 LCS								
Nitrate (as N)			102.4		%		90-110	01-JUL-20
WG3353405-2 MB								
Nitrate (as N)			<0.020		mg/L		0.02	01-JUL-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-N-SK	Water							
Batch R5139560								
WG3353405-3 LCS								
Sulfate (SO4)			103.3		%		90-110	01-JUL-20
WG3353405-2 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	01-JUL-20

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2468045-COFC

COC Number: 15 -

Page of

Report To	Contact and company name below will appear on the final report
Company:	Ensero Technologies
Contact:	Rachel Martz
Phone:	306 978 3111
	Company address below will appear on the final report
Street:	104-411 Downey Road
City/Province:	Saskatoon, SK
Postal Code:	S7H 1R1
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Ensero Technologies
Contact:	Mel Shotenski

Project Information

ALS Account # / Quote #:	Q81011
Job #:	
PO / AFE:	
LSD:	

ALS Lab Work Order # (lab use only)

Report Format / Distribution

Select Report Format:	☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	rmartz@ensero.com
Email 2	rkleinberger@ensero.com
Email 3	kpiecowye@ensero.com

Invoice Distribution

Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	rmartz@ensero.com
Email 2	ap@ensero.com

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Contact: **Sampler:**

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐

EMERGENCY: 1 Business day [E1] ☐ | Same Day, Weekend or Statutory holiday [E0] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	C-DIS-ORG-CL	MET-D-CCMS-SK		NH3-F-CL	NO2-IC-N-SK	NO3-IC-N-SK	SO4-IC-N-SK							Number of Containers
					F/P	F/P		P										
	W12 Water	30-Jun-20	11:15	Water	R	R		R	R	R	R							5

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human drinking water use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Please add cbrizinski@ensero.com and importer@contango.ehsdata.com to emails.

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
4c					

SHIPMENT RELEASE (client use)

Released by:	Date:	Time:

INITIAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:
AKh	30/6/2020	1:25

FINAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:
AKh		1:25

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Ensero Technologies Inc.
ATTN: Rachel Martz
104-411 Downey Road
Saskatoon SK S7N 4L8

Date Received: 27-JUL-20
Report Date: 31-JUL-20 10:43 (MT)
Version: FINAL

Client Phone: 306-978-3111

Certificate of Analysis

Lab Work Order #: L2480099
Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers:
Legal Site Desc:

Brian Morgan, B.Sc. Hons.
Client Services Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2480099-1 W12 WATER							
Sampled By: CLIENT on 27-JUL-20 @ 12:00							
Matrix: WATER							
Miscellaneous Parameters							
Dissolved Organic Carbon	38.4		1.0	mg/L		30-JUL-20	R5172621
Nitrate (as N)	9.22	DLDS	0.10	mg/L		27-JUL-20	R5168416
Nitrite (as N)	1.97	DLDS	0.050	mg/L		27-JUL-20	R5168416
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.029	DLDS	0.015	mg/L		30-JUL-20	R5171056
Antimony (Sb)-Total	<0.00050	DLDS	0.00050	mg/L		30-JUL-20	R5171056
Arsenic (As)-Total	<0.00050	DLDS	0.00050	mg/L		30-JUL-20	R5171056
Barium (Ba)-Total	0.0649	DLDS	0.00050	mg/L		30-JUL-20	R5171056
Beryllium (Be)-Total	<0.00050	DLDS	0.00050	mg/L		30-JUL-20	R5171056
Bismuth (Bi)-Total	<0.00025	DLDS	0.00025	mg/L		30-JUL-20	R5171056
Boron (B)-Total	0.166	DLDS	0.050	mg/L		30-JUL-20	R5171056
Cadmium (Cd)-Total	0.000131	DLDS	0.000025	mg/L		30-JUL-20	R5171056
Calcium (Ca)-Total	282	DLDS	0.25	mg/L		30-JUL-20	R5171056
Cesium (Cs)-Total	<0.000050	DLDS	0.000050	mg/L		30-JUL-20	R5171056
Chromium (Cr)-Total	<0.00050	DLDS	0.00050	mg/L		30-JUL-20	R5171056
Cobalt (Co)-Total	<0.00050	DLDS	0.00050	mg/L		30-JUL-20	R5171056
Copper (Cu)-Total	0.101	DLDS	0.0025	mg/L		30-JUL-20	R5171056
Iron (Fe)-Total	0.058	DLDS	0.050	mg/L		30-JUL-20	R5171056
Lead (Pb)-Total	0.00048	DLDS	0.00025	mg/L		30-JUL-20	R5171056
Lithium (Li)-Total	0.0082	DLDS	0.0050	mg/L		30-JUL-20	R5171056
Magnesium (Mg)-Total	45.6	DLDS	0.025	mg/L		30-JUL-20	R5171056
Manganese (Mn)-Total	0.254	DLDS	0.00050	mg/L		30-JUL-20	R5171056
Molybdenum (Mo)-Total	0.0268	DLDS	0.00025	mg/L		30-JUL-20	R5171056
Nickel (Ni)-Total	0.0026	DLDS	0.0025	mg/L		30-JUL-20	R5171056
Potassium (K)-Total	15.4	DLDS	0.25	mg/L		30-JUL-20	R5171056
Phosphorus (P)-Total	<0.25	DLDS	0.25	mg/L		30-JUL-20	R5171056
Rubidium (Rb)-Total	0.0125	DLDS	0.0010	mg/L		30-JUL-20	R5171056
Selenium (Se)-Total	0.00495	DLDS	0.00025	mg/L		30-JUL-20	R5171056
Silicon (Si)-Total	4.21	DLDS	0.50	mg/L		30-JUL-20	R5171056
Silver (Ag)-Total	<0.000050	DLDS	0.000050	mg/L		30-JUL-20	R5171056
Sodium (Na)-Total	65.2	DLDS	0.25	mg/L		30-JUL-20	R5171056
Strontium (Sr)-Total	4.30	DLDS	0.0010	mg/L		30-JUL-20	R5171056
Sulfur (S)-Total	283	DLDS	2.5	mg/L		30-JUL-20	R5171056
Tellurium (Te)-Total	<0.0010	DLDS	0.0010	mg/L		30-JUL-20	R5171056
Thallium (Tl)-Total	<0.000050	DLDS	0.000050	mg/L		30-JUL-20	R5171056
Thorium (Th)-Total	<0.00050	DLDS	0.00050	mg/L		30-JUL-20	R5171056
Tin (Sn)-Total	<0.00050	DLDS	0.00050	mg/L		30-JUL-20	R5171056
Titanium (Ti)-Total	<0.0015	DLDS	0.0015	mg/L		30-JUL-20	R5171056
Tungsten (W)-Total	0.00100	DLDS	0.00050	mg/L		30-JUL-20	R5171056
Uranium (U)-Total	0.00471	DLDS	0.000050	mg/L		30-JUL-20	R5171056
Vanadium (V)-Total	<0.0025	DLDS	0.0025	mg/L		30-JUL-20	R5171056
Zinc (Zn)-Total	<0.015	DLDS	0.015	mg/L		30-JUL-20	R5171056
Zirconium (Zr)-Total	<0.0010	DLDS	0.0010	mg/L		30-JUL-20	R5171056
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					29-JUL-20	R5171498
Aluminum (Al)-Dissolved	<0.010	DLDS	0.010	mg/L		30-JUL-20	R5172419
Antimony (Sb)-Dissolved	0.00065	DLDS	0.00050	mg/L		30-JUL-20	R5172419
Arsenic (As)-Dissolved	<0.00050	DLDS	0.00050	mg/L		30-JUL-20	R5172419
Barium (Ba)-Dissolved	0.0671	DLDS	0.00050	mg/L		30-JUL-20	R5172419
Beryllium (Be)-Dissolved	<0.00050	DLDS	0.00050	mg/L		30-JUL-20	R5172419
Bismuth (Bi)-Dissolved	<0.00025	DLDS	0.00025	mg/L		30-JUL-20	R5172419

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2480099-1 W12 WATER							
Sampled By: CLIENT on 27-JUL-20 @ 12:00							
Matrix: WATER							
Dissolved Metals in Water by CRC ICPMS							
Boron (B)-Dissolved	0.174	DLDS	0.050	mg/L		30-JUL-20	R5172419
Cadmium (Cd)-Dissolved	0.000111	DLDS	0.000025	mg/L		30-JUL-20	R5172419
Calcium (Ca)-Dissolved	293	DLDS	0.25	mg/L		30-JUL-20	R5172419
Cesium (Cs)-Dissolved	<0.000050	DLDS	0.000050	mg/L		30-JUL-20	R5172419
Chromium (Cr)-Dissolved	<0.00050	DLDS	0.00050	mg/L		30-JUL-20	R5172419
Cobalt (Co)-Dissolved	<0.00050	DLDS	0.00050	mg/L		30-JUL-20	R5172419
Copper (Cu)-Dissolved	0.0898	DLDS	0.0010	mg/L		30-JUL-20	R5172419
Iron (Fe)-Dissolved	<0.050	DLDS	0.050	mg/L		30-JUL-20	R5172419
Lead (Pb)-Dissolved	<0.00025	DLDS	0.00025	mg/L		30-JUL-20	R5172419
Lithium (Li)-Dissolved	0.0092	DLDS	0.0050	mg/L		30-JUL-20	R5172419
Magnesium (Mg)-Dissolved	45.6	DLDS	0.025	mg/L		30-JUL-20	R5172419
Manganese (Mn)-Dissolved	0.255	DLDS	0.00050	mg/L		30-JUL-20	R5172419
Molybdenum (Mo)-Dissolved	0.0276	DLDS	0.00025	mg/L		30-JUL-20	R5172419
Nickel (Ni)-Dissolved	<0.0025	DLDS	0.0025	mg/L		30-JUL-20	R5172419
Phosphorus (P)-Dissolved	<0.25	DLDS	0.25	mg/L		30-JUL-20	R5172419
Potassium (K)-Dissolved	16.0	DLDS	0.25	mg/L		30-JUL-20	R5172419
Rubidium (Rb)-Dissolved	0.0125	DLDS	0.0010	mg/L		30-JUL-20	R5172419
Selenium (Se)-Dissolved	0.00501	DLDS	0.00025	mg/L		30-JUL-20	R5172419
Silicon (Si)-Dissolved	4.26	DLDS	0.25	mg/L		30-JUL-20	R5172419
Silver (Ag)-Dissolved	<0.000050	DLDS	0.000050	mg/L		30-JUL-20	R5172419
Sodium (Na)-Dissolved	63.4	DLDS	0.25	mg/L		30-JUL-20	R5172419
Strontium (Sr)-Dissolved	4.45	DLDS	0.0010	mg/L		30-JUL-20	R5172419
Sulfur (S)-Dissolved	290	DLDS	2.5	mg/L		30-JUL-20	R5172419
Tellurium (Te)-Dissolved	<0.0010	DLDS	0.0010	mg/L		30-JUL-20	R5172419
Thallium (Tl)-Dissolved	<0.000050	DLDS	0.000050	mg/L		30-JUL-20	R5172419
Thorium (Th)-Dissolved	<0.00050	DLDS	0.00050	mg/L		30-JUL-20	R5172419
Tin (Sn)-Dissolved	<0.00050	DLDS	0.00050	mg/L		30-JUL-20	R5172419
Titanium (Ti)-Dissolved	<0.0015	DLDS	0.0015	mg/L		30-JUL-20	R5172419
Tungsten (W)-Dissolved	0.00102	DLDS	0.00050	mg/L		30-JUL-20	R5172419
Uranium (U)-Dissolved	0.00459	DLDS	0.000050	mg/L		30-JUL-20	R5172419
Vanadium (V)-Dissolved	<0.0025	DLDS	0.0025	mg/L		30-JUL-20	R5172419
Zinc (Zn)-Dissolved	0.0117	DLDS	0.0050	mg/L		30-JUL-20	R5172419
Zirconium (Zr)-Dissolved	<0.0010	DLDS	0.0010	mg/L		30-JUL-20	R5172419

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-DIS-ORG-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
Filtered (0.45 um) sample is acidified and purged to remove inorganic carbon, then injected into a heated reaction chamber where organic carbon is oxidized to CO2 which is then transported in the carrier gas stream and measured via a non-dispersive infrared analyzer.			
MET-D-CCMS-SK	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B / EPA 6020A
This procedure involves preliminary filtration through a 0.45 um filter followed by instrumental analysis using collision cell inductively coupled plasma - mass spectrometry (modifed from EPA Method 6020A).			
MET-T-CCMS-SK	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
This procedure involves preliminary digestion with concentrated nitric acid followed by instrumental analysis using collision cell inductively coupled plasma - mass spectrometry (modifed from EPA Method 6020A).			
NO2-IC-N-SK	Water	Nitrite in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-IC-N-SK	Water	Nitrate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: Ensero Technologies Inc.
104-411 Downey Road
Saskatoon SK S7N 4L8
Contact: Rachel Martz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-CL	Water							
Batch R5172621								
WG3373904-2 LCS								
Dissolved Organic Carbon			87.3		%		80-120	29-JUL-20
WG3373904-1 MB								
Dissolved Organic Carbon			<1.0		mg/L		1	29-JUL-20
MET-D-CCMS-SK	Water							
Batch R5172419								
WG3372797-3 CRM		**TMRM_20**						
Aluminum (Al)-Dissolved			102.5		%		80-120	30-JUL-20
Antimony (Sb)-Dissolved			102.8		%		80-120	30-JUL-20
Arsenic (As)-Dissolved			99.0		%		80-120	30-JUL-20
Barium (Ba)-Dissolved			100.4		%		80-120	30-JUL-20
Beryllium (Be)-Dissolved			106.6		%		80-120	30-JUL-20
Bismuth (Bi)-Dissolved			99.0		%		80-120	30-JUL-20
Boron (B)-Dissolved			100.6		%		80-120	30-JUL-20
Cadmium (Cd)-Dissolved			97.0		%		80-120	30-JUL-20
Calcium (Ca)-Dissolved			100.8		%		80-120	30-JUL-20
Cesium (Cs)-Dissolved			93.4		%		80-120	30-JUL-20
Chromium (Cr)-Dissolved			99.6		%		80-120	30-JUL-20
Cobalt (Co)-Dissolved			96.1		%		80-120	30-JUL-20
Copper (Cu)-Dissolved			95.8		%		80-120	30-JUL-20
Iron (Fe)-Dissolved			104.9		%		80-120	30-JUL-20
Lead (Pb)-Dissolved			100.9		%		80-120	30-JUL-20
Lithium (Li)-Dissolved			115.8		%		80-120	30-JUL-20
Magnesium (Mg)-Dissolved			103.7		%		80-120	30-JUL-20
Manganese (Mn)-Dissolved			99.5		%		80-120	30-JUL-20
Molybdenum (Mo)-Dissolved			102.1		%		80-120	30-JUL-20
Nickel (Ni)-Dissolved			96.1		%		80-120	30-JUL-20
Phosphorus (P)-Dissolved			101.9		%		70-130	30-JUL-20
Potassium (K)-Dissolved			99.1		%		80-120	30-JUL-20
Rubidium (Rb)-Dissolved			95.6		%		80-120	30-JUL-20
Selenium (Se)-Dissolved			100.1		%		80-120	30-JUL-20
Silicon (Si)-Dissolved			104.3		%		60-140	30-JUL-20
Silver (Ag)-Dissolved			102.8		%		80-120	30-JUL-20
Sodium (Na)-Dissolved			98.3		%		80-120	30-JUL-20
Strontium (Sr)-Dissolved			105.9		%		80-120	30-JUL-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch R5172419								
WG3372797-3 CRM		**TMRM_20**						
Sulfur (S)-Dissolved			104.0		%		80-120	30-JUL-20
Tellurium (Te)-Dissolved			93.5		%		80-120	30-JUL-20
Thallium (Tl)-Dissolved			96.5		%		80-120	30-JUL-20
Thorium (Th)-Dissolved			95.0		%		80-120	30-JUL-20
Tin (Sn)-Dissolved			97.9		%		80-120	30-JUL-20
Titanium (Ti)-Dissolved			97.3		%		80-120	30-JUL-20
Tungsten (W)-Dissolved			94.2		%		80-120	30-JUL-20
Uranium (U)-Dissolved			95.6		%		80-120	30-JUL-20
Vanadium (V)-Dissolved			97.7		%		80-120	30-JUL-20
Zinc (Zn)-Dissolved			96.0		%		80-120	30-JUL-20
Zirconium (Zr)-Dissolved			99.9		%		80-120	30-JUL-20
WG3372797-2 DUP		**L2480099-1**						
Aluminum (Al)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	30-JUL-20
Antimony (Sb)-Dissolved		0.00065	0.00053		mg/L	20	20	30-JUL-20
Arsenic (As)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	30-JUL-20
Barium (Ba)-Dissolved		0.0671	0.0636		mg/L	5.4	20	30-JUL-20
Beryllium (Be)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	30-JUL-20
Bismuth (Bi)-Dissolved		<0.00025	<0.00025	RPD-NA	mg/L	N/A	20	30-JUL-20
Boron (B)-Dissolved		0.174	0.182		mg/L	4.9	20	30-JUL-20
Cadmium (Cd)-Dissolved		0.000111	0.000129		mg/L	15	20	30-JUL-20
Calcium (Ca)-Dissolved		293	304		mg/L	3.8	20	30-JUL-20
Cesium (Cs)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	30-JUL-20
Chromium (Cr)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	30-JUL-20
Cobalt (Co)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	30-JUL-20
Copper (Cu)-Dissolved		0.0898	0.0890		mg/L	0.9	20	30-JUL-20
Iron (Fe)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	30-JUL-20
Lead (Pb)-Dissolved		<0.00025	<0.00025	RPD-NA	mg/L	N/A	20	30-JUL-20
Lithium (Li)-Dissolved		0.0092	0.0103		mg/L	12	20	30-JUL-20
Magnesium (Mg)-Dissolved		45.6	44.8		mg/L	1.7	20	30-JUL-20
Manganese (Mn)-Dissolved		0.255	0.255		mg/L	0.1	20	30-JUL-20
Molybdenum (Mo)-Dissolved		0.0276	0.0264		mg/L	4.5	20	30-JUL-20
Nickel (Ni)-Dissolved		<0.0025	0.0026	RPD-NA	mg/L	N/A	20	30-JUL-20
Phosphorus (P)-Dissolved		<0.25	<0.25	RPD-NA	mg/L	N/A	20	30-JUL-20
Potassium (K)-Dissolved		16.0	16.1		mg/L	0.8	20	30-JUL-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch R5172419								
WG3372797-2 DUP		**L2480099-1**						
Rubidium (Rb)-Dissolved		0.0125	0.0122		mg/L	2.8	20	30-JUL-20
Selenium (Se)-Dissolved		0.00501	0.00488		mg/L	2.6	20	30-JUL-20
Silicon (Si)-Dissolved		4.26	4.17		mg/L	2.0	20	30-JUL-20
Silver (Ag)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	30-JUL-20
Sodium (Na)-Dissolved		63.4	63.1		mg/L	0.4	20	30-JUL-20
Strontium (Sr)-Dissolved		4.45	4.24		mg/L	4.7	20	30-JUL-20
Sulfur (S)-Dissolved		290	285		mg/L	1.7	20	30-JUL-20
Tellurium (Te)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	30-JUL-20
Thallium (Tl)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	30-JUL-20
Thorium (Th)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	30-JUL-20
Tin (Sn)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	30-JUL-20
Titanium (Ti)-Dissolved		<0.0015	<0.0015	RPD-NA	mg/L	N/A	20	30-JUL-20
Tungsten (W)-Dissolved		0.00102	0.00094		mg/L	8.7	20	30-JUL-20
Uranium (U)-Dissolved		0.00459	0.00450		mg/L	2.0	20	30-JUL-20
Vanadium (V)-Dissolved		<0.0025	<0.0025	RPD-NA	mg/L	N/A	20	30-JUL-20
Zinc (Zn)-Dissolved		0.0117	0.0117		mg/L	0.1	20	30-JUL-20
Zirconium (Zr)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	30-JUL-20
WG3372797-1 MB								
Aluminum (Al)-Dissolved			<0.0020		mg/L		0.002	30-JUL-20
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	30-JUL-20
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	30-JUL-20
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	30-JUL-20
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	30-JUL-20
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	30-JUL-20
Boron (B)-Dissolved			<0.010		mg/L		0.01	30-JUL-20
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	30-JUL-20
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	30-JUL-20
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	30-JUL-20
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	30-JUL-20
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	30-JUL-20
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	30-JUL-20
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	30-JUL-20
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	30-JUL-20
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	30-JUL-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch R5172419								
WG3372797-1 MB								
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	30-JUL-20
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	30-JUL-20
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	30-JUL-20
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	30-JUL-20
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	30-JUL-20
Potassium (K)-Dissolved			<0.050		mg/L		0.05	30-JUL-20
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	30-JUL-20
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	30-JUL-20
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	30-JUL-20
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	30-JUL-20
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	30-JUL-20
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	30-JUL-20
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	30-JUL-20
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	30-JUL-20
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	30-JUL-20
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	30-JUL-20
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	30-JUL-20
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	30-JUL-20
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	30-JUL-20
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	30-JUL-20
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	30-JUL-20
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	30-JUL-20
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	30-JUL-20
WG3372797-4 MS		**L2480099-1**						
Aluminum (Al)-Dissolved			100.3		%		70-130	30-JUL-20
Antimony (Sb)-Dissolved			98.1		%		70-130	30-JUL-20
Arsenic (As)-Dissolved			102.2		%		70-130	30-JUL-20
Barium (Ba)-Dissolved			N/A	MS-B	%		-	30-JUL-20
Beryllium (Be)-Dissolved			99.1		%		70-130	30-JUL-20
Bismuth (Bi)-Dissolved			93.1		%		70-130	30-JUL-20
Boron (B)-Dissolved			N/A	MS-B	%		-	30-JUL-20
Cadmium (Cd)-Dissolved			101.0		%		70-130	30-JUL-20
Calcium (Ca)-Dissolved			N/A	MS-B	%		-	30-JUL-20
Cesium (Cs)-Dissolved			90.0		%		70-130	30-JUL-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch R5172419								
WG3372797-4 MS		**L2480099-1**						
Chromium (Cr)-Dissolved			97.7		%		70-130	30-JUL-20
Cobalt (Co)-Dissolved			93.7		%		70-130	30-JUL-20
Copper (Cu)-Dissolved			N/A	MS-B	%		-	30-JUL-20
Iron (Fe)-Dissolved			100.5		%		70-130	30-JUL-20
Lead (Pb)-Dissolved			92.6		%		70-130	30-JUL-20
Lithium (Li)-Dissolved			107.4		%		70-130	30-JUL-20
Magnesium (Mg)-Dissolved			N/A	MS-B	%		-	30-JUL-20
Manganese (Mn)-Dissolved			N/A	MS-B	%		-	30-JUL-20
Molybdenum (Mo)-Dissolved			N/A	MS-B	%		-	30-JUL-20
Nickel (Ni)-Dissolved			94.1		%		70-130	30-JUL-20
Phosphorus (P)-Dissolved			99.99		%		70-130	30-JUL-20
Potassium (K)-Dissolved			N/A	MS-B	%		-	30-JUL-20
Rubidium (Rb)-Dissolved			91.4		%		70-130	30-JUL-20
Selenium (Se)-Dissolved			100.1		%		70-130	30-JUL-20
Silicon (Si)-Dissolved			98.5		%		70-130	30-JUL-20
Silver (Ag)-Dissolved			98.0		%		70-130	30-JUL-20
Sodium (Na)-Dissolved			N/A	MS-B	%		-	30-JUL-20
Strontium (Sr)-Dissolved			N/A	MS-B	%		-	30-JUL-20
Sulfur (S)-Dissolved			N/A	MS-B	%		-	30-JUL-20
Tellurium (Te)-Dissolved			93.0		%		70-130	30-JUL-20
Thallium (Tl)-Dissolved			92.7		%		70-130	30-JUL-20
Thorium (Th)-Dissolved			96.2		%		70-130	30-JUL-20
Tin (Sn)-Dissolved			97.9		%		70-130	30-JUL-20
Titanium (Ti)-Dissolved			99.6		%		70-130	30-JUL-20
Tungsten (W)-Dissolved			95.0		%		70-130	30-JUL-20
Uranium (U)-Dissolved			N/A	MS-B	%		-	30-JUL-20
Vanadium (V)-Dissolved			96.7		%		70-130	30-JUL-20
Zinc (Zn)-Dissolved			96.5		%		70-130	30-JUL-20
Zirconium (Zr)-Dissolved			100.3		%		70-130	30-JUL-20
MET-T-CCMS-SK	Water							
Batch R5171056								
WG3371818-3 CRM		**TMRM_20**						
Aluminum (Al)-Total			105.0		%		80-120	28-JUL-20
Antimony (Sb)-Total			106.1		%		80-120	28-JUL-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-SK	Water							
Batch R5171056								
WG3371818-3 CRM		**TMRM_20**						
Arsenic (As)-Total			96.6		%		80-120	28-JUL-20
Barium (Ba)-Total			98.6		%		80-120	28-JUL-20
Beryllium (Be)-Total			102.0		%		80-120	28-JUL-20
Bismuth (Bi)-Total			103.7		%		80-120	28-JUL-20
Boron (B)-Total			100.9		%		80-120	28-JUL-20
Cadmium (Cd)-Total			98.8		%		80-120	28-JUL-20
Calcium (Ca)-Total			98.8		%		80-120	28-JUL-20
Cesium (Cs)-Total			94.3		%		80-120	28-JUL-20
Chromium (Cr)-Total			96.7		%		80-120	28-JUL-20
Cobalt (Co)-Total			95.4		%		80-120	28-JUL-20
Copper (Cu)-Total			95.8		%		80-120	28-JUL-20
Iron (Fe)-Total			106.3		%		80-120	28-JUL-20
Lead (Pb)-Total			104.8		%		80-120	28-JUL-20
Lithium (Li)-Total			108.1		%		80-120	28-JUL-20
Magnesium (Mg)-Total			100.8		%		80-120	28-JUL-20
Manganese (Mn)-Total			97.8		%		80-120	28-JUL-20
Molybdenum (Mo)-Total			102.3		%		80-120	28-JUL-20
Nickel (Ni)-Total			95.5		%		80-120	28-JUL-20
Potassium (K)-Total			91.9		%		80-120	28-JUL-20
Phosphorus (P)-Total			103.9		%		70-130	28-JUL-20
Rubidium (Rb)-Total			97.3		%		80-120	28-JUL-20
Selenium (Se)-Total			97.4		%		80-120	28-JUL-20
Silicon (Si)-Total			101.7		%		60-140	28-JUL-20
Silver (Ag)-Total			106.5		%		80-120	28-JUL-20
Sodium (Na)-Total			98.2		%		80-120	28-JUL-20
Strontium (Sr)-Total			111.2		%		80-120	28-JUL-20
Sulfur (S)-Total			105.9		%		80-120	28-JUL-20
Tellurium (Te)-Total			102.1		%		80-120	28-JUL-20
Thallium (Tl)-Total			108.6		%		80-120	28-JUL-20
Thorium (Th)-Total			100.3		%		80-120	28-JUL-20
Tin (Sn)-Total			98.7		%		80-120	28-JUL-20
Titanium (Ti)-Total			92.9		%		80-120	28-JUL-20
Tungsten (W)-Total			103.3		%		80-120	28-JUL-20
Uranium (U)-Total			106.8		%		80-120	28-JUL-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-SK	Water							
Batch R5171056								
WG3371818-3 CRM		**TMRM_20**						
Vanadium (V)-Total			99.4		%		80-120	28-JUL-20
Zinc (Zn)-Total			92.9		%		80-120	28-JUL-20
Zirconium (Zr)-Total			101.0		%		80-120	28-JUL-20
WG3371818-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	28-JUL-20
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	28-JUL-20
Arsenic (As)-Total			<0.00010		mg/L		0.0001	28-JUL-20
Barium (Ba)-Total			<0.00010		mg/L		0.0001	28-JUL-20
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	28-JUL-20
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	28-JUL-20
Boron (B)-Total			<0.010		mg/L		0.01	28-JUL-20
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	28-JUL-20
Calcium (Ca)-Total			<0.050		mg/L		0.05	28-JUL-20
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	28-JUL-20
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	28-JUL-20
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	28-JUL-20
Copper (Cu)-Total			<0.00050		mg/L		0.0005	28-JUL-20
Iron (Fe)-Total			<0.010		mg/L		0.01	28-JUL-20
Lead (Pb)-Total			<0.000050		mg/L		0.00005	28-JUL-20
Lithium (Li)-Total			<0.0010		mg/L		0.001	28-JUL-20
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	28-JUL-20
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	28-JUL-20
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	28-JUL-20
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	28-JUL-20
Potassium (K)-Total			<0.050		mg/L		0.05	28-JUL-20
Phosphorus (P)-Total			<0.050		mg/L		0.05	28-JUL-20
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	28-JUL-20
Selenium (Se)-Total			<0.000050		mg/L		0.00005	28-JUL-20
Silicon (Si)-Total			<0.10		mg/L		0.1	28-JUL-20
Silver (Ag)-Total			<0.000010		mg/L		0.00001	28-JUL-20
Sodium (Na)-Total			<0.050		mg/L		0.05	28-JUL-20
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	28-JUL-20
Sulfur (S)-Total			<0.50		mg/L		0.5	28-JUL-20
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	28-JUL-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-SK	Water							
Batch R5171056								
WG3371818-1 MB								
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	28-JUL-20
Thorium (Th)-Total			<0.00010		mg/L		0.0001	28-JUL-20
Tin (Sn)-Total			<0.00010		mg/L		0.0001	28-JUL-20
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	28-JUL-20
Tungsten (W)-Total			<0.00010		mg/L		0.0001	28-JUL-20
Uranium (U)-Total			<0.000010		mg/L		0.00001	28-JUL-20
Vanadium (V)-Total			<0.00050		mg/L		0.0005	28-JUL-20
Zinc (Zn)-Total			<0.0030		mg/L		0.003	28-JUL-20
Zirconium (Zr)-Total			<0.00020		mg/L		0.0002	28-JUL-20
NO2-IC-N-SK	Water							
Batch R5168416								
WG3371340-3 LCS								
Nitrite (as N)			103.3		%		90-110	27-JUL-20
WG3371340-2 MB								
Nitrite (as N)			<0.010		mg/L		0.01	27-JUL-20
NO3-IC-N-SK	Water							
Batch R5168416								
WG3371340-3 LCS								
Nitrate (as N)			100.6		%		90-110	27-JUL-20
WG3371340-2 MB								
Nitrate (as N)			<0.020		mg/L		0.02	27-JUL-20

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2480099-COFC

COC Number: 15 -

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Report To	Contact and company name below will appear on the final report
Company:	Ensero Technologies
Contact:	Rachel Martz
Phone:	306 978 3111
	Company address below will appear on the final report
Street:	104-411 Downey Road
City/Province:	Saskatoon, SK
Postal Code:	S7H 1R1
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Ensero Technologies
Contact:	Mel Shotenski

Project Information

ALS Account # / Quote #:	Q81011
Job #:	
PO / AFE:	
LSD:	

ALS Lab Work Order # (lab use only)

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax	rmartz@ensero.com
Email 2	rkleinberger@ensero.com
Email 3	kpiecowye@ensero.com

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax	rmartz@ensero.com
Email 2	ap@ensero.com

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Contact: **Sampler:**

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐

EMERGENCY: 1 Business day [E1] ☐ | Same Day, Weekend or Statutory holiday [E0] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	C-DIS-ORG-CL	MET-D-CCMS-SK	NO2-IC-N-SK	NO3-IC-N-SK	MET-T-CCMS-SK									Number of Containers
					F/P	F/P			P									
	W12 Water	27-Jul-20	12:00	Water	R	R	R	R	R									4

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human drinking water use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Please add cbrizinski@ensero.com and importer@contango.ehsdata.com to emails.

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
20					

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
				27/7/2020	9:30			9:30

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

[1] If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Ensero Technologies Inc.
ATTN: Rachel Martz
104- 411 Downey Road
Saskatoon SK S7N 4L8

Date Received: 10- AUG- 20
Report Date: 17- AUG- 20 15:24 (MT)
Version: FINAL

Client Phone: 306- 978- 3111

Certificate of Analysis

Lab Work Order #: L2486240
Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers:
Legal Site Desc:

Brian Morgan, B.Sc. Hons.
Client Services Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2486240-1 TRIAL E1 Sampled By: CLIENT on 07-AUG-20 @ 15:05 Matrix: WATER **Miscellaneous Parameters**							
Dissolved Organic Carbon	35.3		1.0	mg/L		13-AUG-20	R5187818
L2486240-2 TRIAL E1 Sampled By: CLIENT on 07-AUG-20 @ 18:00 Matrix: WATER **Miscellaneous Parameters**							
Dissolved Organic Carbon	136	DLHC	5.0	mg/L		14-AUG-20	R5189508
L2486240-3 TRIEL G2 Sampled By: CLIENT on 07-AUG-20 @ 15:15 Matrix: WATER **Miscellaneous Parameters**							
Dissolved Organic Carbon	34.5		1.0	mg/L		14-AUG-20	R5189508
L2486240-4 TRIAL G2 Sampled By: CLIENT on 07-AUG-20 @ 18:00 Matrix: WATER **Miscellaneous Parameters**							
Dissolved Organic Carbon	135	DLHC	5.0	mg/L		14-AUG-20	R5189508
L2486240-5 TRIAL M3 Sampled By: CLIENT on 07-AUG-20 @ 15:00 Matrix: WATER **Miscellaneous Parameters**							
Dissolved Organic Carbon	51.6	DLHC	5.0	mg/L		14-AUG-20	R5189508
L2486240-6 TRIAL M3 Sampled By: CLIENT on 07-AUG-20 @ 18:00 Matrix: WATER **Miscellaneous Parameters**							
Dissolved Organic Carbon	189	DLHC	5.0	mg/L		14-AUG-20	R5189508
L2486240-7 TRIAL C4 Sampled By: CLIENT on 07-AUG-20 @ 15:10 Matrix: WATER **Miscellaneous Parameters**							
Dissolved Organic Carbon	38.2		1.0	mg/L		13-AUG-20	R5188462
L2486240-8 TRIAL C4 Sampled By: CLIENT on 07-AUG-20 @ 18:00 Matrix: WATER **Miscellaneous Parameters**							
Dissolved Organic Carbon	47.1		1.0	mg/L		13-AUG-20	R5188462

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-DIS-ORG-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental

Filtered (0.45 um) sample is acidified and purged to remove inorganic carbon, then injected into a heated reaction chamber where organic carbon is oxidized to CO2 which is then transported in the carrier gas stream and measured via a non-dispersive infrared analyzer.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: Ensero Technologies Inc.
104-411 Downey Road
Saskatoon SK S7N 4L8
Contact: Rachel Martz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-CL	Water							
Batch R5187818								
WG3383486-10 LCS								
Dissolved Organic Carbon			106.4		%		80-120	13-AUG-20
WG3383486-9 MB								
Dissolved Organic Carbon			<1.0		mg/L		1	13-AUG-20
Batch R5188462								
WG3383627-10 LCS								
Dissolved Organic Carbon			104.4		%		80-120	13-AUG-20
WG3383627-9 MB								
Dissolved Organic Carbon			<1.0		mg/L		1	13-AUG-20
Batch R5189508								
WG3384194-2 LCS								
Dissolved Organic Carbon			110.5		%		80-120	14-AUG-20
WG3384194-1 MB								
Dissolved Organic Carbon			<1.0		mg/L		1	14-AUG-20

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

ALS Environmental

www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2486240-COFC

COC Number: 15 -

Page of

Report To	Contact and company name below will appear on the final report
Company:	Ensero Technologies
Contact:	Rachel Martz
Phone:	306 978 3111
	Company address below will appear on the final report
Street:	104-411 Downey Road
City/Province:	Saskatoon, SK
Postal Code:	S7H 1R1
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Ensero Technologies
Contact:	Mel Shotenski

Report Format / Distribution	
Select Report Format:	☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	rmartz@ensero.com
Email 2	rkleinberger@ensero.com
Email 3	kpiecowye@ensero.com

Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	rmartz@ensero.com
Email 2	ap@ensero.com

Project Information	
ALS Account # / Quote #:	Q81011
Job #:	
PO / AFE:	
LSD:	
ALS Lab Work Order # (lab use only)	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact:	**Sampler:**

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)		EMERGENCY	
	4 day [P4] ☐		1 Business day [E1] ☐
	3 day [P3] ☐		Same Day, Weekend or Statutory holiday [E0] ☐
	2 day [P2] ☐		

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	C-DIS-ORG-CL	Number of Containers
	Trial E1	7-Aug-20	15:05	Water	R	1
	Trial E1	7-Aug-20	18:00	Water	R	1
	Trial G2	7-Aug-20	15:15	Water	R	1
	Trial G2	7-Aug-20	18:00	Water	R	1
	Trial M3	7-Aug-20	15:00	Water	R	1
	Trial M3	7-Aug-20	18:00	Water	R	1
	Trial C4	7-Aug-20	15:10	Water	R	1
	Trial C4	7-Aug-20	18:00	Water	R	1

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human drinking water use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Please add cbrizinski@ensero.com and importer@contango.ehsdata.com to emails.

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
12					

SHIPMENT RELEASE (client use)		
Released by:	Date:	Time:

INITIAL SHIPMENT RECEPTION (lab use only)		
Received by: CS	Date: 10/8/20	Time: 2:17

FINAL SHIPMENT RECEPTION (lab use only)		
Received by: CS	Date:	Time: 2:17

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Ensero Technologies Inc.
ATTN: Rachel Martz
104- 411 Downey Road
Saskatoon SK S7N 4L8

Date Received: 13- AUG- 20
Report Date: 21- AUG- 20 15:59 (MT)
Version: FINAL

Client Phone: 306- 978- 3111

Certificate of Analysis

Lab Work Order #: L2488530
Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers:
Legal Site Desc:

Brian Morgan, B.Sc. Hons.
Client Services Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2488530-1 W12 WATER							
Sampled By: CLIENT on 07-AUG-20 @ 13:30							
Matrix: WATER							
Miscellaneous Parameters							
Nitrate (as N)	8.00	DLDS	0.20	mg/L		21-AUG-20	R5195517
Nitrate and Nitrite (as N)	11.1		0.22	mg/L		20-AUG-20	
Nitrite (as N)	3.07	DLDS	0.10	mg/L		21-AUG-20	R5195517
Total Kjeldahl Nitrogen	3.60	DLM	0.40	mg/L		19-AUG-20	R5191730
Total Nitrogen	14.7		0.46	mg/L		21-AUG-20	
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					14-AUG-20	R5188097
Aluminum (Al)-Dissolved	0.010	DLDS	0.010	mg/L		14-AUG-20	R5191175
Antimony (Sb)-Dissolved	<0.00050	DLDS	0.00050	mg/L		14-AUG-20	R5191175
Arsenic (As)-Dissolved	<0.00050	DLDS	0.00050	mg/L		14-AUG-20	R5191175
Barium (Ba)-Dissolved	0.0618	DLDS	0.00050	mg/L		14-AUG-20	R5191175
Beryllium (Be)-Dissolved	<0.00050	DLDS	0.00050	mg/L		14-AUG-20	R5191175
Bismuth (Bi)-Dissolved	<0.00025	DLDS	0.00025	mg/L		14-AUG-20	R5191175
Boron (B)-Dissolved	0.167	DLDS	0.050	mg/L		14-AUG-20	R5191175
Cadmium (Cd)-Dissolved	0.000114	DLDS	0.000025	mg/L		14-AUG-20	R5191175
Calcium (Ca)-Dissolved	267	DLDS	0.25	mg/L		14-AUG-20	R5191175
Cesium (Cs)-Dissolved	<0.000050	DLDS	0.000050	mg/L		14-AUG-20	R5191175
Chromium (Cr)-Dissolved	<0.00050	DLDS	0.00050	mg/L		14-AUG-20	R5191175
Cobalt (Co)-Dissolved	<0.00050	DLDS	0.00050	mg/L		14-AUG-20	R5191175
Copper (Cu)-Dissolved	0.0865	DLDS	0.0010	mg/L		14-AUG-20	R5191175
Iron (Fe)-Dissolved	<0.050	DLDS	0.050	mg/L		14-AUG-20	R5191175
Lead (Pb)-Dissolved	<0.00025	DLDS	0.00025	mg/L		14-AUG-20	R5191175
Lithium (Li)-Dissolved	0.0066	DLDS	0.0050	mg/L		14-AUG-20	R5191175
Magnesium (Mg)-Dissolved	41.8	DLDS	0.025	mg/L		14-AUG-20	R5191175
Manganese (Mn)-Dissolved	0.235	DLDS	0.00050	mg/L		14-AUG-20	R5191175
Molybdenum (Mo)-Dissolved	0.0268	DLDS	0.00025	mg/L		14-AUG-20	R5191175
Nickel (Ni)-Dissolved	<0.0025	DLDS	0.0025	mg/L		14-AUG-20	R5191175
Phosphorus (P)-Dissolved	<0.25	DLDS	0.25	mg/L		14-AUG-20	R5191175
Potassium (K)-Dissolved	13.8	DLDS	0.25	mg/L		14-AUG-20	R5191175
Rubidium (Rb)-Dissolved	0.0119	DLDS	0.0010	mg/L		14-AUG-20	R5191175
Selenium (Se)-Dissolved	0.00443	DLDS	0.00025	mg/L		14-AUG-20	R5191175
Silicon (Si)-Dissolved	3.84	DLDS	0.25	mg/L		14-AUG-20	R5191175
Silver (Ag)-Dissolved	<0.000050	DLDS	0.000050	mg/L		14-AUG-20	R5191175
Sodium (Na)-Dissolved	66.0	DLDS	0.25	mg/L		14-AUG-20	R5191175
Strontium (Sr)-Dissolved	4.25	DLDS	0.0010	mg/L		14-AUG-20	R5191175
Sulfur (S)-Dissolved	277	DLDS	2.5	mg/L		14-AUG-20	R5191175
Tellurium (Te)-Dissolved	<0.0010	DLDS	0.0010	mg/L		14-AUG-20	R5191175
Thallium (Tl)-Dissolved	<0.000050	DLDS	0.000050	mg/L		14-AUG-20	R5191175
Thorium (Th)-Dissolved	<0.00050	DLDS	0.00050	mg/L		14-AUG-20	R5191175
Tin (Sn)-Dissolved	<0.00050	DLDS	0.00050	mg/L		14-AUG-20	R5191175
Titanium (Ti)-Dissolved	<0.0015	DLDS	0.0015	mg/L		14-AUG-20	R5191175
Tungsten (W)-Dissolved	0.00096	DLDS	0.00050	mg/L		14-AUG-20	R5191175
Uranium (U)-Dissolved	0.00469	DLDS	0.000050	mg/L		14-AUG-20	R5191175
Vanadium (V)-Dissolved	<0.0025	DLDS	0.0025	mg/L		14-AUG-20	R5191175
Zinc (Zn)-Dissolved	0.0144	DLDS	0.0050	mg/L		14-AUG-20	R5191175
Zirconium (Zr)-Dissolved	<0.0010	DLDS	0.0010	mg/L		14-AUG-20	R5191175
L2488530-2 TRIAL E1							
Sampled By: CLIENT on 13-AUG-20 @ 12:50							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	<0.050		0.050	mg/L		18-AUG-20	R5191746

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2488530-2 TRIAL E1							
Sampled By: CLIENT on 13-AUG-20 @ 12:50							
Matrix: WATER							
Nitrate (as N)	<0.10	DLHC	0.10	mg/L		14-AUG-20	R5189689
Nitrite (as N)	<0.050	DLHC	0.050	mg/L		14-AUG-20	R5189689
L2488530-3 TRIAL G2							
Sampled By: CLIENT on 13-AUG-20 @ 12:55							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	0.054		0.050	mg/L		18-AUG-20	R5191746
Nitrate (as N)	<0.20	DLHC	0.20	mg/L		14-AUG-20	R5189689
Nitrite (as N)	<0.10	DLHC	0.10	mg/L		14-AUG-20	R5189689
L2488530-4 TRIAL M3							
Sampled By: CLIENT on 13-AUG-20 @ 13:00							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	0.065		0.050	mg/L		18-AUG-20	R5191746
Nitrate (as N)	<0.10	DLHC	0.10	mg/L		14-AUG-20	R5189689
Nitrite (as N)	<0.050	DLHC	0.050	mg/L		14-AUG-20	R5189689
L2488530-5 TRIAL C4							
Sampled By: CLIENT on 13-AUG-20 @ 13:05							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	1.06	DLHC	0.50	mg/L		18-AUG-20	R5191746
Nitrate (as N)	3.92	DLHC	0.10	mg/L		14-AUG-20	R5189689
Nitrite (as N)	4.90	DLHC	0.050	mg/L		14-AUG-20	R5189689

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
K	Matrix Spike recovery outside ALS DQO due to sample matrix effects.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
MET-D-CCMS-SK	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B / EPA 6020A
This procedure involves preliminary filtration through a 0.45 um filter followed by instrumental analysis using collision cell inductively coupled plasma - mass spectrometry (modifed from EPA Method 6020A).			
N-T-CALC-CL	Water	Total Nitrogen (Calculation)	APHA 4500 N-Calculated
Total Nitrogen is a calculated parameter. Total Nitrogen = Total Kjeldahl Nitrogen + [Nitrate and Nitrite (as N)]			
N2N3-CALC-CL	Water	Nitrate+Nitrite	CALCULATION
NH3-F-CL	Water	Ammonia by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-IC-N-SK	Water	Nitrite in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-IC-N-SK	Water	Nitrate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
TKN-F-CL	Water	Total Kjeldahl Nitrogen by Fluorescence	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: Ensero Technologies Inc.
104-411 Downey Road
Saskatoon SK S7N 4L8
Contact: Rachel Martz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch R5191175								
WG3383104-3 CRM		**TMRM_20**						
Aluminum (Al)-Dissolved			102.8		%		80-120	14-AUG-20
Antimony (Sb)-Dissolved			95.1		%		80-120	14-AUG-20
Arsenic (As)-Dissolved			99.3		%		80-120	14-AUG-20
Barium (Ba)-Dissolved			100.4		%		80-120	14-AUG-20
Beryllium (Be)-Dissolved			101.2		%		80-120	14-AUG-20
Bismuth (Bi)-Dissolved			96.0		%		80-120	14-AUG-20
Boron (B)-Dissolved			97.3		%		80-120	14-AUG-20
Cadmium (Cd)-Dissolved			104.6		%		80-120	14-AUG-20
Calcium (Ca)-Dissolved			99.6		%		80-120	14-AUG-20
Cesium (Cs)-Dissolved			98.5		%		80-120	14-AUG-20
Chromium (Cr)-Dissolved			98.4		%		80-120	14-AUG-20
Cobalt (Co)-Dissolved			97.1		%		80-120	14-AUG-20
Copper (Cu)-Dissolved			96.2		%		80-120	14-AUG-20
Iron (Fe)-Dissolved			108.0		%		80-120	14-AUG-20
Lead (Pb)-Dissolved			99.9		%		80-120	14-AUG-20
Lithium (Li)-Dissolved			110.7		%		80-120	14-AUG-20
Magnesium (Mg)-Dissolved			105.3		%		80-120	14-AUG-20
Manganese (Mn)-Dissolved			98.1		%		80-120	14-AUG-20
Molybdenum (Mo)-Dissolved			100.4		%		80-120	14-AUG-20
Nickel (Ni)-Dissolved			94.6		%		80-120	14-AUG-20
Phosphorus (P)-Dissolved			113.8		%		70-130	14-AUG-20
Potassium (K)-Dissolved			95.5		%		80-120	14-AUG-20
Rubidium (Rb)-Dissolved			99.4		%		80-120	14-AUG-20
Selenium (Se)-Dissolved			98.6		%		80-120	14-AUG-20
Silicon (Si)-Dissolved			98.5		%		60-140	14-AUG-20
Silver (Ag)-Dissolved			104.0		%		80-120	14-AUG-20
Sodium (Na)-Dissolved			104.7		%		80-120	14-AUG-20
Strontium (Sr)-Dissolved			104.0		%		80-120	14-AUG-20
Sulfur (S)-Dissolved			98.3		%		80-120	14-AUG-20
Tellurium (Te)-Dissolved			96.2		%		80-120	14-AUG-20
Thallium (Tl)-Dissolved			97.4		%		80-120	14-AUG-20
Thorium (Th)-Dissolved			100.0		%		80-120	14-AUG-20
Tin (Sn)-Dissolved			99.6		%		80-120	14-AUG-20
Titanium (Ti)-Dissolved			96.3		%		80-120	14-AUG-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch R5191175								
WG3383104-3 CRM		**TMRM_20**						
Tungsten (W)-Dissolved			101.2		%		80-120	14-AUG-20
Uranium (U)-Dissolved			100.8		%		80-120	14-AUG-20
Vanadium (V)-Dissolved			97.7		%		80-120	14-AUG-20
Zinc (Zn)-Dissolved			96.8		%		80-120	14-AUG-20
Zirconium (Zr)-Dissolved			99.4		%		80-120	14-AUG-20
WG3383104-2 DUP		**L2488530-1**						
Aluminum (Al)-Dissolved		0.010	<0.010	RPD-NA	mg/L	N/A	20	14-AUG-20
Antimony (Sb)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	14-AUG-20
Arsenic (As)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	14-AUG-20
Barium (Ba)-Dissolved		0.0618	0.0610		mg/L	1.3	20	14-AUG-20
Beryllium (Be)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	14-AUG-20
Bismuth (Bi)-Dissolved		<0.00025	<0.00025	RPD-NA	mg/L	N/A	20	14-AUG-20
Boron (B)-Dissolved		0.167	0.169		mg/L	0.6	20	14-AUG-20
Cadmium (Cd)-Dissolved		0.000114	0.000108		mg/L	5.1	20	14-AUG-20
Calcium (Ca)-Dissolved		267	267		mg/L	0.0	20	14-AUG-20
Cesium (Cs)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	14-AUG-20
Chromium (Cr)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	14-AUG-20
Cobalt (Co)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	14-AUG-20
Copper (Cu)-Dissolved		0.0865	0.0820		mg/L	5.3	20	14-AUG-20
Iron (Fe)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	14-AUG-20
Lead (Pb)-Dissolved		<0.00025	<0.00025	RPD-NA	mg/L	N/A	20	14-AUG-20
Lithium (Li)-Dissolved		0.0066	0.0066		mg/L	0.8	20	14-AUG-20
Magnesium (Mg)-Dissolved		41.8	40.9		mg/L	2.3	20	14-AUG-20
Manganese (Mn)-Dissolved		0.235	0.225		mg/L	4.2	20	14-AUG-20
Molybdenum (Mo)-Dissolved		0.0268	0.0271		mg/L	1.1	20	14-AUG-20
Nickel (Ni)-Dissolved		<0.0025	<0.0025	RPD-NA	mg/L	N/A	20	14-AUG-20
Phosphorus (P)-Dissolved		<0.25	<0.25	RPD-NA	mg/L	N/A	20	14-AUG-20
Potassium (K)-Dissolved		13.8	13.5		mg/L	2.0	20	14-AUG-20
Rubidium (Rb)-Dissolved		0.0119	0.0125		mg/L	4.8	20	14-AUG-20
Selenium (Se)-Dissolved		0.00443	0.00459		mg/L	3.5	20	14-AUG-20
Silicon (Si)-Dissolved		3.84	3.86		mg/L	0.6	20	14-AUG-20
Silver (Ag)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	14-AUG-20
Sodium (Na)-Dissolved		66.0	62.6		mg/L	5.2	20	14-AUG-20
Strontium (Sr)-Dissolved		4.25	4.35		mg/L	2.3	20	14-AUG-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch R5191175								
WG3383104-2 DUP		**L2488530-1**						
Sulfur (S)-Dissolved		277	274		mg/L	1.2	20	14-AUG-20
Tellurium (Te)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	14-AUG-20
Thallium (Tl)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	14-AUG-20
Thorium (Th)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	14-AUG-20
Tin (Sn)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	14-AUG-20
Titanium (Ti)-Dissolved		<0.0015	<0.0015	RPD-NA	mg/L	N/A	20	14-AUG-20
Tungsten (W)-Dissolved		0.00096	0.00099		mg/L	3.3	20	14-AUG-20
Uranium (U)-Dissolved		0.00469	0.00465		mg/L	0.9	20	14-AUG-20
Vanadium (V)-Dissolved		<0.0025	<0.0025	RPD-NA	mg/L	N/A	20	14-AUG-20
Zinc (Zn)-Dissolved		0.0144	0.0135		mg/L	6.7	20	14-AUG-20
Zirconium (Zr)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	14-AUG-20
WG3383104-1 MB								
Aluminum (Al)-Dissolved			<0.0020		mg/L		0.002	14-AUG-20
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-20
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-20
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-20
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-20
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	14-AUG-20
Boron (B)-Dissolved			<0.010		mg/L		0.01	14-AUG-20
Cadmium (Cd)-Dissolved			<0.000005C		mg/L		0.000005	14-AUG-20
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	14-AUG-20
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	14-AUG-20
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-20
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-20
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	14-AUG-20
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	14-AUG-20
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	14-AUG-20
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	14-AUG-20
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	14-AUG-20
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-20
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	14-AUG-20
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	14-AUG-20
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	14-AUG-20
Potassium (K)-Dissolved			<0.050		mg/L		0.05	14-AUG-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch R5191175								
WG3383104-1 MB								
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	14-AUG-20
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	14-AUG-20
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	14-AUG-20
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	14-AUG-20
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	14-AUG-20
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	14-AUG-20
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	14-AUG-20
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	14-AUG-20
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	14-AUG-20
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-20
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-20
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	14-AUG-20
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	14-AUG-20
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	14-AUG-20
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	14-AUG-20
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	14-AUG-20
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	14-AUG-20
NH3-F-CL	Water							
Batch R5191746								
WG3386206-10 LCS								
Ammonia, Total (as N)			102.7		%		85-115	18-AUG-20
WG3386206-9 MB								
Ammonia, Total (as N)			<0.050		mg/L		0.05	18-AUG-20
NO2-IC-N-SK	Water							
Batch R5189689								
WG3383068-1 DUP		**L2488530-3**						
Nitrite (as N)		<0.10	<0.10	RPD-NA	mg/L	N/A	20	14-AUG-20
WG3383068-3 LCS								
Nitrite (as N)			102.6		%		90-110	14-AUG-20
WG3383068-2 MB								
Nitrite (as N)			<0.010		mg/L		0.01	14-AUG-20
Batch R5195517								
WG3387976-3 LCS								
Nitrite (as N)			99.9		%		90-110	21-AUG-20
WG3387976-2 MB								

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-IC-N-SK	Water							
Batch R5195517								
WG3387976-2 MB								
Nitrite (as N)			<0.010		mg/L		0.01	21-AUG-20
NO3-IC-N-SK	Water							
Batch R5189689								
WG3383068-1 DUP		**L2488530-3**						
Nitrate (as N)		<0.20	0.30	RPD-NA	mg/L	N/A	20	14-AUG-20
WG3383068-3 LCS								
Nitrate (as N)			103.0		%		90-110	14-AUG-20
WG3383068-2 MB								
Nitrate (as N)			<0.020		mg/L		0.02	14-AUG-20
Batch R5195517								
WG3387976-3 LCS								
Nitrate (as N)			103.0		%		90-110	21-AUG-20
WG3387976-2 MB								
Nitrate (as N)			<0.020		mg/L		0.02	21-AUG-20
TKN-F-CL	Water							
Batch R5191730								
WG3386561-15 DUP		**L2488530-1**						
Total Kjeldahl Nitrogen		3.60	3.95		mg/L	9.3	20	19-AUG-20
WG3386561-1 LCS								
Total Kjeldahl Nitrogen			100.4		%		75-125	19-AUG-20
WG3386561-11 LCS								
Total Kjeldahl Nitrogen			97.4		%		75-125	19-AUG-20
WG3386561-14 LCS								
Total Kjeldahl Nitrogen			96.8		%		75-125	19-AUG-20
WG3386561-6 LCS								
Total Kjeldahl Nitrogen			97.4		%		75-125	19-AUG-20
WG3386561-8 LCS								
Total Kjeldahl Nitrogen			92.2		%		75-125	19-AUG-20
WG3386561-10 MB								
Total Kjeldahl Nitrogen			<0.20		mg/L		0.2	19-AUG-20
WG3386561-13 MB								
Total Kjeldahl Nitrogen			<0.20		mg/L		0.2	19-AUG-20
WG3386561-2 MB								
Total Kjeldahl Nitrogen			<0.20		mg/L		0.2	19-AUG-20
WG3386561-5 MB								
Total Kjeldahl Nitrogen			<0.20		mg/L		0.2	19-AUG-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-F-CL	Water							
Batch R5191730								
WG3386561-7 MB								
Total Kjeldahl Nitrogen			<0.20		mg/L		0.2	19-AUG-20

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Anions and Nutrients							
Nitrate in Water by IC							
	1	07-AUG-20 13:30	21-AUG-20 02:00	3	14	days	EHTR
Nitrite in Water by IC							
	1	07-AUG-20 13:30	21-AUG-20 02:00	3	14	days	EHTR

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2488530 were received on 13-AUG-20 15:30.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2488530-COFC

COC Number: 15 -

Page of

Report To	Contact and company name below will appear on the final report
Company:	Ensero Technologies
Contact:	Rachel Martz
Phone:	306 978 3111
	Company address below will appear on the final report
Street:	104-411 Downey Road
City/Province:	Saskatoon, SK
Postal Code:	S7H 1R1
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Ensero Technologies
Contact:	Mel Shotenski

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: rmartz@ensero.com

Email 2: rkleinberger@ensero.com

Email 3: kpiecowye@ensero.com

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: rmartz@ensero.com

Email 2: ap@ensero.com

Project Information

ALS Account # / Quote #: Q81011

Job #:

PO / AFE:

LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#

Major/Minor Code: Routing Code:

Requisitioner:

Location:

ALS Lab Work Order # (lab use only)

ALS Contact: Sampler:

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐

EMERGENCY: 1 Business day [E1] ☐ | Same Day, Weekend or Statutory holiday [E0] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	N-TOT-SK (P)	MET-D-CCMS-SK (F/P)	NO2-IC-N-SK	NO3-IC-N-SK	NH3-F-CL (P)	Number of Containers
	W12 Water	7-Aug-20	13:30	Water	R	R				2
	Trial E1	13-Aug-20	12:50	Water			R	R	R	2
	Trial G2	13-Aug-20	12:55	Water			R	R	R	2
	Trial M3	13-Aug-20	13:00	Water			R	R	R	2
	Trial C4	13-Aug-20	13:05	Water			R	R	R	2

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human drinking water use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Please add cbrizinski@ensero.com and importer@contango.ehsdata.com to emails.

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by: NKh	Date: 13/8/2020	Time: 3:30	Received by: NKh	Date:	Time: 3:50

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Ensero Technologies Inc.
ATTN: Rachel Martz
104- 411 Downey Road
Saskatoon SK S7N 4L8

Date Received: 14- AUG- 20
Report Date: 08- SEP- 20 11:18 (MT)
Version: FINAL REV. 2

Client Phone: 306- 978- 3111

Certificate of Analysis

Lab Work Order #: L2489162
Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers:
Legal Site Desc:

Comments:
8- SEP- 2020 Revised results due to dilution error

Brian Morgan, B.Sc. Hons.
Client Services Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2489162-1 WOODCHIP TRIAL							
Sampled By: CLIENT on 14-AUG-20 @ 13:30							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	1.44	DLHC	0.25	mg/L		19-AUG-20	R5192339
Dissolved Organic Carbon	37.4		1.0	mg/L		19-AUG-20	R5192724
Nitrate (as N)	6.80	DLHC	0.10	mg/L		15-AUG-20	R5189762
Nitrite (as N)	3.73	DLHC	0.050	mg/L		15-AUG-20	R5189762
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					18-AUG-20	R5190766
Aluminum (Al)-Dissolved	<0.010	DLM	0.010	mg/L		03-SEP-20	R5193096
Antimony (Sb)-Dissolved	<0.00050	DLM	0.00050	mg/L		03-SEP-20	R5193096
Arsenic (As)-Dissolved	<0.00050	DLM	0.00050	mg/L		03-SEP-20	R5193096
Barium (Ba)-Dissolved	0.0653	DLM	0.00050	mg/L		03-SEP-20	R5193096
Beryllium (Be)-Dissolved	<0.00050	DLM	0.00050	mg/L		03-SEP-20	R5193096
Bismuth (Bi)-Dissolved	<0.00025	DLM	0.00025	mg/L		03-SEP-20	R5193096
Boron (B)-Dissolved	0.172	DLM	0.050	mg/L		03-SEP-20	R5193096
Cadmium (Cd)-Dissolved	0.000094	DLM	0.000025	mg/L		03-SEP-20	R5193096
Calcium (Ca)-Dissolved	277	DLM	0.25	mg/L		03-SEP-20	R5193096
Cesium (Cs)-Dissolved	<0.000050	DLM	0.000050	mg/L		03-SEP-20	R5193096
Chromium (Cr)-Dissolved	<0.00050	DLM	0.00050	mg/L		03-SEP-20	R5193096
Cobalt (Co)-Dissolved	<0.00050	DLM	0.00050	mg/L		03-SEP-20	R5193096
Copper (Cu)-Dissolved	0.0859	DLM	0.0010	mg/L		03-SEP-20	R5193096
Iron (Fe)-Dissolved	<0.050	DLM	0.050	mg/L		03-SEP-20	R5193096
Lead (Pb)-Dissolved	<0.00025	DLM	0.00025	mg/L		03-SEP-20	R5193096
Lithium (Li)-Dissolved	0.0069	DLM	0.0050	mg/L		03-SEP-20	R5193096
Magnesium (Mg)-Dissolved	43.7	DLM	0.025	mg/L		03-SEP-20	R5193096
Manganese (Mn)-Dissolved	0.247	DLM	0.00050	mg/L		03-SEP-20	R5193096
Molybdenum (Mo)-Dissolved	0.0264	DLM	0.00025	mg/L		03-SEP-20	R5193096
Nickel (Ni)-Dissolved	0.0026	DLM	0.0025	mg/L		03-SEP-20	R5193096
Phosphorus (P)-Dissolved	<0.25	DLM	0.25	mg/L		03-SEP-20	R5193096
Potassium (K)-Dissolved	14.2	DLM	0.25	mg/L		03-SEP-20	R5193096
Rubidium (Rb)-Dissolved	0.0131	DLM	0.0010	mg/L		03-SEP-20	R5193096
Selenium (Se)-Dissolved	0.00503	DLM	0.00025	mg/L		03-SEP-20	R5193096
Silicon (Si)-Dissolved	4.20	DLM	0.25	mg/L		03-SEP-20	R5193096
Silver (Ag)-Dissolved	<0.000050	DLM	0.000050	mg/L		03-SEP-20	R5193096
Sodium (Na)-Dissolved	63.4	DLM	0.25	mg/L		03-SEP-20	R5193096
Strontium (Sr)-Dissolved	4.27	DLM	0.0010	mg/L		03-SEP-20	R5193096
Sulfur (S)-Dissolved	279	DLM	2.5	mg/L		03-SEP-20	R5193096
Tellurium (Te)-Dissolved	<0.0010	DLM	0.0010	mg/L		03-SEP-20	R5193096
Thallium (Tl)-Dissolved	<0.000050	DLM	0.000050	mg/L		03-SEP-20	R5193096
Thorium (Th)-Dissolved	<0.00050	DLM	0.00050	mg/L		03-SEP-20	R5193096
Tin (Sn)-Dissolved	<0.00050	DLM	0.00050	mg/L		03-SEP-20	R5193096
Titanium (Ti)-Dissolved	<0.0015	DLM	0.0015	mg/L		03-SEP-20	R5193096
Tungsten (W)-Dissolved	0.00101	DLM	0.00050	mg/L		03-SEP-20	R5193096
Uranium (U)-Dissolved	0.00455	DLM	0.000050	mg/L		03-SEP-20	R5193096
Vanadium (V)-Dissolved	<0.0025	DLM	0.0025	mg/L		03-SEP-20	R5193096
Zinc (Zn)-Dissolved	0.0099	DLM	0.0050	mg/L		03-SEP-20	R5193096
Zirconium (Zr)-Dissolved	<0.0010	DLM	0.0010	mg/L		03-SEP-20	R5193096

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
K	Matrix Spike recovery outside ALS DQO due to sample matrix effects.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-DIS-ORG-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
Filtered (0.45 um) sample is acidified and purged to remove inorganic carbon, then injected into a heated reaction chamber where organic carbon is oxidized to CO2 which is then transported in the carrier gas stream and measured via a non-dispersive infrared analyzer.			
MET-D-CCMS-SK	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B / EPA 6020A
This procedure involves preliminary filtration through a 0.45 um filter followed by instrumental analysis using collision cell inductively coupled plasma - mass spectrometry (modifed from EPA Method 6020A).			
NH3-F-CL	Water	Ammonia by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-IC-N-SK	Water	Nitrite in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-IC-N-SK	Water	Nitrate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: Ensero Technologies Inc.
104-411 Downey Road
Saskatoon SK S7N 4L8
Contact: Rachel Martz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-CL	Water							
Batch R5192724								
WG3387402-2 LCS								
Dissolved Organic Carbon			111.8		%		80-120	19-AUG-20
WG3387402-1 MB								
Dissolved Organic Carbon			<1.0		mg/L		1	19-AUG-20
MET-D-CCMS-SK	Water							
Batch R5193096								
WG3385241-3 CRM		**TMRM_20**						
Aluminum (Al)-Dissolved			102.3		%		80-120	18-AUG-20
Antimony (Sb)-Dissolved			101.6		%		80-120	18-AUG-20
Arsenic (As)-Dissolved			102.6		%		80-120	18-AUG-20
Barium (Ba)-Dissolved			102.4		%		80-120	18-AUG-20
Beryllium (Be)-Dissolved			99.0		%		80-120	18-AUG-20
Bismuth (Bi)-Dissolved			101.8		%		80-120	18-AUG-20
Boron (B)-Dissolved			93.4		%		80-120	18-AUG-20
Cadmium (Cd)-Dissolved			100.5		%		80-120	18-AUG-20
Calcium (Ca)-Dissolved			98.2		%		80-120	18-AUG-20
Cesium (Cs)-Dissolved			100.8		%		80-120	18-AUG-20
Chromium (Cr)-Dissolved			98.3		%		80-120	18-AUG-20
Cobalt (Co)-Dissolved			97.6		%		80-120	18-AUG-20
Copper (Cu)-Dissolved			98.2		%		80-120	18-AUG-20
Iron (Fe)-Dissolved			110.8		%		80-120	18-AUG-20
Lead (Pb)-Dissolved			101.5		%		80-120	18-AUG-20
Lithium (Li)-Dissolved			98.4		%		80-120	18-AUG-20
Magnesium (Mg)-Dissolved			102.3		%		80-120	18-AUG-20
Manganese (Mn)-Dissolved			101.8		%		80-120	18-AUG-20
Molybdenum (Mo)-Dissolved			100.9		%		80-120	18-AUG-20
Nickel (Ni)-Dissolved			98.0		%		80-120	18-AUG-20
Phosphorus (P)-Dissolved			106.3		%		70-130	18-AUG-20
Potassium (K)-Dissolved			101.9		%		80-120	18-AUG-20
Rubidium (Rb)-Dissolved			98.0		%		80-120	18-AUG-20
Selenium (Se)-Dissolved			103.7		%		80-120	18-AUG-20
Silicon (Si)-Dissolved			100.7		%		60-140	18-AUG-20
Silver (Ag)-Dissolved			103.7		%		80-120	18-AUG-20
Sodium (Na)-Dissolved			102.5		%		80-120	18-AUG-20
Strontium (Sr)-Dissolved			107.4		%		80-120	18-AUG-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch R5193096								
WG3385241-3 CRM		**TMRM_20**						
Sulfur (S)-Dissolved			104.7		%		80-120	18-AUG-20
Tellurium (Te)-Dissolved			106.5		%		80-120	18-AUG-20
Thallium (Tl)-Dissolved			101.0		%		80-120	18-AUG-20
Thorium (Th)-Dissolved			100.7		%		80-120	18-AUG-20
Tin (Sn)-Dissolved			97.7		%		80-120	18-AUG-20
Titanium (Ti)-Dissolved			96.7		%		80-120	18-AUG-20
Tungsten (W)-Dissolved			100.8		%		80-120	18-AUG-20
Uranium (U)-Dissolved			101.1		%		80-120	18-AUG-20
Vanadium (V)-Dissolved			99.2		%		80-120	18-AUG-20
Zinc (Zn)-Dissolved			99.6		%		80-120	18-AUG-20
Zirconium (Zr)-Dissolved			104.4		%		80-120	18-AUG-20
WG3385241-1 MB								
Aluminum (Al)-Dissolved			<0.0020		mg/L		0.002	18-AUG-20
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	18-AUG-20
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	18-AUG-20
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	18-AUG-20
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	18-AUG-20
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	18-AUG-20
Boron (B)-Dissolved			<0.010		mg/L		0.01	18-AUG-20
Cadmium (Cd)-Dissolved			<0.000005C		mg/L		0.000005	18-AUG-20
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	18-AUG-20
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	18-AUG-20
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	18-AUG-20
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	18-AUG-20
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	18-AUG-20
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	18-AUG-20
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	18-AUG-20
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	18-AUG-20
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	18-AUG-20
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	18-AUG-20
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	18-AUG-20
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	18-AUG-20
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	18-AUG-20
Potassium (K)-Dissolved			<0.050		mg/L		0.05	18-AUG-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch R5193096								
WG3385241-1 MB								
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	18-AUG-20
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	18-AUG-20
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	18-AUG-20
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	18-AUG-20
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	18-AUG-20
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	18-AUG-20
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	18-AUG-20
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	18-AUG-20
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	18-AUG-20
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	18-AUG-20
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	18-AUG-20
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	18-AUG-20
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	18-AUG-20
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	18-AUG-20
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	18-AUG-20
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	18-AUG-20
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	18-AUG-20
NH3-F-CL	Water							
Batch R5192339								
WG3387109-14 LCS								
Ammonia, Total (as N)			112.7		%		85-115	19-AUG-20
WG3387109-13 MB								
Ammonia, Total (as N)			<0.050		mg/L		0.05	19-AUG-20
NO2-IC-N-SK	Water							
Batch R5189762								
WG3383971-3 LCS								
Nitrite (as N)			101.6		%		90-110	15-AUG-20
WG3383971-2 MB								
Nitrite (as N)			<0.010		mg/L		0.01	15-AUG-20
NO3-IC-N-SK	Water							
Batch R5189762								
WG3383971-3 LCS								
Nitrate (as N)			102.5		%		90-110	15-AUG-20
WG3383971-2 MB								
Nitrate (as N)			<0.020		mg/L		0.02	15-AUG-20

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2489162-COFC

COC Number: 15 -

Page of

Report To	Contact and company name below will appear on the final report
Company:	Ensero Technologies
Contact:	Rachel Martz
Phone:	306 978 3111
	Company address below will appear on the final report
Street:	104-411 Downey Road
City/Province:	Saskatoon, SK
Postal Code:	S7H 1R1
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Ensero Technologies
Contact:	Mel Shotenski

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax	rmartz@ensero.com
Email 2	rkleinberger@ensero.com
Email 3	kpiecowye@ensero.com

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax	rmartz@ensero.com
Email 2	ap@ensero.com

Project Information

ALS Account # / Quote #:	Q81011
Job #:	
PO / AFE:	
LSD:	

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only)

ALS Contact:

Sampler:

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐

EMERGENCY: 1 Business day [E1] ☐ | Same Day, Weekend or Statutory holiday [E0] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	C-DIS-ORG-CL (F/P)	MET-D-CCMS-SK (F/P)	NO2-IC-N-SK	NO3-IC-N-SK	NH3-F-CL (P)	Number of Containers
	Woodchip Trial	14-Aug-20	13:30	Water	R	R	R	R	R	4

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human drinking water use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Please add cbrizinski@ensero.com and importer@contango.ehsdata.com to emails.

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
13.6					

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by: JMT	Date: 14-Aug-20	Time: 4:00	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Ensero Technologies Inc.
ATTN: Rachel Martz
104- 411 Downey Road
Saskatoon SK S7N 4L8

Date Received: 17- AUG- 20
Report Date: 24- AUG- 20 11:37 (MT)
Version: FINAL

Client Phone: 306- 978- 3111

Certificate of Analysis

Lab Work Order #: L2489663
Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers:
Legal Site Desc:

Brian Morgan, B.Sc. Hons.
Client Services Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2489663-1 WOODCHIP TRIAL							
Sampled By: CLIENT on 15-AUG-20 @ 19:00							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	0.85	DLHC	0.25	mg/L		19-AUG-20	R5192339
Dissolved Organic Carbon	39.2		1.0	mg/L		20-AUG-20	R5195233
Nitrate (as N)	3.26	DLDS	0.10	mg/L		18-AUG-20	R5191609
Nitrite (as N)	6.08	DLDS	0.050	mg/L		18-AUG-20	R5191609
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					18-AUG-20	R5191074
Aluminum (Al)-Dissolved	<0.010	DLDS	0.010	mg/L		20-AUG-20	R5196276
Antimony (Sb)-Dissolved	<0.00050	DLDS	0.00050	mg/L		20-AUG-20	R5196276
Arsenic (As)-Dissolved	<0.00050	DLDS	0.00050	mg/L		20-AUG-20	R5196276
Barium (Ba)-Dissolved	0.132	DLDS	0.00050	mg/L		20-AUG-20	R5196276
Beryllium (Be)-Dissolved	<0.00050	DLDS	0.00050	mg/L		20-AUG-20	R5196276
Bismuth (Bi)-Dissolved	<0.00025	DLDS	0.00025	mg/L		20-AUG-20	R5196276
Boron (B)-Dissolved	0.168	DLDS	0.050	mg/L		20-AUG-20	R5196276
Cadmium (Cd)-Dissolved	0.000175	DLDS	0.000025	mg/L		20-AUG-20	R5196276
Calcium (Ca)-Dissolved	271	DLDS	0.25	mg/L		20-AUG-20	R5196276
Cesium (Cs)-Dissolved	<0.000050	DLDS	0.000050	mg/L		20-AUG-20	R5196276
Chromium (Cr)-Dissolved	<0.00050	DLDS	0.00050	mg/L		20-AUG-20	R5196276
Cobalt (Co)-Dissolved	<0.00050	DLDS	0.00050	mg/L		20-AUG-20	R5196276
Copper (Cu)-Dissolved	0.0533	DLDS	0.0010	mg/L		20-AUG-20	R5196276
Iron (Fe)-Dissolved	<0.050	DLDS	0.050	mg/L		20-AUG-20	R5196276
Lead (Pb)-Dissolved	<0.00025	DLDS	0.00025	mg/L		20-AUG-20	R5196276
Lithium (Li)-Dissolved	<0.0050	DLDS	0.0050	mg/L		20-AUG-20	R5196276
Magnesium (Mg)-Dissolved	45.3	DLDS	0.025	mg/L		20-AUG-20	R5196276
Manganese (Mn)-Dissolved	0.523	DLDS	0.00050	mg/L		20-AUG-20	R5196276
Molybdenum (Mo)-Dissolved	0.0256	DLDS	0.00025	mg/L		20-AUG-20	R5196276
Nickel (Ni)-Dissolved	0.0025	DLDS	0.0025	mg/L		20-AUG-20	R5196276
Phosphorus (P)-Dissolved	<0.25	DLDS	0.25	mg/L		20-AUG-20	R5196276
Potassium (K)-Dissolved	18.9	DLDS	0.25	mg/L		20-AUG-20	R5196276
Rubidium (Rb)-Dissolved	0.0180	DLDS	0.0010	mg/L		20-AUG-20	R5196276
Selenium (Se)-Dissolved	0.00492	DLDS	0.00025	mg/L		20-AUG-20	R5196276
Silicon (Si)-Dissolved	4.01	DLDS	0.25	mg/L		20-AUG-20	R5196276
Silver (Ag)-Dissolved	<0.000050	DLDS	0.000050	mg/L		20-AUG-20	R5196276
Sodium (Na)-Dissolved	61.2	DLDS	0.25	mg/L		20-AUG-20	R5196276
Strontium (Sr)-Dissolved	4.26	DLDS	0.0010	mg/L		20-AUG-20	R5196276
Sulfur (S)-Dissolved	278	DLDS	2.5	mg/L		20-AUG-20	R5196276
Tellurium (Te)-Dissolved	<0.0010	DLDS	0.0010	mg/L		20-AUG-20	R5196276
Thallium (Tl)-Dissolved	<0.000050	DLDS	0.000050	mg/L		20-AUG-20	R5196276
Thorium (Th)-Dissolved	<0.00050	DLDS	0.00050	mg/L		20-AUG-20	R5196276
Tin (Sn)-Dissolved	<0.00050	DLDS	0.00050	mg/L		20-AUG-20	R5196276
Titanium (Ti)-Dissolved	<0.0015	DLDS	0.0015	mg/L		20-AUG-20	R5196276
Tungsten (W)-Dissolved	0.00073	DLDS	0.00050	mg/L		20-AUG-20	R5196276
Uranium (U)-Dissolved	0.00390	DLDS	0.000050	mg/L		20-AUG-20	R5196276
Vanadium (V)-Dissolved	<0.0025	DLDS	0.0025	mg/L		20-AUG-20	R5196276
Zinc (Zn)-Dissolved	0.0361	DLDS	0.0050	mg/L		20-AUG-20	R5196276
Zirconium (Zr)-Dissolved	<0.0010	DLDS	0.0010	mg/L		20-AUG-20	R5196276

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-DIS-ORG-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
Filtered (0.45 um) sample is acidified and purged to remove inorganic carbon, then injected into a heated reaction chamber where organic carbon is oxidized to CO2 which is then transported in the carrier gas stream and measured via a non-dispersive infrared analyzer.			
MET-D-CCMS-SK	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B / EPA 6020A
This procedure involves preliminary filtration through a 0.45 um filter followed by instrumental analysis using collision cell inductively coupled plasma - mass spectrometry (modifed from EPA Method 6020A).			
NH3-F-CL	Water	Ammonia by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-IC-N-SK	Water	Nitrite in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-IC-N-SK	Water	Nitrate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: Ensero Technologies Inc.
104-411 Downey Road
Saskatoon SK S7N 4L8
Contact: Rachel Martz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-CL	Water							
Batch R5195233								
WG3388502-10 LCS								
Dissolved Organic Carbon			100.7		%		80-120	20-AUG-20
WG3388502-9 MB								
Dissolved Organic Carbon			<1.0		mg/L		1	20-AUG-20
MET-D-CCMS-SK	Water							
Batch R5196276								
WG3385243-3 CRM		**TMRM_20**						
Aluminum (Al)-Dissolved			96.5		%		80-120	20-AUG-20
Antimony (Sb)-Dissolved			98.1		%		80-120	20-AUG-20
Arsenic (As)-Dissolved			99.0		%		80-120	20-AUG-20
Barium (Ba)-Dissolved			99.8		%		80-120	20-AUG-20
Beryllium (Be)-Dissolved			101.2		%		80-120	20-AUG-20
Bismuth (Bi)-Dissolved			90.9		%		80-120	20-AUG-20
Boron (B)-Dissolved			90.9		%		80-120	20-AUG-20
Cadmium (Cd)-Dissolved			101.2		%		80-120	20-AUG-20
Calcium (Ca)-Dissolved			98.8		%		80-120	20-AUG-20
Cesium (Cs)-Dissolved			101.3		%		80-120	20-AUG-20
Chromium (Cr)-Dissolved			95.1		%		80-120	20-AUG-20
Cobalt (Co)-Dissolved			93.7		%		80-120	20-AUG-20
Copper (Cu)-Dissolved			96.5		%		80-120	20-AUG-20
Iron (Fe)-Dissolved			109.6		%		80-120	20-AUG-20
Lead (Pb)-Dissolved			96.1		%		80-120	20-AUG-20
Lithium (Li)-Dissolved			109.8		%		80-120	20-AUG-20
Magnesium (Mg)-Dissolved			100.4		%		80-120	20-AUG-20
Manganese (Mn)-Dissolved			94.6		%		80-120	20-AUG-20
Molybdenum (Mo)-Dissolved			100.7		%		80-120	20-AUG-20
Nickel (Ni)-Dissolved			95.1		%		80-120	20-AUG-20
Phosphorus (P)-Dissolved			100.0		%		70-130	20-AUG-20
Potassium (K)-Dissolved			91.8		%		80-120	20-AUG-20
Rubidium (Rb)-Dissolved			94.4		%		80-120	20-AUG-20
Selenium (Se)-Dissolved			101.8		%		80-120	20-AUG-20
Silicon (Si)-Dissolved			100.0		%		60-140	20-AUG-20
Silver (Ag)-Dissolved			105.1		%		80-120	20-AUG-20
Sodium (Na)-Dissolved			103.7		%		80-120	20-AUG-20
Strontium (Sr)-Dissolved			101.5		%		80-120	20-AUG-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch R5196276								
WG3385243-3 CRM		**TMRM_20**						
Sulfur (S)-Dissolved			96.2		%		80-120	20-AUG-20
Tellurium (Te)-Dissolved			104.0		%		80-120	20-AUG-20
Thallium (Tl)-Dissolved			90.5		%		80-120	20-AUG-20
Thorium (Th)-Dissolved			97.1		%		80-120	20-AUG-20
Tin (Sn)-Dissolved			94.7		%		80-120	20-AUG-20
Titanium (Ti)-Dissolved			94.7		%		80-120	20-AUG-20
Tungsten (W)-Dissolved			95.7		%		80-120	20-AUG-20
Uranium (U)-Dissolved			99.4		%		80-120	20-AUG-20
Vanadium (V)-Dissolved			96.3		%		80-120	20-AUG-20
Zinc (Zn)-Dissolved			99.4		%		80-120	20-AUG-20
Zirconium (Zr)-Dissolved			101.2		%		80-120	20-AUG-20
WG3385243-1 MB								
Aluminum (Al)-Dissolved			<0.0020		mg/L		0.002	20-AUG-20
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	20-AUG-20
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	20-AUG-20
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	20-AUG-20
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	20-AUG-20
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	20-AUG-20
Boron (B)-Dissolved			<0.010		mg/L		0.01	20-AUG-20
Cadmium (Cd)-Dissolved			<0.000005C		mg/L		0.000005	20-AUG-20
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	20-AUG-20
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	20-AUG-20
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	20-AUG-20
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	20-AUG-20
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	20-AUG-20
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	20-AUG-20
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	20-AUG-20
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	20-AUG-20
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	20-AUG-20
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	20-AUG-20
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	20-AUG-20
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	20-AUG-20
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	20-AUG-20
Potassium (K)-Dissolved			<0.050		mg/L		0.05	20-AUG-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch R5196276								
WG3385243-1 MB								
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	20-AUG-20
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	20-AUG-20
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	20-AUG-20
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	20-AUG-20
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	20-AUG-20
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	20-AUG-20
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	20-AUG-20
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	20-AUG-20
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	20-AUG-20
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	20-AUG-20
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	20-AUG-20
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	20-AUG-20
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	20-AUG-20
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	20-AUG-20
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	20-AUG-20
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	20-AUG-20
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	20-AUG-20
NH3-F-CL	Water							
Batch R5192339								
WG3387109-14 LCS								
Ammonia, Total (as N)			112.7		%		85-115	19-AUG-20
WG3387109-13 MB								
Ammonia, Total (as N)			<0.050		mg/L		0.05	19-AUG-20
NO2-IC-N-SK	Water							
Batch R5191609								
WG3385118-1 DUP		**L2489663-1**						
Nitrite (as N)		6.08	6.07		mg/L	0.2	20	18-AUG-20
WG3385118-3 LCS								
Nitrite (as N)			100.1		%		90-110	18-AUG-20
WG3385118-2 MB								
Nitrite (as N)			<0.010		mg/L		0.01	18-AUG-20
NO3-IC-N-SK	Water							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-IC-N-SK	Water							
Batch R5191609								
WG3385118-1 DUP		**L2489663-1**						
Nitrate (as N)		3.26	3.24		mg/L	0.7	20	18-AUG-20
WG3385118-3 LCS								
Nitrate (as N)			103.2		%		90-110	18-AUG-20
WG3385118-2 MB								
Nitrate (as N)			<0.020		mg/L		0.02	18-AUG-20

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2489663-COFC

COC Number: 15 -

Page of

Report To	Contact and company name below will appear on the final report
Company:	Ensero Technologies
Contact:	Rachel Martz
Phone:	306 978 3111
	Company address below will appear on the final report
Street:	104-411 Downey Road
City/Province:	Saskatoon, SK
Postal Code:	S7H 1R1
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Ensero Technologies
Contact:	Mel Shotenski

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: rmartz@ensero.com

Email 2: rkleinberger@ensero.com

Email 3: kpiecowye@ensero.com

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: rmartz@ensero.com

Email 2: ap@ensero.com

Project Information

ALS Account # / Quote #:	Q81011
Job #:	
PO / AFE:	
LSD:	
ALS Lab Work Order # (lab use only)	

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact:	**Sampler:**

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐

EMERGENCY: 1 Business day [E1] ☐ | Same Day, Weekend or Statutory holiday [E0] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	C-DIS-ORG-CL (F/P)	MET-D-CCMS-SK (F/P)	NO2-IC-N-SK	NO3-IC-N-SK	NH3-F-CL (P)	Number of Containers
	Woodchip Trial	15-Aug-20	19:00	Water	R	R	R	R	R	4

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human drinking water use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Please add cbrizinski@ensero.com and importer@contango.ehsdata.com to emails.

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
15°					

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by: JMT	Date: 17-Aug-20	Time: 1:30	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Ensero Technologies Inc.
ATTN: Rachel Martz
104- 411 Downey Road
Saskatoon SK S7N 4L8

Date Received: 20- AUG- 20
Report Date: 28- AUG- 20 16:02 (MT)
Version: FINAL

Client Phone: 306- 978- 3111

Certificate of Analysis

Lab Work Order #: L2491965

Project P.O. #: NOT SUBMITTED
Job Reference: ETK20YT00042
C of C Numbers:
Legal Site Desc:

Brian Morgan, B.Sc. Hons.
Client Services Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2491965-1 WOODCHIP TRIAL							
Sampled By: CLIENT on 20-AUG-20 @ 11:00							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	<0.050		0.050	mg/L		24-AUG-20	R5199255
Dissolved Organic Carbon	32.5		1.0	mg/L		24-AUG-20	R5199969
Nitrate (as N)	<0.10	DLDS	0.10	mg/L		21-AUG-20	R5195517
Nitrite (as N)	<0.050	DLDS	0.050	mg/L		21-AUG-20	R5195517
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					22-AUG-20	R5196982
Aluminum (Al)-Dissolved	<0.010	DLM	0.010	mg/L		22-AUG-20	R5199674
Antimony (Sb)-Dissolved	<0.00050	DLM	0.00050	mg/L		22-AUG-20	R5199674
Arsenic (As)-Dissolved	<0.00050	DLM	0.00050	mg/L		22-AUG-20	R5199674
Barium (Ba)-Dissolved	0.159	DLM	0.00050	mg/L		22-AUG-20	R5199674
Beryllium (Be)-Dissolved	<0.00050	DLM	0.00050	mg/L		22-AUG-20	R5199674
Bismuth (Bi)-Dissolved	<0.00025	DLM	0.00025	mg/L		22-AUG-20	R5199674
Boron (B)-Dissolved	0.154	DLM	0.050	mg/L		22-AUG-20	R5199674
Cadmium (Cd)-Dissolved	0.000167	DLM	0.000025	mg/L		22-AUG-20	R5199674
Calcium (Ca)-Dissolved	262	DLM	0.25	mg/L		22-AUG-20	R5199674
Cesium (Cs)-Dissolved	<0.000050	DLM	0.000050	mg/L		22-AUG-20	R5199674
Chromium (Cr)-Dissolved	<0.00050	DLM	0.00050	mg/L		22-AUG-20	R5199674
Cobalt (Co)-Dissolved	<0.00050	DLM	0.00050	mg/L		22-AUG-20	R5199674
Copper (Cu)-Dissolved	0.0325	DLM	0.0010	mg/L		22-AUG-20	R5199674
Iron (Fe)-Dissolved	<0.050	DLM	0.050	mg/L		22-AUG-20	R5199674
Lead (Pb)-Dissolved	<0.00025	DLM	0.00025	mg/L		22-AUG-20	R5199674
Lithium (Li)-Dissolved	0.0051	DLM	0.0050	mg/L		22-AUG-20	R5199674
Magnesium (Mg)-Dissolved	44.2	DLM	0.025	mg/L		22-AUG-20	R5199674
Manganese (Mn)-Dissolved	0.648	DLM	0.00050	mg/L		22-AUG-20	R5199674
Molybdenum (Mo)-Dissolved	0.0254	DLM	0.00025	mg/L		22-AUG-20	R5199674
Nickel (Ni)-Dissolved	<0.0025	DLM	0.0025	mg/L		22-AUG-20	R5199674
Phosphorus (P)-Dissolved	<0.25	DLM	0.25	mg/L		22-AUG-20	R5199674
Potassium (K)-Dissolved	20.1	DLM	0.25	mg/L		22-AUG-20	R5199674
Rubidium (Rb)-Dissolved	0.0191	DLM	0.0010	mg/L		22-AUG-20	R5199674
Selenium (Se)-Dissolved	0.00472	DLM	0.00025	mg/L		22-AUG-20	R5199674
Silicon (Si)-Dissolved	4.19	DLM	0.25	mg/L		22-AUG-20	R5199674
Silver (Ag)-Dissolved	<0.000050	DLM	0.000050	mg/L		22-AUG-20	R5199674
Sodium (Na)-Dissolved	61.6	DLM	0.25	mg/L		22-AUG-20	R5199674
Strontium (Sr)-Dissolved	4.27	DLM	0.0010	mg/L		22-AUG-20	R5199674
Sulfur (S)-Dissolved	286	DLM	2.5	mg/L		22-AUG-20	R5199674
Tellurium (Te)-Dissolved	<0.0010	DLM	0.0010	mg/L		22-AUG-20	R5199674
Thallium (Tl)-Dissolved	<0.000050	DLM	0.000050	mg/L		22-AUG-20	R5199674
Thorium (Th)-Dissolved	<0.00050	DLM	0.00050	mg/L		22-AUG-20	R5199674
Tin (Sn)-Dissolved	<0.00050	DLM	0.00050	mg/L		22-AUG-20	R5199674
Titanium (Ti)-Dissolved	<0.0015	DLM	0.0015	mg/L		22-AUG-20	R5199674
Tungsten (W)-Dissolved	0.00070	DLM	0.00050	mg/L		22-AUG-20	R5199674
Uranium (U)-Dissolved	0.00358	DLM	0.000050	mg/L		22-AUG-20	R5199674
Vanadium (V)-Dissolved	<0.0025	DLM	0.0025	mg/L		22-AUG-20	R5199674
Zinc (Zn)-Dissolved	0.0380	DLM	0.0050	mg/L		22-AUG-20	R5199674
Zirconium (Zr)-Dissolved	<0.0010	DLM	0.0010	mg/L		22-AUG-20	R5199674
L2491965-2 TRIAL E1							
Sampled By: CLIENT on 20-AUG-20 @ 11:00							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	<0.050		0.050	mg/L		24-AUG-20	R5199255
Dissolved Organic Carbon	90.8		1.0	mg/L		24-AUG-20	R5199969

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2491965-2 TRIAL E1							
Sampled By: CLIENT on 20-AUG-20 @ 11:00							
Matrix: WATER							
Nitrate (as N)	<0.10	DLDS	0.10	mg/L		21-AUG-20	R5195517
Nitrite (as N)	<0.050	DLDS	0.050	mg/L		21-AUG-20	R5195517
Sulfate (SO4)	882	DLDS	1.5	mg/L		21-AUG-20	R5195517
Sulphide (as S)	0.0055		0.0015	mg/L		28-AUG-20	R5203823
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					22-AUG-20	R5196982
Aluminum (Al)-Dissolved	0.014	DLM	0.010	mg/L		22-AUG-20	R5199674
Antimony (Sb)-Dissolved	<0.00050	DLM	0.00050	mg/L		22-AUG-20	R5199674
Arsenic (As)-Dissolved	0.00105	DLM	0.00050	mg/L		22-AUG-20	R5199674
Barium (Ba)-Dissolved	0.101	DLM	0.00050	mg/L		22-AUG-20	R5199674
Beryllium (Be)-Dissolved	<0.00050	DLM	0.00050	mg/L		22-AUG-20	R5199674
Bismuth (Bi)-Dissolved	<0.00025	DLM	0.00025	mg/L		22-AUG-20	R5199674
Boron (B)-Dissolved	0.158	DLM	0.050	mg/L		22-AUG-20	R5199674
Cadmium (Cd)-Dissolved	0.000319	DLM	0.000025	mg/L		22-AUG-20	R5199674
Calcium (Ca)-Dissolved	280	DLM	0.25	mg/L		22-AUG-20	R5199674
Cesium (Cs)-Dissolved	<0.000050	DLM	0.000050	mg/L		22-AUG-20	R5199674
Chromium (Cr)-Dissolved	<0.00050	DLM	0.00050	mg/L		22-AUG-20	R5199674
Cobalt (Co)-Dissolved	0.00077	DLM	0.00050	mg/L		22-AUG-20	R5199674
Copper (Cu)-Dissolved	0.0521	DLM	0.0010	mg/L		22-AUG-20	R5199674
Iron (Fe)-Dissolved	0.876	DLM	0.050	mg/L		22-AUG-20	R5199674
Lead (Pb)-Dissolved	<0.00025	DLM	0.00025	mg/L		22-AUG-20	R5199674
Lithium (Li)-Dissolved	<0.0050	DLM	0.0050	mg/L		22-AUG-20	R5199674
Magnesium (Mg)-Dissolved	44.3	DLM	0.025	mg/L		22-AUG-20	R5199674
Manganese (Mn)-Dissolved	0.741	DLM	0.00050	mg/L		22-AUG-20	R5199674
Molybdenum (Mo)-Dissolved	0.0293	DLM	0.00025	mg/L		22-AUG-20	R5199674
Nickel (Ni)-Dissolved	0.0030	DLM	0.0025	mg/L		22-AUG-20	R5199674
Phosphorus (P)-Dissolved	0.80	DLM	0.25	mg/L		22-AUG-20	R5199674
Potassium (K)-Dissolved	21.1	DLM	0.25	mg/L		22-AUG-20	R5199674
Rubidium (Rb)-Dissolved	0.0167	DLM	0.0010	mg/L		22-AUG-20	R5199674
Selenium (Se)-Dissolved	0.00514	DLM	0.00025	mg/L		22-AUG-20	R5199674
Silicon (Si)-Dissolved	4.84	DLM	0.25	mg/L		22-AUG-20	R5199674
Silver (Ag)-Dissolved	0.000069	DLM	0.000050	mg/L		22-AUG-20	R5199674
Sodium (Na)-Dissolved	61.9	DLM	0.25	mg/L		22-AUG-20	R5199674
Strontium (Sr)-Dissolved	4.52	DLM	0.0010	mg/L		22-AUG-20	R5199674
Sulfur (S)-Dissolved	294	DLM	2.5	mg/L		22-AUG-20	R5199674
Tellurium (Te)-Dissolved	<0.0010	DLM	0.0010	mg/L		22-AUG-20	R5199674
Thallium (Tl)-Dissolved	<0.000050	DLM	0.000050	mg/L		22-AUG-20	R5199674
Thorium (Th)-Dissolved	<0.00050	DLM	0.00050	mg/L		22-AUG-20	R5199674
Tin (Sn)-Dissolved	<0.00050	DLM	0.00050	mg/L		22-AUG-20	R5199674
Titanium (Ti)-Dissolved	<0.0015	DLM	0.0015	mg/L		22-AUG-20	R5199674
Tungsten (W)-Dissolved	0.00064	DLM	0.00050	mg/L		22-AUG-20	R5199674
Uranium (U)-Dissolved	0.00467	DLM	0.000050	mg/L		22-AUG-20	R5199674
Vanadium (V)-Dissolved	<0.0025	DLM	0.0025	mg/L		22-AUG-20	R5199674
Zinc (Zn)-Dissolved	0.0197	DLM	0.0050	mg/L		22-AUG-20	R5199674
Zirconium (Zr)-Dissolved	<0.0010	DLM	0.0010	mg/L		22-AUG-20	R5199674
L2491965-3 TRIAL G2							
Sampled By: CLIENT on 20-AUG-20 @ 11:10							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	<0.050		0.050	mg/L		24-AUG-20	R5199255
Dissolved Organic Carbon	99.1		1.0	mg/L		24-AUG-20	R5199969

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2491965-3 TRIAL G2							
Sampled By: CLIENT on 20-AUG-20 @ 11:10							
Matrix: WATER							
Nitrate (as N)	<0.10	DLDS	0.10	mg/L		21-AUG-20	R5195517
Nitrite (as N)	<0.050	DLDS	0.050	mg/L		21-AUG-20	R5195517
Sulfate (SO4)	891	DLDS	1.5	mg/L		21-AUG-20	R5195517
Sulphide (as S)	0.0126		0.0015	mg/L		28-AUG-20	R5203823
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					22-AUG-20	R5196982
Aluminum (Al)-Dissolved	0.025	DLM	0.010	mg/L		22-AUG-20	R5199674
Antimony (Sb)-Dissolved	<0.00050	DLM	0.00050	mg/L		22-AUG-20	R5199674
Arsenic (As)-Dissolved	0.00097	DLM	0.00050	mg/L		22-AUG-20	R5199674
Barium (Ba)-Dissolved	0.113	DLM	0.00050	mg/L		22-AUG-20	R5199674
Beryllium (Be)-Dissolved	<0.00050	DLM	0.00050	mg/L		22-AUG-20	R5199674
Bismuth (Bi)-Dissolved	<0.00025	DLM	0.00025	mg/L		22-AUG-20	R5199674
Boron (B)-Dissolved	0.154	DLM	0.050	mg/L		22-AUG-20	R5199674
Cadmium (Cd)-Dissolved	0.000411	DLM	0.000025	mg/L		22-AUG-20	R5199674
Calcium (Ca)-Dissolved	278	DLM	0.25	mg/L		22-AUG-20	R5199674
Cesium (Cs)-Dissolved	<0.000050	DLM	0.000050	mg/L		22-AUG-20	R5199674
Chromium (Cr)-Dissolved	<0.00050	DLM	0.00050	mg/L		22-AUG-20	R5199674
Cobalt (Co)-Dissolved	0.00123	DLM	0.00050	mg/L		22-AUG-20	R5199674
Copper (Cu)-Dissolved	0.0880	DLM	0.0010	mg/L		22-AUG-20	R5199674
Iron (Fe)-Dissolved	1.31	DLM	0.050	mg/L		22-AUG-20	R5199674
Lead (Pb)-Dissolved	<0.00025	DLM	0.00025	mg/L		22-AUG-20	R5199674
Lithium (Li)-Dissolved	<0.0050	DLM	0.0050	mg/L		22-AUG-20	R5199674
Magnesium (Mg)-Dissolved	43.2	DLM	0.025	mg/L		22-AUG-20	R5199674
Manganese (Mn)-Dissolved	1.01	DLM	0.00050	mg/L		22-AUG-20	R5199674
Molybdenum (Mo)-Dissolved	0.0281	DLM	0.00025	mg/L		22-AUG-20	R5199674
Nickel (Ni)-Dissolved	0.0036	DLM	0.0025	mg/L		22-AUG-20	R5199674
Phosphorus (P)-Dissolved	0.75	DLM	0.25	mg/L		22-AUG-20	R5199674
Potassium (K)-Dissolved	20.9	DLM	0.25	mg/L		22-AUG-20	R5199674
Rubidium (Rb)-Dissolved	0.0162	DLM	0.0010	mg/L		22-AUG-20	R5199674
Selenium (Se)-Dissolved	0.00495	DLM	0.00025	mg/L		22-AUG-20	R5199674
Silicon (Si)-Dissolved	4.82	DLM	0.25	mg/L		22-AUG-20	R5199674
Silver (Ag)-Dissolved	0.000081	DLM	0.000050	mg/L		22-AUG-20	R5199674
Sodium (Na)-Dissolved	61.2	DLM	0.25	mg/L		22-AUG-20	R5199674
Strontium (Sr)-Dissolved	4.42	DLM	0.0010	mg/L		22-AUG-20	R5199674
Sulfur (S)-Dissolved	284	DLM	2.5	mg/L		22-AUG-20	R5199674
Tellurium (Te)-Dissolved	<0.0010	DLM	0.0010	mg/L		22-AUG-20	R5199674
Thallium (Tl)-Dissolved	<0.000050	DLM	0.000050	mg/L		22-AUG-20	R5199674
Thorium (Th)-Dissolved	<0.00050	DLM	0.00050	mg/L		22-AUG-20	R5199674
Tin (Sn)-Dissolved	<0.00050	DLM	0.00050	mg/L		22-AUG-20	R5199674
Titanium (Ti)-Dissolved	<0.0015	DLM	0.0015	mg/L		22-AUG-20	R5199674
Tungsten (W)-Dissolved	0.00062	DLM	0.00050	mg/L		22-AUG-20	R5199674
Uranium (U)-Dissolved	0.00351	DLM	0.000050	mg/L		22-AUG-20	R5199674
Vanadium (V)-Dissolved	<0.0025	DLM	0.0025	mg/L		22-AUG-20	R5199674
Zinc (Zn)-Dissolved	0.0480	DLM	0.0050	mg/L		22-AUG-20	R5199674
Zirconium (Zr)-Dissolved	<0.0010	DLM	0.0010	mg/L		22-AUG-20	R5199674
L2491965-4 TRIAL M3							
Sampled By: CLIENT on 20-AUG-20 @ 11:20							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	<0.050		0.050	mg/L		24-AUG-20	R5199255
Dissolved Organic Carbon	141	DLHC	5.0	mg/L		27-AUG-20	R5199969

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2491965-4 TRIAL M3							
Sampled By: CLIENT on 20-AUG-20 @ 11:20							
Matrix: WATER							
Nitrate (as N)	<0.10	DLDS	0.10	mg/L		21-AUG-20	R5195517
Nitrite (as N)	<0.050	DLDS	0.050	mg/L		21-AUG-20	R5195517
Sulfate (SO4)	880	DLDS	1.5	mg/L		21-AUG-20	R5195517
Sulphide (as S)	0.0188		0.0015	mg/L		28-AUG-20	R5203823
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					22-AUG-20	R5196982
Aluminum (Al)-Dissolved	0.063	DLM	0.010	mg/L		22-AUG-20	R5199674
Antimony (Sb)-Dissolved	<0.00050	DLM	0.00050	mg/L		22-AUG-20	R5199674
Arsenic (As)-Dissolved	0.00106	DLM	0.00050	mg/L		22-AUG-20	R5199674
Barium (Ba)-Dissolved	0.122	DLM	0.00050	mg/L		22-AUG-20	R5199674
Beryllium (Be)-Dissolved	<0.00050	DLM	0.00050	mg/L		22-AUG-20	R5199674
Bismuth (Bi)-Dissolved	<0.00025	DLM	0.00025	mg/L		22-AUG-20	R5199674
Boron (B)-Dissolved	0.163	DLM	0.050	mg/L		22-AUG-20	R5199674
Cadmium (Cd)-Dissolved	0.000531	DLM	0.000025	mg/L		22-AUG-20	R5199674
Calcium (Ca)-Dissolved	294	DLM	0.25	mg/L		22-AUG-20	R5199674
Cesium (Cs)-Dissolved	<0.000050	DLM	0.000050	mg/L		22-AUG-20	R5199674
Chromium (Cr)-Dissolved	0.00099	DLM	0.00050	mg/L		22-AUG-20	R5199674
Cobalt (Co)-Dissolved	0.00160	DLM	0.00050	mg/L		22-AUG-20	R5199674
Copper (Cu)-Dissolved	0.128	DLM	0.0010	mg/L		22-AUG-20	R5199674
Iron (Fe)-Dissolved	2.04	DLM	0.050	mg/L		22-AUG-20	R5199674
Lead (Pb)-Dissolved	<0.00025	DLM	0.00025	mg/L		22-AUG-20	R5199674
Lithium (Li)-Dissolved	0.0054	DLM	0.0050	mg/L		22-AUG-20	R5199674
Magnesium (Mg)-Dissolved	46.1	DLM	0.025	mg/L		22-AUG-20	R5199674
Manganese (Mn)-Dissolved	1.11	DLM	0.00050	mg/L		22-AUG-20	R5199674
Molybdenum (Mo)-Dissolved	0.0266	DLM	0.00025	mg/L		22-AUG-20	R5199674
Nickel (Ni)-Dissolved	0.0044	DLM	0.0025	mg/L		22-AUG-20	R5199674
Phosphorus (P)-Dissolved	0.72	DLM	0.25	mg/L		22-AUG-20	R5199674
Potassium (K)-Dissolved	24.6	DLM	0.25	mg/L		22-AUG-20	R5199674
Rubidium (Rb)-Dissolved	0.0252	DLM	0.0010	mg/L		22-AUG-20	R5199674
Selenium (Se)-Dissolved	0.00479	DLM	0.00025	mg/L		22-AUG-20	R5199674
Silicon (Si)-Dissolved	5.05	DLM	0.25	mg/L		22-AUG-20	R5199674
Silver (Ag)-Dissolved	<0.000050	DLM	0.000050	mg/L		22-AUG-20	R5199674
Sodium (Na)-Dissolved	62.1	DLM	0.25	mg/L		22-AUG-20	R5199674
Strontium (Sr)-Dissolved	4.50	DLM	0.0010	mg/L		22-AUG-20	R5199674
Sulfur (S)-Dissolved	286	DLM	2.5	mg/L		22-AUG-20	R5199674
Tellurium (Te)-Dissolved	<0.0010	DLM	0.0010	mg/L		22-AUG-20	R5199674
Thallium (Tl)-Dissolved	<0.000050	DLM	0.000050	mg/L		22-AUG-20	R5199674
Thorium (Th)-Dissolved	<0.00050	DLM	0.00050	mg/L		22-AUG-20	R5199674
Tin (Sn)-Dissolved	<0.00050	DLM	0.00050	mg/L		22-AUG-20	R5199674
Titanium (Ti)-Dissolved	<0.0015	DLM	0.0015	mg/L		22-AUG-20	R5199674
Tungsten (W)-Dissolved	0.00061	DLM	0.00050	mg/L		22-AUG-20	R5199674
Uranium (U)-Dissolved	0.00155	DLM	0.000050	mg/L		22-AUG-20	R5199674
Vanadium (V)-Dissolved	<0.0025	DLM	0.0025	mg/L		22-AUG-20	R5199674
Zinc (Zn)-Dissolved	0.157	DLM	0.0050	mg/L		22-AUG-20	R5199674
Zirconium (Zr)-Dissolved	<0.0010	DLM	0.0010	mg/L		22-AUG-20	R5199674
L2491965-5 TRIAL C4							
Sampled By: CLIENT on 20-AUG-20 @ 11:30							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	0.38	DLHC	0.25	mg/L		24-AUG-20	R5199255
Dissolved Organic Carbon	38.9		1.0	mg/L		24-AUG-20	R5199969

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2491965-5 TRIAL C4							
Sampled By: CLIENT on 20-AUG-20 @ 11:30							
Matrix: WATER							
Nitrate (as N)	<0.10	DLDS	0.10	mg/L		21-AUG-20	R5195517
Nitrite (as N)	0.082	DLDS	0.050	mg/L		21-AUG-20	R5195517
Sulfate (SO4)	900	DLDS	1.5	mg/L		21-AUG-20	R5195517
Sulphide (as S)	0.0080		0.0015	mg/L		28-AUG-20	R5203823
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					22-AUG-20	R5196982
Aluminum (Al)-Dissolved	0.013	DLM	0.010	mg/L		22-AUG-20	R5199674
Antimony (Sb)-Dissolved	<0.00050	DLM	0.00050	mg/L		22-AUG-20	R5199674
Arsenic (As)-Dissolved	0.00055	DLM	0.00050	mg/L		22-AUG-20	R5199674
Barium (Ba)-Dissolved	0.103	DLM	0.00050	mg/L		22-AUG-20	R5199674
Beryllium (Be)-Dissolved	<0.00050	DLM	0.00050	mg/L		22-AUG-20	R5199674
Bismuth (Bi)-Dissolved	<0.00025	DLM	0.00025	mg/L		22-AUG-20	R5199674
Boron (B)-Dissolved	0.161	DLM	0.050	mg/L		22-AUG-20	R5199674
Cadmium (Cd)-Dissolved	0.000217	DLM	0.000025	mg/L		22-AUG-20	R5199674
Calcium (Ca)-Dissolved	284	DLM	0.25	mg/L		22-AUG-20	R5199674
Cesium (Cs)-Dissolved	0.000050	DLM	0.000050	mg/L		22-AUG-20	R5199674
Chromium (Cr)-Dissolved	<0.00050	DLM	0.00050	mg/L		22-AUG-20	R5199674
Cobalt (Co)-Dissolved	0.00067	DLM	0.00050	mg/L		22-AUG-20	R5199674
Copper (Cu)-Dissolved	0.0813	DLM	0.0010	mg/L		22-AUG-20	R5199674
Iron (Fe)-Dissolved	0.087	DLM	0.050	mg/L		22-AUG-20	R5199674
Lead (Pb)-Dissolved	<0.00025	DLM	0.00025	mg/L		22-AUG-20	R5199674
Lithium (Li)-Dissolved	0.0060	DLM	0.0050	mg/L		22-AUG-20	R5199674
Magnesium (Mg)-Dissolved	45.7	DLM	0.025	mg/L		22-AUG-20	R5199674
Manganese (Mn)-Dissolved	0.800	DLM	0.00050	mg/L		22-AUG-20	R5199674
Molybdenum (Mo)-Dissolved	0.0279	DLM	0.00025	mg/L		22-AUG-20	R5199674
Nickel (Ni)-Dissolved	<0.0025	DLM	0.0025	mg/L		22-AUG-20	R5199674
Phosphorus (P)-Dissolved	<0.25	DLM	0.25	mg/L		22-AUG-20	R5199674
Potassium (K)-Dissolved	18.6	DLM	0.25	mg/L		22-AUG-20	R5199674
Rubidium (Rb)-Dissolved	0.0167	DLM	0.0010	mg/L		22-AUG-20	R5199674
Selenium (Se)-Dissolved	0.00470	DLM	0.00025	mg/L		22-AUG-20	R5199674
Silicon (Si)-Dissolved	4.52	DLM	0.25	mg/L		22-AUG-20	R5199674
Silver (Ag)-Dissolved	0.000062	DLM	0.000050	mg/L		22-AUG-20	R5199674
Sodium (Na)-Dissolved	63.4	DLM	0.25	mg/L		22-AUG-20	R5199674
Strontium (Sr)-Dissolved	4.50	DLM	0.0010	mg/L		22-AUG-20	R5199674
Sulfur (S)-Dissolved	298	DLM	2.5	mg/L		22-AUG-20	R5199674
Tellurium (Te)-Dissolved	<0.0010	DLM	0.0010	mg/L		22-AUG-20	R5199674
Thallium (Tl)-Dissolved	<0.000050	DLM	0.000050	mg/L		22-AUG-20	R5199674
Thorium (Th)-Dissolved	<0.00050	DLM	0.00050	mg/L		22-AUG-20	R5199674
Tin (Sn)-Dissolved	<0.00050	DLM	0.00050	mg/L		22-AUG-20	R5199674
Titanium (Ti)-Dissolved	<0.0015	DLM	0.0015	mg/L		22-AUG-20	R5199674
Tungsten (W)-Dissolved	0.00066	DLM	0.00050	mg/L		22-AUG-20	R5199674
Uranium (U)-Dissolved	0.00477	DLM	0.000050	mg/L		22-AUG-20	R5199674
Vanadium (V)-Dissolved	<0.0025	DLM	0.0025	mg/L		22-AUG-20	R5199674
Zinc (Zn)-Dissolved	0.0228	DLM	0.0050	mg/L		22-AUG-20	R5199674
Zirconium (Zr)-Dissolved	<0.0010	DLM	0.0010	mg/L		22-AUG-20	R5199674
L2491965-6 TRIAL C4 - SPIKE							
Sampled By: CLIENT on 20-AUG-20 @ 11:40							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	1.80	DLHC	0.50	mg/L		24-AUG-20	R5199255
Nitrate (as N)	9.40	DLDS	0.10	mg/L		21-AUG-20	R5195517

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2491965-6 TRIAL C4 - SPIKE Sampled By: CLIENT on 20-AUG-20 @ 11:40 Matrix: WATER							
Nitrite (as N)	2.19	DLDS	0.050	mg/L		21-AUG-20	R5195517

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-DIS-ORG-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
Filtered (0.45 um) sample is acidified and purged to remove inorganic carbon, then injected into a heated reaction chamber where organic carbon is oxidized to CO2 which is then transported in the carrier gas stream and measured via a non-dispersive infrared analyzer.			
MET-D-CCMS-SK	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B / EPA 6020A
This procedure involves preliminary filtration through a 0.45 um filter followed by instrumental analysis using collision cell inductively coupled plasma - mass spectrometry (modifed from EPA Method 6020A).			
NH3-F-CL	Water	Ammonia by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-IC-N-SK	Water	Nitrite in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-IC-N-SK	Water	Nitrate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SO4-IC-N-SK	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SULPHIDE-CFA-ED	Water	Sulphide	APHA 4500 -S E-Auto-Colorimetry
A continuous flow manifold adds HCl to the sample which converts sulphide to a gas, then the sulphide is separated from the flow using a gas dialysis membrane. A colorimetric reaction produces a methylene blue compound which is measured at 660 nm. This follows the Standard Methods procedure 4500 S-E.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: Ensero Technologies Inc.
104-411 Downey Road
Saskatoon SK S7N 4L8
Contact: Rachel Martz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-CL	Water							
Batch R5199969								
WG3390482-2 LCS								
Dissolved Organic Carbon			100.2		%		80-120	24-AUG-20
WG3390482-6 LCS								
Dissolved Organic Carbon			100.7		%		80-120	24-AUG-20
WG3390482-1 MB								
Dissolved Organic Carbon			<1.0		mg/L		1	24-AUG-20
WG3390482-5 MB								
Dissolved Organic Carbon			<1.0		mg/L		1	24-AUG-20
MET-D-CCMS-SK	Water							
Batch R5199674								
WG3389063-3 CRM		**TMRM_20**						
Aluminum (Al)-Dissolved			95.2		%		80-120	22-AUG-20
Antimony (Sb)-Dissolved			102.6		%		80-120	22-AUG-20
Arsenic (As)-Dissolved			94.0		%		80-120	22-AUG-20
Barium (Ba)-Dissolved			95.3		%		80-120	22-AUG-20
Beryllium (Be)-Dissolved			94.6		%		80-120	22-AUG-20
Bismuth (Bi)-Dissolved			92.8		%		80-120	22-AUG-20
Boron (B)-Dissolved			93.8		%		80-120	22-AUG-20
Cadmium (Cd)-Dissolved			90.0		%		80-120	22-AUG-20
Calcium (Ca)-Dissolved			98.1		%		80-120	22-AUG-20
Cesium (Cs)-Dissolved			100.3		%		80-120	22-AUG-20
Chromium (Cr)-Dissolved			92.6		%		80-120	22-AUG-20
Cobalt (Co)-Dissolved			93.0		%		80-120	22-AUG-20
Copper (Cu)-Dissolved			93.4		%		80-120	22-AUG-20
Iron (Fe)-Dissolved			109.2		%		80-120	22-AUG-20
Lead (Pb)-Dissolved			99.3		%		80-120	22-AUG-20
Lithium (Li)-Dissolved			96.7		%		80-120	22-AUG-20
Magnesium (Mg)-Dissolved			95.5		%		80-120	22-AUG-20
Manganese (Mn)-Dissolved			96.6		%		80-120	22-AUG-20
Molybdenum (Mo)-Dissolved			98.6		%		80-120	22-AUG-20
Nickel (Ni)-Dissolved			92.7		%		80-120	22-AUG-20
Phosphorus (P)-Dissolved			94.2		%		70-130	22-AUG-20
Potassium (K)-Dissolved			94.4		%		80-120	22-AUG-20
Rubidium (Rb)-Dissolved			95.1		%		80-120	22-AUG-20
Selenium (Se)-Dissolved			94.3		%		80-120	22-AUG-20
Silicon (Si)-Dissolved			100.0		%		60-140	22-AUG-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch R5199674								
WG3389063-3 CRM		**TMRM_20**						
Silver (Ag)-Dissolved			97.1		%		80-120	22-AUG-20
Sodium (Na)-Dissolved			96.7		%		80-120	22-AUG-20
Strontium (Sr)-Dissolved			99.4		%		80-120	22-AUG-20
Sulfur (S)-Dissolved			102.2		%		80-120	22-AUG-20
Tellurium (Te)-Dissolved			87.2		%		80-120	22-AUG-20
Thallium (Tl)-Dissolved			96.6		%		80-120	22-AUG-20
Thorium (Th)-Dissolved			96.4		%		80-120	22-AUG-20
Tin (Sn)-Dissolved			92.0		%		80-120	22-AUG-20
Titanium (Ti)-Dissolved			89.8		%		80-120	22-AUG-20
Tungsten (W)-Dissolved			97.4		%		80-120	22-AUG-20
Uranium (U)-Dissolved			100.3		%		80-120	22-AUG-20
Vanadium (V)-Dissolved			94.5		%		80-120	22-AUG-20
Zinc (Zn)-Dissolved			88.3		%		80-120	22-AUG-20
Zirconium (Zr)-Dissolved			99.0		%		80-120	22-AUG-20
WG3389063-1 MB								
Aluminum (Al)-Dissolved			<0.0020		mg/L		0.002	22-AUG-20
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	22-AUG-20
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	22-AUG-20
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	22-AUG-20
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	22-AUG-20
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	22-AUG-20
Boron (B)-Dissolved			<0.010		mg/L		0.01	22-AUG-20
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	22-AUG-20
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	22-AUG-20
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	22-AUG-20
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	22-AUG-20
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	22-AUG-20
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	22-AUG-20
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	22-AUG-20
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	22-AUG-20
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	22-AUG-20
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	22-AUG-20
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	22-AUG-20
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	22-AUG-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch R5199674								
WG3389063-1 MB								
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	22-AUG-20
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	22-AUG-20
Potassium (K)-Dissolved			<0.050		mg/L		0.05	22-AUG-20
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	22-AUG-20
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	22-AUG-20
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	22-AUG-20
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	22-AUG-20
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	22-AUG-20
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	22-AUG-20
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	22-AUG-20
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	22-AUG-20
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	22-AUG-20
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	22-AUG-20
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	22-AUG-20
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	22-AUG-20
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	22-AUG-20
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	22-AUG-20
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	22-AUG-20
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	22-AUG-20
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	22-AUG-20
NH3-F-CL	Water							
Batch R5199255								
WG3389883-2 LCS								
Ammonia, Total (as N)			97.5		%		85-115	24-AUG-20
WG3389883-1 MB								
Ammonia, Total (as N)			<0.050		mg/L		0.05	24-AUG-20
NO2-IC-N-SK	Water							
Batch R5195517								
WG3387976-1 DUP		**L2491965-4**						
Nitrite (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	21-AUG-20
WG3387976-3 LCS								
Nitrite (as N)			99.9		%		90-110	21-AUG-20
WG3387976-2 MB								
Nitrite (as N)			<0.010		mg/L		0.01	21-AUG-20
NO3-IC-N-SK	Water							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-IC-N-SK	Water							
Batch R5195517								
WG3387976-1 DUP		**L2491965-4**						
Nitrate (as N)		<0.10	<0.10	RPD-NA	mg/L	N/A	20	21-AUG-20
WG3387976-3 LCS								
Nitrate (as N)			103.0		%		90-110	21-AUG-20
WG3387976-2 MB								
Nitrate (as N)			<0.020		mg/L		0.02	21-AUG-20
SO4-IC-N-SK	Water							
Batch R5195517								
WG3387976-1 DUP		**L2491965-4**						
Sulfate (SO4)		880	889		mg/L	0.9	20	21-AUG-20
WG3387976-3 LCS								
Sulfate (SO4)			104.7		%		90-110	21-AUG-20
WG3387976-2 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	21-AUG-20
SULPHIDE-CFA-ED	Water							
Batch R5203823								
WG3393867-2 LCS								
Sulphide (as S)			107.3		%		75-125	28-AUG-20
WG3393867-1 MB								
Sulphide (as S)			<0.0015		mg/L		0.0015	28-AUG-20

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Anions and Nutrients							
Sulphide							
	2	20-AUG-20 11:00	28-AUG-20 13:00	7	8	days	EHT
	3	20-AUG-20 11:10	28-AUG-20 13:00	7	8	days	EHT
	4	20-AUG-20 11:20	28-AUG-20 13:00	7	8	days	EHT
	5	20-AUG-20 11:30	28-AUG-20 13:00	7	8	days	EHT

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2491965 were received on 20-AUG-20 15:30.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2491965-COFC

COC Number: 15 -

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Report To	Contact and company name below will appear on the final report
Company:	Ensero Technologies
Contact:	Rachel Martz
Phone:	306 978 3111
	Company address below will appear on the final report
Street:	104-411 Downey Road
City/Province:	Saskatoon, SK
Postal Code:	S7H 1R1
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Ensero Technologies
Contact:	Mel Shotenski

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax rmartz@ensero.com

Email 2 rkleinberger@ensero.com

Email 3 kpiecowye@ensero.com

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax rmartz@ensero.com

Email 2 ap@ensero.com

Project Information

ALS Account # / Quote #: Q81011

Job #: ETK20YT00042

PO / AFE:

LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#

Major/Minor Code: Routing Code:

Requisitioner:

Location:

ALS Lab Work Order # (lab use only)

ALS Contact: **Sampler:**

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ 3 day [P3] ☐ 2 day [P2] ☐

EMERGENCY: 1 Business day [E1] ☐ Same Day, Weekend or Statutory holiday [E0] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	C-DIS-ORG-CL (F/P)	MET-D-CCMS-SK (F/P)	NO2-IC-N-SK	NO3-IC-N-SK	NH3-F-CL (P)	SO4-IC-N-SK	SULPHIDE-CFA-ED	Number of Containers
	Woodchip Trial	20-Aug-20	11:00	Water	R	R	R	R	R			4
	Trial E1	20-Aug-20	11:00	Water	R	R	R	R	R	R	R	5
	Trial G2	20-Aug-20	11:10	Water	R	R	R	R	R	R	R	5
	Trial M3	20-Aug-20	11:20	Water	R	R	R	R	R	R	R	5
	Trial C4	20-Aug-20	11:30	Water	R	R	R	R	R	R	R	5
	Trial C4 - Spike	20-Aug-20	11:40	Water			R	R	R			2

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human drinking water use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Please add cbrizinski@ensero.com and importer@contango.ehsdata.com to emails.

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
20					

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
				20/8/2020	3:30			3:30

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Ensero Technologies Inc.
ATTN: Rachel Martz
104-411 Downey Road
Saskatoon SK S7N 4L8

Date Received: 27-AUG-20
Report Date: 01-SEP-20 16:15 (MT)
Version: FINAL

Client Phone: 306-978-3111

Certificate of Analysis

Lab Work Order #: L2495277

Project P.O. #: NOT SUBMITTED
Job Reference: ETK20YT00042
C of C Numbers:
Legal Site Desc:

Brian Morgan, B.Sc. Hons.
Client Services Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2495277-1 TRIAL E1							
Sampled By: CLIENT on 27-AUG-20 @ 09:00							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	0.069		0.050	mg/L		28-AUG-20	R5203947
Nitrate (as N)	<0.20	DLDS	0.20	mg/L		27-AUG-20	R5203579
Nitrite (as N)	<0.10	DLDS	0.10	mg/L		27-AUG-20	R5203579
L2495277-2 TRIAL G2							
Sampled By: CLIENT on 27-AUG-20 @ 09:05							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	0.423		0.050	mg/L		28-AUG-20	R5203947
Nitrate (as N)	<0.10	DLDS	0.10	mg/L		27-AUG-20	R5203579
Nitrite (as N)	<0.050	DLDS	0.050	mg/L		27-AUG-20	R5203579
L2495277-3 TRIAL M3							
Sampled By: CLIENT on 27-AUG-20 @ 09:10							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	2.64	DLHC	0.050	mg/L		28-AUG-20	R5203947
Nitrate (as N)	<0.10	DLDS	0.10	mg/L		27-AUG-20	R5203579
Nitrite (as N)	4.34	DLDS	0.050	mg/L		27-AUG-20	R5203579
L2495277-4 TRIAL C4							
Sampled By: CLIENT on 27-AUG-20 @ 09:15							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	1.68	DLHC	0.50	mg/L		28-AUG-20	R5203947
Nitrate (as N)	1.41	DLDS	0.10	mg/L		27-AUG-20	R5203579
Nitrite (as N)	2.23	DLDS	0.050	mg/L		27-AUG-20	R5203579

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
NH3-F-CL	Water	Ammonia by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-IC-N-SK	Water	Nitrite in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-IC-N-SK	Water	Nitrate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: Ensero Technologies Inc.
104-411 Downey Road
Saskatoon SK S7N 4L8
Contact: Rachel Martz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-F-CL	Water							
Batch R5203947								
WG3393798-14 LCS								
Ammonia, Total (as N)			91.6		%		85-115	28-AUG-20
WG3393798-13 MB								
Ammonia, Total (as N)			<0.050		mg/L		0.05	28-AUG-20
NO2-IC-N-SK	Water							
Batch R5203579								
WG3392771-3 LCS								
Nitrite (as N)			98.4		%		90-110	27-AUG-20
WG3392771-2 MB								
Nitrite (as N)			<0.010		mg/L		0.01	27-AUG-20
NO3-IC-N-SK	Water							
Batch R5203579								
WG3392771-3 LCS								
Nitrate (as N)			102.1		%		90-110	27-AUG-20
WG3392771-2 MB								
Nitrate (as N)			<0.020		mg/L		0.02	27-AUG-20

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Chain of Custody (COC) / Analytical Request Form

L2495277-COFC

Page of

ALS Environmental

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

Report To	Contact and company name below will appear on the final report
Company:	Ensero Technologies
Contact:	Rachel Martz
Phone:	306 978 3111
	Company address below will appear on the final report
Street:	104-411 Downey Road
City/Province:	Saskatoon, SK
Postal Code:	S7H 1R1
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Ensero Technologies
Contact:	Mel Shotenski

Project Information

ALS Account # / Quote #:	Q81011
Job #:	ETK20YT00042
PO / AFE:	
LSD:	
ALS Lab Work Order # (lab use only)	

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: rmartz@ensero.com

Email 2: rkleinberger@ensero.com

Email 3: kplecowye@ensero.com

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: rmartz@ensero.com

Email 2: ap@ensero.com

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Contact: Sampler:

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)		EMERGENCY	
	4 day [P4] ☐		1 Business day [E1] ☐
	3 day [P3] ☐		Same Day, Weekend or Statutory holiday [E0] ☐
	2 day [P2] ☐		

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NO2-IC-N-SK	NO3-IC-N-SK	NH3-F-CL										Number of Containers
							P										
	Trial E1	27-Aug-20	9:00	Water	R	R	R										2
	Trial G2	27-Aug-20	9:05	Water	R	R	R										2
	Trial M3	27-Aug-20	9:10	Water	R	R	R										2
	Trial C4	27-Aug-20	9:15	Water	R	R	R										2

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human drinking water use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Please add cbrizinski@ensero.com and importer@contango.ehsdata.com to emails.

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
10					

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date: 27/8/20	Time: 20	Received by:	Date:	Time: 20

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OCTOBER 2015 FRONT

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Ensero Technologies Inc.
ATTN: Rachel Martz
104-411 Downey Road
Saskatoon SK S7N 4L8

Date Received: 03-SEP-20
Report Date: 10-SEP-20 15:42 (MT)
Version: FINAL

Client Phone: 306-978-3111

Certificate of Analysis

Lab Work Order #: L2498627

Project P.O. #: NOT SUBMITTED
Job Reference: ETK20YT00042
C of C Numbers:
Legal Site Desc:

Brian Morgan, B.Sc. Hons.
Client Services Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2498627-1 TRIAL E1							
Sampled By: CLIENT on 03-SEP-20 @ 10:30							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	0.232		0.050	mg/L		04-SEP-20	R5214846
Dissolved Organic Carbon	57.4	DLM	5.0	mg/L		05-SEP-20	R5212641
Nitrate (as N)	<0.10	DLDS	0.10	mg/L		03-SEP-20	R5210505
Nitrite (as N)	<0.050	DLDS	0.050	mg/L		03-SEP-20	R5210505
Sulfate (SO4)	866	DLDS	1.5	mg/L		03-SEP-20	R5210505
Sulphide (as S)	0.23	DLHC	0.18	mg/L		09-SEP-20	R5216896
Sulphide (as H2S)	0.24		0.19	mg/L		09-SEP-20	
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					08-SEP-20	R5214556
Aluminum (Al)-Dissolved	0.013	DLDS	0.010	mg/L		08-SEP-20	R5215836
Antimony (Sb)-Dissolved	0.00061	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Arsenic (As)-Dissolved	0.00092	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Barium (Ba)-Dissolved	0.0946	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Beryllium (Be)-Dissolved	<0.00050	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Bismuth (Bi)-Dissolved	<0.00025	DLDS	0.00025	mg/L		08-SEP-20	R5215836
Boron (B)-Dissolved	0.178	DLDS	0.050	mg/L		08-SEP-20	R5215836
Cadmium (Cd)-Dissolved	0.000036	DLDS	0.000025	mg/L		08-SEP-20	R5215836
Calcium (Ca)-Dissolved	305	DLDS	0.25	mg/L		08-SEP-20	R5215836
Cesium (Cs)-Dissolved	<0.000050	DLDS	0.000050	mg/L		08-SEP-20	R5215836
Chromium (Cr)-Dissolved	<0.00050	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Cobalt (Co)-Dissolved	0.00123	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Copper (Cu)-Dissolved	0.0326	DLDS	0.0010	mg/L		08-SEP-20	R5215836
Iron (Fe)-Dissolved	2.69	DLDS	0.050	mg/L		08-SEP-20	R5215836
Lead (Pb)-Dissolved	<0.00025	DLDS	0.00025	mg/L		08-SEP-20	R5215836
Lithium (Li)-Dissolved	0.0076	DLDS	0.0050	mg/L		08-SEP-20	R5215836
Magnesium (Mg)-Dissolved	45.5	DLDS	0.025	mg/L		08-SEP-20	R5215836
Manganese (Mn)-Dissolved	0.910	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Molybdenum (Mo)-Dissolved	0.0301	DLDS	0.00025	mg/L		08-SEP-20	R5215836
Nickel (Ni)-Dissolved	0.0032	DLDS	0.0025	mg/L		08-SEP-20	R5215836
Phosphorus (P)-Dissolved	0.50	DLDS	0.25	mg/L		08-SEP-20	R5215836
Potassium (K)-Dissolved	20.0	DLDS	0.25	mg/L		08-SEP-20	R5215836
Rubidium (Rb)-Dissolved	0.0154	DLDS	0.0010	mg/L		08-SEP-20	R5215836
Selenium (Se)-Dissolved	0.00276	DLDS	0.00025	mg/L		08-SEP-20	R5215836
Silicon (Si)-Dissolved	5.46	DLDS	0.25	mg/L		08-SEP-20	R5215836
Silver (Ag)-Dissolved	<0.000050	DLDS	0.000050	mg/L		08-SEP-20	R5215836
Sodium (Na)-Dissolved	69.1	DLDS	0.25	mg/L		08-SEP-20	R5215836
Strontium (Sr)-Dissolved	4.31	DLDS	0.0010	mg/L		08-SEP-20	R5215836
Sulfur (S)-Dissolved	286	DLDS	2.5	mg/L		08-SEP-20	R5215836
Tellurium (Te)-Dissolved	<0.0010	DLDS	0.0010	mg/L		08-SEP-20	R5215836
Thallium (Tl)-Dissolved	<0.000050	DLDS	0.000050	mg/L		08-SEP-20	R5215836
Thorium (Th)-Dissolved	<0.00050	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Tin (Sn)-Dissolved	<0.00050	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Titanium (Ti)-Dissolved	<0.0015	DLDS	0.0015	mg/L		08-SEP-20	R5215836
Tungsten (W)-Dissolved	0.00059	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Uranium (U)-Dissolved	0.00465	DLDS	0.000050	mg/L		08-SEP-20	R5215836
Vanadium (V)-Dissolved	<0.0025	DLDS	0.0025	mg/L		08-SEP-20	R5215836
Zinc (Zn)-Dissolved	0.0056	DLDS	0.0050	mg/L		08-SEP-20	R5215836
Zirconium (Zr)-Dissolved	<0.0010	DLDS	0.0010	mg/L		08-SEP-20	R5215836

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2498627-2 TRIAL G2							
Sampled By: CLIENT on 03-SEP-20 @ 10:45							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	0.467		0.050	mg/L		04-SEP-20	R5214846
Dissolved Organic Carbon	66.2	DLM	5.0	mg/L		05-SEP-20	R5212641
Nitrate (as N)	<0.10	DLDS	0.10	mg/L		03-SEP-20	R5210505
Nitrite (as N)	<0.050	DLDS	0.050	mg/L		03-SEP-20	R5210505
Sulfate (SO4)	868	DLDS	1.5	mg/L		03-SEP-20	R5210505
Sulphide (as S)	0.178		0.018	mg/L		09-SEP-20	R5216896
Sulphide (as H2S)	0.189		0.019	mg/L		09-SEP-20	
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					08-SEP-20	R5214556
Aluminum (Al)-Dissolved	0.021	DLDS	0.010	mg/L		08-SEP-20	R5215836
Antimony (Sb)-Dissolved	0.00051	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Arsenic (As)-Dissolved	0.00088	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Barium (Ba)-Dissolved	0.109	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Beryllium (Be)-Dissolved	<0.00050	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Bismuth (Bi)-Dissolved	<0.00025	DLDS	0.00025	mg/L		08-SEP-20	R5215836
Boron (B)-Dissolved	0.172	DLDS	0.050	mg/L		08-SEP-20	R5215836
Cadmium (Cd)-Dissolved	0.000027	DLDS	0.000025	mg/L		08-SEP-20	R5215836
Calcium (Ca)-Dissolved	312	DLDS	0.25	mg/L		08-SEP-20	R5215836
Cesium (Cs)-Dissolved	<0.000050	DLDS	0.000050	mg/L		08-SEP-20	R5215836
Chromium (Cr)-Dissolved	0.00051	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Cobalt (Co)-Dissolved	0.00190	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Copper (Cu)-Dissolved	0.0320	DLDS	0.0010	mg/L		08-SEP-20	R5215836
Iron (Fe)-Dissolved	3.54	DLDS	0.050	mg/L		08-SEP-20	R5215836
Lead (Pb)-Dissolved	<0.00025	DLDS	0.00025	mg/L		08-SEP-20	R5215836
Lithium (Li)-Dissolved	0.0070	DLDS	0.0050	mg/L		08-SEP-20	R5215836
Magnesium (Mg)-Dissolved	45.2	DLDS	0.025	mg/L		08-SEP-20	R5215836
Manganese (Mn)-Dissolved	1.25	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Molybdenum (Mo)-Dissolved	0.0281	DLDS	0.00025	mg/L		08-SEP-20	R5215836
Nickel (Ni)-Dissolved	0.0071	DLDS	0.0025	mg/L		08-SEP-20	R5215836
Phosphorus (P)-Dissolved	0.41	DLDS	0.25	mg/L		08-SEP-20	R5215836
Potassium (K)-Dissolved	20.1	DLDS	0.25	mg/L		08-SEP-20	R5215836
Rubidium (Rb)-Dissolved	0.0162	DLDS	0.0010	mg/L		08-SEP-20	R5215836
Selenium (Se)-Dissolved	0.00340	DLDS	0.00025	mg/L		08-SEP-20	R5215836
Silicon (Si)-Dissolved	5.61	DLDS	0.25	mg/L		08-SEP-20	R5215836
Silver (Ag)-Dissolved	<0.000050	DLDS	0.000050	mg/L		08-SEP-20	R5215836
Sodium (Na)-Dissolved	67.2	DLDS	0.25	mg/L		08-SEP-20	R5215836
Strontium (Sr)-Dissolved	4.34	DLDS	0.0010	mg/L		08-SEP-20	R5215836
Sulfur (S)-Dissolved	293	DLDS	2.5	mg/L		08-SEP-20	R5215836
Tellurium (Te)-Dissolved	<0.0010	DLDS	0.0010	mg/L		08-SEP-20	R5215836
Thallium (Tl)-Dissolved	<0.000050	DLDS	0.000050	mg/L		08-SEP-20	R5215836
Thorium (Th)-Dissolved	<0.00050	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Tin (Sn)-Dissolved	<0.00050	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Titanium (Ti)-Dissolved	<0.0015	DLDS	0.0015	mg/L		08-SEP-20	R5215836
Tungsten (W)-Dissolved	0.00056	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Uranium (U)-Dissolved	0.00404	DLDS	0.000050	mg/L		08-SEP-20	R5215836
Vanadium (V)-Dissolved	<0.0025	DLDS	0.0025	mg/L		08-SEP-20	R5215836
Zinc (Zn)-Dissolved	0.0185	DLDS	0.0050	mg/L		08-SEP-20	R5215836
Zirconium (Zr)-Dissolved	<0.0010	DLDS	0.0010	mg/L		08-SEP-20	R5215836

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2498627-3 TRIAL M3							
Sampled By: CLIENT on 03-SEP-20 @ 11:00							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	1.58	DLHC	0.50	mg/L		04-SEP-20	R5214846
Dissolved Organic Carbon	81.5	DLM	5.0	mg/L		05-SEP-20	R5212641
Nitrate (as N)	<0.10	DLDS	0.10	mg/L		03-SEP-20	R5210505
Nitrite (as N)	<0.050	DLDS	0.050	mg/L		03-SEP-20	R5210505
Sulfate (SO4)	833	DLDS	1.5	mg/L		03-SEP-20	R5210505
Sulphide (as S)	8.1	DLHC	3.6	mg/L		09-SEP-20	R5216896
Sulphide (as H2S)	8.6		3.8	mg/L		09-SEP-20	
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					08-SEP-20	R5214556
Aluminum (Al)-Dissolved	0.042	DLDS	0.010	mg/L		08-SEP-20	R5215836
Antimony (Sb)-Dissolved	<0.00050	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Arsenic (As)-Dissolved	<0.00050	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Barium (Ba)-Dissolved	0.118	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Beryllium (Be)-Dissolved	<0.00050	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Bismuth (Bi)-Dissolved	<0.00025	DLDS	0.00025	mg/L		08-SEP-20	R5215836
Boron (B)-Dissolved	0.172	DLDS	0.050	mg/L		08-SEP-20	R5215836
Cadmium (Cd)-Dissolved	0.000161	DLDS	0.000025	mg/L		08-SEP-20	R5215836
Calcium (Ca)-Dissolved	315	DLDS	0.25	mg/L		08-SEP-20	R5215836
Cesium (Cs)-Dissolved	<0.000050	DLDS	0.000050	mg/L		08-SEP-20	R5215836
Chromium (Cr)-Dissolved	0.00113	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Cobalt (Co)-Dissolved	0.00136	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Copper (Cu)-Dissolved	0.0399	DLDS	0.0010	mg/L		08-SEP-20	R5215836
Iron (Fe)-Dissolved	3.49	DLDS	0.050	mg/L		08-SEP-20	R5215836
Lead (Pb)-Dissolved	<0.00025	DLDS	0.00025	mg/L		08-SEP-20	R5215836
Lithium (Li)-Dissolved	<0.0050	DLDS	0.0050	mg/L		08-SEP-20	R5215836
Magnesium (Mg)-Dissolved	45.4	DLDS	0.025	mg/L		08-SEP-20	R5215836
Manganese (Mn)-Dissolved	1.30	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Molybdenum (Mo)-Dissolved	0.00626	DLDS	0.00025	mg/L		08-SEP-20	R5215836
Nickel (Ni)-Dissolved	0.0033	DLDS	0.0025	mg/L		08-SEP-20	R5215836
Phosphorus (P)-Dissolved	0.44	DLDS	0.25	mg/L		08-SEP-20	R5215836
Potassium (K)-Dissolved	23.1	DLDS	0.25	mg/L		08-SEP-20	R5215836
Rubidium (Rb)-Dissolved	0.0226	DLDS	0.0010	mg/L		08-SEP-20	R5215836
Selenium (Se)-Dissolved	0.00331	DLDS	0.00025	mg/L		08-SEP-20	R5215836
Silicon (Si)-Dissolved	5.67	DLDS	0.25	mg/L		08-SEP-20	R5215836
Silver (Ag)-Dissolved	<0.000050	DLDS	0.000050	mg/L		08-SEP-20	R5215836
Sodium (Na)-Dissolved	66.7	DLDS	0.25	mg/L		08-SEP-20	R5215836
Strontium (Sr)-Dissolved	4.26	DLDS	0.0010	mg/L		08-SEP-20	R5215836
Sulfur (S)-Dissolved	291	DLDS	2.5	mg/L		08-SEP-20	R5215836
Tellurium (Te)-Dissolved	<0.0010	DLDS	0.0010	mg/L		08-SEP-20	R5215836
Thallium (Tl)-Dissolved	<0.000050	DLDS	0.000050	mg/L		08-SEP-20	R5215836
Thorium (Th)-Dissolved	<0.00050	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Tin (Sn)-Dissolved	<0.00050	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Titanium (Ti)-Dissolved	0.0016	DLDS	0.0015	mg/L		08-SEP-20	R5215836
Tungsten (W)-Dissolved	<0.00050	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Uranium (U)-Dissolved	0.00278	DLDS	0.000050	mg/L		08-SEP-20	R5215836
Vanadium (V)-Dissolved	<0.0025	DLDS	0.0025	mg/L		08-SEP-20	R5215836
Zinc (Zn)-Dissolved	0.0169	DLDS	0.0050	mg/L		08-SEP-20	R5215836
Zirconium (Zr)-Dissolved	<0.0010	DLDS	0.0010	mg/L		08-SEP-20	R5215836

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2498627-4 TRIAL C4							
Sampled By: CLIENT on 03-SEP-20 @ 11:15							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	1.89	DLHC	0.50	mg/L		04-SEP-20	R5214846
Dissolved Organic Carbon	26.9	DLM	5.0	mg/L		05-SEP-20	R5212641
Nitrate (as N)	0.14	DLDS	0.10	mg/L		03-SEP-20	R5210505
Nitrite (as N)	0.443	DLDS	0.050	mg/L		03-SEP-20	R5210505
Sulfate (SO4)	884	DLDS	1.5	mg/L		03-SEP-20	R5210505
Sulphide (as S)	0.036		0.018	mg/L		09-SEP-20	R5216896
Sulphide (as H2S)	0.038		0.019	mg/L		09-SEP-20	
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					08-SEP-20	R5214556
Aluminum (Al)-Dissolved	<0.010	DLDS	0.010	mg/L		08-SEP-20	R5215836
Antimony (Sb)-Dissolved	<0.00050	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Arsenic (As)-Dissolved	0.00062	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Barium (Ba)-Dissolved	0.105	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Beryllium (Be)-Dissolved	<0.00050	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Bismuth (Bi)-Dissolved	<0.00025	DLDS	0.00025	mg/L		08-SEP-20	R5215836
Boron (B)-Dissolved	0.160	DLDS	0.050	mg/L		08-SEP-20	R5215836
Cadmium (Cd)-Dissolved	0.000250	DLDS	0.000025	mg/L		08-SEP-20	R5215836
Calcium (Ca)-Dissolved	307	DLDS	0.25	mg/L		08-SEP-20	R5215836
Cesium (Cs)-Dissolved	0.000055	DLDS	0.000050	mg/L		08-SEP-20	R5215836
Chromium (Cr)-Dissolved	<0.00050	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Cobalt (Co)-Dissolved	0.00088	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Copper (Cu)-Dissolved	0.114	DLDS	0.0010	mg/L		08-SEP-20	R5215836
Iron (Fe)-Dissolved	0.075	DLDS	0.050	mg/L		08-SEP-20	R5215836
Lead (Pb)-Dissolved	<0.00025	DLDS	0.00025	mg/L		08-SEP-20	R5215836
Lithium (Li)-Dissolved	0.0054	DLDS	0.0050	mg/L		08-SEP-20	R5215836
Magnesium (Mg)-Dissolved	44.6	DLDS	0.025	mg/L		08-SEP-20	R5215836
Manganese (Mn)-Dissolved	0.890	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Molybdenum (Mo)-Dissolved	0.0257	DLDS	0.00025	mg/L		08-SEP-20	R5215836
Nickel (Ni)-Dissolved	<0.0025	DLDS	0.0025	mg/L		08-SEP-20	R5215836
Phosphorus (P)-Dissolved	<0.25	DLDS	0.25	mg/L		08-SEP-20	R5215836
Potassium (K)-Dissolved	18.6	DLDS	0.25	mg/L		08-SEP-20	R5215836
Rubidium (Rb)-Dissolved	0.0165	DLDS	0.0010	mg/L		08-SEP-20	R5215836
Selenium (Se)-Dissolved	0.00352	DLDS	0.00025	mg/L		08-SEP-20	R5215836
Silicon (Si)-Dissolved	4.47	DLDS	0.25	mg/L		08-SEP-20	R5215836
Silver (Ag)-Dissolved	0.000090	DLDS	0.000050	mg/L		08-SEP-20	R5215836
Sodium (Na)-Dissolved	65.5	DLDS	0.25	mg/L		08-SEP-20	R5215836
Strontium (Sr)-Dissolved	4.17	DLDS	0.0010	mg/L		08-SEP-20	R5215836
Sulfur (S)-Dissolved	283	DLDS	2.5	mg/L		08-SEP-20	R5215836
Tellurium (Te)-Dissolved	<0.0010	DLDS	0.0010	mg/L		08-SEP-20	R5215836
Thallium (Tl)-Dissolved	<0.000050	DLDS	0.000050	mg/L		08-SEP-20	R5215836
Thorium (Th)-Dissolved	<0.00050	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Tin (Sn)-Dissolved	<0.00050	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Titanium (Ti)-Dissolved	<0.0015	DLDS	0.0015	mg/L		08-SEP-20	R5215836
Tungsten (W)-Dissolved	<0.00050	DLDS	0.00050	mg/L		08-SEP-20	R5215836
Uranium (U)-Dissolved	0.00486	DLDS	0.000050	mg/L		08-SEP-20	R5215836
Vanadium (V)-Dissolved	<0.0025	DLDS	0.0025	mg/L		08-SEP-20	R5215836
Zinc (Zn)-Dissolved	0.0213	DLDS	0.0050	mg/L		08-SEP-20	R5215836
Zirconium (Zr)-Dissolved	<0.0010	DLDS	0.0010	mg/L		08-SEP-20	R5215836

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-DIS-ORG-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
Filtered (0.45 um) sample is acidified and purged to remove inorganic carbon, then injected into a heated reaction chamber where organic carbon is oxidized to CO2 which is then transported in the carrier gas stream and measured via a non-dispersive infrared analyzer.			
MET-D-CCMS-SK	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B / EPA 6020A
This procedure involves preliminary filtration through a 0.45 um filter followed by instrumental analysis using collision cell inductively coupled plasma - mass spectrometry (modifed from EPA Method 6020A).			
NH3-F-CL	Water	Ammonia by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-IC-N-SK	Water	Nitrite in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-IC-N-SK	Water	Nitrate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
S2-T>H2S-CALC-WT	Water	Total Sulphide Calculated as H2S	Calculation
This calculation converts Total Sulphide as (S2-) and reports it as Total Sulphide as (H2S). Total Sulphide as (S2-) is determined using procedures adapted from APHA 4500-S2 "Sulphide".			
SO4-IC-N-SK	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SULPHIDE-WT	Water	Sulphide (as S)	APHA 4500S2D
This analysis is carried out using procedures adapted from APHA Method 4500-S2-D "Methylene Blue Method". Sulphide is determined colourmetrically.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: Ensero Technologies Inc.
104-411 Downey Road
Saskatoon SK S7N 4L8
Contact: Rachel Martz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-CL	Water							
Batch R5212641								
WG3399411-2 LCS								
Dissolved Organic Carbon			92.0		%		80-120	05-SEP-20
WG3399411-1 MB								
Dissolved Organic Carbon			<1.0		mg/L		1	05-SEP-20
MET-D-CCMS-SK	Water							
Batch R5215836								
WG3399803-3 CRM		**TMRM_20**						
Aluminum (Al)-Dissolved			104.5		%		80-120	08-SEP-20
Antimony (Sb)-Dissolved			100.5		%		80-120	08-SEP-20
Arsenic (As)-Dissolved			100.2		%		80-120	08-SEP-20
Barium (Ba)-Dissolved			99.6		%		80-120	08-SEP-20
Beryllium (Be)-Dissolved			110.6		%		80-120	08-SEP-20
Bismuth (Bi)-Dissolved			94.7		%		80-120	08-SEP-20
Boron (B)-Dissolved			103.3		%		80-120	08-SEP-20
Cadmium (Cd)-Dissolved			105.9		%		80-120	08-SEP-20
Calcium (Ca)-Dissolved			102.7		%		80-120	08-SEP-20
Cesium (Cs)-Dissolved			103.7		%		80-120	08-SEP-20
Chromium (Cr)-Dissolved			99.4		%		80-120	08-SEP-20
Cobalt (Co)-Dissolved			98.8		%		80-120	08-SEP-20
Copper (Cu)-Dissolved			99.3		%		80-120	08-SEP-20
Iron (Fe)-Dissolved			108.3		%		80-120	08-SEP-20
Lead (Pb)-Dissolved			96.6		%		80-120	08-SEP-20
Lithium (Li)-Dissolved			113.0		%		80-120	08-SEP-20
Magnesium (Mg)-Dissolved			101.7		%		80-120	08-SEP-20
Manganese (Mn)-Dissolved			101.7		%		80-120	08-SEP-20
Molybdenum (Mo)-Dissolved			101.3		%		80-120	08-SEP-20
Nickel (Ni)-Dissolved			98.7		%		80-120	08-SEP-20
Phosphorus (P)-Dissolved			101.0		%		70-130	08-SEP-20
Potassium (K)-Dissolved			100.9		%		80-120	08-SEP-20
Rubidium (Rb)-Dissolved			97.5		%		80-120	08-SEP-20
Selenium (Se)-Dissolved			98.0		%		80-120	08-SEP-20
Silicon (Si)-Dissolved			102.2		%		60-140	08-SEP-20
Silver (Ag)-Dissolved			101.5		%		80-120	08-SEP-20
Sodium (Na)-Dissolved			99.7		%		80-120	08-SEP-20
Strontium (Sr)-Dissolved			106.4		%		80-120	08-SEP-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch R5215836								
WG3399803-3 CRM		**TMRM_20**						
Sulfur (S)-Dissolved			107.7		%		80-120	08-SEP-20
Tellurium (Te)-Dissolved			96.9		%		80-120	08-SEP-20
Thallium (Tl)-Dissolved			97.6		%		80-120	08-SEP-20
Thorium (Th)-Dissolved			93.8		%		80-120	08-SEP-20
Tin (Sn)-Dissolved			100.9		%		80-120	08-SEP-20
Titanium (Ti)-Dissolved			95.4		%		80-120	08-SEP-20
Tungsten (W)-Dissolved			96.5		%		80-120	08-SEP-20
Uranium (U)-Dissolved			98.0		%		80-120	08-SEP-20
Vanadium (V)-Dissolved			100.5		%		80-120	08-SEP-20
Zinc (Zn)-Dissolved			101.3		%		80-120	08-SEP-20
Zirconium (Zr)-Dissolved			102.7		%		80-120	08-SEP-20
WG3399803-1 MB								
Aluminum (Al)-Dissolved			<0.0020		mg/L		0.002	08-SEP-20
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	08-SEP-20
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	08-SEP-20
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	08-SEP-20
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	08-SEP-20
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	08-SEP-20
Boron (B)-Dissolved			<0.010		mg/L		0.01	08-SEP-20
Cadmium (Cd)-Dissolved			<0.000005C		mg/L		0.000005	08-SEP-20
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	08-SEP-20
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	08-SEP-20
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	08-SEP-20
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	08-SEP-20
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	08-SEP-20
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	08-SEP-20
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	08-SEP-20
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	08-SEP-20
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	08-SEP-20
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	08-SEP-20
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	08-SEP-20
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	08-SEP-20
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	08-SEP-20
Potassium (K)-Dissolved			<0.050		mg/L		0.05	08-SEP-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch R5215836								
WG3399803-1 MB								
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	08-SEP-20
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	08-SEP-20
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	08-SEP-20
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	08-SEP-20
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	08-SEP-20
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	08-SEP-20
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	08-SEP-20
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	08-SEP-20
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	08-SEP-20
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	08-SEP-20
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	08-SEP-20
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	08-SEP-20
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	08-SEP-20
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	08-SEP-20
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	08-SEP-20
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	08-SEP-20
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	08-SEP-20
NH3-F-CL	Water							
Batch R5214846								
WG3398942-6 LCS								
Ammonia, Total (as N)			114.2		%		85-115	04-SEP-20
WG3398942-5 MB								
Ammonia, Total (as N)			<0.050		mg/L		0.05	04-SEP-20
NO2-IC-N-SK	Water							
Batch R5210505								
WG3397946-1 DUP		**L2498627-2**						
Nitrite (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	03-SEP-20
WG3397946-3 LCS								
Nitrite (as N)			98.8		%		90-110	03-SEP-20
WG3397946-2 MB								
Nitrite (as N)			<0.010		mg/L		0.01	03-SEP-20
NO3-IC-N-SK	Water							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-IC-N-SK	Water							
Batch R5210505								
WG3397946-1 DUP		**L2498627-2**						
Nitrate (as N)		<0.10	<0.10	RPD-NA	mg/L	N/A	20	03-SEP-20
WG3397946-3 LCS								
Nitrate (as N)			101.1		%		90-110	03-SEP-20
WG3397946-2 MB								
Nitrate (as N)			<0.020		mg/L		0.02	03-SEP-20
SO4-IC-N-SK	Water							
Batch R5210505								
WG3397946-1 DUP		**L2498627-2**						
Sulfate (SO4)		868	869		mg/L	0.2	20	03-SEP-20
WG3397946-3 LCS								
Sulfate (SO4)			103.5		%		90-110	03-SEP-20
WG3397946-2 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	03-SEP-20
SULPHIDE-WT	Water							
Batch R5216896								
WG3400443-2 LCS								
Sulphide (as S)			108.8		%		75-125	09-SEP-20
WG3400443-1 MB								
Sulphide (as S)			<0.018		mg/L		0.018	09-SEP-20

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2498627-COFC

COC Number: 15 -

Page of

Report To	Contact and company name below will appear on the final report
Company:	Ensero Technologies
Contact:	Rachel Martz
Phone:	306 978 3111
	Company address below will appear on the final report
Street:	104-411 Downey Road
City/Province:	Saskatoon, SK
Postal Code:	S7H 1R1
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Ensero Technologies
Contact:	Mel Shotenski

Report Format / Di

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax rmartz@ensero.com

Email 2 rkleinberger@ensero.com

Email 3 kpiecowye@ensero.com

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax rmartz@ensero.com

Email 2 ap@ensero.com

Project Information

ALS Account # / Quote #: Q81011

Job #: ETK20YT00042

PO / AFE:

LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#

Major/Minor Code: Routing Code:

Requisitioner:

Location:

ALS Lab Work Order # (lab use only)

ALS Contact: **Sampler:**

E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐

EMERGENCY: 1 Business day [E1] ☐ | Same Day, Weekend or Statutory holiday [E0] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NO2-IC-N-SK	NO3-IC-N-SK	NH3-F-CL	C-DIS-ORG-CL	MET-D-CCMS-SK	SO4-IC-N-SK	SULPHIDE-CFA-ED	Number of Containers
							P	F/P	F/P		P	
	Trial E1	3-Sep-20	10:30	Water	R	R	R	R	R	R	R	5
	Trial G2	3-Sep-20	10:45	Water	R	R	R	R	R	R	R	5
	Trial M3	3-Sep-20	11:00	Water	R	R	R	R	R	R	R	5
	Trial C4	3-Sep-20	11:15	Water	R	R	R	R	R	R	R	5

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ ☐ NO

Are samples for human drinking water use? ☐ ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Please add cbrizinski@ensero.com and importer@contango.ehsdata.com to emails.

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
13°C					

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by: JP14	Date: 3/9/2020	Time: 2:00	Received by: JP14	Date:	Time: 2:05

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System,** please submit using an **Authorized DW COC form.**

Ensero Technologies Inc.
ATTN: Rachel Martz
104-411 Downey Road
Saskatoon SK S7N 4L8

Date Received: 11-SEP-20
Report Date: 18-SEP-20 14:10 (MT)
Version: FINAL

Client Phone: 306-978-3111

Certificate of Analysis

Lab Work Order #: L2502033

Project P.O. #: NOT SUBMITTED
Job Reference: ETK20YT000042
C of C Numbers:
Legal Site Desc:

Brian Morgan, B.Sc. Hons.
Client Services Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2502033-1 TRIAL E1							
Sampled By: CLIENT on 10-SEP-20 @ 10:00							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	0.249		0.050	mg/L		15-SEP-20	R5224062
Nitrate (as N)	<0.10	DLDS	0.10	mg/L		11-SEP-20	R5223434
Nitrite (as N)	<0.050	DLDS	0.050	mg/L		11-SEP-20	R5223434
L2502033-2 TRIAL G2							
Sampled By: CLIENT on 10-SEP-20 @ 10:00							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	1.33	DLHC	0.50	mg/L		15-SEP-20	R5224062
Nitrate (as N)	<0.10	DLDS	0.10	mg/L		11-SEP-20	R5223434
Nitrite (as N)	<0.050	DLDS	0.050	mg/L		11-SEP-20	R5223434
L2502033-3 TRIAL M3							
Sampled By: CLIENT on 10-SEP-20 @ 10:00							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	1.32	DLHC	0.50	mg/L		15-SEP-20	R5224062
Nitrate (as N)	<0.040	DLDS	0.040	mg/L		11-SEP-20	R5223434
Nitrite (as N)	0.031	DLDS	0.020	mg/L		11-SEP-20	R5223434
L2502033-4 TRIAL C4							
Sampled By: CLIENT on 10-SEP-20 @ 10:00							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	3.42	DLHC	0.50	mg/L		15-SEP-20	R5224062
Nitrate (as N)	7.30	DLDS	0.10	mg/L		11-SEP-20	R5223434
Nitrite (as N)	2.44	DLDS	0.050	mg/L		11-SEP-20	R5223434

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
NH3-F-CL	Water	Ammonia by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-IC-N-SK	Water	Nitrite in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-IC-N-SK	Water	Nitrate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: Ensero Technologies Inc.
104-411 Downey Road
Saskatoon SK S7N 4L8
Contact: Rachel Martz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-F-CL	Water							
Batch R5224062								
WG3404326-6 LCS								
Ammonia, Total (as N)			106.9		%		85-115	14-SEP-20
WG3404326-5 MB								
Ammonia, Total (as N)			<0.050		mg/L		0.05	14-SEP-20
NO2-IC-N-SK	Water							
Batch R5223434								
WG3402908-1 DUP		**L2502033-4**						
Nitrite (as N)		2.44	2.46		mg/L	1.0	20	11-SEP-20
WG3402908-3 LCS								
Nitrite (as N)			100.3		%		90-110	11-SEP-20
WG3402908-2 MB								
Nitrite (as N)			<0.010		mg/L		0.01	11-SEP-20
NO3-IC-N-SK	Water							
Batch R5223434								
WG3402908-1 DUP		**L2502033-4**						
Nitrate (as N)		7.30	7.38		mg/L	1.0	20	11-SEP-20
WG3402908-3 LCS								
Nitrate (as N)			102.2		%		90-110	11-SEP-20
WG3402908-2 MB								
Nitrate (as N)			<0.020		mg/L		0.02	11-SEP-20

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

ALS Environmental

www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2502033-COFC

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Report To	Contact and company name below will appear on the final report
Company:	Ensero Technologies
Contact:	Rachel Martz
Phone:	306 978 3111
	Company address below will appear on the final report
Street:	104-411 Downey Road
City/Province:	Saskatoon, SK
Postal Code:	S7H 1R1
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Ensero Technologies
Contact:	Mel Shotenski

Project Information	
ALS Account # / Quote #:	Q81011
Job #:	ETK20YT00042
PO / AFE:	
LSD:	
ALS Lab Work Order # (lab use only)	

Report Format / Distribution	
Select Report Format:	☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	rmartz@ensero.com
Email 2	rkleinberger@ensero.com
Email 3	kpiecowye@ensero.com

Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	rmartz@ensero.com
Email 2	ap@ensero.com

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact:	Sampler:

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)		EMERGENCY	
	4 day [P4] ☐		1 Business day [E1] ☐
	3 day [P3] ☐		Same Day, Weekend or Statutory holiday [E0] ☐
	2 day [P2] ☐		

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NO2-IC-N-SK	NO3-IC-N-SK	NH3-F-CL										Number of Containers
							P										
	Trial E1	10-Sep-20	10:00	Water	R	R	R										2
	Trial G2	10-Sep-20	10:10	Water	R	R	R										2
	Trial M3	10-Sep-20	10:20	Water	R	R	R										2
	Trial C4	10-Sep-20	10:30	Water	R	R	R										2

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human drinking water use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Please add cbrizinski@ensero.com and importer@contango.ehsdata.com to emails.

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
13°C					

SHIPMENT RELEASE (client use)		
Released by:	Date:	Time:

INITIAL SHIPMENT RECEPTION (lab use only)		
Received by: JDLA	Date: 11/9/2020	Time: 11:30

FINAL SHIPMENT RECEPTION (lab use only)		
Received by: JDLA	Date: 11/9/2020	Time: 11:45

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Ensero Technologies Inc.
ATTN: Rachel Martz
104-411 Downey Road
Saskatoon SK S7N 4L8

Date Received: 17-SEP-20
Report Date: 24-SEP-20 15:54 (MT)
Version: FINAL

Client Phone: 306-978-3111

Certificate of Analysis

Lab Work Order #: L2504725

Project P.O. #: NOT SUBMITTED
Job Reference: ETK20YT00042
C of C Numbers:
Legal Site Desc:

Brian Morgan, B.Sc. Hons.
Client Services Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2504725-1 TRIAL E1							
Sampled By: CLIENT on 17-SEP-20 @ 09:00							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	<0.050		0.050	mg/L		21-SEP-20	R5232236
Dissolved Organic Carbon	42.2		1.0	mg/L		20-SEP-20	R5231439
Nitrate (as N)	<0.10	DLDS	0.10	mg/L		18-SEP-20	R5230881
Nitrite (as N)	<0.050	DLDS	0.050	mg/L		18-SEP-20	R5230881
Sulfate (SO4)	820	DLDS	1.5	mg/L		18-SEP-20	R5230881
Sulphide (as S)	1.68	DLHC	0.030	mg/L		23-SEP-20	R5233351
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					18-SEP-20	R5228818
Aluminum (Al)-Dissolved	0.016	DLM	0.010	mg/L		18-SEP-20	R5229551
Antimony (Sb)-Dissolved	<0.00050	DLM	0.00050	mg/L		18-SEP-20	R5229551
Arsenic (As)-Dissolved	<0.00050	DLM	0.00050	mg/L		18-SEP-20	R5229551
Barium (Ba)-Dissolved	0.100	DLM	0.00050	mg/L		18-SEP-20	R5229551
Beryllium (Be)-Dissolved	<0.00050	DLM	0.00050	mg/L		18-SEP-20	R5229551
Bismuth (Bi)-Dissolved	<0.00025	DLM	0.00025	mg/L		18-SEP-20	R5229551
Boron (B)-Dissolved	0.181	DLM	0.050	mg/L		18-SEP-20	R5229551
Cadmium (Cd)-Dissolved	<0.000025	DLM	0.000025	mg/L		18-SEP-20	R5229551
Calcium (Ca)-Dissolved	300	DLM	0.25	mg/L		18-SEP-20	R5229551
Cesium (Cs)-Dissolved	<0.000050	DLM	0.000050	mg/L		18-SEP-20	R5229551
Chromium (Cr)-Dissolved	0.00051	DLM	0.00050	mg/L		18-SEP-20	R5229551
Cobalt (Co)-Dissolved	<0.00050	DLM	0.00050	mg/L		18-SEP-20	R5229551
Copper (Cu)-Dissolved	0.0035	DLM	0.0010	mg/L		18-SEP-20	R5229551
Iron (Fe)-Dissolved	0.848	DLM	0.050	mg/L		18-SEP-20	R5229551
Lead (Pb)-Dissolved	<0.00025	DLM	0.00025	mg/L		18-SEP-20	R5229551
Lithium (Li)-Dissolved	0.0052	DLM	0.0050	mg/L		18-SEP-20	R5229551
Magnesium (Mg)-Dissolved	47.7	DLM	0.025	mg/L		18-SEP-20	R5229551
Manganese (Mn)-Dissolved	1.02	DLM	0.00050	mg/L		18-SEP-20	R5229551
Molybdenum (Mo)-Dissolved	0.0117	DLM	0.00025	mg/L		18-SEP-20	R5229551
Nickel (Ni)-Dissolved	<0.0025	DLM	0.0025	mg/L		18-SEP-20	R5229551
Phosphorus (P)-Dissolved	0.45	DLM	0.25	mg/L		18-SEP-20	R5229551
Potassium (K)-Dissolved	20.1	DLM	0.25	mg/L		18-SEP-20	R5229551
Rubidium (Rb)-Dissolved	0.0135	DLM	0.0010	mg/L		18-SEP-20	R5229551
Selenium (Se)-Dissolved	0.00277	DLM	0.00025	mg/L		18-SEP-20	R5229551
Silicon (Si)-Dissolved	6.01	DLM	0.25	mg/L		18-SEP-20	R5229551
Silver (Ag)-Dissolved	<0.000050	DLM	0.000050	mg/L		18-SEP-20	R5229551
Sodium (Na)-Dissolved	74.7	DLM	0.25	mg/L		18-SEP-20	R5229551
Strontium (Sr)-Dissolved	4.36	DLM	0.0010	mg/L		18-SEP-20	R5229551
Sulfur (S)-Dissolved	280	DLM	2.5	mg/L		18-SEP-20	R5229551
Tellurium (Te)-Dissolved	<0.0010	DLM	0.0010	mg/L		18-SEP-20	R5229551
Thallium (Tl)-Dissolved	<0.000050	DLM	0.000050	mg/L		18-SEP-20	R5229551
Thorium (Th)-Dissolved	<0.00050	DLM	0.00050	mg/L		18-SEP-20	R5229551
Tin (Sn)-Dissolved	<0.00050	DLM	0.00050	mg/L		18-SEP-20	R5229551
Titanium (Ti)-Dissolved	<0.0015	DLM	0.0015	mg/L		18-SEP-20	R5229551
Tungsten (W)-Dissolved	<0.00050	DLM	0.00050	mg/L		18-SEP-20	R5229551
Uranium (U)-Dissolved	0.00389	DLM	0.000050	mg/L		18-SEP-20	R5229551
Vanadium (V)-Dissolved	<0.0025	DLM	0.0025	mg/L		18-SEP-20	R5229551
Zinc (Zn)-Dissolved	<0.0050	DLM	0.0050	mg/L		18-SEP-20	R5229551
Zirconium (Zr)-Dissolved	<0.0010	DLM	0.0010	mg/L		18-SEP-20	R5229551
L2504725-2 TRIAL G2							
Sampled By: CLIENT on 17-SEP-20 @ 09:00							
Matrix: WATER							
Miscellaneous Parameters							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2504725-2 TRIAL G2							
Sampled By: CLIENT on 17-SEP-20 @ 09:00							
Matrix: WATER							
Ammonia, Total (as N)	0.80	DLHC	0.50	mg/L		21-SEP-20	R5232236
Dissolved Organic Carbon	58.6		1.0	mg/L		20-SEP-20	R5231439
Nitrate (as N)	<0.10	DLDS	0.10	mg/L		18-SEP-20	R5230881
Nitrite (as N)	<0.050	DLDS	0.050	mg/L		18-SEP-20	R5230881
Sulfate (SO4)	836	DLDS	1.5	mg/L		18-SEP-20	R5230881
Sulphide (as S)	1.60	DLHC	0.030	mg/L		23-SEP-20	R5233351
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					18-SEP-20	R5228818
Aluminum (Al)-Dissolved	0.019	DLM	0.010	mg/L		18-SEP-20	R5229551
Antimony (Sb)-Dissolved	<0.00050	DLM	0.00050	mg/L		18-SEP-20	R5229551
Arsenic (As)-Dissolved	<0.00050	DLM	0.00050	mg/L		18-SEP-20	R5229551
Barium (Ba)-Dissolved	0.115	DLM	0.00050	mg/L		18-SEP-20	R5229551
Beryllium (Be)-Dissolved	<0.00050	DLM	0.00050	mg/L		18-SEP-20	R5229551
Bismuth (Bi)-Dissolved	<0.00025	DLM	0.00025	mg/L		18-SEP-20	R5229551
Boron (B)-Dissolved	0.164	DLM	0.050	mg/L		18-SEP-20	R5229551
Cadmium (Cd)-Dissolved	<0.000025	DLM	0.000025	mg/L		18-SEP-20	R5229551
Calcium (Ca)-Dissolved	314	DLM	0.25	mg/L		18-SEP-20	R5229551
Cesium (Cs)-Dissolved	<0.000050	DLM	0.000050	mg/L		18-SEP-20	R5229551
Chromium (Cr)-Dissolved	0.00072	DLM	0.00050	mg/L		18-SEP-20	R5229551
Cobalt (Co)-Dissolved	0.00052	DLM	0.00050	mg/L		18-SEP-20	R5229551
Copper (Cu)-Dissolved	0.0037	DLM	0.0010	mg/L		18-SEP-20	R5229551
Iron (Fe)-Dissolved	1.56	DLM	0.050	mg/L		18-SEP-20	R5229551
Lead (Pb)-Dissolved	<0.00025	DLM	0.00025	mg/L		18-SEP-20	R5229551
Lithium (Li)-Dissolved	0.0051	DLM	0.0050	mg/L		18-SEP-20	R5229551
Magnesium (Mg)-Dissolved	45.9	DLM	0.025	mg/L		18-SEP-20	R5229551
Manganese (Mn)-Dissolved	1.35	DLM	0.00050	mg/L		18-SEP-20	R5229551
Molybdenum (Mo)-Dissolved	0.0145	DLM	0.00025	mg/L		18-SEP-20	R5229551
Nickel (Ni)-Dissolved	<0.0025	DLM	0.0025	mg/L		18-SEP-20	R5229551
Phosphorus (P)-Dissolved	0.59	DLM	0.25	mg/L		18-SEP-20	R5229551
Potassium (K)-Dissolved	20.4	DLM	0.25	mg/L		18-SEP-20	R5229551
Rubidium (Rb)-Dissolved	0.0150	DLM	0.0010	mg/L		18-SEP-20	R5229551
Selenium (Se)-Dissolved	0.00209	DLM	0.00025	mg/L		18-SEP-20	R5229551
Silicon (Si)-Dissolved	6.00	DLM	0.25	mg/L		18-SEP-20	R5229551
Silver (Ag)-Dissolved	<0.000050	DLM	0.000050	mg/L		18-SEP-20	R5229551
Sodium (Na)-Dissolved	72.8	DLM	0.25	mg/L		18-SEP-20	R5229551
Strontium (Sr)-Dissolved	4.31	DLM	0.0010	mg/L		18-SEP-20	R5229551
Sulfur (S)-Dissolved	284	DLM	2.5	mg/L		18-SEP-20	R5229551
Tellurium (Te)-Dissolved	<0.0010	DLM	0.0010	mg/L		18-SEP-20	R5229551
Thallium (Tl)-Dissolved	<0.000050	DLM	0.000050	mg/L		18-SEP-20	R5229551
Thorium (Th)-Dissolved	<0.00050	DLM	0.00050	mg/L		18-SEP-20	R5229551
Tin (Sn)-Dissolved	<0.00050	DLM	0.00050	mg/L		18-SEP-20	R5229551
Titanium (Ti)-Dissolved	<0.0015	DLM	0.0015	mg/L		18-SEP-20	R5229551
Tungsten (W)-Dissolved	0.00051	DLM	0.00050	mg/L		18-SEP-20	R5229551
Uranium (U)-Dissolved	0.00373	DLM	0.000050	mg/L		18-SEP-20	R5229551
Vanadium (V)-Dissolved	<0.0025	DLM	0.0025	mg/L		18-SEP-20	R5229551
Zinc (Zn)-Dissolved	<0.0050	DLM	0.0050	mg/L		18-SEP-20	R5229551
Zirconium (Zr)-Dissolved	<0.0010	DLM	0.0010	mg/L		18-SEP-20	R5229551
L2504725-3 TRIAL M3							
Sampled By: CLIENT on 17-SEP-20 @ 09:00							
Matrix: WATER							
Miscellaneous Parameters							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2504725-3 TRIAL M3							
Sampled By: CLIENT on 17-SEP-20 @ 09:00							
Matrix: WATER							
Ammonia, Total (as N)	0.81	DLHC	0.50	mg/L		21-SEP-20	R5232236
Dissolved Organic Carbon	41.5		1.0	mg/L		24-SEP-20	R5231439
Nitrate (as N)	<0.20	DLDS	0.20	mg/L		18-SEP-20	R5230881
Nitrite (as N)	<0.10	DLDS	0.10	mg/L		18-SEP-20	R5230881
Sulfate (SO4)	791	DLDS	3.0	mg/L		18-SEP-20	R5230881
Sulphide (as S)	3.29	DLHC	0.030	mg/L		23-SEP-20	R5233351
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					18-SEP-20	R5228818
Aluminum (Al)-Dissolved	0.033	DLM	0.010	mg/L		18-SEP-20	R5229551
Antimony (Sb)-Dissolved	<0.00050	DLM	0.00050	mg/L		18-SEP-20	R5229551
Arsenic (As)-Dissolved	<0.00050	DLM	0.00050	mg/L		18-SEP-20	R5229551
Barium (Ba)-Dissolved	0.118	DLM	0.00050	mg/L		18-SEP-20	R5229551
Beryllium (Be)-Dissolved	<0.00050	DLM	0.00050	mg/L		18-SEP-20	R5229551
Bismuth (Bi)-Dissolved	<0.00025	DLM	0.00025	mg/L		18-SEP-20	R5229551
Boron (B)-Dissolved	0.160	DLM	0.050	mg/L		18-SEP-20	R5229551
Cadmium (Cd)-Dissolved	0.000092	DLM	0.000025	mg/L		18-SEP-20	R5229551
Calcium (Ca)-Dissolved	297	DLM	0.25	mg/L		18-SEP-20	R5229551
Cesium (Cs)-Dissolved	<0.000050	DLM	0.000050	mg/L		18-SEP-20	R5229551
Chromium (Cr)-Dissolved	0.00131	DLM	0.00050	mg/L		18-SEP-20	R5229551
Cobalt (Co)-Dissolved	<0.00050	DLM	0.00050	mg/L		18-SEP-20	R5229551
Copper (Cu)-Dissolved	0.0241	DLM	0.0010	mg/L		18-SEP-20	R5229551
Iron (Fe)-Dissolved	1.13	DLM	0.050	mg/L		18-SEP-20	R5229551
Lead (Pb)-Dissolved	0.00051	DLM	0.00025	mg/L		18-SEP-20	R5229551
Lithium (Li)-Dissolved	<0.0050	DLM	0.0050	mg/L		18-SEP-20	R5229551
Magnesium (Mg)-Dissolved	45.7	DLM	0.025	mg/L		18-SEP-20	R5229551
Manganese (Mn)-Dissolved	1.36	DLM	0.00050	mg/L		18-SEP-20	R5229551
Molybdenum (Mo)-Dissolved	0.00452	DLM	0.00025	mg/L		18-SEP-20	R5229551
Nickel (Ni)-Dissolved	<0.0025	DLM	0.0025	mg/L		18-SEP-20	R5229551
Phosphorus (P)-Dissolved	0.38	DLM	0.25	mg/L		18-SEP-20	R5229551
Potassium (K)-Dissolved	22.7	DLM	0.25	mg/L		18-SEP-20	R5229551
Rubidium (Rb)-Dissolved	0.0216	DLM	0.0010	mg/L		18-SEP-20	R5229551
Selenium (Se)-Dissolved	0.00212	DLM	0.00025	mg/L		18-SEP-20	R5229551
Silicon (Si)-Dissolved	6.07	DLM	0.25	mg/L		18-SEP-20	R5229551
Silver (Ag)-Dissolved	<0.000050	DLM	0.000050	mg/L		18-SEP-20	R5229551
Sodium (Na)-Dissolved	70.9	DLM	0.25	mg/L		18-SEP-20	R5229551
Strontium (Sr)-Dissolved	4.31	DLM	0.0010	mg/L		18-SEP-20	R5229551
Sulfur (S)-Dissolved	271	DLM	2.5	mg/L		18-SEP-20	R5229551
Tellurium (Te)-Dissolved	<0.0010	DLM	0.0010	mg/L		18-SEP-20	R5229551
Thallium (Tl)-Dissolved	<0.000050	DLM	0.000050	mg/L		18-SEP-20	R5229551
Thorium (Th)-Dissolved	<0.00050	DLM	0.00050	mg/L		18-SEP-20	R5229551
Tin (Sn)-Dissolved	<0.00050	DLM	0.00050	mg/L		18-SEP-20	R5229551
Titanium (Ti)-Dissolved	0.0016	DLM	0.0015	mg/L		18-SEP-20	R5229551
Tungsten (W)-Dissolved	0.00053	DLM	0.00050	mg/L		18-SEP-20	R5229551
Uranium (U)-Dissolved	0.00324	DLM	0.000050	mg/L		18-SEP-20	R5229551
Vanadium (V)-Dissolved	<0.0025	DLM	0.0025	mg/L		18-SEP-20	R5229551
Zinc (Zn)-Dissolved	0.0286	DLM	0.0050	mg/L		18-SEP-20	R5229551
Zirconium (Zr)-Dissolved	<0.0010	DLM	0.0010	mg/L		18-SEP-20	R5229551
L2504725-4 TRIAL C4							
Sampled By: CLIENT on 17-SEP-20 @ 09:00							
Matrix: WATER							
Miscellaneous Parameters							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2504725-4 TRIAL C4							
Sampled By: CLIENT on 17-SEP-20 @ 09:00							
Matrix: WATER							
Ammonia, Total (as N)	3.04	DLHC	0.50	mg/L		21-SEP-20	R5232236
Dissolved Organic Carbon	22.9		1.0	mg/L		24-SEP-20	R5231439
Nitrate (as N)	5.22	DLDS	0.10	mg/L		18-SEP-20	R5230881
Nitrite (as N)	1.56	DLDS	0.050	mg/L		18-SEP-20	R5230881
Sulfate (SO4)	869	DLDS	1.5	mg/L		18-SEP-20	R5230881
Sulphide (as S)	0.0059		0.0015	mg/L		23-SEP-20	R5233351
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					18-SEP-20	R5228818
Aluminum (Al)-Dissolved	0.020	DLM	0.010	mg/L		18-SEP-20	R5229551
Antimony (Sb)-Dissolved	<0.00050	DLM	0.00050	mg/L		18-SEP-20	R5229551
Arsenic (As)-Dissolved	0.00065	DLM	0.00050	mg/L		18-SEP-20	R5229551
Barium (Ba)-Dissolved	0.123	DLM	0.00050	mg/L		18-SEP-20	R5229551
Beryllium (Be)-Dissolved	<0.00050	DLM	0.00050	mg/L		18-SEP-20	R5229551
Bismuth (Bi)-Dissolved	<0.00025	DLM	0.00025	mg/L		18-SEP-20	R5229551
Boron (B)-Dissolved	0.163	DLM	0.050	mg/L		18-SEP-20	R5229551
Cadmium (Cd)-Dissolved	0.000254	DLM	0.000025	mg/L		18-SEP-20	R5229551
Calcium (Ca)-Dissolved	305	DLM	0.25	mg/L		18-SEP-20	R5229551
Cesium (Cs)-Dissolved	0.000056	DLM	0.000050	mg/L		18-SEP-20	R5229551
Chromium (Cr)-Dissolved	<0.00050	DLM	0.00050	mg/L		18-SEP-20	R5229551
Cobalt (Co)-Dissolved	0.00100	DLM	0.00050	mg/L		18-SEP-20	R5229551
Copper (Cu)-Dissolved	0.100	DLM	0.0010	mg/L		18-SEP-20	R5229551
Iron (Fe)-Dissolved	<0.050	DLM	0.050	mg/L		18-SEP-20	R5229551
Lead (Pb)-Dissolved	<0.00025	DLM	0.00025	mg/L		18-SEP-20	R5229551
Lithium (Li)-Dissolved	<0.0050	DLM	0.0050	mg/L		18-SEP-20	R5229551
Magnesium (Mg)-Dissolved	46.4	DLM	0.025	mg/L		18-SEP-20	R5229551
Manganese (Mn)-Dissolved	0.966	DLM	0.00050	mg/L		18-SEP-20	R5229551
Molybdenum (Mo)-Dissolved	0.0261	DLM	0.00025	mg/L		18-SEP-20	R5229551
Nickel (Ni)-Dissolved	<0.0025	DLM	0.0025	mg/L		18-SEP-20	R5229551
Phosphorus (P)-Dissolved	<0.25	DLM	0.25	mg/L		18-SEP-20	R5229551
Potassium (K)-Dissolved	18.5	DLM	0.25	mg/L		18-SEP-20	R5229551
Rubidium (Rb)-Dissolved	0.0157	DLM	0.0010	mg/L		18-SEP-20	R5229551
Selenium (Se)-Dissolved	0.00303	DLM	0.00025	mg/L		18-SEP-20	R5229551
Silicon (Si)-Dissolved	4.48	DLM	0.25	mg/L		18-SEP-20	R5229551
Silver (Ag)-Dissolved	0.000059	DLM	0.000050	mg/L		18-SEP-20	R5229551
Sodium (Na)-Dissolved	70.8	DLM	0.25	mg/L		18-SEP-20	R5229551
Strontium (Sr)-Dissolved	4.51	DLM	0.0010	mg/L		18-SEP-20	R5229551
Sulfur (S)-Dissolved	292	DLM	2.5	mg/L		18-SEP-20	R5229551
Tellurium (Te)-Dissolved	<0.0010	DLM	0.0010	mg/L		18-SEP-20	R5229551
Thallium (Tl)-Dissolved	<0.000050	DLM	0.000050	mg/L		18-SEP-20	R5229551
Thorium (Th)-Dissolved	<0.00050	DLM	0.00050	mg/L		18-SEP-20	R5229551
Tin (Sn)-Dissolved	<0.00050	DLM	0.00050	mg/L		18-SEP-20	R5229551
Titanium (Ti)-Dissolved	<0.0015	DLM	0.0015	mg/L		18-SEP-20	R5229551
Tungsten (W)-Dissolved	0.00051	DLM	0.00050	mg/L		18-SEP-20	R5229551
Uranium (U)-Dissolved	0.00553	DLM	0.000050	mg/L		18-SEP-20	R5229551
Vanadium (V)-Dissolved	<0.0025	DLM	0.0025	mg/L		18-SEP-20	R5229551
Zinc (Zn)-Dissolved	0.0254	DLM	0.0050	mg/L		18-SEP-20	R5229551
Zirconium (Zr)-Dissolved	<0.0010	DLM	0.0010	mg/L		18-SEP-20	R5229551

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-DIS-ORG-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
Filtered (0.45 um) sample is acidified and purged to remove inorganic carbon, then injected into a heated reaction chamber where organic carbon is oxidized to CO2 which is then transported in the carrier gas stream and measured via a non-dispersive infrared analyzer.			
MET-D-CCMS-SK	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B / EPA 6020A
This procedure involves preliminary filtration through a 0.45 um filter followed by instrumental analysis using collision cell inductively coupled plasma - mass spectrometry (modifed from EPA Method 6020A).			
NH3-F-CL	Water	Ammonia by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-IC-N-SK	Water	Nitrite in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-IC-N-SK	Water	Nitrate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SO4-IC-N-SK	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SULPHIDE-CFA-ED	Water	Sulphide	APHA 4500 -S E-Auto-Colorimetry
A continuous flow manifold adds HCl to the sample which converts sulphide to a gas, then the sulphide is separated from the flow using a gas dialysis membrane. A colorimetric reaction produces a methylene blue compound which is measured at 660 nm. This follows the Standard Methods procedure 4500 S-E.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: Ensero Technologies Inc.
104-411 Downey Road
Saskatoon SK S7N 4L8
Contact: Rachel Martz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-CL	Water							
Batch R5231439								
WG3408405-10 LCS								
Dissolved Organic Carbon			98.0		%		80-120	20-SEP-20
WG3408405-6 LCS								
Dissolved Organic Carbon			91.7		%		80-120	20-SEP-20
WG3408405-5 MB								
Dissolved Organic Carbon			<1.0		mg/L		1	20-SEP-20
WG3408405-9 MB								
Dissolved Organic Carbon			<1.0		mg/L		1	20-SEP-20
MET-D-CCMS-SK	Water							
Batch R5229551								
WG3407066-3 CRM		**TMRM_20**						
Aluminum (Al)-Dissolved			105.5		%		80-120	18-SEP-20
Antimony (Sb)-Dissolved			105.6		%		80-120	18-SEP-20
Arsenic (As)-Dissolved			103.2		%		80-120	18-SEP-20
Barium (Ba)-Dissolved			105.8		%		80-120	18-SEP-20
Beryllium (Be)-Dissolved			104.1		%		80-120	18-SEP-20
Bismuth (Bi)-Dissolved			100.9		%		80-120	18-SEP-20
Boron (B)-Dissolved			93.7		%		80-120	18-SEP-20
Cadmium (Cd)-Dissolved			104.4		%		80-120	18-SEP-20
Calcium (Ca)-Dissolved			99.4		%		80-120	18-SEP-20
Cesium (Cs)-Dissolved			101.7		%		80-120	18-SEP-20
Chromium (Cr)-Dissolved			103.8		%		80-120	18-SEP-20
Cobalt (Co)-Dissolved			101.8		%		80-120	18-SEP-20
Copper (Cu)-Dissolved			99.3		%		80-120	18-SEP-20
Iron (Fe)-Dissolved			109.6		%		80-120	18-SEP-20
Lead (Pb)-Dissolved			107.4		%		80-120	18-SEP-20
Lithium (Li)-Dissolved			99.9		%		80-120	18-SEP-20
Magnesium (Mg)-Dissolved			106.3		%		80-120	18-SEP-20
Manganese (Mn)-Dissolved			102.4		%		80-120	18-SEP-20
Molybdenum (Mo)-Dissolved			102.4		%		80-120	18-SEP-20
Nickel (Ni)-Dissolved			100.3		%		80-120	18-SEP-20
Phosphorus (P)-Dissolved			110.7		%		70-130	18-SEP-20
Potassium (K)-Dissolved			105.0		%		80-120	18-SEP-20
Rubidium (Rb)-Dissolved			99.6		%		80-120	18-SEP-20
Selenium (Se)-Dissolved			104.2		%		80-120	18-SEP-20
Silicon (Si)-Dissolved			103.7		%		60-140	18-SEP-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch R5229551								
WG3407066-3 CRM		**TMRM_20**						
Silver (Ag)-Dissolved			102.3		%		80-120	18-SEP-20
Sodium (Na)-Dissolved			109.6		%		80-120	18-SEP-20
Strontium (Sr)-Dissolved			104.6		%		80-120	18-SEP-20
Sulfur (S)-Dissolved			100.2		%		80-120	18-SEP-20
Tellurium (Te)-Dissolved			102.6		%		80-120	18-SEP-20
Thallium (Tl)-Dissolved			110.6		%		80-120	18-SEP-20
Thorium (Th)-Dissolved			101.8		%		80-120	18-SEP-20
Tin (Sn)-Dissolved			100.9		%		80-120	18-SEP-20
Titanium (Ti)-Dissolved			97.6		%		80-120	18-SEP-20
Tungsten (W)-Dissolved			105.7		%		80-120	18-SEP-20
Uranium (U)-Dissolved			108.3		%		80-120	18-SEP-20
Vanadium (V)-Dissolved			103.2		%		80-120	18-SEP-20
Zinc (Zn)-Dissolved			104.6		%		80-120	18-SEP-20
Zirconium (Zr)-Dissolved			100.4		%		80-120	18-SEP-20
WG3407066-2 DUP		**L2504725-4**						
Aluminum (Al)-Dissolved		0.020	0.013	J	mg/L	0.007	0.02	18-SEP-20
Antimony (Sb)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	18-SEP-20
Arsenic (As)-Dissolved		0.00065	0.00060		mg/L	8.2	20	18-SEP-20
Barium (Ba)-Dissolved		0.123	0.111		mg/L	9.8	20	18-SEP-20
Beryllium (Be)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	18-SEP-20
Bismuth (Bi)-Dissolved		<0.00025	<0.00025	RPD-NA	mg/L	N/A	20	18-SEP-20
Boron (B)-Dissolved		0.163	0.168		mg/L	2.9	20	18-SEP-20
Cadmium (Cd)-Dissolved		0.000254	0.000235		mg/L	7.9	20	18-SEP-20
Calcium (Ca)-Dissolved		305	315		mg/L	3.2	20	18-SEP-20
Cesium (Cs)-Dissolved		0.000056	0.000053		mg/L	5.3	20	18-SEP-20
Chromium (Cr)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	18-SEP-20
Cobalt (Co)-Dissolved		0.00100	0.00108		mg/L	7.5	20	18-SEP-20
Copper (Cu)-Dissolved		0.100	0.101		mg/L	0.6	20	18-SEP-20
Iron (Fe)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	18-SEP-20
Lead (Pb)-Dissolved		<0.00025	<0.00025	RPD-NA	mg/L	N/A	20	18-SEP-20
Lithium (Li)-Dissolved		<0.0050	0.0055	RPD-NA	mg/L	N/A	20	18-SEP-20
Magnesium (Mg)-Dissolved		46.4	46.8		mg/L	0.9	20	18-SEP-20
Manganese (Mn)-Dissolved		0.966	0.978		mg/L	1.2	20	18-SEP-20
Molybdenum (Mo)-Dissolved		0.0261	0.0261		mg/L	0.1	20	18-SEP-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch R5229551								
WG3407066-2 DUP		**L2504725-4**						
Nickel (Ni)-Dissolved		<0.0025	<0.0025	RPD-NA	mg/L	N/A	20	18-SEP-20
Phosphorus (P)-Dissolved		<0.25	<0.25	RPD-NA	mg/L	N/A	20	18-SEP-20
Potassium (K)-Dissolved		18.5	18.6		mg/L	0.3	20	18-SEP-20
Rubidium (Rb)-Dissolved		0.0157	0.0159		mg/L	1.6	20	18-SEP-20
Selenium (Se)-Dissolved		0.00303	0.00281		mg/L	7.2	20	18-SEP-20
Silicon (Si)-Dissolved		4.48	4.51		mg/L	0.7	20	18-SEP-20
Silver (Ag)-Dissolved		0.000059	0.000057		mg/L	3.1	20	18-SEP-20
Sodium (Na)-Dissolved		70.8	71.6		mg/L	1.1	20	18-SEP-20
Strontium (Sr)-Dissolved		4.51	4.39		mg/L	2.6	20	18-SEP-20
Sulfur (S)-Dissolved		292	287		mg/L	1.8	20	18-SEP-20
Tellurium (Te)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	18-SEP-20
Thallium (Tl)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	18-SEP-20
Thorium (Th)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	18-SEP-20
Tin (Sn)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	18-SEP-20
Titanium (Ti)-Dissolved		<0.0015	<0.0015	RPD-NA	mg/L	N/A	20	18-SEP-20
Tungsten (W)-Dissolved		0.00051	0.00050		mg/L	2.1	20	18-SEP-20
Uranium (U)-Dissolved		0.00553	0.00526		mg/L	5.0	20	18-SEP-20
Vanadium (V)-Dissolved		<0.0025	<0.0025	RPD-NA	mg/L	N/A	20	18-SEP-20
Zinc (Zn)-Dissolved		0.0254	0.0230		mg/L	9.7	20	18-SEP-20
Zirconium (Zr)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	18-SEP-20
WG3407066-1 MB								
Aluminum (Al)-Dissolved			<0.0020		mg/L		0.002	18-SEP-20
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	18-SEP-20
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	18-SEP-20
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	18-SEP-20
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	18-SEP-20
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	18-SEP-20
Boron (B)-Dissolved			<0.010		mg/L		0.01	18-SEP-20
Cadmium (Cd)-Dissolved			<0.000005(		mg/L		0.000005	18-SEP-20
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	18-SEP-20
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	18-SEP-20
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	18-SEP-20
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	18-SEP-20
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	18-SEP-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch R5229551								
WG3407066-1 MB								
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	18-SEP-20
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	18-SEP-20
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	18-SEP-20
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	18-SEP-20
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	18-SEP-20
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	18-SEP-20
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	18-SEP-20
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	18-SEP-20
Potassium (K)-Dissolved			<0.050		mg/L		0.05	18-SEP-20
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	18-SEP-20
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	18-SEP-20
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	18-SEP-20
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	18-SEP-20
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	18-SEP-20
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	18-SEP-20
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	18-SEP-20
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	18-SEP-20
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	18-SEP-20
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	18-SEP-20
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	18-SEP-20
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	18-SEP-20
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	18-SEP-20
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	18-SEP-20
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	18-SEP-20
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	18-SEP-20
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	18-SEP-20
WG3407066-4 MS		**L2504725-1**						
Aluminum (Al)-Dissolved			100.9		%		70-130	18-SEP-20
Antimony (Sb)-Dissolved			101.7		%		70-130	18-SEP-20
Arsenic (As)-Dissolved			101.6		%		70-130	18-SEP-20
Barium (Ba)-Dissolved			N/A	MS-B	%		-	18-SEP-20
Beryllium (Be)-Dissolved			95.3		%		70-130	18-SEP-20
Bismuth (Bi)-Dissolved			87.8		%		70-130	18-SEP-20
Boron (B)-Dissolved			N/A	MS-B	%		-	18-SEP-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch R5229551								
WG3407066-4 MS		**L2504725-1**						
Cadmium (Cd)-Dissolved			95.9		%		70-130	18-SEP-20
Calcium (Ca)-Dissolved			N/A	MS-B	%		-	18-SEP-20
Cesium (Cs)-Dissolved			100.9		%		70-130	18-SEP-20
Chromium (Cr)-Dissolved			99.99		%		70-130	18-SEP-20
Cobalt (Co)-Dissolved			97.6		%		70-130	18-SEP-20
Copper (Cu)-Dissolved			92.7		%		70-130	18-SEP-20
Iron (Fe)-Dissolved			92.1		%		70-130	18-SEP-20
Lead (Pb)-Dissolved			98.6		%		70-130	18-SEP-20
Lithium (Li)-Dissolved			97.5		%		70-130	18-SEP-20
Magnesium (Mg)-Dissolved			N/A	MS-B	%		-	18-SEP-20
Manganese (Mn)-Dissolved			N/A	MS-B	%		-	18-SEP-20
Molybdenum (Mo)-Dissolved			99.4		%		70-130	18-SEP-20
Nickel (Ni)-Dissolved			96.2		%		70-130	18-SEP-20
Phosphorus (P)-Dissolved			110.2		%		70-130	18-SEP-20
Potassium (K)-Dissolved			N/A	MS-B	%		-	18-SEP-20
Rubidium (Rb)-Dissolved			97.5		%		70-130	18-SEP-20
Selenium (Se)-Dissolved			103.1		%		70-130	18-SEP-20
Silicon (Si)-Dissolved			98.3		%		70-130	18-SEP-20
Silver (Ag)-Dissolved			87.0		%		70-130	18-SEP-20
Sodium (Na)-Dissolved			N/A	MS-B	%		-	18-SEP-20
Strontium (Sr)-Dissolved			N/A	MS-B	%		-	18-SEP-20
Sulfur (S)-Dissolved			N/A	MS-B	%		-	18-SEP-20
Tellurium (Te)-Dissolved			82.2		%		70-130	18-SEP-20
Thallium (Tl)-Dissolved			99.5		%		70-130	18-SEP-20
Thorium (Th)-Dissolved			95.7		%		70-130	18-SEP-20
Tin (Sn)-Dissolved			98.0		%		70-130	18-SEP-20
Titanium (Ti)-Dissolved			98.1		%		70-130	18-SEP-20
Tungsten (W)-Dissolved			101.0		%		70-130	18-SEP-20
Uranium (U)-Dissolved			102.4		%		70-130	18-SEP-20
Vanadium (V)-Dissolved			102.5		%		70-130	18-SEP-20
Zinc (Zn)-Dissolved			97.0		%		70-130	18-SEP-20
Zirconium (Zr)-Dissolved			101.5		%		70-130	18-SEP-20
NH3-F-CL	Water							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-F-CL	Water							
Batch R5232236								
WG3409307-6 LCS								
Ammonia, Total (as N)			100.0		%		85-115	21-SEP-20
WG3409307-5 MB								
Ammonia, Total (as N)			<0.050		mg/L		0.05	21-SEP-20
NO2-IC-N-SK	Water							
Batch R5230881								
WG3407016-3 LCS								
Nitrite (as N)			97.8		%		90-110	18-SEP-20
WG3407016-2 MB								
Nitrite (as N)			<0.010		mg/L		0.01	18-SEP-20
WG3407016-4 MS		**L2504725-3**						
Nitrite (as N)			98.9		%		75-125	18-SEP-20
NO3-IC-N-SK	Water							
Batch R5230881								
WG3407016-3 LCS								
Nitrate (as N)			99.4		%		90-110	18-SEP-20
WG3407016-2 MB								
Nitrate (as N)			<0.020		mg/L		0.02	18-SEP-20
WG3407016-4 MS		**L2504725-3**						
Nitrate (as N)			101.5		%		75-125	18-SEP-20
SO4-IC-N-SK	Water							
Batch R5230881								
WG3407016-3 LCS								
Sulfate (SO4)			100.5		%		90-110	18-SEP-20
WG3407016-2 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	18-SEP-20
WG3407016-4 MS		**L2504725-3**						
Sulfate (SO4)			N/A	MS-B	%		-	18-SEP-20
SULPHIDE-CFA-ED	Water							
Batch R5233351								
WG3411111-6 LCS								
Sulphide (as S)			94.5		%		75-125	23-SEP-20
WG3411111-5 MB								
Sulphide (as S)			<0.0015		mg/L		0.0015	23-SEP-20

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2504725-COFC

COC Number 15 -

Page of

Report To	Contact and company name below will appear on the final report	Report Format / Distribution		Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply
Company:	Ensero Technologies	Select Report Format:		Regular [R]
Contact:	Rachel Martz	Quality Control (QC) Report with Report		PRIORITY (Business Days): 4 day [P4] / 3 day [P3] / 2 day [P2] — EMERGENCY: 1 Business day [E1] / Same Day, Weekend or Statutory holiday [E0]
Phone:	306 978 3111			Date and Time Required for all E&P TATs:
	Company address below will appear on the final report	Select Distribution:		For tests that can not be performed according to the service level selected, you will be contacted.
Street:	104-411 Downey Road	Email 1 or Fax	rmartz@ensero.com	
City/Province:	Saskatoon, SK	Email 2	rkleinberger@ensero.com	
Postal Code:	S7H 1R1	Email 3	kpiecowye@ensero.com	
Invoice To	Same as Report To	Invoice Distribution		
	Copy of Invoice with Report	Select Invoice Distribution:		
Company:	Ensero Technologies	Email 1 or Fax	rmartz@ensero.com	
Contact:	Mel Shotenski	Email 2	ap@ensero.com	
Project Information		Oil and Gas Required Fields (client use)		
ALS Account # / Quote #:	Q81011	AFE/Cost Center:	PO#	
Job #:	ETK20YT00042	Major/Minor Code:	Routing Code:	
PO / AFE:		Requisitioner:		
LSD:		Location:		
[redacted]		ALS Contact:	Sampler:	

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NO2-IC-N-SK	NO3-IC-N-SK	NH3-F-CL	C-DIS-ORG-CL	MET-D-ICPMS-SK	SO4-IC-N-SK	SULPHIDE-CFA-ED							Number of Containers
							P	F/P	F/P		P							
	Trial E1	17-Sep-20	9:00	Water	R	R	R	R	R	R	R							5
	Trial G2	17-Sep-20	9:15	Water	R	R	R	R	R	R	R							5
	Trial M3	17-Sep-20	9:30	Water	R	R	R	R	R	R	R							5
	Trial C4	17-Sep-20	9:45	Water	R	R	R	R	R	R	R							5

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System?	
Are samples for human drinking water use?	Please add cbrizinski@ensero.com and importer@contango.ehsdata.com to emails.

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

14.1°C

SHIPMENT RELEASE (client use)									
Released by: Braden Richards Jr	Date: 17 Sept 2020	Time: 1200	Received by: Stephen	Date: 17/09/20	Time: 1340	Received by: Stephen	Date: 17/09/20	Time: 1345

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form.**

Ensero Technologies Inc.
ATTN: Rachel Martz
104-411 Downey Road
Saskatoon SK S7N 4L8

Date Received: 24-SEP-20
Report Date: 01-OCT-20 12:27 (MT)
Version: FINAL

Client Phone: 306-978-3111

Certificate of Analysis

Lab Work Order #: L2508060

Project P.O. #: NOT SUBMITTED
Job Reference: ETK20YT00042
C of C Numbers:
Legal Site Desc:

Brian Morgan, B.Sc. Hons.
Client Services Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2508060-1 TRIAL E1							
Sampled By: CLIENT on 24-SEP-20 @ 13:15							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	0.62	DLHC	0.25	mg/L		29-SEP-20	R5242826
Nitrate (as N)	0.18	DLDS	0.10	mg/L		26-SEP-20	R5239316
Nitrite (as N)	<0.050	DLDS	0.050	mg/L		26-SEP-20	R5239316
L2508060-2 TRIAL G2							
Sampled By: CLIENT on 24-SEP-20 @ 13:15							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	1.45	DLHC	0.50	mg/L		29-SEP-20	R5242826
Nitrate (as N)	<0.20	DLDS	0.20	mg/L		26-SEP-20	R5239316
Nitrite (as N)	<0.10	DLDS	0.10	mg/L		26-SEP-20	R5239316
L2508060-3 TRIAL M3							
Sampled By: CLIENT on 24-SEP-20 @ 13:15							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	1.50	DLHC	0.50	mg/L		29-SEP-20	R5242826
Nitrate (as N)	<0.20	DLDS	0.20	mg/L		26-SEP-20	R5239316
Nitrite (as N)	<0.10	DLDS	0.10	mg/L		26-SEP-20	R5239316
L2508060-4 TRIAL C4							
Sampled By: CLIENT on 24-SEP-20 @ 13:15							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	4.00	DLHC	0.50	mg/L		29-SEP-20	R5242826
Nitrate (as N)	11.8	DLDS	0.20	mg/L		26-SEP-20	R5239316
Nitrite (as N)	3.57	DLDS	0.10	mg/L		26-SEP-20	R5239316

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
NH3-F-CL	Water	Ammonia by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-IC-N-SK	Water	Nitrite in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-IC-N-SK	Water	Nitrate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: Ensero Technologies Inc.
104-411 Downey Road
Saskatoon SK S7N 4L8
Contact: Rachel Martz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-F-CL	Water							
Batch R5242826								
WG3414664-2 LCS								
Ammonia, Total (as N)			98.0		%		85-115	29-SEP-20
WG3414664-1 MB								
Ammonia, Total (as N)			<0.050		mg/L		0.05	29-SEP-20
NO2-IC-N-SK	Water							
Batch R5239316								
WG3411918-3 LCS								
Nitrite (as N)			95.3		%		90-110	26-SEP-20
WG3411918-2 MB								
Nitrite (as N)			<0.010		mg/L		0.01	26-SEP-20
NO3-IC-N-SK	Water							
Batch R5239316								
WG3411918-3 LCS								
Nitrate (as N)			99.96		%		90-110	26-SEP-20
WG3411918-2 MB								
Nitrate (as N)			<0.020		mg/L		0.02	26-SEP-20

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2508060-COFC

COC Number: 15 -

Page of

Report To	Contact and company name below will appear on the final report
Company:	Ensero Technologies
Contact:	Rachel Martz
Phone:	306 978 3111
	Company address below will appear on the final report
Street:	104-411 Downey Road
City/Province:	Saskatoon, SK
Postal Code:	S7H 1R1
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Ensero Technologies
Contact:	Mel Shotenski

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: rmartz@ensero.com

Email 2: rkleinberger@ensero.com

Email 3: kpiecowye@ensero.com

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: rmartz@ensero.com

Email 2: ap@ensero.com

Project Information

ALS Account # / Quote #:	Q81011
Job #:	ETK20YT00042
PO / AFE:	
LSD:	

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only)

ALS Contact:

Sampler:

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐

EMERGENCY: 1 Business day [E1] ☐ | Same Day, Weekend or Statutory holiday [E0] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NO2-IC-N-SK	NO3-IC-N-SK	NH3-F-CL										Number of Containers
							P										
	Trial E1	24-Sep-20	13:15	Water	R	R	R										2
	Trial G2	24-Sep-20	13:15	Water	R	R	R										2
	Trial M3	24-Sep-20	13:15	Water	R	R	R										2
	Trial C4	24-Sep-20	13:15	Water	R	R	R										2

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human drinking water use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Please add cbrizinski@ensero.com and importer@contango.ehsdata.com to emails.

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ | SIF Observations Yes ☐ No ☐

Ice Packs ☐ | Ice Cubes ☐ | Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
12					

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
				24/09/2020	3:30			5:50

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Ensero Technologies Inc.
ATTN: Rachel Martz
104-411 Downey Road
Saskatoon SK S7N 4L8

Date Received: 01-OCT-20
Report Date: 08-OCT-20 17:01 (MT)
Version: FINAL

Client Phone: 306-978-3111

Certificate of Analysis

Lab Work Order #: L2511141

Project P.O. #: NOT SUBMITTED
Job Reference: ETK20YT00042
C of C Numbers:
Legal Site Desc:

Brian Morgan, B.Sc. Hons.
Client Services Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2511141-1 TRIAL E1							
Sampled By: CLIENT on 01-OCT-20 @ 11:00							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	1.08	DLHC	0.50	mg/L		05-OCT-20	R5246956
Dissolved Organic Carbon	21.2		1.0	mg/L		07-OCT-20	R5251793
Nitrate (as N)	<0.20	DLDS	0.20	mg/L		02-OCT-20	R5244667
Nitrite (as N)	<0.10	DLDS	0.10	mg/L		02-OCT-20	R5244667
Sulfate (SO4)	826	DLDS	3.0	mg/L		02-OCT-20	R5244667
Sulphide (as S)	0.78	DLHC	0.18	mg/L		07-OCT-20	R5250582
Sulphide (as H2S)	0.83		0.19	mg/L		07-OCT-20	
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					02-OCT-20	R5243965
Aluminum (Al)-Dissolved	0.012	DLDS	0.010	mg/L		06-OCT-20	R5247837
Antimony (Sb)-Dissolved	<0.00050	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Arsenic (As)-Dissolved	0.00073	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Barium (Ba)-Dissolved	0.0930	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Beryllium (Be)-Dissolved	<0.00050	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Bismuth (Bi)-Dissolved	<0.00025	DLDS	0.00025	mg/L		06-OCT-20	R5247837
Boron (B)-Dissolved	0.160	DLDS	0.050	mg/L		06-OCT-20	R5247837
Cadmium (Cd)-Dissolved	<0.000025	DLDS	0.000025	mg/L		06-OCT-20	R5247837
Calcium (Ca)-Dissolved	320	DLDS	0.25	mg/L		06-OCT-20	R5247837
Cesium (Cs)-Dissolved	<0.000050	DLDS	0.000050	mg/L		06-OCT-20	R5247837
Chromium (Cr)-Dissolved	0.00051	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Cobalt (Co)-Dissolved	<0.00050	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Copper (Cu)-Dissolved	0.0207	DLDS	0.0010	mg/L		06-OCT-20	R5247837
Iron (Fe)-Dissolved	1.21	DLDS	0.050	mg/L		06-OCT-20	R5247837
Lead (Pb)-Dissolved	<0.00025	DLDS	0.00025	mg/L		06-OCT-20	R5247837
Lithium (Li)-Dissolved	0.0078	DLDS	0.0050	mg/L		06-OCT-20	R5247837
Magnesium (Mg)-Dissolved	47.3	DLDS	0.025	mg/L		06-OCT-20	R5247837
Manganese (Mn)-Dissolved	1.14	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Molybdenum (Mo)-Dissolved	0.0178	DLDS	0.00025	mg/L		06-OCT-20	R5247837
Nickel (Ni)-Dissolved	<0.0025	DLDS	0.0025	mg/L		06-OCT-20	R5247837
Phosphorus (P)-Dissolved	0.30	DLDS	0.25	mg/L		06-OCT-20	R5247837
Potassium (K)-Dissolved	19.5	DLDS	0.25	mg/L		06-OCT-20	R5247837
Rubidium (Rb)-Dissolved	0.0144	DLDS	0.0010	mg/L		06-OCT-20	R5247837
Selenium (Se)-Dissolved	0.00069	DLDS	0.00025	mg/L		06-OCT-20	R5247837
Silicon (Si)-Dissolved	6.21	DLDS	0.25	mg/L		06-OCT-20	R5247837
Silver (Ag)-Dissolved	<0.000050	DLDS	0.000050	mg/L		06-OCT-20	R5247837
Sodium (Na)-Dissolved	73.9	DLDS	0.25	mg/L		06-OCT-20	R5247837
Strontium (Sr)-Dissolved	4.61	DLDS	0.0010	mg/L		06-OCT-20	R5247837
Sulfur (S)-Dissolved	277	DLDS	2.5	mg/L		06-OCT-20	R5247837
Tellurium (Te)-Dissolved	<0.0010	DLDS	0.0010	mg/L		06-OCT-20	R5247837
Thallium (Tl)-Dissolved	<0.000050	DLDS	0.000050	mg/L		06-OCT-20	R5247837
Thorium (Th)-Dissolved	<0.00050	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Tin (Sn)-Dissolved	<0.00050	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Titanium (Ti)-Dissolved	<0.0015	DLDS	0.0015	mg/L		06-OCT-20	R5247837
Tungsten (W)-Dissolved	0.00052	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Uranium (U)-Dissolved	0.00445	DLDS	0.000050	mg/L		06-OCT-20	R5247837
Vanadium (V)-Dissolved	<0.0025	DLDS	0.0025	mg/L		06-OCT-20	R5247837
Zinc (Zn)-Dissolved	<0.0050	DLDS	0.0050	mg/L		06-OCT-20	R5247837
Zirconium (Zr)-Dissolved	<0.0010	DLDS	0.0010	mg/L		06-OCT-20	R5247837

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2511141-2 TRIAL G2							
Sampled By: CLIENT on 01-OCT-20 @ 11:00							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	1.06	DLHC	0.50	mg/L		05-OCT-20	R5246956
Dissolved Organic Carbon	27.3		1.0	mg/L		07-OCT-20	R5251793
Nitrate (as N)	<0.20	DLDS	0.20	mg/L		02-OCT-20	R5244667
Nitrite (as N)	<0.10	DLDS	0.10	mg/L		02-OCT-20	R5244667
Sulfate (SO4)	837	DLDS	3.0	mg/L		02-OCT-20	R5244667
Sulphide (as S)	1.30	DLHC	0.18	mg/L		07-OCT-20	R5250582
Sulphide (as H2S)	1.38		0.19	mg/L		07-OCT-20	
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					02-OCT-20	R5243965
Aluminum (Al)-Dissolved	0.016	DLDS	0.010	mg/L		06-OCT-20	R5247837
Antimony (Sb)-Dissolved	<0.00050	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Arsenic (As)-Dissolved	0.00050	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Barium (Ba)-Dissolved	0.107	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Beryllium (Be)-Dissolved	<0.00050	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Bismuth (Bi)-Dissolved	<0.00025	DLDS	0.00025	mg/L		06-OCT-20	R5247837
Boron (B)-Dissolved	0.166	DLDS	0.050	mg/L		06-OCT-20	R5247837
Cadmium (Cd)-Dissolved	<0.000025	DLDS	0.000025	mg/L		06-OCT-20	R5247837
Calcium (Ca)-Dissolved	336	DLDS	0.25	mg/L		06-OCT-20	R5247837
Cesium (Cs)-Dissolved	<0.000050	DLDS	0.000050	mg/L		06-OCT-20	R5247837
Chromium (Cr)-Dissolved	0.00067	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Cobalt (Co)-Dissolved	<0.00050	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Copper (Cu)-Dissolved	0.0038	DLDS	0.0010	mg/L		06-OCT-20	R5247837
Iron (Fe)-Dissolved	1.62	DLDS	0.050	mg/L		06-OCT-20	R5247837
Lead (Pb)-Dissolved	<0.00025	DLDS	0.00025	mg/L		06-OCT-20	R5247837
Lithium (Li)-Dissolved	0.0086	DLDS	0.0050	mg/L		06-OCT-20	R5247837
Magnesium (Mg)-Dissolved	47.6	DLDS	0.025	mg/L		06-OCT-20	R5247837
Manganese (Mn)-Dissolved	1.48	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Molybdenum (Mo)-Dissolved	0.0157	DLDS	0.00025	mg/L		06-OCT-20	R5247837
Nickel (Ni)-Dissolved	<0.0025	DLDS	0.0025	mg/L		06-OCT-20	R5247837
Phosphorus (P)-Dissolved	0.35	DLDS	0.25	mg/L		06-OCT-20	R5247837
Potassium (K)-Dissolved	19.7	DLDS	0.25	mg/L		06-OCT-20	R5247837
Rubidium (Rb)-Dissolved	0.0149	DLDS	0.0010	mg/L		06-OCT-20	R5247837
Selenium (Se)-Dissolved	0.00050	DLDS	0.00025	mg/L		06-OCT-20	R5247837
Silicon (Si)-Dissolved	6.26	DLDS	0.25	mg/L		06-OCT-20	R5247837
Silver (Ag)-Dissolved	<0.000050	DLDS	0.000050	mg/L		06-OCT-20	R5247837
Sodium (Na)-Dissolved	73.9	DLDS	0.25	mg/L		06-OCT-20	R5247837
Strontium (Sr)-Dissolved	4.65	DLDS	0.0010	mg/L		06-OCT-20	R5247837
Sulfur (S)-Dissolved	285	DLDS	2.5	mg/L		06-OCT-20	R5247837
Tellurium (Te)-Dissolved	<0.0010	DLDS	0.0010	mg/L		06-OCT-20	R5247837
Thallium (Tl)-Dissolved	<0.000050	DLDS	0.000050	mg/L		06-OCT-20	R5247837
Thorium (Th)-Dissolved	<0.00050	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Tin (Sn)-Dissolved	<0.00050	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Titanium (Ti)-Dissolved	<0.0015	DLDS	0.0015	mg/L		06-OCT-20	R5247837
Tungsten (W)-Dissolved	<0.00050	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Uranium (U)-Dissolved	0.00391	DLDS	0.000050	mg/L		06-OCT-20	R5247837
Vanadium (V)-Dissolved	<0.0025	DLDS	0.0025	mg/L		06-OCT-20	R5247837
Zinc (Zn)-Dissolved	<0.0050	DLDS	0.0050	mg/L		06-OCT-20	R5247837
Zirconium (Zr)-Dissolved	<0.0010	DLDS	0.0010	mg/L		06-OCT-20	R5247837

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2511141-3 TRIAL M3							
Sampled By: CLIENT on 01-OCT-20 @ 11:00							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	2.18	DLHC	0.50	mg/L		05-OCT-20	R5246956
Dissolved Organic Carbon	49.9		1.0	mg/L		08-OCT-20	R5251793
Nitrate (as N)	<0.20	DLDS	0.20	mg/L		02-OCT-20	R5244667
Nitrite (as N)	<0.10	DLDS	0.10	mg/L		02-OCT-20	R5244667
Sulfate (SO4)	810	DLDS	3.0	mg/L		02-OCT-20	R5244667
Sulphide (as S)	2.74	DLHC	0.36	mg/L		07-OCT-20	R5250582
Sulphide (as H2S)	2.91		0.38	mg/L		07-OCT-20	
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					02-OCT-20	R5243965
Aluminum (Al)-Dissolved	0.031	DLDS	0.010	mg/L		06-OCT-20	R5247837
Antimony (Sb)-Dissolved	<0.00050	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Arsenic (As)-Dissolved	0.00057	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Barium (Ba)-Dissolved	0.112	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Beryllium (Be)-Dissolved	<0.00050	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Bismuth (Bi)-Dissolved	<0.00025	DLDS	0.00025	mg/L		06-OCT-20	R5247837
Boron (B)-Dissolved	0.159	DLDS	0.050	mg/L		06-OCT-20	R5247837
Cadmium (Cd)-Dissolved	0.000082	DLDS	0.000025	mg/L		06-OCT-20	R5247837
Calcium (Ca)-Dissolved	328	DLDS	0.25	mg/L		06-OCT-20	R5247837
Cesium (Cs)-Dissolved	<0.000050	DLDS	0.000050	mg/L		06-OCT-20	R5247837
Chromium (Cr)-Dissolved	0.00129	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Cobalt (Co)-Dissolved	<0.00050	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Copper (Cu)-Dissolved	0.0198	DLDS	0.0010	mg/L		06-OCT-20	R5247837
Iron (Fe)-Dissolved	0.933	DLDS	0.050	mg/L		06-OCT-20	R5247837
Lead (Pb)-Dissolved	<0.00025	DLDS	0.00025	mg/L		06-OCT-20	R5247837
Lithium (Li)-Dissolved	0.0069	DLDS	0.0050	mg/L		06-OCT-20	R5247837
Magnesium (Mg)-Dissolved	47.3	DLDS	0.025	mg/L		06-OCT-20	R5247837
Manganese (Mn)-Dissolved	1.49	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Molybdenum (Mo)-Dissolved	0.00572	DLDS	0.00025	mg/L		06-OCT-20	R5247837
Nickel (Ni)-Dissolved	<0.0025	DLDS	0.0025	mg/L		06-OCT-20	R5247837
Phosphorus (P)-Dissolved	0.40	DLDS	0.25	mg/L		06-OCT-20	R5247837
Potassium (K)-Dissolved	22.5	DLDS	0.25	mg/L		06-OCT-20	R5247837
Rubidium (Rb)-Dissolved	0.0213	DLDS	0.0010	mg/L		06-OCT-20	R5247837
Selenium (Se)-Dissolved	0.00079	DLDS	0.00025	mg/L		06-OCT-20	R5247837
Silicon (Si)-Dissolved	6.50	DLDS	0.25	mg/L		06-OCT-20	R5247837
Silver (Ag)-Dissolved	<0.000050	DLDS	0.000050	mg/L		06-OCT-20	R5247837
Sodium (Na)-Dissolved	71.9	DLDS	0.25	mg/L		06-OCT-20	R5247837
Strontium (Sr)-Dissolved	4.55	DLDS	0.0010	mg/L		06-OCT-20	R5247837
Sulfur (S)-Dissolved	268	DLDS	2.5	mg/L		06-OCT-20	R5247837
Tellurium (Te)-Dissolved	<0.0010	DLDS	0.0010	mg/L		06-OCT-20	R5247837
Thallium (Tl)-Dissolved	<0.000050	DLDS	0.000050	mg/L		06-OCT-20	R5247837
Thorium (Th)-Dissolved	<0.00050	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Tin (Sn)-Dissolved	<0.00050	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Titanium (Ti)-Dissolved	0.0022	DLDS	0.0015	mg/L		06-OCT-20	R5247837
Tungsten (W)-Dissolved	0.00053	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Uranium (U)-Dissolved	0.00362	DLDS	0.000050	mg/L		06-OCT-20	R5247837
Vanadium (V)-Dissolved	0.0026	DLDS	0.0025	mg/L		06-OCT-20	R5247837
Zinc (Zn)-Dissolved	0.0155	DLDS	0.0050	mg/L		06-OCT-20	R5247837
Zirconium (Zr)-Dissolved	<0.0010	DLDS	0.0010	mg/L		06-OCT-20	R5247837

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2511141-4 TRIAL C4							
Sampled By: CLIENT on 01-OCT-20 @ 11:00							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	4.46	DLHC	0.50	mg/L		05-OCT-20	R5246956
Dissolved Organic Carbon	22.2		1.0	mg/L		07-OCT-20	R5251793
Nitrate (as N)	11.4	DLDS	0.10	mg/L		03-OCT-20	R5244823
Nitrite (as N)	2.25	DLDS	0.050	mg/L		03-OCT-20	R5244823
Sulfate (SO4)	862	DLDS	1.5	mg/L		03-OCT-20	R5244823
Sulphide (as S)	0.024	SP	0.018	mg/L		07-OCT-20	R5250582
Sulphide (as H2S)	0.026		0.019	mg/L		07-OCT-20	
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					02-OCT-20	R5243965
Aluminum (Al)-Dissolved	<0.010	DLDS	0.010	mg/L		06-OCT-20	R5247837
Antimony (Sb)-Dissolved	<0.00050	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Arsenic (As)-Dissolved	0.00070	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Barium (Ba)-Dissolved	0.101	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Beryllium (Be)-Dissolved	<0.00050	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Bismuth (Bi)-Dissolved	<0.00025	DLDS	0.00025	mg/L		06-OCT-20	R5247837
Boron (B)-Dissolved	0.160	DLDS	0.050	mg/L		06-OCT-20	R5247837
Cadmium (Cd)-Dissolved	0.000255	DLDS	0.000025	mg/L		06-OCT-20	R5247837
Calcium (Ca)-Dissolved	322	DLDS	0.25	mg/L		06-OCT-20	R5247837
Cesium (Cs)-Dissolved	0.000057	DLDS	0.000050	mg/L		06-OCT-20	R5247837
Chromium (Cr)-Dissolved	<0.00050	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Cobalt (Co)-Dissolved	0.00096	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Copper (Cu)-Dissolved	0.0897	DLDS	0.0010	mg/L		06-OCT-20	R5247837
Iron (Fe)-Dissolved	<0.050	DLDS	0.050	mg/L		06-OCT-20	R5247837
Lead (Pb)-Dissolved	<0.00025	DLDS	0.00025	mg/L		06-OCT-20	R5247837
Lithium (Li)-Dissolved	0.0079	DLDS	0.0050	mg/L		06-OCT-20	R5247837
Magnesium (Mg)-Dissolved	46.0	DLDS	0.025	mg/L		06-OCT-20	R5247837
Manganese (Mn)-Dissolved	1.01	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Molybdenum (Mo)-Dissolved	0.0271	DLDS	0.00025	mg/L		06-OCT-20	R5247837
Nickel (Ni)-Dissolved	<0.0025	DLDS	0.0025	mg/L		06-OCT-20	R5247837
Phosphorus (P)-Dissolved	<0.25	DLDS	0.25	mg/L		06-OCT-20	R5247837
Potassium (K)-Dissolved	17.9	DLDS	0.25	mg/L		06-OCT-20	R5247837
Rubidium (Rb)-Dissolved	0.0167	DLDS	0.0010	mg/L		06-OCT-20	R5247837
Selenium (Se)-Dissolved	0.00203	DLDS	0.00025	mg/L		06-OCT-20	R5247837
Silicon (Si)-Dissolved	4.47	DLDS	0.25	mg/L		06-OCT-20	R5247837
Silver (Ag)-Dissolved	0.000052	DLDS	0.000050	mg/L		06-OCT-20	R5247837
Sodium (Na)-Dissolved	71.2	DLDS	0.25	mg/L		06-OCT-20	R5247837
Strontium (Sr)-Dissolved	4.53	DLDS	0.0010	mg/L		06-OCT-20	R5247837
Sulfur (S)-Dissolved	288	DLDS	2.5	mg/L		06-OCT-20	R5247837
Tellurium (Te)-Dissolved	<0.0010	DLDS	0.0010	mg/L		06-OCT-20	R5247837
Thallium (Tl)-Dissolved	<0.000050	DLDS	0.000050	mg/L		06-OCT-20	R5247837
Thorium (Th)-Dissolved	<0.00050	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Tin (Sn)-Dissolved	<0.00050	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Titanium (Ti)-Dissolved	<0.0015	DLDS	0.0015	mg/L		06-OCT-20	R5247837
Tungsten (W)-Dissolved	<0.00050	DLDS	0.00050	mg/L		06-OCT-20	R5247837
Uranium (U)-Dissolved	0.00513	DLDS	0.000050	mg/L		06-OCT-20	R5247837
Vanadium (V)-Dissolved	<0.0025	DLDS	0.0025	mg/L		06-OCT-20	R5247837
Zinc (Zn)-Dissolved	0.0182	DLDS	0.0050	mg/L		06-OCT-20	R5247837
Zirconium (Zr)-Dissolved	<0.0010	DLDS	0.0010	mg/L		06-OCT-20	R5247837

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
SP	Sample was Preserved at the laboratory

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-DIS-ORG-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
Filtered (0.45 um) sample is acidified and purged to remove inorganic carbon, then injected into a heated reaction chamber where organic carbon is oxidized to CO2 which is then transported in the carrier gas stream and measured via a non-dispersive infrared analyzer.			
MET-D-CCMS-SK	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B / EPA 6020A
This procedure involves preliminary filtration through a 0.45 um filter followed by instrumental analysis using collision cell inductively coupled plasma - mass spectrometry (modifed from EPA Method 6020A).			
NH3-F-CL	Water	Ammonia by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-IC-N-SK	Water	Nitrite in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-IC-N-SK	Water	Nitrate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
S2-T>H2S-CALC-WT	Water	Total Sulphide Calculated as H2S	Calculation
This calculation converts Total Sulphide as (S2-) and reports it as Total Sulphide as (H2S). Total Sulphide as (S2-) is determined using procedures adapted from APHA 4500-S2 "Sulphide".			
SO4-IC-N-SK	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SULPHIDE-WT	Water	Sulphide (as S)	APHA 4500S2D
This analysis is carried out using procedures adapted from APHA Method 4500-S2-D "Methylene Blue Method". Sulphide is determined colourmetrically.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: Ensero Technologies Inc.
104-411 Downey Road
Saskatoon SK S7N 4L8
Contact: Rachel Martz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-CL	Water							
Batch R5251793								
WG3420952-6 LCS								
Dissolved Organic Carbon			87.0		%		80-120	07-OCT-20
WG3420952-5 MB								
Dissolved Organic Carbon			<1.0		mg/L		1	07-OCT-20
MET-D-CCMS-SK	Water							
Batch R5247837								
WG3416950-3 CRM		**TMRM_20**						
Aluminum (Al)-Dissolved			104.8		%		80-120	06-OCT-20
Antimony (Sb)-Dissolved			100.4		%		80-120	06-OCT-20
Arsenic (As)-Dissolved			104.5		%		80-120	06-OCT-20
Barium (Ba)-Dissolved			99.0		%		80-120	06-OCT-20
Beryllium (Be)-Dissolved			103.7		%		80-120	06-OCT-20
Bismuth (Bi)-Dissolved			100.8		%		80-120	06-OCT-20
Boron (B)-Dissolved			98.2		%		80-120	06-OCT-20
Cadmium (Cd)-Dissolved			104.5		%		80-120	06-OCT-20
Calcium (Ca)-Dissolved			101.2		%		80-120	06-OCT-20
Cesium (Cs)-Dissolved			99.7		%		80-120	06-OCT-20
Chromium (Cr)-Dissolved			102.4		%		80-120	06-OCT-20
Cobalt (Co)-Dissolved			100.5		%		80-120	06-OCT-20
Copper (Cu)-Dissolved			100.7		%		80-120	06-OCT-20
Iron (Fe)-Dissolved			107.6		%		80-120	06-OCT-20
Lead (Pb)-Dissolved			98.2		%		80-120	06-OCT-20
Lithium (Li)-Dissolved			107.9		%		80-120	06-OCT-20
Magnesium (Mg)-Dissolved			101.2		%		80-120	06-OCT-20
Manganese (Mn)-Dissolved			106.0		%		80-120	06-OCT-20
Molybdenum (Mo)-Dissolved			104.2		%		80-120	06-OCT-20
Nickel (Ni)-Dissolved			102.3		%		80-120	06-OCT-20
Phosphorus (P)-Dissolved			103.6		%		70-130	06-OCT-20
Potassium (K)-Dissolved			99.7		%		80-120	06-OCT-20
Rubidium (Rb)-Dissolved			105.4		%		80-120	06-OCT-20
Selenium (Se)-Dissolved			101.9		%		80-120	06-OCT-20
Silicon (Si)-Dissolved			103.9		%		60-140	06-OCT-20
Silver (Ag)-Dissolved			102.6		%		80-120	06-OCT-20
Sodium (Na)-Dissolved			103.8		%		80-120	06-OCT-20
Strontium (Sr)-Dissolved			107.3		%		80-120	06-OCT-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch R5247837								
WG3416950-3 CRM		**TMRM_20**						
Sulfur (S)-Dissolved			112.5		%		80-120	06-OCT-20
Tellurium (Te)-Dissolved			101.4		%		80-120	06-OCT-20
Thallium (Tl)-Dissolved			100.9		%		80-120	06-OCT-20
Thorium (Th)-Dissolved			94.4		%		80-120	06-OCT-20
Tin (Sn)-Dissolved			101.2		%		80-120	06-OCT-20
Titanium (Ti)-Dissolved			95.0		%		80-120	06-OCT-20
Tungsten (W)-Dissolved			100.5		%		80-120	06-OCT-20
Uranium (U)-Dissolved			98.9		%		80-120	06-OCT-20
Vanadium (V)-Dissolved			103.4		%		80-120	06-OCT-20
Zinc (Zn)-Dissolved			100.0		%		80-120	06-OCT-20
Zirconium (Zr)-Dissolved			99.1		%		80-120	06-OCT-20
WG3416950-1 MB								
Aluminum (Al)-Dissolved			<0.0020		mg/L		0.002	06-OCT-20
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	06-OCT-20
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	06-OCT-20
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	06-OCT-20
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	06-OCT-20
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	06-OCT-20
Boron (B)-Dissolved			<0.010		mg/L		0.01	06-OCT-20
Cadmium (Cd)-Dissolved			<0.000005C		mg/L		0.000005	06-OCT-20
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	06-OCT-20
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	06-OCT-20
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	06-OCT-20
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	06-OCT-20
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	06-OCT-20
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	06-OCT-20
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	06-OCT-20
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	06-OCT-20
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	06-OCT-20
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	06-OCT-20
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	06-OCT-20
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	06-OCT-20
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	06-OCT-20
Potassium (K)-Dissolved			<0.050		mg/L		0.05	06-OCT-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch R5247837								
WG3416950-1 MB								
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	06-OCT-20
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	06-OCT-20
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	06-OCT-20
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	06-OCT-20
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	06-OCT-20
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	06-OCT-20
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	06-OCT-20
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	06-OCT-20
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	06-OCT-20
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	06-OCT-20
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	06-OCT-20
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	06-OCT-20
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	06-OCT-20
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	06-OCT-20
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	06-OCT-20
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	06-OCT-20
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	06-OCT-20
WG3416950-4 MS		**L2511141-1**						
Aluminum (Al)-Dissolved			94.6		%		70-130	06-OCT-20
Antimony (Sb)-Dissolved			101.0		%		70-130	06-OCT-20
Arsenic (As)-Dissolved			95.4		%		70-130	06-OCT-20
Barium (Ba)-Dissolved			N/A	MS-B	%		-	06-OCT-20
Beryllium (Be)-Dissolved			92.5		%		70-130	06-OCT-20
Bismuth (Bi)-Dissolved			94.1		%		70-130	06-OCT-20
Boron (B)-Dissolved			N/A	MS-B	%		-	06-OCT-20
Cadmium (Cd)-Dissolved			99.3		%		70-130	06-OCT-20
Calcium (Ca)-Dissolved			N/A	MS-B	%		-	06-OCT-20
Cesium (Cs)-Dissolved			99.8		%		70-130	06-OCT-20
Chromium (Cr)-Dissolved			96.1		%		70-130	06-OCT-20
Cobalt (Co)-Dissolved			94.2		%		70-130	06-OCT-20
Copper (Cu)-Dissolved			N/A	MS-B	%		-	06-OCT-20
Iron (Fe)-Dissolved			93.8		%		70-130	06-OCT-20
Lead (Pb)-Dissolved			92.2		%		70-130	06-OCT-20
Lithium (Li)-Dissolved			95.0		%		70-130	06-OCT-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch R5247837								
WG3416950-4 MS		**L2511141-1**						
Magnesium (Mg)-Dissolved			N/A	MS-B	%		-	06-OCT-20
Manganese (Mn)-Dissolved			N/A	MS-B	%		-	06-OCT-20
Molybdenum (Mo)-Dissolved			98.6		%		70-130	06-OCT-20
Nickel (Ni)-Dissolved			92.8		%		70-130	06-OCT-20
Phosphorus (P)-Dissolved			99.1		%		70-130	06-OCT-20
Potassium (K)-Dissolved			N/A	MS-B	%		-	06-OCT-20
Rubidium (Rb)-Dissolved			90.1		%		70-130	06-OCT-20
Selenium (Se)-Dissolved			93.8		%		70-130	06-OCT-20
Silicon (Si)-Dissolved			96.0		%		70-130	06-OCT-20
Silver (Ag)-Dissolved			94.5		%		70-130	06-OCT-20
Sodium (Na)-Dissolved			N/A	MS-B	%		-	06-OCT-20
Strontium (Sr)-Dissolved			N/A	MS-B	%		-	06-OCT-20
Sulfur (S)-Dissolved			N/A	MS-B	%		-	06-OCT-20
Tellurium (Te)-Dissolved			101.2		%		70-130	06-OCT-20
Thallium (Tl)-Dissolved			95.2		%		70-130	06-OCT-20
Thorium (Th)-Dissolved			98.8		%		70-130	06-OCT-20
Tin (Sn)-Dissolved			98.9		%		70-130	06-OCT-20
Titanium (Ti)-Dissolved			94.0		%		70-130	06-OCT-20
Tungsten (W)-Dissolved			97.9		%		70-130	06-OCT-20
Uranium (U)-Dissolved			N/A	MS-B	%		-	06-OCT-20
Vanadium (V)-Dissolved			99.8		%		70-130	06-OCT-20
Zinc (Zn)-Dissolved			90.0		%		70-130	06-OCT-20
Zirconium (Zr)-Dissolved			100.8		%		70-130	06-OCT-20
NH3-F-CL	Water							
Batch R5246956								
WG3418723-10 LCS								
Ammonia, Total (as N)			108.5		%		85-115	05-OCT-20
WG3418723-9 MB								
Ammonia, Total (as N)			<0.050		mg/L		0.05	05-OCT-20
NO2-IC-N-SK	Water							
Batch R5244667								
WG3416686-1 DUP		**L2511141-2**						
Nitrite (as N)		<0.10	<0.10	RPD-NA	mg/L	N/A	20	02-OCT-20
WG3416686-3 LCS								
Nitrite (as N)			100.9		%		90-110	02-OCT-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-IC-N-SK	Water							
Batch R5244667								
WG3416686-2 MB								
Nitrite (as N)			<0.010		mg/L		0.01	02-OCT-20
Batch R5244823								
WG3417214-3 LCS								
Nitrite (as N)			97.8		%		90-110	03-OCT-20
WG3417214-2 MB								
Nitrite (as N)			<0.010		mg/L		0.01	03-OCT-20
NO3-IC-N-SK	Water							
Batch R5244667								
WG3416686-1 DUP		**L2511141-2**						
Nitrate (as N)		<0.20	<0.20	RPD-NA	mg/L	N/A	20	02-OCT-20
WG3416686-3 LCS								
Nitrate (as N)			101.3		%		90-110	02-OCT-20
WG3416686-2 MB								
Nitrate (as N)			<0.020		mg/L		0.02	02-OCT-20
Batch R5244823								
WG3417214-3 LCS								
Nitrate (as N)			101.4		%		90-110	03-OCT-20
WG3417214-2 MB								
Nitrate (as N)			<0.020		mg/L		0.02	03-OCT-20
SO4-IC-N-SK	Water							
Batch R5244667								
WG3416686-1 DUP		**L2511141-2**						
Sulfate (SO4)		837	832		mg/L	0.6	20	02-OCT-20
WG3416686-3 LCS								
Sulfate (SO4)			102.1		%		90-110	02-OCT-20
WG3416686-2 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	02-OCT-20
Batch R5244823								
WG3417214-3 LCS								
Sulfate (SO4)			102.4		%		90-110	03-OCT-20
WG3417214-2 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	03-OCT-20
SULPHIDE-WT	Water							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SULPHIDE-WT	Water							
Batch R5250582								
WG3419788-2 LCS								
Sulphide (as S)			96.9		%		75-125	07-OCT-20
WG3419788-1 MB								
Sulphide (as S)			<0.018		mg/L		0.018	07-OCT-20

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2511141-COFC

COC Number: 15 -

Page of

Report To	Contact and company name below will appear on the final report
Company:	Ensero Technologies
Contact:	Rachel Martz
Phone:	306 978 3111
	Company address below will appear on the final report
Street:	104-411 Downey Road
City/Province:	Saskatoon, SK
Postal Code:	S7H 1R1
Invoice To	Same as Report To
	Copy of Invoice with Report
Company:	Ensero Technologies
Contact:	Mel Shotenski

Report Format / Distribution

Select Report Format: Quality Control (QC) Report with Report

Select Distribution:

Email 1 or Fax rmartz@ensero.com

Email 2 rkleinberger@ensero.com

Email 3 kpiecowye@ensero.com

Invoice Distribution

Select Invoice Distribution:

Email 1 or Fax rmartz@ensero.com

Email 2 ap@ensero.com

Project Information

ALS Account # / Quote #: Q81011

Job #: ETK20YT00042

PO / AFE:

LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#

Major/Minor Code: Routing Code:

Requisitioner:

Location:

ALS Lab Work Order # (lab use only)

ALS Contact: Sampler:

Select Service Level Below - Confirm all E&P TATs with your AM - surcharges will apply

Regular [R]

PRIORITY (Business Days): 4 day [P4] | 3 day [P3] | 2 day [P2]

EMERGENCY: 1 Business day [E1] | Same Day, Weekend or Statutory holiday [E0]

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

		P	F/P	F/P		P								
NO2-IC-N-SK	NO3-IC-N-SK	NH3-F-CL	C-DIS-ORG-CL	MET-D-CCMS-SK	SO4-IC-N-SK	SULPHIDE-CFA-ED								Number of Containers
R	R	R	R	R	R	R								5
R	R	R	R	R	R	R								5
R	R	R	R	R	R	R								5
R	R	R	R	R	R	R								5

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type
	Trial E1	1-Oct-20	11:00	Water
	Trial G2	1-Oct-20	11:05	Water
	Trial M3	1-Oct-20	11:10	Water
	Trial C4	1-Oct-20	11:15	Water

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?

Are samples for human drinking water use?

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Please add cbrizinski@ensero.com and importer@contango.ehsdata.com to emails.

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
17°					

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
	01 Oct 2020	13:00		01-Oct-20	4:00			

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Ensero Technologies Inc.
ATTN: Rachel Martz
104- 411 Downey Road
Saskatoon SK S7N 4L8

Date Received: 08- OCT- 20
Report Date: 17- OCT- 20 15:43 (MT)
Version: FINAL

Client Phone: 306- 978- 3111

Certificate of Analysis

Lab Work Order #: L2514496

Project P.O. #: NOT SUBMITTED
Job Reference: ETK20YT00042
C of C Numbers:
Legal Site Desc:

Brian Morgan, B.Sc. Hons.
Client Services Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2514496-1 TRIAL E1							
Sampled By: CLIENT on 08-OCT-20 @ 09:00							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	1.73	DLHC	0.50	mg/L		16-OCT-20	R5256114
Nitrate (as N)	<0.10	DLDS	0.10	mg/L		10-OCT-20	R5253006
Nitrite (as N)	<0.050	DLDS	0.050	mg/L		10-OCT-20	R5253006
L2514496-2 TRIAL G2							
Sampled By: CLIENT on 08-OCT-20 @ 09:10							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	1.06	DLHC	0.50	mg/L		16-OCT-20	R5256114
Nitrate (as N)	<0.20	DLDS	0.20	mg/L		10-OCT-20	R5253006
Nitrite (as N)	<0.10	DLDS	0.10	mg/L		10-OCT-20	R5253006
L2514496-3 TRIAL M3							
Sampled By: CLIENT on 08-OCT-20 @ 09:20							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	2.25	DLHC	0.50	mg/L		16-OCT-20	R5256114
Nitrate (as N)	<0.20	DLDS	0.20	mg/L		10-OCT-20	R5253006
Nitrite (as N)	0.12	DLDS	0.10	mg/L		10-OCT-20	R5253006
L2514496-4 TRIAL C4							
Sampled By: CLIENT on 08-OCT-20 @ 09:30							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	4.83	DLHC	0.50	mg/L		16-OCT-20	R5256114
Nitrate (as N)	9.79	DLDS	0.20	mg/L		10-OCT-20	R5253006
Nitrite (as N)	2.03	DLDS	0.10	mg/L		10-OCT-20	R5253006

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
NH3-F-CL	Water	Ammonia by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-IC-N-SK	Water	Nitrite in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-IC-N-SK	Water	Nitrate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: Ensero Technologies Inc.
104-411 Downey Road
Saskatoon SK S7N 4L8
Contact: Rachel Martz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-F-CL	Water							
Batch R5256114								
WG3426131-6 LCS								
Ammonia, Total (as N)			100.0		%		85-115	16-OCT-20
WG3426131-5 MB								
Ammonia, Total (as N)			<0.050		mg/L		0.05	16-OCT-20
NO2-IC-N-SK	Water							
Batch R5253006								
WG3421792-3 LCS								
Nitrite (as N)			101.9		%		90-110	10-OCT-20
WG3421792-2 MB								
Nitrite (as N)			<0.010		mg/L		0.01	10-OCT-20
WG3421792-4 MS		**L2514496-4**						
Nitrite (as N)			N/A	MS-B	%		-	10-OCT-20
NO3-IC-N-SK	Water							
Batch R5253006								
WG3421792-3 LCS								
Nitrate (as N)			101.0		%		90-110	10-OCT-20
WG3421792-2 MB								
Nitrate (as N)			<0.020		mg/L		0.02	10-OCT-20
WG3421792-4 MS		**L2514496-4**						
Nitrate (as N)			N/A	MS-B	%		-	10-OCT-20

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2514496-COFC

COC Number: 15 -

Page of

Report To	Contact and company name below will appear on the final report
Company:	Ensero Technologies
Contact:	Rachel Martz
Phone:	306 978 3111
	Company address below will appear on the final report
Street:	104-411 Downey Road
City/Province:	Saskatoon, SK
Postal Code:	S7H 1R1
Invoice To	Same as Report To
	Copy of Invoice with Report
Company:	Ensero Technologies
Contact:	Mel Shotenski

Project Information

ALS Account # / Quote #:	Q81011
Job #:	ETK20YT00042
PO / AFE:	
LSD:	
ALS Lab Work Order # (lab use only)	

Report Format / Distribution

Select Report Format: Quality Control (QC) Report with Report

Select Distribution:

Email 1 or Fax	rmartz@ensero.com
Email 2	rkleinberger@ensero.com
Email 3	kpiecowye@ensero.com

Invoice Distribution

Select Invoice Distribution:

Email 1 or Fax	rmartz@ensero.com
Email 2	ap@ensero.com

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact:	**Sampler:**

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R]

PRIORITY (Business Days)		EMERGENCY	
	4 day [P4]		1 Business day [E1]
	3 day [P3]		Same Day, Weekend or Statutory holiday [E0]
	2 day [P2]		

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NO2-IC-N-SK	NO3-IC-N-SK	NH3-F-CL										Number of Containers
							P										
	Trial E1	8-Oct-20	9:00	Water	R	R	R										2
	Trial G2	8-Oct-20	9:10	Water	R	R	R										2
	Trial M3	8-Oct-20	9:20	Water	R	R	R										2
	Trial C4	8-Oct-20	9:30	Water	R	R	R										2

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?

Are samples for human drinking water use?

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Please add cbrizinski@ensero.com and importer@contango.ehsdata.com to emails.

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
14.0					

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
	Date:	Time:	Received by: JM	Date: 08-Oct-20	Time: 1400	Received by:	Date:	Time:

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

AGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

ns of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

n from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Ensero Technologies Inc.
ATTN: Rachel Martz
104-411 Downey Road
Saskatoon SK S7N 4L8

Date Received: 15-OCT-20
Report Date: 23-OCT-20 10:13 (MT)
Version: FINAL

Client Phone: 306-978-3111

Certificate of Analysis

Lab Work Order #: L2517662
Project P.O. #: NOT SUBMITTED
Job Reference: ETK20YT00042
C of C Numbers:
Legal Site Desc:

Brian Morgan, B.Sc. Hons.
Client Services Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2517662-1 TRIAL E1							
Sampled By: CLIENT on 15-OCT-20 @ 09:00							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	1.75	DLHC	0.50	mg/L		21-OCT-20	R5264117
Dissolved Organic Carbon	18.9		1.0	mg/L		22-OCT-20	R5265958
Nitrate (as N)	<0.050	HTDC	0.050	mg/L		19-OCT-20	R5258701
Nitrite (as N)	0.014	HTDC	0.010	mg/L		19-OCT-20	R5258701
Sulfate (SO4)	847	DLDS	3.0	mg/L		19-OCT-20	R5258701
Sulphide (as S)	0.116		0.018	mg/L		20-OCT-20	R5259792
Sulphide (as H2S)	0.123		0.019	mg/L		21-OCT-20	
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					19-OCT-20	R5256821
Aluminum (Al)-Dissolved	<0.010	DLM	0.010	mg/L		19-OCT-20	R5257719
Antimony (Sb)-Dissolved	<0.00050	DLM	0.00050	mg/L		19-OCT-20	R5257719
Arsenic (As)-Dissolved	0.00056	DLM	0.00050	mg/L		19-OCT-20	R5257719
Barium (Ba)-Dissolved	0.0922	DLM	0.00050	mg/L		19-OCT-20	R5257719
Beryllium (Be)-Dissolved	<0.00050	DLM	0.00050	mg/L		19-OCT-20	R5257719
Bismuth (Bi)-Dissolved	<0.00025	DLM	0.00025	mg/L		19-OCT-20	R5257719
Boron (B)-Dissolved	0.190	DLM	0.050	mg/L		19-OCT-20	R5257719
Cadmium (Cd)-Dissolved	<0.000025	DLM	0.000025	mg/L		19-OCT-20	R5257719
Calcium (Ca)-Dissolved	338	DLM	0.25	mg/L		19-OCT-20	R5257719
Cesium (Cs)-Dissolved	<0.000050	DLM	0.000050	mg/L		19-OCT-20	R5257719
Chromium (Cr)-Dissolved	<0.00050	DLM	0.00050	mg/L		19-OCT-20	R5257719
Cobalt (Co)-Dissolved	<0.00050	DLM	0.00050	mg/L		19-OCT-20	R5257719
Copper (Cu)-Dissolved	0.0043	DLM	0.0010	mg/L		19-OCT-20	R5257719
Iron (Fe)-Dissolved	1.03	DLM	0.050	mg/L		19-OCT-20	R5257719
Lead (Pb)-Dissolved	<0.00025	DLM	0.00025	mg/L		19-OCT-20	R5257719
Lithium (Li)-Dissolved	0.0083	DLM	0.0050	mg/L		19-OCT-20	R5257719
Magnesium (Mg)-Dissolved	45.2	DLM	0.025	mg/L		19-OCT-20	R5257719
Manganese (Mn)-Dissolved	1.19	DLM	0.00050	mg/L		19-OCT-20	R5257719
Molybdenum (Mo)-Dissolved	0.0162	DLM	0.00025	mg/L		19-OCT-20	R5257719
Nickel (Ni)-Dissolved	<0.0025	DLM	0.0025	mg/L		19-OCT-20	R5257719
Phosphorus (P)-Dissolved	<0.25	DLM	0.25	mg/L		19-OCT-20	R5257719
Potassium (K)-Dissolved	19.8	DLM	0.25	mg/L		19-OCT-20	R5257719
Rubidium (Rb)-Dissolved	0.0143	DLM	0.0010	mg/L		19-OCT-20	R5257719
Selenium (Se)-Dissolved	0.00076	DLM	0.00025	mg/L		19-OCT-20	R5257719
Silicon (Si)-Dissolved	6.47	DLM	0.25	mg/L		19-OCT-20	R5257719
Silver (Ag)-Dissolved	<0.000050	DLM	0.000050	mg/L		19-OCT-20	R5257719
Sodium (Na)-Dissolved	81.8	DLM	0.25	mg/L		19-OCT-20	R5257719
Strontium (Sr)-Dissolved	4.31	DLM	0.0010	mg/L		19-OCT-20	R5257719
Sulfur (S)-Dissolved	301	DLM	2.5	mg/L		19-OCT-20	R5257719
Tellurium (Te)-Dissolved	<0.0010	DLM	0.0010	mg/L		19-OCT-20	R5257719
Thallium (Tl)-Dissolved	<0.000050	DLM	0.000050	mg/L		19-OCT-20	R5257719
Thorium (Th)-Dissolved	<0.00050	DLM	0.00050	mg/L		19-OCT-20	R5257719
Tin (Sn)-Dissolved	<0.00050	DLM	0.00050	mg/L		19-OCT-20	R5257719
Titanium (Ti)-Dissolved	<0.0015	DLM	0.0015	mg/L		19-OCT-20	R5257719
Tungsten (W)-Dissolved	<0.00050	DLM	0.00050	mg/L		19-OCT-20	R5257719
Uranium (U)-Dissolved	0.00382	DLM	0.000050	mg/L		19-OCT-20	R5257719
Vanadium (V)-Dissolved	<0.0025	DLM	0.0025	mg/L		19-OCT-20	R5257719
Zinc (Zn)-Dissolved	<0.0050	DLM	0.0050	mg/L		19-OCT-20	R5257719
Zirconium (Zr)-Dissolved	<0.0010	DLM	0.0010	mg/L		19-OCT-20	R5257719

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2517662-2 TRIAL G2							
Sampled By: CLIENT on 15-OCT-20 @ 09:00							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	1.71	DLHC	0.50	mg/L		21-OCT-20	R5264117
Dissolved Organic Carbon	21.0		1.0	mg/L		22-OCT-20	R5265958
Nitrate (as N)	<0.025	HTDC	0.025	mg/L		19-OCT-20	R5258701
Nitrite (as N)	0.0141	HTDC	0.0050	mg/L		19-OCT-20	R5258701
Sulfate (SO4)	845	DLDS	1.5	mg/L		19-OCT-20	R5258701
Sulphide (as S)	<0.18	DLM	0.18	mg/L		20-OCT-20	R5259792
Sulphide (as H2S)	<0.19		0.19	mg/L		21-OCT-20	
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					19-OCT-20	R5256821
Aluminum (Al)-Dissolved	0.011	DLM	0.010	mg/L		19-OCT-20	R5257719
Antimony (Sb)-Dissolved	<0.00050	DLM	0.00050	mg/L		19-OCT-20	R5257719
Arsenic (As)-Dissolved	<0.00050	DLM	0.00050	mg/L		19-OCT-20	R5257719
Barium (Ba)-Dissolved	0.101	DLM	0.00050	mg/L		19-OCT-20	R5257719
Beryllium (Be)-Dissolved	<0.00050	DLM	0.00050	mg/L		19-OCT-20	R5257719
Bismuth (Bi)-Dissolved	<0.00025	DLM	0.00025	mg/L		19-OCT-20	R5257719
Boron (B)-Dissolved	0.183	DLM	0.050	mg/L		19-OCT-20	R5257719
Cadmium (Cd)-Dissolved	<0.000025	DLM	0.000025	mg/L		19-OCT-20	R5257719
Calcium (Ca)-Dissolved	330	DLM	0.25	mg/L		19-OCT-20	R5257719
Cesium (Cs)-Dissolved	<0.000050	DLM	0.000050	mg/L		19-OCT-20	R5257719
Chromium (Cr)-Dissolved	<0.00050	DLM	0.00050	mg/L		19-OCT-20	R5257719
Cobalt (Co)-Dissolved	<0.00050	DLM	0.00050	mg/L		19-OCT-20	R5257719
Copper (Cu)-Dissolved	0.0019	DLM	0.0010	mg/L		19-OCT-20	R5257719
Iron (Fe)-Dissolved	0.873	DLM	0.050	mg/L		19-OCT-20	R5257719
Lead (Pb)-Dissolved	<0.00025	DLM	0.00025	mg/L		19-OCT-20	R5257719
Lithium (Li)-Dissolved	0.0078	DLM	0.0050	mg/L		19-OCT-20	R5257719
Magnesium (Mg)-Dissolved	44.4	DLM	0.025	mg/L		19-OCT-20	R5257719
Manganese (Mn)-Dissolved	1.47	DLM	0.00050	mg/L		19-OCT-20	R5257719
Molybdenum (Mo)-Dissolved	0.00832	DLM	0.00025	mg/L		19-OCT-20	R5257719
Nickel (Ni)-Dissolved	<0.0025	DLM	0.0025	mg/L		19-OCT-20	R5257719
Phosphorus (P)-Dissolved	<0.25	DLM	0.25	mg/L		19-OCT-20	R5257719
Potassium (K)-Dissolved	19.2	DLM	0.25	mg/L		19-OCT-20	R5257719
Rubidium (Rb)-Dissolved	0.0136	DLM	0.0010	mg/L		19-OCT-20	R5257719
Selenium (Se)-Dissolved	0.00042	DLM	0.00025	mg/L		19-OCT-20	R5257719
Silicon (Si)-Dissolved	6.50	DLM	0.25	mg/L		19-OCT-20	R5257719
Silver (Ag)-Dissolved	<0.000050	DLM	0.000050	mg/L		19-OCT-20	R5257719
Sodium (Na)-Dissolved	78.8	DLM	0.25	mg/L		19-OCT-20	R5257719
Strontium (Sr)-Dissolved	4.17	DLM	0.0010	mg/L		19-OCT-20	R5257719
Sulfur (S)-Dissolved	295	DLM	2.5	mg/L		19-OCT-20	R5257719
Tellurium (Te)-Dissolved	<0.0010	DLM	0.0010	mg/L		19-OCT-20	R5257719
Thallium (Tl)-Dissolved	<0.000050	DLM	0.000050	mg/L		19-OCT-20	R5257719
Thorium (Th)-Dissolved	<0.00050	DLM	0.00050	mg/L		19-OCT-20	R5257719
Tin (Sn)-Dissolved	<0.00050	DLM	0.00050	mg/L		19-OCT-20	R5257719
Titanium (Ti)-Dissolved	<0.0015	DLM	0.0015	mg/L		19-OCT-20	R5257719
Tungsten (W)-Dissolved	<0.00050	DLM	0.00050	mg/L		19-OCT-20	R5257719
Uranium (U)-Dissolved	0.00320	DLM	0.000050	mg/L		19-OCT-20	R5257719
Vanadium (V)-Dissolved	<0.0025	DLM	0.0025	mg/L		19-OCT-20	R5257719
Zinc (Zn)-Dissolved	0.0052	DLM	0.0050	mg/L		19-OCT-20	R5257719
Zirconium (Zr)-Dissolved	<0.0010	DLM	0.0010	mg/L		19-OCT-20	R5257719

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2517662-3 TRIAL M3							
Sampled By: CLIENT on 15-OCT-20 @ 09:00							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	2.83	DLHC	0.50	mg/L		21-OCT-20	R5264117
Dissolved Organic Carbon	36.8		1.0	mg/L		22-OCT-20	R5265958
Nitrate (as N)	0.039	HTDC	0.025	mg/L		19-OCT-20	R5258701
Nitrite (as N)	0.0302	HTDC	0.0050	mg/L		19-OCT-20	R5258701
Sulfate (SO4)	818	DLDS	1.5	mg/L		19-OCT-20	R5258701
Sulphide (as S)	<1.8	DLM	1.8	mg/L		20-OCT-20	R5259792
Sulphide (as H2S)	<1.9		1.9	mg/L		21-OCT-20	
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					19-OCT-20	R5256821
Aluminum (Al)-Dissolved	0.028	DLM	0.010	mg/L		19-OCT-20	R5257719
Antimony (Sb)-Dissolved	<0.00050	DLM	0.00050	mg/L		19-OCT-20	R5257719
Arsenic (As)-Dissolved	<0.00050	DLM	0.00050	mg/L		19-OCT-20	R5257719
Barium (Ba)-Dissolved	0.111	DLM	0.00050	mg/L		19-OCT-20	R5257719
Beryllium (Be)-Dissolved	<0.00050	DLM	0.00050	mg/L		19-OCT-20	R5257719
Bismuth (Bi)-Dissolved	<0.00025	DLM	0.00025	mg/L		19-OCT-20	R5257719
Boron (B)-Dissolved	0.173	DLM	0.050	mg/L		19-OCT-20	R5257719
Cadmium (Cd)-Dissolved	0.000045	DLM	0.000025	mg/L		19-OCT-20	R5257719
Calcium (Ca)-Dissolved	308	DLM	0.25	mg/L		19-OCT-20	R5257719
Cesium (Cs)-Dissolved	<0.000050	DLM	0.000050	mg/L		19-OCT-20	R5257719
Chromium (Cr)-Dissolved	0.00124	DLM	0.00050	mg/L		19-OCT-20	R5257719
Cobalt (Co)-Dissolved	<0.00050	DLM	0.00050	mg/L		19-OCT-20	R5257719
Copper (Cu)-Dissolved	0.0120	DLM	0.0010	mg/L		19-OCT-20	R5257719
Iron (Fe)-Dissolved	0.661	DLM	0.050	mg/L		19-OCT-20	R5257719
Lead (Pb)-Dissolved	<0.00025	DLM	0.00025	mg/L		19-OCT-20	R5257719
Lithium (Li)-Dissolved	0.0078	DLM	0.0050	mg/L		19-OCT-20	R5257719
Magnesium (Mg)-Dissolved	43.9	DLM	0.025	mg/L		19-OCT-20	R5257719
Manganese (Mn)-Dissolved	1.45	DLM	0.00050	mg/L		19-OCT-20	R5257719
Molybdenum (Mo)-Dissolved	0.00358	DLM	0.00025	mg/L		19-OCT-20	R5257719
Nickel (Ni)-Dissolved	<0.0025	DLM	0.0025	mg/L		19-OCT-20	R5257719
Phosphorus (P)-Dissolved	0.29	DLM	0.25	mg/L		19-OCT-20	R5257719
Potassium (K)-Dissolved	21.5	DLM	0.25	mg/L		19-OCT-20	R5257719
Rubidium (Rb)-Dissolved	0.0200	DLM	0.0010	mg/L		19-OCT-20	R5257719
Selenium (Se)-Dissolved	0.00062	DLM	0.00025	mg/L		19-OCT-20	R5257719
Silicon (Si)-Dissolved	6.79	DLM	0.25	mg/L		19-OCT-20	R5257719
Silver (Ag)-Dissolved	<0.000050	DLM	0.000050	mg/L		19-OCT-20	R5257719
Sodium (Na)-Dissolved	75.9	DLM	0.25	mg/L		19-OCT-20	R5257719
Strontium (Sr)-Dissolved	4.08	DLM	0.0010	mg/L		19-OCT-20	R5257719
Sulfur (S)-Dissolved	282	DLM	2.5	mg/L		19-OCT-20	R5257719
Tellurium (Te)-Dissolved	<0.0010	DLM	0.0010	mg/L		19-OCT-20	R5257719
Thallium (Tl)-Dissolved	<0.000050	DLM	0.000050	mg/L		19-OCT-20	R5257719
Thorium (Th)-Dissolved	<0.00050	DLM	0.00050	mg/L		19-OCT-20	R5257719
Tin (Sn)-Dissolved	<0.00050	DLM	0.00050	mg/L		19-OCT-20	R5257719
Titanium (Ti)-Dissolved	0.0023	DLM	0.0015	mg/L		19-OCT-20	R5257719
Tungsten (W)-Dissolved	<0.00050	DLM	0.00050	mg/L		19-OCT-20	R5257719
Uranium (U)-Dissolved	0.00285	DLM	0.000050	mg/L		19-OCT-20	R5257719
Vanadium (V)-Dissolved	0.0028	DLM	0.0025	mg/L		19-OCT-20	R5257719
Zinc (Zn)-Dissolved	0.0136	DLM	0.0050	mg/L		19-OCT-20	R5257719
Zirconium (Zr)-Dissolved	<0.0010	DLM	0.0010	mg/L		19-OCT-20	R5257719

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2517662-4 TRIAL C4							
Sampled By: CLIENT on 15-OCT-20 @ 09:00							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	5.2	DLHC	1.0	mg/L		21-OCT-20	R5264117
Dissolved Organic Carbon	20.3		1.0	mg/L		22-OCT-20	R5265958
Nitrate (as N)	8.47	HTDC	0.025	mg/L		19-OCT-20	R5258701
Nitrite (as N)	1.47	HTDC	0.0050	mg/L		19-OCT-20	R5258701
Sulfate (SO4)	889	DLDS	1.5	mg/L		19-OCT-20	R5258701
Sulphide (as S)	<0.18	DLM	0.18	mg/L		20-OCT-20	R5259792
Sulphide (as H2S)	<0.19		0.19	mg/L		21-OCT-20	
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					19-OCT-20	R5256821
Aluminum (Al)-Dissolved	<0.010	DLM	0.010	mg/L		19-OCT-20	R5257719
Antimony (Sb)-Dissolved	<0.00050	DLM	0.00050	mg/L		19-OCT-20	R5257719
Arsenic (As)-Dissolved	<0.00050	DLM	0.00050	mg/L		19-OCT-20	R5257719
Barium (Ba)-Dissolved	0.0997	DLM	0.00050	mg/L		19-OCT-20	R5257719
Beryllium (Be)-Dissolved	<0.00050	DLM	0.00050	mg/L		19-OCT-20	R5257719
Bismuth (Bi)-Dissolved	<0.00025	DLM	0.00025	mg/L		19-OCT-20	R5257719
Boron (B)-Dissolved	0.180	DLM	0.050	mg/L		19-OCT-20	R5257719
Cadmium (Cd)-Dissolved	0.000247	DLM	0.000025	mg/L		19-OCT-20	R5257719
Calcium (Ca)-Dissolved	312	DLM	0.25	mg/L		19-OCT-20	R5257719
Cesium (Cs)-Dissolved	0.000060	DLM	0.000050	mg/L		19-OCT-20	R5257719
Chromium (Cr)-Dissolved	<0.00050	DLM	0.00050	mg/L		19-OCT-20	R5257719
Cobalt (Co)-Dissolved	0.00092	DLM	0.00050	mg/L		19-OCT-20	R5257719
Copper (Cu)-Dissolved	0.0846	DLM	0.0010	mg/L		19-OCT-20	R5257719
Iron (Fe)-Dissolved	<0.050	DLM	0.050	mg/L		19-OCT-20	R5257719
Lead (Pb)-Dissolved	<0.00025	DLM	0.00025	mg/L		19-OCT-20	R5257719
Lithium (Li)-Dissolved	0.0101	DLM	0.0050	mg/L		19-OCT-20	R5257719
Magnesium (Mg)-Dissolved	43.3	DLM	0.025	mg/L		19-OCT-20	R5257719
Manganese (Mn)-Dissolved	1.01	DLM	0.00050	mg/L		19-OCT-20	R5257719
Molybdenum (Mo)-Dissolved	0.0253	DLM	0.00025	mg/L		19-OCT-20	R5257719
Nickel (Ni)-Dissolved	<0.0025	DLM	0.0025	mg/L		19-OCT-20	R5257719
Phosphorus (P)-Dissolved	<0.25	DLM	0.25	mg/L		19-OCT-20	R5257719
Potassium (K)-Dissolved	17.5	DLM	0.25	mg/L		19-OCT-20	R5257719
Rubidium (Rb)-Dissolved	0.0171	DLM	0.0010	mg/L		19-OCT-20	R5257719
Selenium (Se)-Dissolved	0.00187	DLM	0.00025	mg/L		19-OCT-20	R5257719
Silicon (Si)-Dissolved	4.50	DLM	0.25	mg/L		19-OCT-20	R5257719
Silver (Ag)-Dissolved	<0.000050	DLM	0.000050	mg/L		19-OCT-20	R5257719
Sodium (Na)-Dissolved	74.8	DLM	0.25	mg/L		19-OCT-20	R5257719
Strontium (Sr)-Dissolved	4.24	DLM	0.0010	mg/L		19-OCT-20	R5257719
Sulfur (S)-Dissolved	304	DLM	2.5	mg/L		19-OCT-20	R5257719
Tellurium (Te)-Dissolved	<0.0010	DLM	0.0010	mg/L		19-OCT-20	R5257719
Thallium (Tl)-Dissolved	<0.000050	DLM	0.000050	mg/L		19-OCT-20	R5257719
Thorium (Th)-Dissolved	<0.00050	DLM	0.00050	mg/L		19-OCT-20	R5257719
Tin (Sn)-Dissolved	<0.00050	DLM	0.00050	mg/L		19-OCT-20	R5257719
Titanium (Ti)-Dissolved	<0.0015	DLM	0.0015	mg/L		19-OCT-20	R5257719
Tungsten (W)-Dissolved	<0.00050	DLM	0.00050	mg/L		19-OCT-20	R5257719
Uranium (U)-Dissolved	0.00484	DLM	0.000050	mg/L		19-OCT-20	R5257719
Vanadium (V)-Dissolved	<0.0025	DLM	0.0025	mg/L		19-OCT-20	R5257719
Zinc (Zn)-Dissolved	0.0183	DLM	0.0050	mg/L		19-OCT-20	R5257719
Zirconium (Zr)-Dissolved	<0.0010	DLM	0.0010	mg/L		19-OCT-20	R5257719

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
HTDC	Hold time exceeded for dilution or re-analysis. Reported results are consistent with initial results (tested within hold time), and are valid and defensible.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-DIS-ORG-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
Filtered (0.45 um) sample is acidified and purged to remove inorganic carbon, then injected into a heated reaction chamber where organic carbon is oxidized to CO2 which is then transported in the carrier gas stream and measured via a non-dispersive infrared analyzer.			
MET-D-CCMS-SK	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B / EPA 6020A
This procedure involves preliminary filtration through a 0.45 um filter followed by instrumental analysis using collision cell inductively coupled plasma - mass spectrometry (modifed from EPA Method 6020A).			
NH3-F-CL	Water	Ammonia by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-L-IC-N-SK	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-SK	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
S2-T>H2S-CALC-WT	Water	Total Sulphide Calculated as H2S	Calculation
This calculation converts Total Sulphide as (S2-) and reports it as Total Sulphide as (H2S). Total Sulphide as (S2-) is determined using procedures adapted from APHA 4500-S2 "Sulphide".			
SO4-IC-N-SK	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SULPHIDE-WT	Water	Sulphide (as S)	APHA 4500S2D
This analysis is carried out using procedures adapted from APHA Method 4500-S2-D "Methylene Blue Method". Sulphide is determined colourmetrically.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: Ensero Technologies Inc.
104-411 Downey Road
Saskatoon SK S7N 4L8
Contact: Rachel Martz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-CL	Water							
Batch R5265958								
WG3430735-2 LCS								
Dissolved Organic Carbon			95.5		%		80-120	22-OCT-20
WG3430735-1 MB								
Dissolved Organic Carbon			<1.0		mg/L		1	22-OCT-20
MET-D-CCMS-SK	Water							
Batch R5257719								
WG3427127-3 CRM		**TMRM_20**						
Aluminum (Al)-Dissolved			101.4		%		80-120	19-OCT-20
Antimony (Sb)-Dissolved			98.5		%		80-120	19-OCT-20
Arsenic (As)-Dissolved			101.5		%		80-120	19-OCT-20
Barium (Ba)-Dissolved			102.7		%		80-120	19-OCT-20
Beryllium (Be)-Dissolved			101.0		%		80-120	19-OCT-20
Bismuth (Bi)-Dissolved			95.7		%		80-120	19-OCT-20
Boron (B)-Dissolved			101.6		%		80-120	19-OCT-20
Cadmium (Cd)-Dissolved			101.6		%		80-120	19-OCT-20
Calcium (Ca)-Dissolved			95.6		%		80-120	19-OCT-20
Cesium (Cs)-Dissolved			98.0		%		80-120	19-OCT-20
Chromium (Cr)-Dissolved			101.9		%		80-120	19-OCT-20
Cobalt (Co)-Dissolved			101.4		%		80-120	19-OCT-20
Copper (Cu)-Dissolved			100.2		%		80-120	19-OCT-20
Iron (Fe)-Dissolved			110.4		%		80-120	19-OCT-20
Lead (Pb)-Dissolved			101.1		%		80-120	19-OCT-20
Lithium (Li)-Dissolved			103.5		%		80-120	19-OCT-20
Magnesium (Mg)-Dissolved			94.2		%		80-120	19-OCT-20
Manganese (Mn)-Dissolved			100.0		%		80-120	19-OCT-20
Molybdenum (Mo)-Dissolved			99.8		%		80-120	19-OCT-20
Nickel (Ni)-Dissolved			99.4		%		80-120	19-OCT-20
Phosphorus (P)-Dissolved			103.7		%		70-130	19-OCT-20
Potassium (K)-Dissolved			99.3		%		80-120	19-OCT-20
Rubidium (Rb)-Dissolved			102.2		%		80-120	19-OCT-20
Selenium (Se)-Dissolved			105.7		%		80-120	19-OCT-20
Silicon (Si)-Dissolved			105.7		%		60-140	19-OCT-20
Silver (Ag)-Dissolved			102.8		%		80-120	19-OCT-20
Sodium (Na)-Dissolved			110.2		%		80-120	19-OCT-20
Strontium (Sr)-Dissolved			96.7		%		80-120	19-OCT-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch R5257719								
WG3427127-3 CRM		**TMRM_20**						
Sulfur (S)-Dissolved			101.7		%		80-120	19-OCT-20
Tellurium (Te)-Dissolved			98.2		%		80-120	19-OCT-20
Thallium (Tl)-Dissolved			98.6		%		80-120	19-OCT-20
Thorium (Th)-Dissolved			96.8		%		80-120	19-OCT-20
Tin (Sn)-Dissolved			98.3		%		80-120	19-OCT-20
Titanium (Ti)-Dissolved			99.0		%		80-120	19-OCT-20
Tungsten (W)-Dissolved			98.5		%		80-120	19-OCT-20
Uranium (U)-Dissolved			99.9		%		80-120	19-OCT-20
Vanadium (V)-Dissolved			103.3		%		80-120	19-OCT-20
Zinc (Zn)-Dissolved			104.2		%		80-120	19-OCT-20
Zirconium (Zr)-Dissolved			100.2		%		80-120	19-OCT-20
WG3427127-1 MB								
Aluminum (Al)-Dissolved			<0.0020		mg/L		0.002	19-OCT-20
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	19-OCT-20
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	19-OCT-20
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	19-OCT-20
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	19-OCT-20
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	19-OCT-20
Boron (B)-Dissolved			<0.010		mg/L		0.01	19-OCT-20
Cadmium (Cd)-Dissolved			<0.000005C		mg/L		0.000005	19-OCT-20
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	19-OCT-20
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	19-OCT-20
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	19-OCT-20
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	19-OCT-20
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	19-OCT-20
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	19-OCT-20
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	19-OCT-20
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	19-OCT-20
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	19-OCT-20
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	19-OCT-20
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	19-OCT-20
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	19-OCT-20
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	19-OCT-20
Potassium (K)-Dissolved			<0.050		mg/L		0.05	19-OCT-20

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch R5257719								
WG3427127-1 MB								
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	19-OCT-20
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	19-OCT-20
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	19-OCT-20
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	19-OCT-20
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	19-OCT-20
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	19-OCT-20
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	19-OCT-20
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	19-OCT-20
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	19-OCT-20
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	19-OCT-20
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	19-OCT-20
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	19-OCT-20
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	19-OCT-20
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	19-OCT-20
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	19-OCT-20
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	19-OCT-20
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	19-OCT-20
WG3427127-4 MS		**L2517662-4**						
Aluminum (Al)-Dissolved			102.5		%		70-130	19-OCT-20
Antimony (Sb)-Dissolved			98.5		%		70-130	19-OCT-20
Arsenic (As)-Dissolved			101.3		%		70-130	19-OCT-20
Barium (Ba)-Dissolved			N/A	MS-B	%		-	19-OCT-20
Beryllium (Be)-Dissolved			103.7		%		70-130	19-OCT-20
Bismuth (Bi)-Dissolved			87.4		%		70-130	19-OCT-20
Boron (B)-Dissolved			N/A	MS-B	%		-	19-OCT-20
Cadmium (Cd)-Dissolved			102.3		%		70-130	19-OCT-20
Calcium (Ca)-Dissolved			N/A	MS-B	%		-	19-OCT-20
Cesium (Cs)-Dissolved			95.6		%		70-130	19-OCT-20
Chromium (Cr)-Dissolved			101.2		%		70-130	19-OCT-20
Cobalt (Co)-Dissolved			100.1		%		70-130	19-OCT-20
Copper (Cu)-Dissolved			N/A	MS-B	%		-	19-OCT-20
Iron (Fe)-Dissolved			102.8		%		70-130	19-OCT-20
Lead (Pb)-Dissolved			91.6		%		70-130	19-OCT-20
Lithium (Li)-Dissolved			103.5		%		70-130	19-OCT-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch R5257719								
WG3427127-4 MS		**L2517662-4**						
Magnesium (Mg)-Dissolved			N/A	MS-B	%		-	19-OCT-20
Manganese (Mn)-Dissolved			N/A	MS-B	%		-	19-OCT-20
Molybdenum (Mo)-Dissolved			N/A	MS-B	%		-	19-OCT-20
Nickel (Ni)-Dissolved			98.0		%		70-130	19-OCT-20
Phosphorus (P)-Dissolved			109.2		%		70-130	19-OCT-20
Potassium (K)-Dissolved			N/A	MS-B	%		-	19-OCT-20
Rubidium (Rb)-Dissolved			98.0		%		70-130	19-OCT-20
Selenium (Se)-Dissolved			105.3		%		70-130	19-OCT-20
Silicon (Si)-Dissolved			102.6		%		70-130	19-OCT-20
Silver (Ag)-Dissolved			97.3		%		70-130	19-OCT-20
Sodium (Na)-Dissolved			N/A	MS-B	%		-	19-OCT-20
Strontium (Sr)-Dissolved			N/A	MS-B	%		-	19-OCT-20
Sulfur (S)-Dissolved			N/A	MS-B	%		-	19-OCT-20
Tellurium (Te)-Dissolved			96.8		%		70-130	19-OCT-20
Thallium (Tl)-Dissolved			89.9		%		70-130	19-OCT-20
Thorium (Th)-Dissolved			91.6		%		70-130	19-OCT-20
Tin (Sn)-Dissolved			93.7		%		70-130	19-OCT-20
Titanium (Ti)-Dissolved			97.1		%		70-130	19-OCT-20
Tungsten (W)-Dissolved			94.0		%		70-130	19-OCT-20
Uranium (U)-Dissolved			N/A	MS-B	%		-	19-OCT-20
Vanadium (V)-Dissolved			103.6		%		70-130	19-OCT-20
Zinc (Zn)-Dissolved			96.6		%		70-130	19-OCT-20
Zirconium (Zr)-Dissolved			98.7		%		70-130	19-OCT-20
NH3-F-CL	Water							
Batch R5264117								
WG3429624-22 LCS								
Ammonia, Total (as N)			102.7		%		85-115	21-OCT-20
WG3429624-21 MB								
Ammonia, Total (as N)			<0.050		mg/L		0.05	21-OCT-20
NO2-L-IC-N-SK	Water							
Batch R5258701								
WG3426463-3 LCS								
Nitrite (as N)			98.1		%		90-110	17-OCT-20
WG3426463-2 MB								

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-L-IC-N-SK	Water							
Batch R5258701								
WG3426463-2 MB								
Nitrite (as N)			0.0013	B	mg/L		0.001	17-OCT-20
NO3-L-IC-N-SK	Water							
Batch R5258701								
WG3426463-3 LCS								
Nitrate (as N)			101.9		%		90-110	17-OCT-20
WG3426463-2 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	17-OCT-20
SO4-IC-N-SK	Water							
Batch R5258701								
WG3426463-3 LCS								
Sulfate (SO4)			102.2		%		90-110	17-OCT-20
WG3426463-2 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	17-OCT-20
SULPHIDE-WT	Water							
Batch R5259792								
WG3428537-2 LCS								
Sulphide (as S)			93.5		%		75-125	20-OCT-20
WG3428537-1 MB								
Sulphide (as S)			<0.018		mg/L		0.018	20-OCT-20

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Anions and Nutrients							
Nitrate in Water by IC (Low Level)							
	1	15-OCT-20 09:00	19-OCT-20 15:00	3	4	days	EHT
	2	15-OCT-20 09:00	19-OCT-20 15:00	3	4	days	EHT
	3	15-OCT-20 09:00	19-OCT-20 15:00	3	4	days	EHT
	4	15-OCT-20 09:00	19-OCT-20 15:00	3	4	days	EHT
Nitrite in Water by IC (Low Level)							
	1	15-OCT-20 09:00	19-OCT-20 15:00	3	4	days	EHT
	2	15-OCT-20 09:00	19-OCT-20 15:00	3	4	days	EHT
	3	15-OCT-20 09:00	19-OCT-20 15:00	3	4	days	EHT
	4	15-OCT-20 09:00	19-OCT-20 15:00	3	4	days	EHT

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2517662 were received on 15-OCT-20 15:45.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2517662-COFC

COC Number: 15 -

Page of

Report To	Contact and company name below will appear on the final report
Company:	Ensero Technologies
Contact:	Rachel Martz
Phone:	306 978 3111
	Company address below will appear on the final report
Street:	104-411 Downey Road
City/Province:	Saskatoon, SK
Postal Code:	S7H 1R1
Invoice To	Same as Report To
	Copy of Invoice with Report
Company:	Ensero Technologies
Contact:	Mel Shotenski

Report Format / Distribution

Select Report Format: Quality Control (QC) Report with Report

Select Distribution:

Email 1 or Fax	rmartz@ensero.com
Email 2	rkleinberger@ensero.com
Email 3	kpiecowye@ensero.com

Invoice Distribution

Select Invoice Distribution:

Email 1 or Fax	rmartz@ensero.com
Email 2	ap@ensero.com

Project Information

ALS Account # / Quote #:	Q81011
Job #:	ETK20YT00042
PO / AFE:	
LSD:	
ALS Lab Work Order # (lab use only)	

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact:	Sampler:

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R]

PRIORITY (Business Days): 4 day [P4]; 3 day [P3]; 2 day [P2]

EMERGENCY: 1 Business day [E1]; Same Day, Weekend or Statutory holiday [E0]

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

		P	F/P	F/P		P							
ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NO2-L-IC-N-SK	NO3-IC-N-SK	NH3-F-CL	C-DIS-ORG-CL	MET-D-CCMS-SK	SO4-IC-N-SK	SULPHIDE-CFA-ED							Number of Containers
	Trial E1	15-Oct-20	9:00	Water	R	R	R	R	R	R	R							5
	Trial G2	15-Oct-20	9:05	Water	R	R	R	R	R	R	R							5
	Trial M3	15-Oct-20	9:10	Water	R	R	R	R	R	R	R							5
	Trial C4	15-Oct-20	9:15	Water	R	R	R	R	R	R	R							5

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?

Are samples for human drinking water use?

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Please add cbrizinski@ensero.com and importer@contango.ehsdata.com to emails.

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
10					

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date: 15 Oct 20	Time: 11:30	Received by:	Date: 15/10/20	Time: 3:45	Received by:	Date:	Time: 3:45

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Ensero Technologies Inc.
ATTN: Rachel Martz
104-411 Downey Road
Saskatoon SK S7N 4L8

Date Received: 22-OCT-20
Report Date: 29-OCT-20 13:03 (MT)
Version: FINAL

Client Phone: 306-978-3111

Certificate of Analysis

Lab Work Order #: L2520403
Project P.O. #: NOT SUBMITTED
Job Reference: ETK20YT00042
C of C Numbers:
Legal Site Desc:

Brian Morgan, B.Sc. Hons.
Client Services Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2520403-1 TRIAL E1							
Sampled By: CLIENT on 22-OCT-20 @ 09:00							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	1.35	DLHC	0.50	mg/L		28-OCT-20	R5270613
Nitrate (as N)	<0.20	DLDS	0.20	mg/L		22-OCT-20	R5266857
Nitrite (as N)	<0.010		0.010	mg/L		27-OCT-20	R5269283
Nitrite (as N)	<0.0050	DLHC	0.0050	mg/L		27-OCT-20	R5269983
L2520403-2 TRIAL G2							
Sampled By: CLIENT on 22-OCT-20 @ 09:10							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	1.59	DLHC	0.50	mg/L		28-OCT-20	R5270613
Nitrate (as N)	<0.20	DLDS	0.20	mg/L		22-OCT-20	R5266857
Nitrite (as N)	<0.010		0.010	mg/L		27-OCT-20	R5269283
Nitrite (as N)	<0.0050	DLHC	0.0050	mg/L		27-OCT-20	R5269983
L2520403-3 TRIAL M3							
Sampled By: CLIENT on 22-OCT-20 @ 09:20							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	2.28	DLHC	0.50	mg/L		28-OCT-20	R5270613
Nitrate (as N)	<0.20	DLDS	0.20	mg/L		22-OCT-20	R5266857
Nitrite (as N)	0.024		0.010	mg/L		27-OCT-20	R5269283
Nitrite (as N)	0.0091	DLHC	0.0050	mg/L		27-OCT-20	R5269983
L2520403-4 TRIAL C4							
Sampled By: CLIENT on 22-OCT-20 @ 09:30							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	4.43	DLHC	0.50	mg/L		28-OCT-20	R5270613
Nitrate (as N)	7.25	DLDS	0.20	mg/L		22-OCT-20	R5266857
Nitrite (as N)	0.743		0.010	mg/L		27-OCT-20	R5269283
Nitrite (as N)	0.815	DLHC	0.0050	mg/L		27-OCT-20	R5269983

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
NH3-F-CL	Water	Ammonia by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-IC-N-SK	Water	Nitrite in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO2-L-IC-N-CL	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-IC-N-SK	Water	Nitrate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: Ensero Technologies Inc.
104-411 Downey Road
Saskatoon SK S7N 4L8
Contact: Rachel Martz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-F-CL	Water							
Batch R5270613								
WG3434201-18 LCS								
Ammonia, Total (as N)			97.5		%		85-115	28-OCT-20
WG3434201-17 MB								
Ammonia, Total (as N)			<0.050		mg/L		0.05	28-OCT-20
NO2-IC-N-SK	Water							
Batch R5269283								
WG3432503-3 LCS								
Nitrite (as N)			102.0		%		90-110	27-OCT-20
WG3432503-2 MB								
Nitrite (as N)			<0.010		mg/L		0.01	27-OCT-20
NO2-L-IC-N-CL	Water							
Batch R5269983								
WG3433728-2 LCS								
Nitrite (as N)			105.5		%		90-110	27-OCT-20
WG3433728-1 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	27-OCT-20
NO3-IC-N-SK	Water							
Batch R5266857								
WG3430367-3 LCS								
Nitrate (as N)			102.6		%		90-110	22-OCT-20
WG3430367-2 MB								
Nitrate (as N)			<0.020		mg/L		0.02	22-OCT-20

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Anions and Nutrients							
Nitrite in Water by IC							
	1	22-OCT-20 09:00	27-OCT-20 00:00	3	5	days	EHT
	2	22-OCT-20 09:10	27-OCT-20 00:00	3	5	days	EHT
	3	22-OCT-20 09:20	27-OCT-20 00:00	3	5	days	EHT
	4	22-OCT-20 09:30	27-OCT-20 00:00	3	5	days	EHT
Nitrite in Water by IC (Low Level)							
	1	22-OCT-20 09:00	27-OCT-20 08:30	3	5	days	EHT
	2	22-OCT-20 09:10	27-OCT-20 08:30	3	5	days	EHT
	3	22-OCT-20 09:20	27-OCT-20 08:30	3	5	days	EHT
	4	22-OCT-20 09:30	27-OCT-20 08:30	3	5	days	EHT

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2520403 were received on 22-OCT-20 14:10.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2520403-COFC

COC Number: 15 -

Page of

Report To	Contact and company name below will appear on the final report
Company:	Ensero Technologies
Contact:	Rachel Martz
Phone:	306 978 3111
	Company address below will appear on the final report
Street:	104-411 Downey Road
City/Province:	Saskatoon, SK
Postal Code:	S7H 1R1
Invoice To	Same as Report To
	Copy of Invoice with Report
Company:	Ensero Technologies
Contact:	Mel Shotenski

Project Information	
ALS Account # / Quote #:	Q81011
Job #:	ETK20YT00042
PO / AFE:	
LSD:	
ALS Lab Work Order # (lab use only)	

Report Format / Distribution	
Select Report Format:	
Quality Control (QC) Report with Report	
Select Distribution:	
Email 1 or Fax	rmartz@ensero.com
Email 2	rkleinberger@ensero.com
Email 3	kpiecowye@ensero.com

Invoice Distribution	
Select Invoice Distribution:	
Email 1 or Fax	rmartz@ensero.com
Email 2	ap@ensero.com

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact:	Sampler:

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R]

PRIORITY (Business Days): 4 day [P4] | 3 day [P3] | 2 day [P2]

EMERGENCY: 1 Business day [E1] | Same Day, Weekend or Statutory holiday [E0]

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NO2-L-IC-N-SK	NO3-IC-N-SK	NH3-F-CL										Number of Containers
							P										
	Trial E1	22-Oct-20	9:00	Water	R	R	R										2
	Trial G2	22-Oct-20	9:10	Water	R	R	R										2
	Trial M3	22-Oct-20	9:20	Water	R	R	R										2
	Trial C4	22-Oct-20	9:30	Water	R	R	R										2

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?

Are samples for human drinking water use?

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Please add cbrizinski@ensero.com and importer@contango.ehsdata.com to emails.

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
9.0					

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by: DM/Z	Date: 22/10/20	Time: 2:10	Received by: JP/4	Date: 22/10/2020	Time: 2:20

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Ensero Technologies Inc.
ATTN: Rachel Martz
104-411 Downey Road
Saskatoon SK S7N 4L8

Date Received: 29-OCT-20
Report Date: 04-NOV-20 13:37 (MT)
Version: FINAL

Client Phone: 306-978-3111

Certificate of Analysis

Lab Work Order #: L2523537
Project P.O. #: NOT SUBMITTED
Job Reference: ETK20YT00042
C of C Numbers:
Legal Site Desc:

Brian Morgan, B.Sc. Hons.
Client Services Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2523537-1 TRIAL E13							
Sampled By: CLIENT on 29-OCT-20 @ 09:00							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	1.36	DLHC	0.50	mg/L		02-NOV-20	R5272822
Dissolved Organic Carbon	20.8		1.0	mg/L		02-NOV-20	R5275031
Nitrate (as N)	<0.025	DLHC	0.025	mg/L		31-OCT-20	R5275637
Nitrite (as N)	<0.0050	DLHC	0.0050	mg/L		31-OCT-20	R5275637
Sulfate (SO4)	832	DLHC	1.5	mg/L		31-OCT-20	R5275637
Sulphide (as S)	0.036		0.018	mg/L		04-NOV-20	R5278216
Sulphide (as H2S)	0.038		0.019	mg/L		04-NOV-20	
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					30-OCT-20	R5271666
Aluminum (Al)-Dissolved	<0.010	DLM	0.010	mg/L		30-OCT-20	R5272032
Antimony (Sb)-Dissolved	<0.00050	DLM	0.00050	mg/L		30-OCT-20	R5272032
Arsenic (As)-Dissolved	<0.00050	DLM	0.00050	mg/L		30-OCT-20	R5272032
Barium (Ba)-Dissolved	0.0893	DLM	0.00050	mg/L		30-OCT-20	R5272032
Beryllium (Be)-Dissolved	<0.00050	DLM	0.00050	mg/L		30-OCT-20	R5272032
Bismuth (Bi)-Dissolved	<0.00025	DLM	0.00025	mg/L		30-OCT-20	R5272032
Boron (B)-Dissolved	0.158	DLM	0.050	mg/L		30-OCT-20	R5272032
Cadmium (Cd)-Dissolved	<0.000025	DLM	0.000025	mg/L		30-OCT-20	R5272032
Calcium (Ca)-Dissolved	302	DLM	0.25	mg/L		30-OCT-20	R5272032
Cesium (Cs)-Dissolved	<0.000050	DLM	0.000050	mg/L		30-OCT-20	R5272032
Chromium (Cr)-Dissolved	<0.00050	DLM	0.00050	mg/L		30-OCT-20	R5272032
Cobalt (Co)-Dissolved	<0.00050	DLM	0.00050	mg/L		30-OCT-20	R5272032
Copper (Cu)-Dissolved	0.0014	DLM	0.0010	mg/L		30-OCT-20	R5272032
Iron (Fe)-Dissolved	0.198	DLM	0.050	mg/L		30-OCT-20	R5272032
Lead (Pb)-Dissolved	<0.00025	DLM	0.00025	mg/L		30-OCT-20	R5272032
Lithium (Li)-Dissolved	<0.0050	DLM	0.0050	mg/L		30-OCT-20	R5272032
Magnesium (Mg)-Dissolved	45.4	DLM	0.025	mg/L		30-OCT-20	R5272032
Manganese (Mn)-Dissolved	1.17	DLM	0.00050	mg/L		30-OCT-20	R5272032
Molybdenum (Mo)-Dissolved	0.0141	DLM	0.00025	mg/L		30-OCT-20	R5272032
Nickel (Ni)-Dissolved	<0.0025	DLM	0.0025	mg/L		30-OCT-20	R5272032
Phosphorus (P)-Dissolved	<0.25	DLM	0.25	mg/L		30-OCT-20	R5272032
Potassium (K)-Dissolved	18.5	DLM	0.25	mg/L		30-OCT-20	R5272032
Rubidium (Rb)-Dissolved	0.0130	DLM	0.0010	mg/L		30-OCT-20	R5272032
Selenium (Se)-Dissolved	0.00113	DLM	0.00025	mg/L		30-OCT-20	R5272032
Silicon (Si)-Dissolved	5.99	DLM	0.25	mg/L		30-OCT-20	R5272032
Silver (Ag)-Dissolved	<0.000050	DLM	0.000050	mg/L		30-OCT-20	R5272032
Sodium (Na)-Dissolved	72.6	DLM	0.25	mg/L		30-OCT-20	R5272032
Strontium (Sr)-Dissolved	4.30	DLM	0.0010	mg/L		30-OCT-20	R5272032
Sulfur (S)-Dissolved	267	DLM	2.5	mg/L		30-OCT-20	R5272032
Tellurium (Te)-Dissolved	<0.0010	DLM	0.0010	mg/L		30-OCT-20	R5272032
Thallium (Tl)-Dissolved	<0.000050	DLM	0.000050	mg/L		30-OCT-20	R5272032
Thorium (Th)-Dissolved	<0.00050	DLM	0.00050	mg/L		30-OCT-20	R5272032
Tin (Sn)-Dissolved	<0.00050	DLM	0.00050	mg/L		30-OCT-20	R5272032
Titanium (Ti)-Dissolved	<0.0015	DLM	0.0015	mg/L		30-OCT-20	R5272032
Tungsten (W)-Dissolved	<0.00050	DLM	0.00050	mg/L		30-OCT-20	R5272032
Uranium (U)-Dissolved	0.00366	DLM	0.000050	mg/L		30-OCT-20	R5272032
Vanadium (V)-Dissolved	<0.0025	DLM	0.0025	mg/L		30-OCT-20	R5272032
Zinc (Zn)-Dissolved	<0.0050	DLM	0.0050	mg/L		30-OCT-20	R5272032
Zirconium (Zr)-Dissolved	<0.0010	DLM	0.0010	mg/L		30-OCT-20	R5272032

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2523537-2 TRIAL G2							
Sampled By: CLIENT on 29-OCT-20 @ 09:10							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	2.09	DLHC	0.50	mg/L		02-NOV-20	R5272822
Dissolved Organic Carbon	25.2		1.0	mg/L		02-NOV-20	R5275031
Nitrate (as N)	0.026	DLHC	0.025	mg/L		03-NOV-20	R5277901
Nitrite (as N)	0.0178	DLHC	0.0050	mg/L		03-NOV-20	R5277901
Sulfate (SO4)	789	DLHC	1.5	mg/L		03-NOV-20	R5277901
Sulphide (as S)	0.038		0.018	mg/L		04-NOV-20	R5278216
Sulphide (as H2S)	0.040		0.019	mg/L		04-NOV-20	
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					30-OCT-20	R5271666
Aluminum (Al)-Dissolved	0.012	DLM	0.010	mg/L		30-OCT-20	R5272032
Antimony (Sb)-Dissolved	<0.00050	DLM	0.00050	mg/L		30-OCT-20	R5272032
Arsenic (As)-Dissolved	<0.00050	DLM	0.00050	mg/L		30-OCT-20	R5272032
Barium (Ba)-Dissolved	0.105	DLM	0.00050	mg/L		30-OCT-20	R5272032
Beryllium (Be)-Dissolved	<0.00050	DLM	0.00050	mg/L		30-OCT-20	R5272032
Bismuth (Bi)-Dissolved	<0.00025	DLM	0.00025	mg/L		30-OCT-20	R5272032
Boron (B)-Dissolved	0.164	DLM	0.050	mg/L		30-OCT-20	R5272032
Cadmium (Cd)-Dissolved	<0.000025	DLM	0.000025	mg/L		30-OCT-20	R5272032
Calcium (Ca)-Dissolved	306	DLM	0.25	mg/L		30-OCT-20	R5272032
Cesium (Cs)-Dissolved	<0.000050	DLM	0.000050	mg/L		30-OCT-20	R5272032
Chromium (Cr)-Dissolved	<0.00050	DLM	0.00050	mg/L		30-OCT-20	R5272032
Cobalt (Co)-Dissolved	<0.00050	DLM	0.00050	mg/L		30-OCT-20	R5272032
Copper (Cu)-Dissolved	0.0020	DLM	0.0010	mg/L		30-OCT-20	R5272032
Iron (Fe)-Dissolved	0.526	DLM	0.050	mg/L		30-OCT-20	R5272032
Lead (Pb)-Dissolved	<0.00025	DLM	0.00025	mg/L		30-OCT-20	R5272032
Lithium (Li)-Dissolved	<0.0050	DLM	0.0050	mg/L		30-OCT-20	R5272032
Magnesium (Mg)-Dissolved	46.8	DLM	0.025	mg/L		30-OCT-20	R5272032
Manganese (Mn)-Dissolved	1.54	DLM	0.00050	mg/L		30-OCT-20	R5272032
Molybdenum (Mo)-Dissolved	0.00493	DLM	0.00025	mg/L		30-OCT-20	R5272032
Nickel (Ni)-Dissolved	<0.0025	DLM	0.0025	mg/L		30-OCT-20	R5272032
Phosphorus (P)-Dissolved	<0.25	DLM	0.25	mg/L		30-OCT-20	R5272032
Potassium (K)-Dissolved	19.5	DLM	0.25	mg/L		30-OCT-20	R5272032
Rubidium (Rb)-Dissolved	0.0144	DLM	0.0010	mg/L		30-OCT-20	R5272032
Selenium (Se)-Dissolved	0.00120	DLM	0.00025	mg/L		30-OCT-20	R5272032
Silicon (Si)-Dissolved	6.23	DLM	0.25	mg/L		30-OCT-20	R5272032
Silver (Ag)-Dissolved	<0.000050	DLM	0.000050	mg/L		30-OCT-20	R5272032
Sodium (Na)-Dissolved	73.4	DLM	0.25	mg/L		30-OCT-20	R5272032
Strontium (Sr)-Dissolved	4.17	DLM	0.0010	mg/L		30-OCT-20	R5272032
Sulfur (S)-Dissolved	265	DLM	2.5	mg/L		30-OCT-20	R5272032
Tellurium (Te)-Dissolved	<0.0010	DLM	0.0010	mg/L		30-OCT-20	R5272032
Thallium (Tl)-Dissolved	<0.000050	DLM	0.000050	mg/L		30-OCT-20	R5272032
Thorium (Th)-Dissolved	<0.00050	DLM	0.00050	mg/L		30-OCT-20	R5272032
Tin (Sn)-Dissolved	<0.00050	DLM	0.00050	mg/L		30-OCT-20	R5272032
Titanium (Ti)-Dissolved	<0.0015	DLM	0.0015	mg/L		30-OCT-20	R5272032
Tungsten (W)-Dissolved	<0.00050	DLM	0.00050	mg/L		30-OCT-20	R5272032
Uranium (U)-Dissolved	0.00343	DLM	0.000050	mg/L		30-OCT-20	R5272032
Vanadium (V)-Dissolved	<0.0025	DLM	0.0025	mg/L		30-OCT-20	R5272032
Zinc (Zn)-Dissolved	<0.0050	DLM	0.0050	mg/L		30-OCT-20	R5272032
Zirconium (Zr)-Dissolved	<0.0010	DLM	0.0010	mg/L		30-OCT-20	R5272032

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2523537-3 TRIAL M3							
Sampled By: CLIENT on 29-OCT-20 @ 09:20							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	2.51	DLHC	0.50	mg/L		02-NOV-20	R5272822
Dissolved Organic Carbon	38.3		1.0	mg/L		02-NOV-20	R5275031
Nitrate (as N)	<0.025	DLHC	0.025	mg/L		03-NOV-20	R5277901
Nitrite (as N)	0.0247	DLHC	0.0050	mg/L		03-NOV-20	R5277901
Sulfate (SO4)	766	DLHC	1.5	mg/L		03-NOV-20	R5277901
Sulphide (as S)	0.76	DLHC	0.18	mg/L		04-NOV-20	R5278216
Sulphide (as H2S)	0.81		0.19	mg/L		04-NOV-20	
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					30-OCT-20	R5271666
Aluminum (Al)-Dissolved	0.028	DLM	0.010	mg/L		30-OCT-20	R5272032
Antimony (Sb)-Dissolved	<0.00050	DLM	0.00050	mg/L		30-OCT-20	R5272032
Arsenic (As)-Dissolved	<0.00050	DLM	0.00050	mg/L		30-OCT-20	R5272032
Barium (Ba)-Dissolved	0.111	DLM	0.00050	mg/L		30-OCT-20	R5272032
Beryllium (Be)-Dissolved	<0.00050	DLM	0.00050	mg/L		30-OCT-20	R5272032
Bismuth (Bi)-Dissolved	<0.00025	DLM	0.00025	mg/L		30-OCT-20	R5272032
Boron (B)-Dissolved	0.168	DLM	0.050	mg/L		30-OCT-20	R5272032
Cadmium (Cd)-Dissolved	0.000042	DLM	0.000025	mg/L		30-OCT-20	R5272032
Calcium (Ca)-Dissolved	317	DLM	0.25	mg/L		30-OCT-20	R5272032
Cesium (Cs)-Dissolved	<0.000050	DLM	0.000050	mg/L		30-OCT-20	R5272032
Chromium (Cr)-Dissolved	0.00115	DLM	0.00050	mg/L		30-OCT-20	R5272032
Cobalt (Co)-Dissolved	<0.00050	DLM	0.00050	mg/L		30-OCT-20	R5272032
Copper (Cu)-Dissolved	0.0097	DLM	0.0010	mg/L		30-OCT-20	R5272032
Iron (Fe)-Dissolved	0.781	DLM	0.050	mg/L		30-OCT-20	R5272032
Lead (Pb)-Dissolved	<0.00025	DLM	0.00025	mg/L		30-OCT-20	R5272032
Lithium (Li)-Dissolved	<0.0050	DLM	0.0050	mg/L		30-OCT-20	R5272032
Magnesium (Mg)-Dissolved	46.0	DLM	0.025	mg/L		30-OCT-20	R5272032
Manganese (Mn)-Dissolved	1.48	DLM	0.00050	mg/L		30-OCT-20	R5272032
Molybdenum (Mo)-Dissolved	0.00359	DLM	0.00025	mg/L		30-OCT-20	R5272032
Nickel (Ni)-Dissolved	<0.0025	DLM	0.0025	mg/L		30-OCT-20	R5272032
Phosphorus (P)-Dissolved	0.45	DLM	0.25	mg/L		30-OCT-20	R5272032
Potassium (K)-Dissolved	22.1	DLM	0.25	mg/L		30-OCT-20	R5272032
Rubidium (Rb)-Dissolved	0.0193	DLM	0.0010	mg/L		30-OCT-20	R5272032
Selenium (Se)-Dissolved	0.00172	DLM	0.00025	mg/L		30-OCT-20	R5272032
Silicon (Si)-Dissolved	6.57	DLM	0.25	mg/L		30-OCT-20	R5272032
Silver (Ag)-Dissolved	<0.000050	DLM	0.000050	mg/L		30-OCT-20	R5272032
Sodium (Na)-Dissolved	73.3	DLM	0.25	mg/L		30-OCT-20	R5272032
Strontium (Sr)-Dissolved	4.36	DLM	0.0010	mg/L		30-OCT-20	R5272032
Sulfur (S)-Dissolved	256	DLM	2.5	mg/L		30-OCT-20	R5272032
Tellurium (Te)-Dissolved	<0.0010	DLM	0.0010	mg/L		30-OCT-20	R5272032
Thallium (Tl)-Dissolved	<0.000050	DLM	0.000050	mg/L		30-OCT-20	R5272032
Thorium (Th)-Dissolved	<0.00050	DLM	0.00050	mg/L		30-OCT-20	R5272032
Tin (Sn)-Dissolved	<0.00050	DLM	0.00050	mg/L		30-OCT-20	R5272032
Titanium (Ti)-Dissolved	0.0019	DLM	0.0015	mg/L		30-OCT-20	R5272032
Tungsten (W)-Dissolved	<0.00050	DLM	0.00050	mg/L		30-OCT-20	R5272032
Uranium (U)-Dissolved	0.00314	DLM	0.000050	mg/L		30-OCT-20	R5272032
Vanadium (V)-Dissolved	0.0027	DLM	0.0025	mg/L		30-OCT-20	R5272032
Zinc (Zn)-Dissolved	0.0102	DLM	0.0050	mg/L		30-OCT-20	R5272032
Zirconium (Zr)-Dissolved	<0.0010	DLM	0.0010	mg/L		30-OCT-20	R5272032

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2523537-4 TRIAL C4							
Sampled By: CLIENT on 29-OCT-20 @ 09:30							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	4.84	DLHC	0.50	mg/L		02-NOV-20	R5272822
Dissolved Organic Carbon	25.3		1.0	mg/L		02-NOV-20	R5275031
Nitrate (as N)	5.85	DLHC	0.025	mg/L		03-NOV-20	R5277901
Nitrite (as N)	0.193	DLHC	0.0050	mg/L		03-NOV-20	R5277901
Sulfate (SO4)	826	DLHC	1.5	mg/L		03-NOV-20	R5277901
Sulphide (as S)	<0.018		0.018	mg/L		04-NOV-20	R5278216
Sulphide (as H2S)	<0.019		0.019	mg/L		04-NOV-20	
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					30-OCT-20	R5271666
Aluminum (Al)-Dissolved	<0.010	DLM	0.010	mg/L		30-OCT-20	R5272032
Antimony (Sb)-Dissolved	<0.00050	DLM	0.00050	mg/L		30-OCT-20	R5272032
Arsenic (As)-Dissolved	<0.00050	DLM	0.00050	mg/L		30-OCT-20	R5272032
Barium (Ba)-Dissolved	0.106	DLM	0.00050	mg/L		30-OCT-20	R5272032
Beryllium (Be)-Dissolved	<0.00050	DLM	0.00050	mg/L		30-OCT-20	R5272032
Bismuth (Bi)-Dissolved	<0.00025	DLM	0.00025	mg/L		30-OCT-20	R5272032
Boron (B)-Dissolved	0.156	DLM	0.050	mg/L		30-OCT-20	R5272032
Cadmium (Cd)-Dissolved	0.000231	DLM	0.000025	mg/L		30-OCT-20	R5272032
Calcium (Ca)-Dissolved	296	DLM	0.25	mg/L		30-OCT-20	R5272032
Cesium (Cs)-Dissolved	0.000064	DLM	0.000050	mg/L		30-OCT-20	R5272032
Chromium (Cr)-Dissolved	<0.00050	DLM	0.00050	mg/L		30-OCT-20	R5272032
Cobalt (Co)-Dissolved	0.00103	DLM	0.00050	mg/L		30-OCT-20	R5272032
Copper (Cu)-Dissolved	0.0870	DLM	0.0010	mg/L		30-OCT-20	R5272032
Iron (Fe)-Dissolved	<0.050	DLM	0.050	mg/L		30-OCT-20	R5272032
Lead (Pb)-Dissolved	<0.00025	DLM	0.00025	mg/L		30-OCT-20	R5272032
Lithium (Li)-Dissolved	<0.0050	DLM	0.0050	mg/L		30-OCT-20	R5272032
Magnesium (Mg)-Dissolved	45.7	DLM	0.025	mg/L		30-OCT-20	R5272032
Manganese (Mn)-Dissolved	1.05	DLM	0.00050	mg/L		30-OCT-20	R5272032
Molybdenum (Mo)-Dissolved	0.0264	DLM	0.00025	mg/L		30-OCT-20	R5272032
Nickel (Ni)-Dissolved	<0.0025	DLM	0.0025	mg/L		30-OCT-20	R5272032
Phosphorus (P)-Dissolved	<0.25	DLM	0.25	mg/L		30-OCT-20	R5272032
Potassium (K)-Dissolved	17.7	DLM	0.25	mg/L		30-OCT-20	R5272032
Rubidium (Rb)-Dissolved	0.0170	DLM	0.0010	mg/L		30-OCT-20	R5272032
Selenium (Se)-Dissolved	0.00200	DLM	0.00025	mg/L		30-OCT-20	R5272032
Silicon (Si)-Dissolved	4.24	DLM	0.25	mg/L		30-OCT-20	R5272032
Silver (Ag)-Dissolved	<0.000050	DLM	0.000050	mg/L		30-OCT-20	R5272032
Sodium (Na)-Dissolved	73.7	DLM	0.25	mg/L		30-OCT-20	R5272032
Strontium (Sr)-Dissolved	4.40	DLM	0.0010	mg/L		30-OCT-20	R5272032
Sulfur (S)-Dissolved	278	DLM	2.5	mg/L		30-OCT-20	R5272032
Tellurium (Te)-Dissolved	<0.0010	DLM	0.0010	mg/L		30-OCT-20	R5272032
Thallium (Tl)-Dissolved	<0.000050	DLM	0.000050	mg/L		30-OCT-20	R5272032
Thorium (Th)-Dissolved	<0.00050	DLM	0.00050	mg/L		30-OCT-20	R5272032
Tin (Sn)-Dissolved	<0.00050	DLM	0.00050	mg/L		30-OCT-20	R5272032
Titanium (Ti)-Dissolved	<0.0015	DLM	0.0015	mg/L		30-OCT-20	R5272032
Tungsten (W)-Dissolved	<0.00050	DLM	0.00050	mg/L		30-OCT-20	R5272032
Uranium (U)-Dissolved	0.00558	DLM	0.000050	mg/L		30-OCT-20	R5272032
Vanadium (V)-Dissolved	<0.0025	DLM	0.0025	mg/L		30-OCT-20	R5272032
Zinc (Zn)-Dissolved	0.0162	DLM	0.0050	mg/L		30-OCT-20	R5272032
Zirconium (Zr)-Dissolved	<0.0010	DLM	0.0010	mg/L		30-OCT-20	R5272032

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-DIS-ORG-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
Filtered (0.45 um) sample is acidified and purged to remove inorganic carbon, then injected into a heated reaction chamber where organic carbon is oxidized to CO2 which is then transported in the carrier gas stream and measured via a non-dispersive infrared analyzer.			
MET-D-CCMS-SK	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B / EPA 6020A
This procedure involves preliminary filtration through a 0.45 um filter followed by instrumental analysis using collision cell inductively coupled plasma - mass spectrometry (modifed from EPA Method 6020A).			
NH3-F-CL	Water	Ammonia by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-L-IC-N-CL	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-CL	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
S2-T>H2S-CALC-WT	Water	Total Sulphide Calculated as H2S	Calculation
This calculation converts Total Sulphide as (S2-) and reports it as Total Sulphide as (H2S). Total Sulphide as (S2-) is determined using procedures adapted from APHA 4500-S2 "Sulphide".			
SO4-IC-N-CL	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SULPHIDE-WT	Water	Sulphide (as S)	APHA 4500S2D
This analysis is carried out using procedures adapted from APHA Method 4500-S2-D "Methylene Blue Method". Sulphide is determined colourmetrically.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: Ensero Technologies Inc.
104-411 Downey Road
Saskatoon SK S7N 4L8
Contact: Rachel Martz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-CL	Water							
Batch R5275031								
WG3437576-6 LCS								
Dissolved Organic Carbon			101.2		%		80-120	02-NOV-20
WG3437576-5 MB								
Dissolved Organic Carbon			<1.0		mg/L		1	02-NOV-20
MET-D-CCMS-SK	Water							
Batch R5272032								
WG3435591-3 CRM		**TMRM_20**						
Aluminum (Al)-Dissolved			95.6		%		80-120	30-OCT-20
Antimony (Sb)-Dissolved			97.9		%		80-120	30-OCT-20
Arsenic (As)-Dissolved			100.6		%		80-120	30-OCT-20
Barium (Ba)-Dissolved			104.6		%		80-120	30-OCT-20
Beryllium (Be)-Dissolved			98.3		%		80-120	30-OCT-20
Bismuth (Bi)-Dissolved			96.0		%		80-120	30-OCT-20
Boron (B)-Dissolved			97.3		%		80-120	30-OCT-20
Cadmium (Cd)-Dissolved			100.2		%		80-120	30-OCT-20
Calcium (Ca)-Dissolved			99.1		%		80-120	30-OCT-20
Cesium (Cs)-Dissolved			97.8		%		80-120	30-OCT-20
Chromium (Cr)-Dissolved			99.0		%		80-120	30-OCT-20
Cobalt (Co)-Dissolved			97.8		%		80-120	30-OCT-20
Copper (Cu)-Dissolved			98.0		%		80-120	30-OCT-20
Iron (Fe)-Dissolved			102.4		%		80-120	30-OCT-20
Lead (Pb)-Dissolved			98.6		%		80-120	30-OCT-20
Lithium (Li)-Dissolved			99.8		%		80-120	30-OCT-20
Magnesium (Mg)-Dissolved			97.8		%		80-120	30-OCT-20
Manganese (Mn)-Dissolved			95.6		%		80-120	30-OCT-20
Molybdenum (Mo)-Dissolved			100.5		%		80-120	30-OCT-20
Nickel (Ni)-Dissolved			97.6		%		80-120	30-OCT-20
Phosphorus (P)-Dissolved			106.0		%		70-130	30-OCT-20
Potassium (K)-Dissolved			95.6		%		80-120	30-OCT-20
Rubidium (Rb)-Dissolved			98.8		%		80-120	30-OCT-20
Selenium (Se)-Dissolved			103.0		%		80-120	30-OCT-20
Silicon (Si)-Dissolved			95.7		%		60-140	30-OCT-20
Silver (Ag)-Dissolved			101.7		%		80-120	30-OCT-20
Sodium (Na)-Dissolved			99.4		%		80-120	30-OCT-20
Strontium (Sr)-Dissolved			101.9		%		80-120	30-OCT-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch R5272032								
WG3435591-3 CRM		**TMRM_20**						
Sulfur (S)-Dissolved			102.1		%		80-120	30-OCT-20
Tellurium (Te)-Dissolved			94.0		%		80-120	30-OCT-20
Thallium (Tl)-Dissolved			97.5		%		80-120	30-OCT-20
Thorium (Th)-Dissolved			94.7		%		80-120	30-OCT-20
Tin (Sn)-Dissolved			99.1		%		80-120	30-OCT-20
Titanium (Ti)-Dissolved			99.5		%		80-120	30-OCT-20
Tungsten (W)-Dissolved			96.5		%		80-120	30-OCT-20
Uranium (U)-Dissolved			100.7		%		80-120	30-OCT-20
Vanadium (V)-Dissolved			99.0		%		80-120	30-OCT-20
Zinc (Zn)-Dissolved			91.9		%		80-120	30-OCT-20
Zirconium (Zr)-Dissolved			102.3		%		80-120	30-OCT-20
WG3435591-2 DUP		**L2523537-1**						
Aluminum (Al)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	30-OCT-20
Antimony (Sb)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	30-OCT-20
Arsenic (As)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	30-OCT-20
Barium (Ba)-Dissolved		0.0893	0.0902		mg/L	0.9	20	30-OCT-20
Beryllium (Be)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	30-OCT-20
Bismuth (Bi)-Dissolved		<0.00025	<0.00025	RPD-NA	mg/L	N/A	20	30-OCT-20
Boron (B)-Dissolved		0.158	0.159		mg/L	0.4	20	30-OCT-20
Cadmium (Cd)-Dissolved		<0.000025	<0.000025	RPD-NA	mg/L	N/A	20	30-OCT-20
Calcium (Ca)-Dissolved		302	288		mg/L	4.9	20	30-OCT-20
Cesium (Cs)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	30-OCT-20
Chromium (Cr)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	30-OCT-20
Cobalt (Co)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	30-OCT-20
Copper (Cu)-Dissolved		0.0014	0.0015		mg/L	6.2	20	30-OCT-20
Iron (Fe)-Dissolved		0.198	0.201		mg/L	1.5	20	30-OCT-20
Lead (Pb)-Dissolved		<0.00025	<0.00025	RPD-NA	mg/L	N/A	20	30-OCT-20
Lithium (Li)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	30-OCT-20
Magnesium (Mg)-Dissolved		45.4	45.6		mg/L	0.5	20	30-OCT-20
Manganese (Mn)-Dissolved		1.17	1.20		mg/L	2.8	20	30-OCT-20
Molybdenum (Mo)-Dissolved		0.0141	0.0143		mg/L	1.3	20	30-OCT-20
Nickel (Ni)-Dissolved		<0.0025	<0.0025	RPD-NA	mg/L	N/A	20	30-OCT-20
Phosphorus (P)-Dissolved		<0.25	<0.25	RPD-NA	mg/L	N/A	20	30-OCT-20
Potassium (K)-Dissolved		18.5	19.1		mg/L	2.8	20	30-OCT-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch R5272032								
WG3435591-2 DUP		**L2523537-1**						
Rubidium (Rb)-Dissolved		0.0130	0.0126		mg/L	3.6	20	30-OCT-20
Selenium (Se)-Dissolved		0.00113	0.00107		mg/L	5.7	20	30-OCT-20
Silicon (Si)-Dissolved		5.99	5.99		mg/L	0.0	20	30-OCT-20
Silver (Ag)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	30-OCT-20
Sodium (Na)-Dissolved		72.6	74.4		mg/L	2.4	20	30-OCT-20
Strontium (Sr)-Dissolved		4.30	4.21		mg/L	2.3	20	30-OCT-20
Sulfur (S)-Dissolved		267	268		mg/L	0.5	20	30-OCT-20
Tellurium (Te)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	30-OCT-20
Thallium (Tl)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	30-OCT-20
Thorium (Th)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	30-OCT-20
Tin (Sn)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	30-OCT-20
Titanium (Ti)-Dissolved		<0.0015	<0.0015	RPD-NA	mg/L	N/A	20	30-OCT-20
Tungsten (W)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	30-OCT-20
Uranium (U)-Dissolved		0.00366	0.00363		mg/L	0.7	20	30-OCT-20
Vanadium (V)-Dissolved		<0.0025	<0.0025	RPD-NA	mg/L	N/A	20	30-OCT-20
Zinc (Zn)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	30-OCT-20
Zirconium (Zr)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	30-OCT-20
WG3435591-1 MB								
Aluminum (Al)-Dissolved			<0.0020		mg/L		0.002	30-OCT-20
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	30-OCT-20
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	30-OCT-20
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	30-OCT-20
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	30-OCT-20
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	30-OCT-20
Boron (B)-Dissolved			<0.010		mg/L		0.01	30-OCT-20
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	30-OCT-20
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	30-OCT-20
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	30-OCT-20
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	30-OCT-20
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	30-OCT-20
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	30-OCT-20
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	30-OCT-20
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	30-OCT-20
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	30-OCT-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch R5272032								
WG3435591-1 MB								
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	30-OCT-20
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	30-OCT-20
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	30-OCT-20
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	30-OCT-20
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	30-OCT-20
Potassium (K)-Dissolved			<0.050		mg/L		0.05	30-OCT-20
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	30-OCT-20
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	30-OCT-20
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	30-OCT-20
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	30-OCT-20
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	30-OCT-20
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	30-OCT-20
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	30-OCT-20
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	30-OCT-20
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	30-OCT-20
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	30-OCT-20
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	30-OCT-20
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	30-OCT-20
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	30-OCT-20
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	30-OCT-20
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	30-OCT-20
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	30-OCT-20
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	30-OCT-20
NH3-F-CL	Water							
Batch R5272822								
WG3436584-14 LCS								
Ammonia, Total (as N)			100.4		%		85-115	02-NOV-20
WG3436584-13 MB								
Ammonia, Total (as N)			<0.050		mg/L		0.05	02-NOV-20
NO2-L-IC-N-CL	Water							
Batch R5275637								
WG3437825-6 LCS								
Nitrite (as N)			104.4		%		90-110	31-OCT-20
WG3437825-5 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	31-OCT-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-L-IC-N-CL	Water							
Batch R5277901								
WG3438657-2 LCS								
Nitrite (as N)			99.8		%		90-110	03-NOV-20
WG3438657-1 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	03-NOV-20
NO3-L-IC-N-CL	Water							
Batch R5275637								
WG3437825-6 LCS								
Nitrate (as N)			106.0		%		90-110	31-OCT-20
WG3437825-5 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	31-OCT-20
Batch R5277901								
WG3438657-2 LCS								
Nitrate (as N)			100.6		%		90-110	03-NOV-20
WG3438657-1 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	03-NOV-20
SO4-IC-N-CL	Water							
Batch R5275637								
WG3437825-6 LCS								
Sulfate (SO4)			103.0		%		90-110	31-OCT-20
WG3437825-5 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	31-OCT-20
Batch R5277901								
WG3438657-2 LCS								
Sulfate (SO4)			98.7		%		90-110	03-NOV-20
WG3438657-1 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	03-NOV-20
SULPHIDE-WT	Water							
Batch R5278216								
WG3438367-3 DUP		**L2523537-3**						
Sulphide (as S)		0.76	0.80		mg/L	5.4	20	04-NOV-20
WG3438367-2 LCS								
Sulphide (as S)			104.5		%		75-125	04-NOV-20
WG3438367-1 MB								
Sulphide (as S)			<0.018		mg/L		0.018	04-NOV-20
WG3438367-4 MS		**L2523537-3**						
Sulphide (as S)			N/A	MS-B	%		-	04-NOV-20

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Anions and Nutrients							
Nitrate in Water by IC (Low Level)							
	2	29-OCT-20 09:10	03-NOV-20 08:19	3	5	days	EHT
	3	29-OCT-20 09:20	03-NOV-20 08:19	3	5	days	EHT
	4	29-OCT-20 09:30	03-NOV-20 08:19	3	5	days	EHT
Nitrite in Water by IC (Low Level)							
	2	29-OCT-20 09:10	03-NOV-20 08:19	3	5	days	EHT
	3	29-OCT-20 09:20	03-NOV-20 08:19	3	5	days	EHT
	4	29-OCT-20 09:30	03-NOV-20 08:19	3	5	days	EHT

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2523537 were received on 29-OCT-20 15:30.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2523537-COFC

COC Number: 15 -

Page of

Report To	Contact and company name below will appear on the final report
Company:	Ensero Technologies
Contact:	Rachel Martz
Phone:	306 978 3111
	Company address below will appear on the final report
Street:	104-411 Downey Road
City/Province:	Saskatoon, SK
Postal Code:	S7H 1R1
Invoice To	Same as Report To
	Copy of Invoice with Report
Company:	Ensero Technologies
Contact:	Mel Shotenski

Project Information

ALS Account # / Quote #:	Q81011
Job #:	ETK20YT00042
PO / AFE:	
LSD:	
ALS Lab Work Order #: (lab use only)	

Report Format / Distribution

Select Report Format: Quality Control (QC) Report with Report

Select Distribution:

Email 1 or Fax	rmartz@ensero.com
Email 2	rkleinberger@ensero.com
Email 3	kpiecowye@ensero.com

Invoice Distribution

Select Invoice Distribution:

Email 1 or Fax	rmartz@ensero.com
Email 2	ap@ensero.com

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact:	Sampler:

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R]

PRIORITY (Business Days): 4 day [P4] | 3 day [P3] | 2 day [P2]

EMERGENCY: 1 Business day [E1] | Same Day, Weekend or Statutory holiday [E0]

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NO2-L-IC-N-SK	NO3-IC-N-SK	NH3-F-CL	C-DIS-ORG-CL	MET-D-CCMS-SK	SO4-IC-N-SK	SULPHIDE-CFA-ED							Number of Containers
							P	F/P	F/P		P							
	Trial E1	29-Oct-20	9:00	Water	R	R	R	R	R	R	R							5
	Trial G2	29-Oct-20	9:10	Water	R	R	R	R	R	R	R							5
	Trial M3	29-Oct-20	9:20	Water	R	R	R	R	R	R	R							5
	Trial C4	29-Oct-20	9:30	Water	R	R	R	R	R	R	R							5

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?

Are samples for human drinking water use?

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Please add cbrizinski@ensero.com and importer@contango.ehsdata.com to emails.

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
13°					

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by: JMT	Date: 29-Oct-20	Time: 3:30	Received by: JMT	Date:	Time: 3:35

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Ensero Technologies Inc.
ATTN: Rachel Martz
104-411 Downey Road
Saskatoon SK S7N 4L8

Date Received: 05-NOV-20
Report Date: 13-NOV-20 14:50 (MT)
Version: FINAL

Client Phone: 306-978-3111

Certificate of Analysis

Lab Work Order #: L2526515
Project P.O. #: NOT SUBMITTED
Job Reference: ETK20YT00042
C of C Numbers:
Legal Site Desc:

Brian Morgan, B.Sc. Hons.
Client Services Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2526515-1 TRIAL E1							
Sampled By: CLIENT on 05-NOV-20 @ 12:00							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	1.71		0.050	mg/L		12-NOV-20	R5284669
Nitrate (as N)	<0.025	DLHC	0.025	mg/L		12-NOV-20	R5285110
Nitrite (as N)	<0.0050	DLHC	0.0050	mg/L		12-NOV-20	R5285110
L2526515-2 TRIAL G2							
Sampled By: CLIENT on 05-NOV-20 @ 12:05							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	2.58		0.050	mg/L		12-NOV-20	R5284669
Nitrate (as N)	<0.025	DLHC	0.025	mg/L		12-NOV-20	R5285110
Nitrite (as N)	<0.0050	DLHC	0.0050	mg/L		12-NOV-20	R5285110
L2526515-3 TRIAL M3							
Sampled By: CLIENT on 05-NOV-20 @ 12:10							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	3.21		0.050	mg/L		12-NOV-20	R5284669
Nitrate (as N)	<0.025	DLHC	0.025	mg/L		12-NOV-20	R5285110
Nitrite (as N)	<0.0050	DLHC	0.0050	mg/L		12-NOV-20	R5285110
L2526515-4 TRIAL C4							
Sampled By: CLIENT on 05-NOV-20 @ 12:15							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	4.78		0.050	mg/L		12-NOV-20	R5284669
Nitrate (as N)	4.64	DLHC	0.025	mg/L		12-NOV-20	R5285110
Nitrite (as N)	0.0696	DLHC	0.0050	mg/L		12-NOV-20	R5285110
L2526515-5 W12 WATER							
Sampled By: CLIENT on 05-NOV-20 @ 12:30							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	1.83		0.050	mg/L		12-NOV-20	R5284669
Dissolved Organic Carbon	12.2		1.0	mg/L		10-NOV-20	R5283822
Nitrate (as N)	3.17	DLHC	0.025	mg/L		12-NOV-20	R5285110
Nitrite (as N)	5.85	DLHC	0.0050	mg/L		12-NOV-20	R5285110
Sulfate (SO4)	871	DLDS	3.0	mg/L		08-NOV-20	R5283673
Sulphide (as S)	<0.018		0.018	mg/L		12-NOV-20	R5284301
Sulphide (as H2S)	<0.019		0.019	mg/L		12-NOV-20	
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					12-NOV-20	R5284336
Aluminum (Al)-Dissolved	0.012	DLDS	0.010	mg/L		13-NOV-20	R5285168
Antimony (Sb)-Dissolved	<0.00050	DLDS	0.00050	mg/L		13-NOV-20	R5285168
Arsenic (As)-Dissolved	<0.00050	DLDS	0.00050	mg/L		13-NOV-20	R5285168
Barium (Ba)-Dissolved	0.0610	DLDS	0.00050	mg/L		13-NOV-20	R5285168
Beryllium (Be)-Dissolved	<0.00050	DLDS	0.00050	mg/L		13-NOV-20	R5285168
Bismuth (Bi)-Dissolved	<0.00025	DLDS	0.00025	mg/L		13-NOV-20	R5285168
Boron (B)-Dissolved	0.186	DLDS	0.050	mg/L		13-NOV-20	R5285168
Cadmium (Cd)-Dissolved	0.000091	DLDS	0.000025	mg/L		13-NOV-20	R5285168
Calcium (Ca)-Dissolved	286	DLDS	0.25	mg/L		13-NOV-20	R5285168
Cesium (Cs)-Dissolved	<0.000050	DLDS	0.000050	mg/L		13-NOV-20	R5285168
Chromium (Cr)-Dissolved	<0.00050	DLDS	0.00050	mg/L		13-NOV-20	R5285168

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2526515-5 W12 WATER							
Sampled By: CLIENT on 05-NOV-20 @ 12:30							
Matrix: WATER							
Dissolved Metals in Water by CRC ICPMS							
Cobalt (Co)-Dissolved	<0.00050	DLDS	0.00050	mg/L		13-NOV-20	R5285168
Copper (Cu)-Dissolved	0.0774	DLDS	0.0010	mg/L		13-NOV-20	R5285168
Iron (Fe)-Dissolved	<0.050	DLDS	0.050	mg/L		13-NOV-20	R5285168
Lead (Pb)-Dissolved	<0.00025	DLDS	0.00025	mg/L		13-NOV-20	R5285168
Lithium (Li)-Dissolved	0.0056	DLDS	0.0050	mg/L		13-NOV-20	R5285168
Magnesium (Mg)-Dissolved	45.9	DLDS	0.025	mg/L		13-NOV-20	R5285168
Manganese (Mn)-Dissolved	0.111	DLDS	0.00050	mg/L		13-NOV-20	R5285168
Molybdenum (Mo)-Dissolved	0.0265	DLDS	0.00025	mg/L		13-NOV-20	R5285168
Nickel (Ni)-Dissolved	<0.0025	DLDS	0.0025	mg/L		13-NOV-20	R5285168
Phosphorus (P)-Dissolved	<0.25	DLDS	0.25	mg/L		13-NOV-20	R5285168
Potassium (K)-Dissolved	14.7	DLDS	0.25	mg/L		13-NOV-20	R5285168
Rubidium (Rb)-Dissolved	0.0117	DLDS	0.0010	mg/L		13-NOV-20	R5285168
Selenium (Se)-Dissolved	0.00436	DLDS	0.00025	mg/L		13-NOV-20	R5285168
Silicon (Si)-Dissolved	4.15	DLDS	0.25	mg/L		13-NOV-20	R5285168
Silver (Ag)-Dissolved	<0.000050	DLDS	0.000050	mg/L		13-NOV-20	R5285168
Sodium (Na)-Dissolved	67.7	DLDS	0.25	mg/L		13-NOV-20	R5285168
Strontium (Sr)-Dissolved	4.32	DLDS	0.0010	mg/L		13-NOV-20	R5285168
Sulfur (S)-Dissolved	292	DLDS	2.5	mg/L		13-NOV-20	R5285168
Tellurium (Te)-Dissolved	<0.0010	DLDS	0.0010	mg/L		13-NOV-20	R5285168
Thallium (Tl)-Dissolved	<0.000050	DLDS	0.000050	mg/L		13-NOV-20	R5285168
Thorium (Th)-Dissolved	<0.00050	DLDS	0.00050	mg/L		13-NOV-20	R5285168
Tin (Sn)-Dissolved	<0.00050	DLDS	0.00050	mg/L		13-NOV-20	R5285168
Titanium (Ti)-Dissolved	<0.0015	DLDS	0.0015	mg/L		13-NOV-20	R5285168
Tungsten (W)-Dissolved	0.00090	DLDS	0.00050	mg/L		13-NOV-20	R5285168
Uranium (U)-Dissolved	0.00459	DLDS	0.000050	mg/L		13-NOV-20	R5285168
Vanadium (V)-Dissolved	<0.0025	DLDS	0.0025	mg/L		13-NOV-20	R5285168
Zinc (Zn)-Dissolved	0.0120	DLDS	0.0050	mg/L		13-NOV-20	R5285168
Zirconium (Zr)-Dissolved	<0.0010	DLDS	0.0010	mg/L		13-NOV-20	R5285168

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-DIS-ORG-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
Filtered (0.45 um) sample is acidified and purged to remove inorganic carbon, then injected into a heated reaction chamber where organic carbon is oxidized to CO2 which is then transported in the carrier gas stream and measured via a non-dispersive infrared analyzer.			
MET-D-CCMS-SK	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B / EPA 6020A
This procedure involves preliminary filtration through a 0.45 um filter followed by instrumental analysis using collision cell inductively coupled plasma - mass spectrometry (modifed from EPA Method 6020A).			
NH3-F-CL	Water	Ammonia by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-L-IC-N-CL	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-CL	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
S2-T>H2S-CALC-WT	Water	Total Sulphide Calculated as H2S	Calculation
This calculation converts Total Sulphide as (S2-) and reports it as Total Sulphide as (H2S). Total Sulphide as (S2-) is determined using procedures adapted from APHA 4500-S2 "Sulphide".			
SO4-IC-N-SK	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SULPHIDE-WT	Water	Sulphide (as S)	APHA 4500S2D
This analysis is carried out using procedures adapted from APHA Method 4500-S2-D "Methylene Blue Method". Sulphide is determined colourmetrically.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: Ensero Technologies Inc.
104-411 Downey Road
Saskatoon SK S7N 4L8
Contact: Rachel Martz

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-CL	Water							
Batch R5283822								
WG3443114-10 LCS								
Dissolved Organic Carbon			84.2		%		80-120	10-NOV-20
WG3443114-9 MB								
Dissolved Organic Carbon			<1.0		mg/L		1	10-NOV-20
MET-D-CCMS-SK	Water							
Batch R5285168								
WG3442461-3 CRM		**TMRM_20**						
Aluminum (Al)-Dissolved			102.1		%		80-120	13-NOV-20
Antimony (Sb)-Dissolved			95.7		%		80-120	13-NOV-20
Arsenic (As)-Dissolved			98.8		%		80-120	13-NOV-20
Barium (Ba)-Dissolved			98.2		%		80-120	13-NOV-20
Beryllium (Be)-Dissolved			106.9		%		80-120	13-NOV-20
Bismuth (Bi)-Dissolved			97.0		%		80-120	13-NOV-20
Boron (B)-Dissolved			104.8		%		80-120	13-NOV-20
Cadmium (Cd)-Dissolved			109.4		%		80-120	13-NOV-20
Calcium (Ca)-Dissolved			104.9		%		80-120	13-NOV-20
Cesium (Cs)-Dissolved			99.2		%		80-120	13-NOV-20
Chromium (Cr)-Dissolved			99.4		%		80-120	13-NOV-20
Cobalt (Co)-Dissolved			97.9		%		80-120	13-NOV-20
Copper (Cu)-Dissolved			97.5		%		80-120	13-NOV-20
Iron (Fe)-Dissolved			94.8		%		80-120	13-NOV-20
Lead (Pb)-Dissolved			108.4		%		80-120	13-NOV-20
Lithium (Li)-Dissolved			112.8		%		80-120	13-NOV-20
Magnesium (Mg)-Dissolved			105.7		%		80-120	13-NOV-20
Manganese (Mn)-Dissolved			98.2		%		80-120	13-NOV-20
Molybdenum (Mo)-Dissolved			100.1		%		80-120	13-NOV-20
Nickel (Ni)-Dissolved			98.7		%		80-120	13-NOV-20
Phosphorus (P)-Dissolved			101.4		%		70-130	13-NOV-20
Potassium (K)-Dissolved			94.3		%		80-120	13-NOV-20
Rubidium (Rb)-Dissolved			95.8		%		80-120	13-NOV-20
Selenium (Se)-Dissolved			100.0		%		80-120	13-NOV-20
Silicon (Si)-Dissolved			103.9		%		80-120	13-NOV-20
Silver (Ag)-Dissolved			104.1		%		80-120	13-NOV-20
Sodium (Na)-Dissolved			102.7		%		80-120	13-NOV-20
Strontium (Sr)-Dissolved			109.1		%		80-120	13-NOV-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch R5285168								
WG3442461-3 CRM		**TMRM_20**						
Sulfur (S)-Dissolved			106.7		%		80-120	13-NOV-20
Tellurium (Te)-Dissolved			100.8		%		80-120	13-NOV-20
Thallium (Tl)-Dissolved			101.0		%		80-120	13-NOV-20
Thorium (Th)-Dissolved			103.2		%		80-120	13-NOV-20
Tin (Sn)-Dissolved			105.8		%		80-120	13-NOV-20
Titanium (Ti)-Dissolved			95.9		%		80-120	13-NOV-20
Tungsten (W)-Dissolved			103.6		%		80-120	13-NOV-20
Uranium (U)-Dissolved			106.9		%		80-120	13-NOV-20
Vanadium (V)-Dissolved			100.4		%		80-120	13-NOV-20
Zinc (Zn)-Dissolved			99.0		%		80-120	13-NOV-20
Zirconium (Zr)-Dissolved			100.3		%		80-120	13-NOV-20
WG3442461-2 DUP		**L2526515-5**						
Aluminum (Al)-Dissolved		0.012	0.011		mg/L	5.9	20	13-NOV-20
Antimony (Sb)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	13-NOV-20
Arsenic (As)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	13-NOV-20
Barium (Ba)-Dissolved		0.0610	0.0627		mg/L	2.8	20	13-NOV-20
Beryllium (Be)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	13-NOV-20
Bismuth (Bi)-Dissolved		<0.00025	<0.00025	RPD-NA	mg/L	N/A	20	13-NOV-20
Boron (B)-Dissolved		0.186	0.185		mg/L	0.3	20	13-NOV-20
Cadmium (Cd)-Dissolved		0.000091	0.000099		mg/L	8.3	20	13-NOV-20
Calcium (Ca)-Dissolved		286	279		mg/L	2.2	20	13-NOV-20
Cesium (Cs)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-NOV-20
Chromium (Cr)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	13-NOV-20
Cobalt (Co)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	13-NOV-20
Copper (Cu)-Dissolved		0.0774	0.0777		mg/L	0.4	20	13-NOV-20
Iron (Fe)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	13-NOV-20
Lead (Pb)-Dissolved		<0.00025	<0.00025	RPD-NA	mg/L	N/A	20	13-NOV-20
Lithium (Li)-Dissolved		0.0056	0.0061		mg/L	9.6	20	13-NOV-20
Magnesium (Mg)-Dissolved		45.9	45.0		mg/L	2.1	20	13-NOV-20
Manganese (Mn)-Dissolved		0.111	0.111		mg/L	0.4	20	13-NOV-20
Molybdenum (Mo)-Dissolved		0.0265	0.0262		mg/L	1.0	20	13-NOV-20
Nickel (Ni)-Dissolved		<0.0025	<0.0025	RPD-NA	mg/L	N/A	20	13-NOV-20
Phosphorus (P)-Dissolved		<0.25	<0.25	RPD-NA	mg/L	N/A	20	13-NOV-20
Potassium (K)-Dissolved		14.7	14.7		mg/L	0.1	20	13-NOV-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch R5285168								
WG3442461-2 DUP		**L2526515-5**						
Rubidium (Rb)-Dissolved		0.0117	0.0134		mg/L	13	20	13-NOV-20
Selenium (Se)-Dissolved		0.00436	0.00458		mg/L	4.9	20	13-NOV-20
Silicon (Si)-Dissolved		4.15	4.19		mg/L	0.9	20	13-NOV-20
Silver (Ag)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-NOV-20
Sodium (Na)-Dissolved		67.7	68.2		mg/L	0.8	20	13-NOV-20
Strontium (Sr)-Dissolved		4.32	4.26		mg/L	1.3	20	13-NOV-20
Sulfur (S)-Dissolved		292	296		mg/L	1.5	20	13-NOV-20
Tellurium (Te)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	13-NOV-20
Thallium (Tl)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-NOV-20
Thorium (Th)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	13-NOV-20
Tin (Sn)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	13-NOV-20
Titanium (Ti)-Dissolved		<0.0015	<0.0015	RPD-NA	mg/L	N/A	20	13-NOV-20
Tungsten (W)-Dissolved		0.00090	0.00092		mg/L	2.0	20	13-NOV-20
Uranium (U)-Dissolved		0.00459	0.00477		mg/L	3.7	20	13-NOV-20
Vanadium (V)-Dissolved		<0.0025	<0.0025	RPD-NA	mg/L	N/A	20	13-NOV-20
Zinc (Zn)-Dissolved		0.0120	0.0118		mg/L	2.3	20	13-NOV-20
Zirconium (Zr)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	13-NOV-20
WG3442461-1 MB								
Aluminum (Al)-Dissolved			<0.0020		mg/L		0.002	13-NOV-20
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	13-NOV-20
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	13-NOV-20
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	13-NOV-20
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	13-NOV-20
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	13-NOV-20
Boron (B)-Dissolved			<0.010		mg/L		0.01	13-NOV-20
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	13-NOV-20
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	13-NOV-20
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	13-NOV-20
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	13-NOV-20
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	13-NOV-20
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	13-NOV-20
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	13-NOV-20
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	13-NOV-20
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	13-NOV-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-SK	Water							
Batch R5285168								
WG3442461-1 MB								
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	13-NOV-20
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	13-NOV-20
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	13-NOV-20
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	13-NOV-20
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	13-NOV-20
Potassium (K)-Dissolved			<0.050		mg/L		0.05	13-NOV-20
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	13-NOV-20
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	13-NOV-20
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	13-NOV-20
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	13-NOV-20
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	13-NOV-20
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	13-NOV-20
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	13-NOV-20
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	13-NOV-20
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	13-NOV-20
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	13-NOV-20
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	13-NOV-20
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	13-NOV-20
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	13-NOV-20
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	13-NOV-20
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	13-NOV-20
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	13-NOV-20
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	13-NOV-20
NH3-F-CL	Water							
Batch R5284669								
WG3443694-30 LCS								
Ammonia, Total (as N)			94.1		%		85-115	12-NOV-20
WG3443694-29 MB								
Ammonia, Total (as N)			<0.050		mg/L		0.05	12-NOV-20
NO2-L-IC-N-CL	Water							
Batch R5285110								
WG3444531-2 LCS								
Nitrite (as N)			100.0		%		90-110	12-NOV-20
WG3444531-1 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	12-NOV-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-L-IC-N-CL	Water							
Batch R5285110								
WG3444531-2 LCS								
Nitrate (as N)			102.8		%		90-110	12-NOV-20
WG3444531-1 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	12-NOV-20
SO4-IC-N-SK	Water							
Batch R5283673								
WG3441006-3 LCS								
Sulfate (SO4)			104.5		%		90-110	08-NOV-20
WG3441006-2 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	08-NOV-20
SULPHIDE-WT	Water							
Batch R5284301								
WG3443222-2 LCS								
Sulphide (as S)			93.3		%		75-125	12-NOV-20
WG3443222-1 MB								
Sulphide (as S)			<0.018		mg/L		0.018	12-NOV-20

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Anions and Nutrients							
Nitrate in Water by IC (Low Level)							
	1	05-NOV-20 12:00	12-NOV-20 08:00	3	7	days	EHT
	2	05-NOV-20 12:05	12-NOV-20 08:00	3	7	days	EHT
	3	05-NOV-20 12:10	12-NOV-20 08:00	3	7	days	EHT
	4	05-NOV-20 12:15	12-NOV-20 08:00	3	7	days	EHT
	5	05-NOV-20 12:30	12-NOV-20 08:00	3	7	days	EHT
Nitrite in Water by IC (Low Level)							
	1	05-NOV-20 12:00	12-NOV-20 08:00	3	7	days	EHT
	2	05-NOV-20 12:05	12-NOV-20 08:00	3	7	days	EHT
	3	05-NOV-20 12:10	12-NOV-20 08:00	3	7	days	EHT
	4	05-NOV-20 12:15	12-NOV-20 08:00	3	7	days	EHT
	5	05-NOV-20 12:30	12-NOV-20 08:00	3	7	days	EHT

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2526515 were received on 05-NOV-20 15:40.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2526515-COFC

COC Number: 15 -

Page of

Report To	Contact and company name below will appear on the final report
Company:	Ensero Technologies
Contact:	Rachel Martz
Phone:	306 978 3111
Company address below will appear on the final report	
Street:	104-411 Downey Road
City/Province:	Saskatoon, SK
Postal Code:	S7H 1R1
Invoice To	Same as Report To
	Copy of Invoice with Report
Company:	Ensero Technologies
Contact:	Mel Shotenski

Report Format / Distribution	
Select Report Format:	
Quality Control (QC) Report with Report	
Select Distribution:	
Email 1 or Fax	rmartz@ensero.com
Email 2	rkleinberger@ensero.com
Email 3	kpiecowye@ensero.com

Invoice Distribution	
Select Invoice Distribution:	
Email 1 or Fax	rmartz@ensero.com
Email 2	ap@ensero.com

Project Information	
ALS Account # / Quote #:	Q81011
Job #:	ETK20YT00042
PO / AFE:	
LSD:	
ALS Lab Work Order # (lab use only)	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact:	**Sampler:**

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R]

PRIORITY (Business Days): 4 day [P4] | 3 day [P3] | 2 day [P2]

EMERGENCY: 1 Business day [E1] | Same Day, Weekend or Statutory holiday [E0]

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NO2-IC-N-SK	NO3-IC-N-SK	NH3-F-CL	C-DIS-ORG-CL	MET-D-CCMS-SK	SO4-IC-N-SK	SULPHIDE-CFA-ED	Number of Containers
					P	F/P	F/P		P			
	Trial E1	5-Nov-20	12:00	Water	R	R	R					2
	Trial G2	5-Nov-20	12:05	Water	R	R	R					2
	Trial M3	5-Nov-20	12:10	Water	R	R	R					2
	Trial C4	5-Nov-20	12:15	Water	R	R	R					2
	W12 Water	5-Nov-20	12:30	Water	R	R	R	R	R	R	R	5

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?

Are samples for human drinking water use?

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Please add cbrizinski@ensero.com and importer@contango.ehsdata.com to emails.

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
6					

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
	05 Nov 2020	14:00		05/11/20	3:40			5:40

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Appendix S – 2020 Socio-Economic Report

2020 Socio-economic Report

Prepared by:
Minto Explorations Ltd.
March 2021

1.0 Introduction

This report has been prepared by Minto Explorations Ltd. in regard to the Minto Mine property (Mine), located in central Yukon. The following report summarizes the results of the socio-economic monitoring activities at Minto for 2020, as required by the Socio-Economic Monitoring Program Framework.

The Minto Mine Socio-economic Monitoring Program (Minto Explorations, Yukon Government, Selkirk First Nation, 2014) is a program that was developed collaboratively between the Selkirk First Nation and the Yukon Government to monitor the socio-economic effects of Minto Mine. The Minto Mine Socio-economic Monitoring Program (SEMP) is a multi-year monitoring program that includes an implementation plan, baseline information and a community-based survey (conducted by SFN and YG) and information from SFN and YG relating to Policy Crossing in the Yukon. Information collected through the SEMP is reviewed in the event of the preparation of an assessment report pursuant to a new quartz mining licence.

Not all of the data that has been requested from historical records is available. Going forward, Minto will collect the required information and ensure that it is stored in a manner which facilitates information for the annual reports. Minto has given direct effects a critical and citizen historical perspective to the socio-economic effects of the mine and to the implementation of the SEMP.

1.1 Factors at Minto that may have a socio-economic impact

The Minto Mine is located approximately 160 km northwest of the communities north of Whitehorse in the Yukon Territory. The Minto Mine is owned by Minto Metals Corp. (MMC). The Minto Mine operation agreement (OA) between Selkirk First Nation and Minto was signed upon and effective as of the commencement of commercial production on January 1, 2007. The agreement addresses a number of socio-economic issues including employment, and royalties at the Minto Mine as Selkirk First Nation land.

The economics of Policy Crossing is located along the Klondike Highway on the banks of the Pelly River, 350 kilometres northwest of Whitehorse. Pelly Crossing is home to 299 people (Yukon Bureau of Statistics, 2016) and is the largest community in the Selkirk First Nation (SFN) traditional territory. Other communities in the Selkirk First Nation traditional territory are Mayo (402 residents total additional incumbent of population 2016 years and over in Pelly Crossing is 2016 census), Carmacks (504 residents) and Faro (365 residents). The Selkirk First Nation has a population of approximately 1,000 people and is one of eight self-governing First Nations in the Yukon.

The city of Whitehorse is the capital of Yukon and is the largest community in the territory with a population of 30,000 (2019 Bank Canada) at 70,000 in the Whitehorse Census Subdivision. The remote location and access to Minto Whitehorse is fly in fly out (FIFO) camp operation. In Yukon, the Minto Mine is the largest private sector employer and contributor to the GDP. The mine also contributes to the economy with many transferred goods and services.

The advanced and post-secondary education and training opportunities available in Yukon are generally lower than opportunities available in southern Canada. Yukon College is the territory's only post-secondary institution. Yukon College is a community college that provides a wide range of academic and vocational programs. Yukon College has campuses in Whitehorse, Dawson City, Mayo, Pelly Crossing and Watson Lake. Yukon College is the territory's only post-secondary institution. Yukon College is a community college that provides a wide range of academic and vocational programs. Yukon College has campuses in Whitehorse, Dawson City, Mayo, Pelly Crossing and Watson Lake.

1.2 Mines and Surrounding Activity Statistics

The below table (Table 1.1) summarizes the activity statistics for Minto Whitehorse and other mines in the Yukon Territory. Minto Whitehorse is the only mine in the Yukon that, while also property changed, had minimum that could have resulted in an incident, medical aid that. Others mines in the Yukon Territory are all underground mines, with the exception of Minto Whitehorse, which is an open pit mine.

Table 1.1 Mines and Surrounding Activity Statistics

Incident Type	Total Incidents	Mine	Contractors
Lost Time	0	0	0
Medical Aid	0	0	0
Environmental	0	0	0
Property	0	0	0
Serious	0	0	0

2.1.1 Average employment income by residence for Minto employees (2016)

Mine	Policy Crossing	Whitehorse	Yukon	Rest of Canada
Full November 31, 2020	44	28	16	31

3.0 Employment

Minto Mine has a preferential hiring recruitment approach as outlined in our Cooperation Agreement (CA) with the Selkirk First Nation. Selkirk First Nation hiring receives the following Numbers are then advertised and offered in the following order of priority: SFN, NTT (Northern Tutchone), Other Incoming Members, Other Yukon First Nations.

3.1 Employment Income and Distribution

The following tables and graphs provide trend figures that demonstrate salaries are higher for those who are in major centres and lowest for residents of small communities, such as Pelly Crossing.

At the end of 2019, 32 of the 79 employees who are the management staff majority live in Whitehorse.

The professional and paraprofessional staff have been residents of the rest of Canada (Non-Yukon) and Whitehorse. Pelly Crossing has the lowest number of staff. Most of the employees who live in Whitehorse are professional and paraprofessional staff. Most of the employees who live in Pelly Crossing have been hiring their progress and only employed locally.

Other factors for this trend statistics are the lack of potential candidates pools in Yukon of professional and managerial experienced staff. Further, the post-secondary education opportunities available in Yukon are limited.

The Company operates a fly in fly out (FIFO) camp which is attractive to employees who live outside of the Yukon. The Minto Whitehorse camp is a fly in fly out (FIFO) camp. Employees in Minto Whitehorse camp are provided with room and board without rotation, driving a team way hotels, new however, they are committed to living from the Yukon. Studies has 90% of their staff from the Yukon and 10% from outside the Yukon (Minto Mine, 2020).

3.2 Annual employment income for Mines and subsidiaries

Contractor	Policy Crossing	YTN	Whitehorse	Yukon	Rest of Canada	Average
Full-time	$72,000	0%	$72,000	$72,000	$72,000	$72,000
Part-time	$0	0%	$0	$0	$0	$0
Mines	$60,00	0%	$72,00	$72,00	$72,00	$78,00
Subsidiaries	$72,00	0%	$72,00	$72,00	$72,00	$72,00
Total	$72,00	0%	$72,00	$72,00	$72,00	$72,00

3.3 Mine Employment by Various Incidents

Mines is located in eastern Canada including that their talent pool in the Southern Governor, Northern Territories, Nunavut, Northwest Territories, Yukon and Alaska.

Most Yukon residents are employed in the mining and related industries, driving a team way hotels, new however, they are committed to living from the Yukon. Studies has 90% of their staff from the Yukon and 10% from outside the Yukon (Minto Mine, 2020).

3.3 Annual employment income for Mines and subsidiaries

Contractor	Policy Crossing	YTN	Whitehorse	Yukon	Rest of Canada	Average
Full-time	$72,000	0%	$72,000	$72,000	$72,000	$72,000
Part-time	$0	0%	$0	$0	$0	$0
Mines	$60,00	0%	$72,00	$72,00	$72,00	$78,00
Subsidiaries	$72,00	0%	$72,00	$72,00	$72,00	$72,00
Total	$72,00	0%	$72,00	$72,00	$72,00	$72,00

3.4 Mine Employment by Region

3.5 Mine Employment by Residency

3.6 Contractor employment by residency

As of December 31, 2020	Pelly Crossing	Whitehorse	YTN	Other Yukon	Other Canadians	Total
Full-time	0	0	0	0	0	0
Casual	0	0	0	0	0	0
Part-time	0	0	0	0	0	0
Payroll	0	0	0	0	0	0
Total	0	0	0	0	0	0

3.7 Mines new hires by group

As of December 31, 2020	Pelly Crossing	YTN	Whitehorse	Other Yukon	Other Canadians	Total
Mines	0	0	0	0	0	0
Contractors	0	0	0	0	0	0
Total	0	0	0	0	0	0

3.8 Mine employment by gender and group

As of December 31, 2020	M%	F%	M#	F#	Other Yukon	Other Canadians	Total
Mines	0	0	0	0	0	0	0
Contractors	0	0	0	0	0	0	0
Skilled	0	0	0	0	0	0	0
Semi-skilled	0	0	0	0	0	0	0
Entry-level	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0

3.9 Contractor employment by group

As of December 31, 2020	M%	F%	M#	F#	Other Yukon	Other Canadians	Total
Mines	0	0	0	0	0	0	0
Contractors	0	0	0	0	0	0	0
Skilled	0	0	0	0	0	0	0
Semi-skilled	0	0	0	0	0	0	0
Entry-level	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0

3.2 Voluntary Exits

From the June 2019 acquisition and to the end of 2019, there was only 1 voluntary exit which was a Yukon resident. There were no exits in 2020. Minto has a low turnover rate and has had no exits since the mine was first in June since transition in 2019 and continued in the staffing at the camp as period at Minto. We had several employees return who previously worked at the mine and have since moved to other jurisdictions.

4.0 Business

As part of Mines and SFN's cooperation agreement there is a requirement for the company to provide preferred opportunity notification to SFN to negotiate and potentially be awarded a contract for goods and services. Minto Mine has established a procurement process to ensure that SFN is aware of the benefits of business opportunities that Minto is not privy to. As such, this section summarizes expenditures by the company that is the primary vendor and does not account for SFN business opportunities or joint ventures.

The six rights of procurement must be met in selection of such vendor relationships.

Right Price (cost effectiveness)
Right Person (value proposition)
Right Quantity and Quality (high quality and ability to supply)
Right Time (ability to meet schedule and delivery, however, value added service)
Right Location (proximity to value added)
Right price (competitive commercial price)

Procurement processes involved see:

Company Name	Service Provided
AFS Petroleum	Fuel & Delivery
Bell	Flights
Bell Air	Helicopter Maintenance
BLR Environmental	Environmental Services
Brenntag Canada	Chemicals
Brenntag Pacific	Water Waste Wtr Lithium
C.A.M Distributors	Supplies
Cardium Transportation	Waste, supply & related supplies
Carmacks Enterprises	Transportation
Carmacks Enterprises	Camp Accommodation Services Per Diem
Cintas	Uniforms
Cole Bros.	Fuel Fuel and Lubricants
Cubex Construction	Surface Surface Mining Equipment
Dawson Trucking	Mine Haul and Mining services
Driftwood Drilling	Diamond Drilling
Ellerbeck Mining	Surface Mining Equipment
Emil Anderson	Mine Construction
Enviroclean	Environmental reclamation
Fastrac Fuels	Fuel
Gibson Energy	Water Waste Wtr Lithium
Gold Belt	Surface Mining Equipment
Hemmera	Environmental Services
Hertz	Vehicle, supply & related supplies
Hydrocarbon Contractors	Surface Surface Mining Equipment
Kluane Drilling	Diamond Drilling
Kudz Ze Kayah	Camp Accommodation Services Per Diem
Maksa Mining	Surface Mining Equipment
Mammoth Exploration Ltd.	Surface Mining Equipment
Mammoth Exploration Ltd.	Surface Mining Equipment
Mayo Logistics	Freight services
Midnight Sun Drilling	Drill and mobile drilling
Minto	Electrical conducting and supplies
Minto Explorations	Mine Construction
Nordwind Transportation	Vehicle, supply & related supplies
Northern Mechanical & Supply	Mine Construction
Pacific Coast Transportation	Freight
Peregrine Diamonds	Fuel
Polaris Drilling	Diamond drilling
Pelly Construction	Surface mining road construction/maintenance
Quantum Murray	Chemicals Chemicals
Quantum Murray Mine	Chemicals Chemicals
Rimrock Logistics	Freight services
Selkirk First Nation	Camp Accommodation Services Per Diem
Selkirk First Nation	Mine Construction
Selkirk First Nation	Mine Construction
Selkirk First Nation	Mine Construction