2018 ANNUAL RECLAMATION REPORT for Quartz Mining License QML-0004

Name of Property: **Sä Dena Hes Mine**

Company Name: **Sä Dena Hes Operating Company c/o Teck Resources Limited**

Prepared by: Gerry Murdoch, (250) 427-8408

March 31, 2019

Teck

EXECUTIVE SUMMARY

The Annual Reclamation Report for 2018 for the Sä Dena Hes (SDH) mine site was prepared by Teck Resources Limited on behalf of Sä Dena Hes Mining Corporation, as required in accordance with Yukon Quartz Mining License QML-0004. This annual report describes the progress of closure and reclamation related activities at the Sä Dena Hes Mine in 2018.

The Sä Dena Hes (SDH) property is the site of a former lead-zinc mine that operated from 1991 to 1992. The property is located 45 km north of Watson Lake in the Yukon Territory and is owned by the Sä Dena Hes Mining Corporation which is a joint venture between Teck Resources Limited (Teck) and Pan-Pacific Metal Mining Corp., a wholly-owned subsidiary of Korea Zinc. Teck is the operator under the joint venture agreement for the site.

Permanent closure and decommissioning activities commenced in 2013 and were completed in 2015. Reclamation activities conducted at the site includes applying a simple cover, using natural glacial till materials, to most mine disturbed areas limiting the release of contaminants to the air, water and land. Surface contouring and vegetation have been completed for protection against water erosion. A revegetation program was implemented once the cover system was finished in 2015.

In 2018, samples from all of the required water quality monitoring stations met the standards in licence QZ16-051 for all water quality parameters. Water quality monitoring was also conducted under the Adaptive Management Plan (AMP) as part of the new Water Licence. Although there were a few specific performance threshold exceedances, none triggered further action.

Revegetation monitoring was conducted and the overall survival rate was high, with greater than 85% in 10 of the 14 plots. Survival rate at other plots ranged from 50% to 70%.

Physical work conducted at the site was limited to maintenance of culverts.

Physical and environmental monitoring will continue in 2019. Additional work in 2019, pending regulatory approves and timeline, is to apply a 30cm till cap on 1,384 m^2 identified in the mill area as per the 2018 Revegetation Report.

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2. Revegetation Monitoring at the Reclaimed Sä Dena Hes Mining Site, dated October 2018, prepared by Laberge Environmental Services

1.0 INTRODUCTION

The Sä Dena Hes (SDH) property is the site of a former lead-zinc mine that operated from 1991 to 1992. The property is located 45 km north of Watson Lake in the Yukon Territory and is owned by the Sä Dena Hes Mining Corporation which is a joint venture between Teck Resources Limited (Teck) and Pan-Pacific Metal Mining Corp., a wholly-owned subsidiary of Korea Zinc. Teck is the operator under the joint venture agreement for the site.

Teck submitted notice to begin "Permanent Closure" to the Ministry of Energy, Mines and Natural Gas (EMR) on February 17, 2012. The Detailed Decommissioning and Reclamation Plan (DDRP) (Teck 2012, 2013) was revised to plan for permanent closure. Permanent closure and decommissioning activities were carried out in 2014 and in 2015. A final DDRP was submitted in August 2015 (Teck, 2015) to account for amendments issued in 2014 and 2015. In 2015 Teck amended the Quartz Mining License (QML-0004), which expires on December 31, 2040. The current status of the site is Permanent Closure and Reclamation.

The objectives of the decommissioning and reclamation plan are to ensure the:

- Protection of public health and safety;
- Implementation of environmental protection measures that minimize adverse environment impacts;
- Ensuring land use commensurate with surrounding lands;
- Post closure monitoring of the site to assess effectiveness of closure measures for the long term.

Reclamation activities conducted at the site includes applying a simple cover, using natural glacial till materials, to most mine disturbed areas limiting the release of contaminants to the air, water and land. Surface contouring and vegetation have been completed for protection against water erosion. A revegetation program was implemented once the cover system was finished in 2015.

The Yukon Water Board regulates water management of the mine site. Water Use Licence QZ16-051 addressing permanent closure came into effect on April 1, 2017.

2.0 2018 DECOMMISSIONING AND RECLAMATION ACTIVITIES

The QML and Water Use Licence both require post-reclamation environmental monitoring, physical/geotechnical inspections, and maintenance of constructed/engineered structures to be completed under the *Environmental Monitoring, Surveillance and Reporting Plan* (EMSRP) and Adaptive Management Plan (AMP).

The following summarizes the activities with details further discussed within the subsequent sections:

- Surface Water and Groundwater Quality Monitoring
  - Bi-monthly/quarterly surface water and groundwater monitoring and sampling was conducted from January to December conducted using helicopter/snowmobiles in the

winter months and an all-terrain vehicle in the snow free months as per the 2018 Water Use Licence QZ16-051.
    - Supplementary sampling was conducted as part of the Surface Water/Groundwater Interaction Study. The results are submitted with the Water Licence Annual report.
- Aquatic Resources Monitoring
    - The Environmental Effects Monitoring program under QZ16-051 was conducted in September 2018.
- Terrestrial Monitoring
    - The 2018 re-vegetation assessment was completed in July to assess the 2015 site planting program.
- Physical/geotechnical inspections
    - Spring and fall routine site inspection of physical/geotechnical features was completed by Teck and the site care taker.
    - The annual 2018 Dam Safety Inspection (DSI) was completed by the engineer of record in July.
    - Survey completed on the North Dam settlement gauges in July.
- Maintenance of constructed/engineered structures or access road
    - Beaver dam in the North Creek channel was removed in July.

3.0 2019 DECOMMISSIONING AND RECLAMATION ACTIVITIES

There are no planned physical activities in 2019 other than monitoring the newly reclaimed areas and completing maintenance of any areas that may be identified following freshet.

The post closure monitoring as outlined in the EMSRP and AMP will be conducted in 2019 as per the Water Licence issued in April 2017.

A small area of 1,384 m^2 at the mill site containing high metal concentrations was confirmed by LaBerge Environmental Services and delineated in 2018. Engineering and planning will be conducted in 2019 to cap this are in late 2019 or 2020.

4.0 EFFECTIVENESS OF THE REMEDIATION MEASURES

All the physical remediation and revegetation activities were completed in 2015 as such it is too early to determine the effectiveness of the remediation measures conducted. It is anticipated that the EMSRP will assist in determining the effectiveness of the remediation measures in the next five years.

5.0 MAP SHOWING THE STATUS OF ALL DECOMMISSIONING AND RECLAMATION ACTIVITIES

All the physical remediation and revegetation activities were completed in 2015. In the 2015 Annual Report, several drawings were included within the AMEC 2015 As-built report. Due to the limited physical work and revegetation completed in 2018 there are no updated maps included within this report.

6.0 INSPECTION OF ENGINEERED STRUCTURES

The 2018 geotechnical inspection of the structures and features associated with the Tailings Management Area at SDH completed by SRK on July 24, 2018. The inspection report *Sä Dena Hes Mine, Yukon Territory 2018 Dam Safety Inspection, dated October 2018,* submitted to EMR on November 23, 2018.

The report presents SRK's observations of the following structures and features, identifies any deficiencies and provides recommendations where appropriate:

- The North Dam;
- The decommissioned North Creek Dyke and Second Crossing;
- The relocated Camp Creek Channel;
- The North Channel and South Channel;
- The Sediment Retaining Structure (SRS);
- The Burnick Portals (1200 and 1300) and Waste Rock Dumps;
- The Jewelbox and Main Zone Waste Rock Dump and Portal areas.

The South and Reclaim Dams including the tailings were decommissioned in 2014. The Camp Creek Diversion and Exit Chute were decommissioned in 2015. The North Creek Dyke and spillway including a second crossing culvert system on North Creek downstream below the dyke were decommissioned in 2015.

The North Dam remains as an earthen embankment that retains the stored tailings. A variable depth till cover was placed over the tailings in 2014 as a growth medium and to control the migration of windblown tailings. No resloping of the downstream dam face was needed.

The SRS is an approximately 5 m high berm that was formed during the decommissioning and removal of the South Dam. The berm was designed to retain sediment in runoff from the till tailings cover and incorporates a riprap lined spillway. The spillway has capacity for the 1 in 1000-year flood event.

The Burnick 1200 and 1300 Portals were capped in 2015 with locally available waste rock and graded with a gently sloped face to provide long term stability. The crests of the associated waste rock dumps were recontoured to provide added stability. No resloping of the downstream face of the dumps was required.

The 2018 Dam Safety Inspection Deficiencies:

- North Dam - 2018-01 NDW-2B and 1A missing caps – Install plastic caps and label – Completed October 18, 2018 - Closed
- North Creek Channel - 2018-02 Beaver Dam at inlet channel – Remove beaver dam channel – Completed July 26, 2018 - Closed
- Jewelbox Waste Rock Dump – 2018-03 Erosion Gully in Northeast corner – Installed additional monitoring pins – Completed July 26, 2018

7.0 RESULTS OF STUDIES AND MONITORING PROGRAMS

7.1. Water Licence Monitoring

The water quality standards and monitoring requirements are managed under Water Licence QZ16-051 Effective Date April 1, 2017 with the expiry date of December 31, 2040.

The licence describes the water quality monitoring program for post closure monitoring, which is the applicable program for the current status of the SDH (Permanent Closure and Reclamation). The water quality program outlines the sampling sites, frequency and required water quality parameters.

As required by Licence QZ16-051, water quality data is reported quarterly to the Yukon Territory Water Board. The 2018 monitoring results are discussed in the annual report prepared by Alexco Environmental Group entitled *Sä Dena Hes – 2018 Annual Report Yukon Water Licence QZ16-051 dated March 2019* (Alexco, 2019). The report is included as Attachment 1. Surface and groundwater water quality monitoring conducted under the AMP are also included in the water licence monitoring requirements. The AMP describes a means of interpreting data to indicate if water quality is changing from conditions observed over the past 20 years. The plan also describes when and how changes in water quality require a response. In 2018, there were a few instances that concentrations triggered AMP specific performance threshold exceedances that required a response.

In summary, samples from all of the required water quality monitoring stations met the receiving water quality standards in the licence with the exception of selenium at MH-12 during the April 2018 event. This triggered following the steps outlined in the AMP which involved data validation and a full synoptic event during the June bi-monthly sampling and no exceedance were observed. A few other instances occurred where the AMP triggered a data review including:

- MW13-01 (downgradient of the 1380 portal) had concentrations of dissolved zinc and cadmium triggered specific threshold 1 (ST1) twice which includes 3 consecutive monitoring results with progressively increasing concentrations. Despite the increase, the concentrations remain well below the ST2 concentrations and are within historical ranges at this location. Additional sampling of locations upstream and downstream also confirmed that levels of these metals were stable and below the AMP thresholds. As such, no further action was deemed necessary.
- In February 2018, site MH-02 (North Dam Seepage) exceeded the AMP Specific Threshold 2 (ST2) for total lead (0.013 mg/L vs. 0.007 mg/L ST2 threshold). After review, it was determined that the sample was not representative, as it was taken below the pipe in very turbid water; Total suspended solids measured at 49 mg/L was much higher than that of the historical median which is <4 mg/L. All subsequent samples collected at the receiving environment monitoring stations had lower concentrations for both total and dissolved lead. As such, no further AMP action was deemed necessary.
- Three consecutive samples collected at MW13-06, downstream from the Burnick

Portal, had increasing dissolved zinc concentrations, triggering the ST1 threshold. Despite the gradual increase in the dissolved zinc concentrations at MW13-06, the results were a five-fold lower than the ST2 thresholds, and no increasing trend was observed either upstream or downstream of the well. As such, no further AMP actions were deemed necessary.

7.2. Vegetation Monitoring

In 2015, a total 27,000 plugs were planted of *Salix alaxensis, S. bebbiana, S. barclayi, S. planifolia* and *Populus balsamifera* were installed in several discrete areas throughout the reclaim, south pond, north pond and mill areas. The remaining open areas of these sites were planted with approximately 70,000 alder (*Alnus viridis crispa*) plugs. The alder were planted at a much lower density than the other tree species.

Revegetation monitoring was conducted in 2018 by Laberge Environmental Services. The detailed results of the monitoring are included in the attached report entitled *"Revegetation Monitoring at the Reclaimed Sä Dena Hes Mining Site, 2018"* dated October 2018 (Laberge, 2018). In summary, 14 permanent tree-monitoring plots were established and monitored from July 24th to July 27th, 2018. Overall the survival rate was high with greater than 85% in 10 of the 14 plots. The survival rate at the other plots ranged from 50% to 70%.

In 2015, grass was hand seeded at an application rate of 44 kg/ha, in various areas throughout the mine site. A low elevation seed mix was used on the reclaimed roads and the lower borrow pit. A high elevation seed mix was used at the Burnick and Jewel Box waste rock zones. Seven grass monitoring plots were established. Overall the grass growth was gradually increasing in all plots since the assessment in 2018.

Photograph 1: Grass growing in seeded area

Following up on the high metal concentration documented in the soil assessment at the mill site plots in 2017, and observations of the stressed and dying trees, a step-out soil-sampling program conducted in 2018 to determine the extent of contamination. The locations and methods described in Laberge 2018. An area of 1,384 m^2 has been identified and mapped at the mill site requiring a supplementary cap of 30cm of till material.

8.0 INVASIVE PLANTS

Similar to 2017, the most common invasive species was Hawksbeard (*Leucantbenum vulgara*) and was generally found sporadically along the road sides within the study area and near monitoring plot VMP-9 at the landfill site (Laberge 2018). As in 2017 individual white sweetclover plants (*Melilotus alba)* were identified near the boneyard site again in 2018 and were removed form site and disposed appropriately.

9.0 SPILLS AND ACCIDENTS

There were no reportable spills or accidents in 2018.

10.0 WILDLIFE INCIDENTS AND OTHER ACCIDENTS

There were no direct wildlife incidents or other accidents reported in 2018 other than notable activity of beavers plugging road culverts along the main access road and North Creek Cannel.

11.0 SITE IMPROVEMENTS TO ADDRESS SEDIMENT AND EROSION

There were no signs of major erosion in any the capped areas in 2018. Some minor erosion has occurred in areas where surface water is collecting and forming into small streams. The capping material contains a component of larger stones that are self-armoring the small steams and reducing the overall erosion. The small streams will be reassessed in 2019 to determine if any remedial action is required.

12.0 CLOSING

I trust this reports meets the requirements under Part 5, Section 11.4 of QML-0004. Please contact Gerry Murdoch at 250-427-8408 gerry.murdoch@teck.com if you have any questions regarding this report.

Gerry Murdoch
Project Manager
Teck Legacy Properties

13.0 REFERENCES

Alexco. (2018). *Sa Dena Hes Mine - Post-Reclamation Adaptive Management Plan, dated February 12, 2018.*

Alexco. (2019). *Sä Dena Hes – 2018 Annual Report Yukon Water Licence QZ16-051 dated March 2019.*

Laberge. (2018). *Revegetation Monitoring at the Reclaimed Sä Dena Hes Mining Site, 2018.*

Teck. (2017). *Sa Dena Hes Mine – Environmental Monitoring, Surveillance and Reporting Plan, June 28, 2017.*

Teck. (2018). *Water Licence #QZ16-051 – Sa Dena Hes Mine – Submission of Revised Adaptive Management Plan, dated March 7, 2018.*

APPENDED REPORTS

1. Sä Dena Hes – 2018 Annual Report Yukon Water License QZ16-051 dated March 2019, prepared by Alexco Environmental Group
2. Revegetation Monitoring at the Reclaimed Sä Dena Hes Mining Site, 2018 dated October 2018, prepared by Laberge Environmental Services

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SÄ DENA HES

2018 ANNUAL REPORT YUKON WATER LICENCE QZ16-051

Final

March 2019

Prepared for:

YUKON WATER BOARD

March 22, 2019

Yukon Water Board
attn.: Chairperson
Y106-419 Range Road
Whitehorse, YT

Regarding: 2018 Annual Report Yukon Water Licence QZ16-051

On behalf of Teck Resources Limited and in accordance with Water Use Licence QZ16-051 Part H Clause 65 please find attached the required report for 2018 for the Sä Dena Hes Mine. Additionally, appended to this report is the Surface Water and Groundwater Interaction Study, which fulfills Part E Clause 37 of the licence.

If you have any questions regarding this report, please contact the undersigned at (867) 668-6463.

Sincerely,
Alexco Environmental Group

Andrew MacPhail
Environmental Manager

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1 INTRODUCTION

The Sä Dena Hes (SDH) property is the site of a former lead-zinc mine that operated from 1991 to 1992. The property is located 45 km north of Watson Lake (Figure 1-1) in the Yukon Territory and is owned by the Sä Dena Hes Mining Corporation which is a joint venture between Teck Resources Limited (Teck) and Pan-Pacific Metal Mining Corp., a wholly-owned subsidiary of Korea Zinc. Teck is the operator under the joint venture agreement for the site.

The Yukon Waterboard regulates water management of mine sites within Yukon Territory through the use of site-specific Water Use Licences. Water Use Licence QZ16-051 (Appendix A), addressing permanent closure came into effect on April 1, 2017. A requirement of QZ16-051 is that annual reports addressing the terms of the licence be submitted to the Water Board. Alexco Environmental Group (AEG), was retained by Teck to prepare the 2018 report.

475,000

500,000

6,725,000

6,700,000

6,675,000

N

W

E

S

PROJECT LOCATION

QUARRY

ROAD

ACCESS

MAIN

ROBERT CAMPBELL HIGHWAY

ALASKA HIGHWAY

WATSON LAKE

1:250,000 *When printed on 11 by 17 Inch paper*

0 5 10 15

Kilometers

Quartz Claim Boundary

Primary road

Main Access Road

Teck

SÄ DENA HES MINE
2018 ANNUAL REPORT
YUKON WATER LICENSE QZ16-051

FIGURE 1-1
PROJECT LOCATION

National topographic Data Base (NTDB) compiled by Natural Resources Canada at a scale of 1:250,000. Reproduced under license from Her Majesty the Queen, as represented by the Minister of Natural Resources Canada. All rights reserved. Land Lease and Claim boundary obtained from SRK, August 2014.
Main Map Datum: NAD 83; Projection: UTM Zone 9N.

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(*Last edited by: amatlashevska;6/16/2016/11:40 AM*)

2 WATER USAGE AND DISCHARGE

Water usage requirements are presented in Part B- Water Use and Deposit of Waste of licence QZ16-051 (Appendix A). No water was withdrawn from any wells on site for industrial or domestic use in 2018.

The Reclaim Dam and the South Dam were both decommissioned in 2014. Decommissioning activities involved lowering the South Dam and constructing a spillway through the dam to form a Sediment Retaining Structure (SRS). Water ponded with the SRS overflows the spillway when water levels reach the invert of the spillway. The Reclaim Dam was completely removed, and Camp Creek is now conveyed in a constructed channel through the former Reclaim Pond footprint. The conditions in QZ16-051 does not present any provisions for regulating the amount of water discharged from these locations.

3 CLOSURE STATUS

Teck submitted notice to begin "Permanent Closure" to the Ministry of Energy, Mines and Natural Gas on February 17, 2012. The Detailed Decommissioning and Reclamation Plan (DDRP) (Teck 2012, 2013) was revised to plan for permanent closure. Permanent closure and decommissioning activities were carried out in 2014 and in 2015. A final DDRP was submitted in August 2015 (Teck, 2015) to account for amendments issued in 2014 and 2015. In 2015 Teck amended the Quartz Mining Licence (QML-0004), which expires on December 31, 2040. The current status of the site is Permanent Closure and Reclamation.

Reclamation activities at SDH were completed in 2015 and all reclamation activities have been documented in the aforementioned submissions.

Environmental Monitoring and Adaptive Management Planning are part of a comprehensive system of identifying and managing potential adverse effects through the post-reclamation phase of the SDH Mine. Post-reclamation environmental monitoring, physical/geotechnical inspections, and maintenance of constructed/engineered structures will be undertaken at the site in the post-closure period as described in the Environmental Monitoring, Surveillance and Reporting Plan (EMSRP, 2017) and WUL QZ16-051.

4 WATER QUALITY MONITORING

The Water Quality Monitoring Program is a key monitoring program for the post-reclamation condition of the SDH mine site. The water monitoring program includes monitoring of the discharge sources, downstream stations which are potentially influenced by mine discharge (compliance stations), and downstream reference stations which are not influenced by mine discharge.

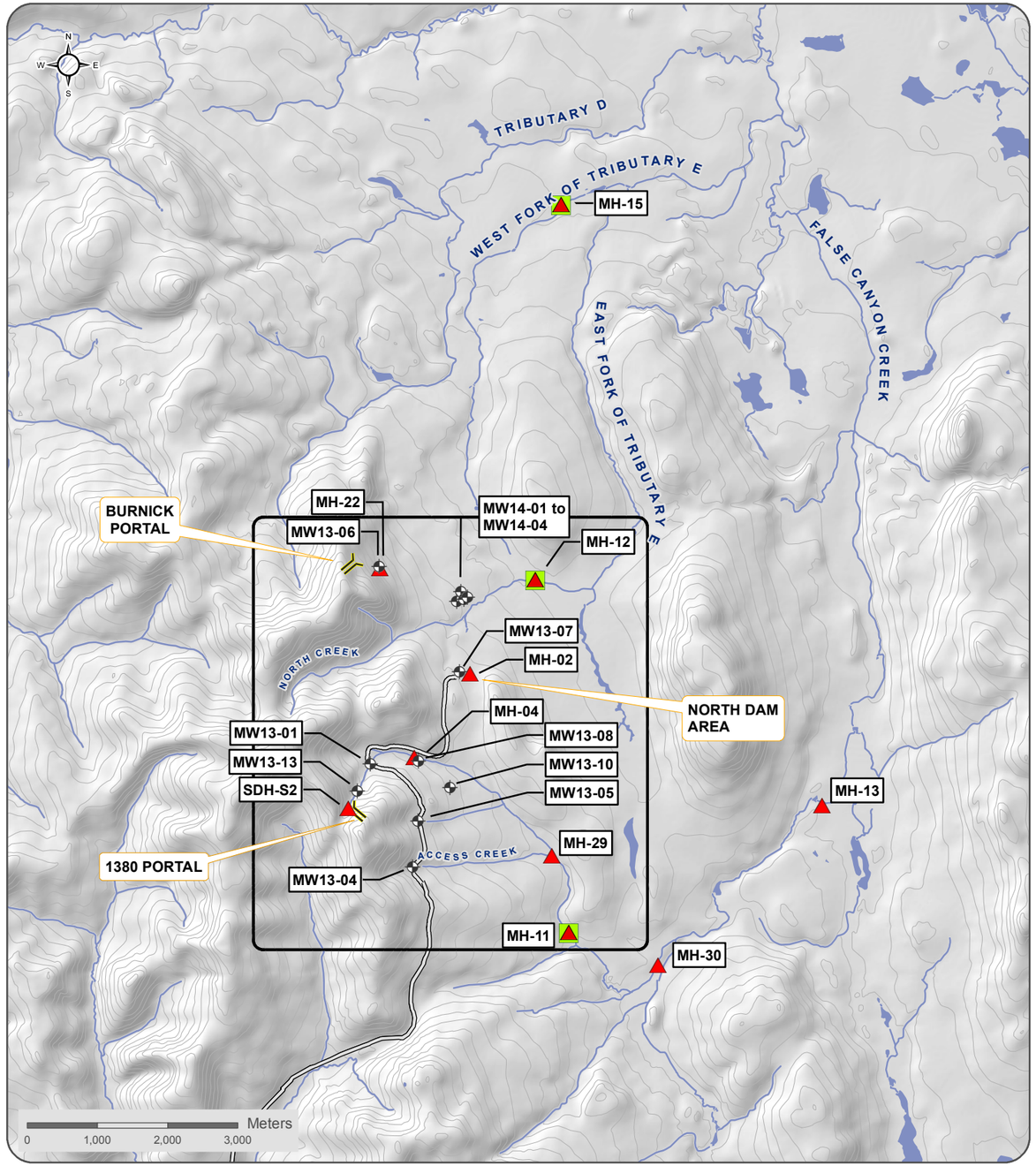
4.1 2018 WATER QUALITY MONITORING PROGRAMS AND REPORTING REQUIREMENTS

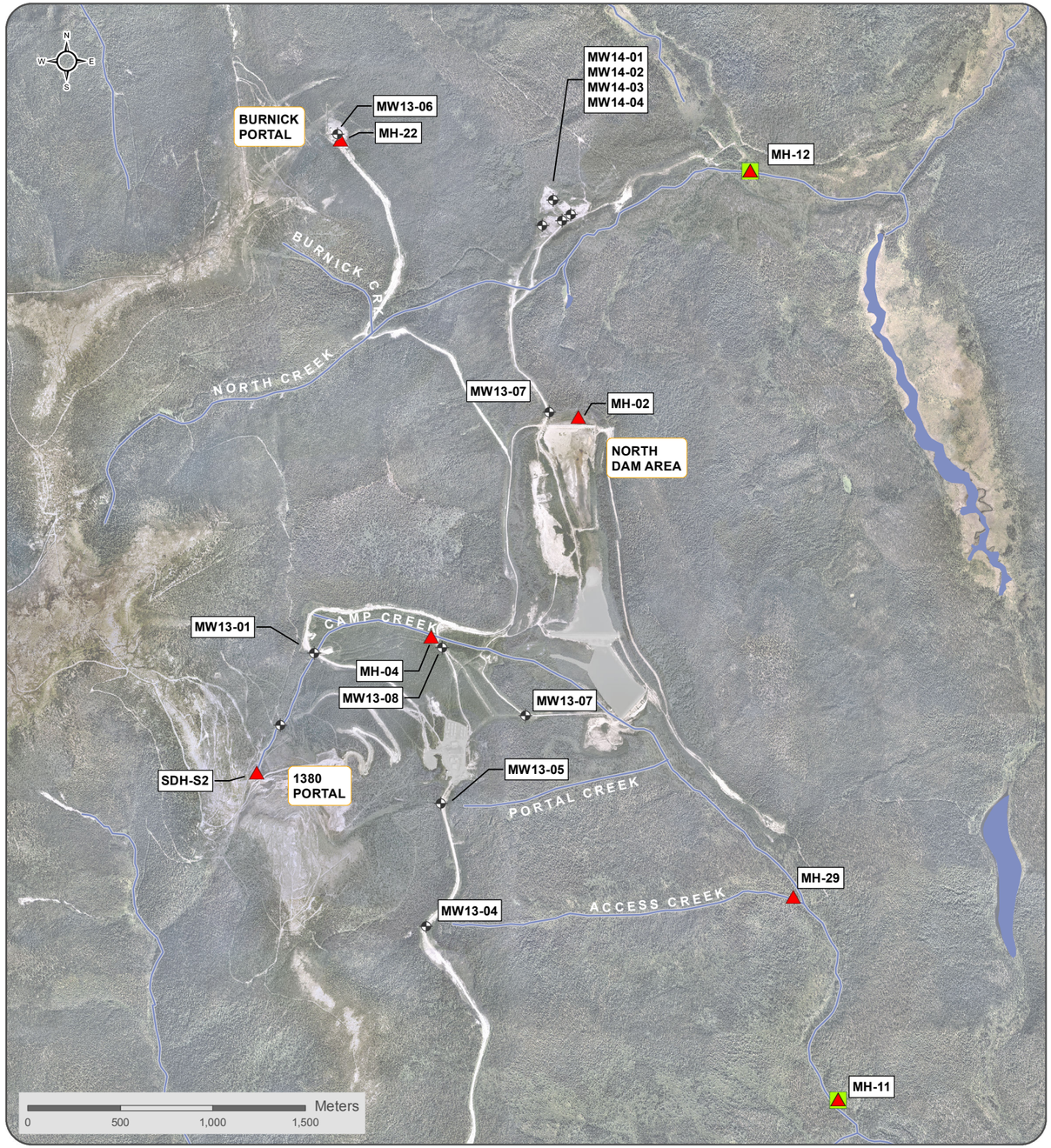
4.1.1 Water Use Licence QZ16-051

There are four water quality monitoring programs defined as part of Licence QZ16-051:

- Mine source surface water;
- Mine source groundwater;
- Landfill groundwater; and
- Contaminated sites groundwater.

Schedule A Parts 1 and 2 of Licence QZ16-051 (Appendix A) outline the surface and groundwater water quality monitoring sites, sampling schedule and analytical program. Furthermore, Part 2 defines which surface water quality stations are compliance points, discharge sources and additional surface water stations. Figure 4-1 shows the locations of the surface and groundwater water monitoring stations. Figure 4-2 shows the conceptual loading for the discharge source conceptual flow paths.





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Datum: NAD 83; Map Projection: UTM Zone 9N

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- Portal
- Receiving Surface Water Quality Station
- Surface Water Quality Station
- Goundwater Monitoring Well
- Watercourse
- Waterbody
- Access Road
- Contour

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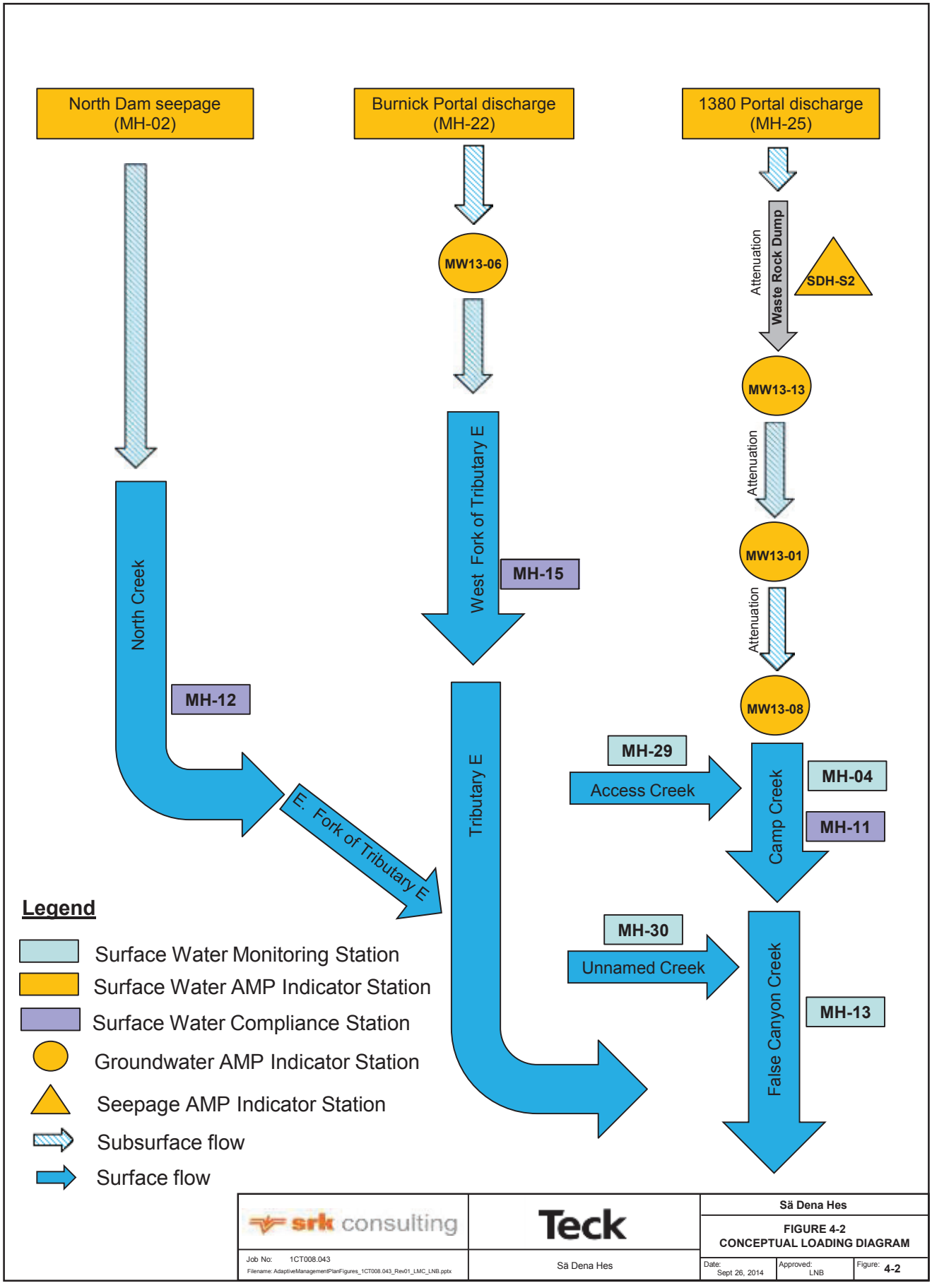
SÄ DENA HES
2018 ANNUAL REPORT
YUKON WATER LICENCE QZ16-051

FIGURE 4-1
WATER QUALITY MONITORING STATIONS

MARCH 2019

D:\Project\AllProjects\Sa_Dena_Hess\GIS\Maps\01-Overview_Maps\WQ_Stations\BOTH\Post_Rec_WQ_MonitoringProgram_20190304.mxd (*Last edited by: mducharme;3/5/2019/14:27 PM*)


North Dam seepage (MH-02)
Burnick Portal discharge (MH-22)
1380 Portal discharge (MH-25)
MW13-06
Attenuation
Waste Rock Dump
SDH-S2
MW13-13
Attenuation
MW13-01
Attenuation
MW13-08
West Fork of Tributary E
MH-15
North Creek
MH-12
E. Fork of Tributary E
Tributary E
MH-29
Access Creek
Camp Creek
MH-04
MH-11
MH-30
Unnamed Creek
False Canyon Creek
MH-13
Legend
Surface Water Monitoring Station
Surface Water AMP Indicator Station
Surface Water Compliance Station
Groundwater AMP Indicator Station
Seepage AMP Indicator Station
Subsurface flow
Surface flow
srk consulting
Teck
Sä Dena Hes
FIGURE 4-2
CONCEPTUAL LOADING DIAGRAM
Job No: 1CT008.043
Filename: AdaptiveManagementPlanFigures_1CT008.043_Rev01_LMC_LNB.pptx
Sä Dena Hes
Date: Sept 26, 2014
Approved: LNB
Figure: 4-2

Under the current water licence ten surface water monitoring stations are sampled bi-monthly. Stations MH-11 (Upper False Canyon Creek), MH-12 (East Fork of Tributary E), and MH-15 (West Fork of Tributary E) are compliance points and are monitored against the receiving water quality standards of the WUL.

The following discharge source monitoring stations are part of the monitoring program but do not have specific water quality standards under the WUL:

- MH-02 (North Dam seepage);
- MH-22 (Burnick 1200 Portal discharge); and
- SDH-S2[1] (1380 Portal discharge as seep in the downslope waste rock dump).

Additional surface water monitoring stations located downstream of the mine site are also part of the monitoring program in order to detect potential changes to baseline water quality. These comprise of:

- MH-13 (False Canyon Creek 10 km downstream of the former reclaim pond);
- MH-04 (Camp Creek headwaters above former reclaim pond);
- MH-29 (Access Creek upstream of Camp Creek); and
- MH-30 (unnamed tributary upstream of False Creek Canyon).

In this report, the water quality measured at these collections points may be compared to the generic Canadian water quality guidelines (CCME) for the protection of aquatic life or the British Columbia Water Quality guidelines for the protection of aquatic life (BCMOE) for reference purposes only.

The groundwater stations are visited and sampled on a quarterly basis. The mine source groundwater monitoring stations include three stations within the expected groundwater flow path of 1380 Portal (MW13-01, MW13-08, and MW13-13) and one within the expected flow path of the Burnick 1200 Portal (MW13-06). Monitoring at these groundwater monitoring wells began in 2013.

The landfill groundwater monitoring wells are MW14-01, MW14-02, MW14-03, and MW14-04. Monitoring of these wells was initiated in mid-2016.

The contaminated sites groundwater monitoring stations include MW13-04, MW13-05, MW13-07, and MW13-10. MW13-04 and MW13-05 are located along the Main Access Road and downgradient from the Mill site and

[1] In the past (2001 to 2014), the Main Zone 1380 Portal (MH-25), monitored the discharge. It can no longer be sampled since it was decommissioned during closure. SDH-S2 is sampled instead of MH-25, as it receives drainage from the 1380 Portal. It is present as a seep in the waste rock downslope of the portal.

Jewelbox Pit. MW13-07 is located downstream of the North Dam and reclaimed tailings impoundment area. MW13-10 is located northeast and downgradient from the Mill site. Monitoring of these stations began in 2013.

The 2018 monitoring schedule was designed to meet the requirement of the Water Use Licence (WUL) QZ16-051, which came into effect on April 1, 2017. Table 4-1 shows the sampling effort for 2018 by month for the surface water quality stations sampled bi-monthly, and by quarter for the groundwater monitoring stations. Five supplementary surface samples were collected in 2018 by Laberge Environmental for the Environmental Effects Monitoring (EEM) in September, and ten extra samples by AEG as part of the Surface Water/Groundwater Interaction Study (December). These samples are included in this summary.

Table 4-1: Surface Water Samples Collected Per Quarter

	Feb	Apr	Jun	Aug	Sep	Oct	Dec
MH-02	Sampled	Sampled	Sampled	Sampled		Sampled	Sampled
MH-04	Sampled	Sampled	Sampled	Sampled	Sampled	Sampled	Sampled
MH-11	Sampled	Sampled	Sampled	Sampled	Sampled	Sampled	Sampled
MH-12	1	1	Sampled	Sampled	Sampled	Sampled	Sampled
MH-13	Sampled	Sampled	Sampled	Sampled	Sampled	Sampled	Sampled
MH-15	Sampled	Sampled	Sampled	Sampled		Sampled	Sampled
MH-22	Sampled	Sampled	Sampled	Sampled		Sampled	Sampled
MH-29	Sampled	1	Sampled	Sampled	Sampled	Sampled	Sampled
MH-30	Sampled	Sampled	Sampled	Sampled		Sampled	Sampled
SDH-S2	dry	2	dry	dry		dry	dry

1. Frozen
2. Site Inaccessible

Table 4-2: Groundwater Samples Collected per Quarter

	Q1	Q2	Q3	Q4
MW13-01	Sampled	Sampled	Sampled	Sampled
MW13-04	Dry	Sampled	Sampled	Sampled
MW13-05	Dry	Sampled	Sampled	Dry
MW13-06	Sampled	Sampled	Not Sampled[3]	Sampled
MW13-07	Sampled	Sampled	Sampled	Sampled
MW13-08	Sampled	Sampled	Sampled	Sampled
MW13-10	Sampled[1]	Sampled	Sampled	Sampled
MW13-13	Not Sampled[2]	Sampled	Sampled	Sampled
MW14-01	Dry	Dry	Sampled	Sampled
MW14-02	Dry	Dry	Dry	Dry
MW14-03	Dry	Dry	Dry	Dry
MW14-04	Sampled	Sampled	Dry	Sampled

1. *Sampled in April 2018*
2. *Unable to access site for safety reasons*
3. *Unable to sample due to equipment malfunction*

4.1.2 Adaptive Management Plan

The Water Use Licence QZ16-051 requires submission of an updated Adaptive Management Plan (AMP) to the Yukon Water Board. Water licence QZ16-051 requires that the annual report include a detailed assessment of the parameters being measured at AMP indicator stations and identification of any additional indicator parameters that should be incorporated into the AMP. The AMP (Appendix B) was prepared by Alexco Environmental Group and submitted in June 2017 (Alexco, 2017) and revised in February 2018 due to transcription errors detected in 2017 (Alexco, 2018 and Teck, 2018).

The AMP is a critical component for evaluating and responding to emerging or changing conditions on site. The AMP describes a means of interpreting data to indicate if water quality is changing from conditions observed over the past 20 years. The plan also describes when and how changes in water quality necessitate a response. The AMP outlines the conceptual geochemical model and associated risks and identifies monitoring stations, specific indicators and associated numerical water quality specific performance thresholds. If a specific performance threshold is exceeded, the AMP outlines required responses.

Receiving environment surface water quality, mine source water, and groundwater quantity and quality are the AMP components that have been identified as having the potential for unexpected conditions during the post-reclamation period for which the DDRP may not provide adequate mitigation against potential effects to the environment or human health and safety. Any activities carried out at the site under the DDRP or the AMP are included in the Annual Report, as well as any updates to the AMP.

The objective of the mine source flow path AMP monitoring program is to detect changes from existing conditions that may have the potential to adversely affect receiving aquatic environments. Water quality is monitored to observe any potential changes indicative of loading from the North Dam, Burnick Portal and 1380 Portal. The mine source AMP indicator stations include the North Dam Seepage (MH-02), Burnick 1200 Portal Discharge (MH-22), and the 1380 Portal drainage present as a seep in the downgradient waste rock dump (SDH-S2).

The specific indicators used detect changes from existing conditions are cadmium, lead, zinc, and sulphate. Stations MH-02 and MH-22 have specific performance thresholds for sulphate and total cadmium, lead, and zinc. Stations MH-11, MH-12, and MH-15 have specific performance thresholds for sulphate, and both total and dissolved cadmium, lead, and zinc. Stations SDH-S2, MW13-01, MW13-08, and MW13-13 have specific performance thresholds for sulphate and dissolved cadmium, lead, and zinc. Station MW13-06 has specific performance thresholds for dissolved cadmium, lead, and zinc. AMP specific indicators and performance thresholds can be referenced in Appendix B.

All the stations monitored under the AMP are included in the water licence monitoring requirements. Instances where the AMP was triggered in 2018 are presented in section 4.4 for each of the three mine sources (the North Dam Seepage (MH-02), Burnick 1200 Portal Discharge (MH-22), and the 1380 Portal drainage present as a seep in the downgradient waste rock dump (SDH-S2)), for landfill groundwater monitoring and contaminated sites groundwater monitoring.

4.1.3 Water Quality Trends

Clause 65a of licence QZ16-051 states that any variances from baseline conditions or from the previous year's data should be discussed. This section of the report compares the 2018 data to the long-term trends for selected parameters and stations.

Parameters included in the discussion were selected based on the following rationale:

- pH, sulphate, and total alkalinity as indicators of acid rock drainage, sulphide oxidation, and buffering capacity;
- Hardness as it is used to calculate some WUL QZ16-051 water quality standards (e.g., cadmium, copper, lead, nickel, zinc, and sulphate) as well as some AMP thresholds;
- Parameters with levels above WUL QZ16-051 standards in 2018 (selenium[2], zinc)
- Cadmium[3] as it historically exceeded the licence standard at MH-25 between 2001 and 2014, before it was decommissioned. MH-25 can no longer be monitored therefore, SDH-S2 has been monitored instead. Although the most recently updated Canadian generic WQ guideline applies to dissolved cadmium (BCMOE), the total cadmium data are also presented since it has a longer data record.
- Silver and lead are also briefly discussed as some samples taken from receiving environment sites located upstream of the WUL compliance stations exceeded the generic Canadian water quality guidelines (CCME) for the protection of aquatic life or the British Columbia Water Quality guidelines for the protection of aquatic life (BCMOE). Comparison to these guidelines is for reference purposes only and not mandated by the WUL. Total metals are not analyzed in groundwater samples so dissolved cadmium and zinc are discussed rather than total.

[2] Selenium detection limits were higher and more variable before 2007. These high detection limits limit the interpretation of the data and therefore, only trends from 2007 data in beyond included.

[3] Cadmium analytical detection limits have decreased over time. Detection limits were higher and more variable before 2005. A few samples had concentrations at 0.002 and 0.003 mg/L prior to 2005. These were not entered as below detection limits in the database but are likely within the range of analytical error of instrumentation. Since 2005, detection limits have been as low as 0.00001 mg/L but occasionally have been higher (0.0001 mg/L) due to matrix effects. The varying limits confound interpretation of long-term trends for stations that have lower cadmium levels (e.g. MH-04 and MH-11).

4.2 METHODOLOGY

At each of the surface water monitoring stations, samples were collected for analysis of general chemical parameters, total and dissolved metals, and nutrients. Samples for dissolved metals samples were filtered in the field using 0.45 µm disposable filterware. Samples for total and dissolved metals were preserved in the field with laboratory supplied nitric acid. Samples for nutrients were collected and preserved with laboratory-supplied sulphuric acid.

At each groundwater well, samples were collected for analysis of general chemical parameters, dissolved metals, and nutrients, when sufficient water was encountered in the monitoring wells. Samples taken from the landfill monitoring wells are also analyzed for hydrocarbons (BTEX, LEPH, HEPH, VPH, PAH). Samples for dissolved metals samples were filtered in the field using 0.45 µm disposable filterware. Samples for dissolved metals were preserved in the field with nitric acid. Samples for nutrients were preserved with sulphuric acid.

In-situ water pH, conductivity, oxidation – reduction potential (ORP), and temperature were measured and recorded at each surface water station and groundwater monitoring well. Water and substrate appearance (colour, turbidity) was also noted for surface water stations and purge volumes and groundwater levels were noted for groundwater wells.

All samples were stored in coolers with freezer packs to remain cold (4°C), but not frozen, during sampling at site and during transport to ALS Environmental in Vancouver for all the sampling events. ALS Environmental is certified with the Canadian Association for Environmental Analytical Laboratories (CAEAL).

4.3 QUALITY ASSURANCE

Quality assurance/quality control measures implemented as part of this program generally consisted of:

- Collection, handling, storage and chemical analysis in accordance with "Standard Methods for Examination of Water and Wastewater" and Alexco Environmental Group protocols; and
- Establishment of Data Quality Objectives and documentation of sample variability due to natural variability and analytical variability.

The Relative Percent Difference (RPD) is used to determine variability. The RPD is the difference between the sample result and replicate result, divided by the average of the sample result and replicate result. This number is then multiplied by 100 and the outcome is the RPD. The RPD is not considered further where one or both results being compared are less than the practical quantitation limit (PQL). The PQL is five times the Method Detection Limit (MDL) and is defined as the minimum concentration that can be measured within specified limits of precision and accuracy. A constituent with results below the PQL means that the constituent being analyzed is not present in a sufficient amount to be reliably quantified. Typically, as parameters approach their detection limit, high variability is more likely to occur. Where applicable, the RPD of <25% can be used as a benchmark whereby an RPD of greater than 25% warrants further comment or consideration.

4.3.1.1 Analytical Variability

Laboratory duplicates were used to measure laboratory analytical variability. Results of quality assurance analysis are included in Appendix C within the laboratory reports. The laboratory duplicates for five sampling events met the lab quality control limit of 20% relative percent difference (RPD) for all parameters tested. ALS Environmental also ran analyses on matrix spikes, spiked blanks and method blanks with internal Data Quality Objectives achieved for all samples ensuring data precision and accuracy.

4.3.1.2 Field Variability

During the monitoring program field replicates were collected to measure field variability between simultaneous grab samples. A total of 12 field replicates were collected in 2018. The highest variability was observed for dissolved zinc for the August MW13-13 sample with an RPD of 85%. The parameters with RPD values greater than 25% that met the PQL are shown in Table 4-3.

Table 4-3: Parameters with RPD values greater than 25% and met the PQL

Site	Date	Parameter with value greater than 25% and met the PQL	RDP
MW13-07	28-Mar-18	2-Bromobenzotrifluoride	26%
MW13-07	28-Mar-18	3,4-Dichlorotoluene (SS)	66%
MW13-13	15-Aug-18	Dissolved Cadmium	75%
MW13-13	15-Aug-18	Dissolved Uranium	50%
MW13-13	15-Aug-18	Dissolved Zinc	85%

4.3.1.3 Field and Travel Blanks

Additional field quality control samples include field blanks and trip blanks, where de-ionized water is handled, processed and analyzed in the same manner as the site water samples. Blanks can provide an indication of sample contamination occurring in the field (field blank) or laboratory (method blanks) and at any point in between (trip blanks). Concentrations of parameters should not be detectable, though a PQL of two-times the reportable detection limit allows for slight "noise" around the detection limit.

A field blank is processed by taking de-ionized water (analyte free media) to the sample station, opening it and exposing it to ambient air and 'collecting' it in the sample bottles. These samples are treated the same as the actual water samples, preserved and filtered as necessary, and their analysis can provide an indication of contamination that may be affecting the actual samples. Eight field blanks were analyzed in 2018 for the February, March, June, August, September, October and December sample events.; the field blank data are provided in Appendix C.

Trip blanks (sample of de-ionized water) are supplied and prepared by the lab and are intended to accompany the sample bottles provided by the lab for the monitoring program. The trip blank travels with the sample bottles to the sample stations and is returned unopened back to the lab with the collected samples. The purpose of the trip blank is to identify any potential contamination (e.g. cross contamination from other samples or ambient air conditions) to which the samples may be exposed. Seven trip blanks were analyzed in 2018 for the February, March, June, August, October and December sample events. The results of the Trip Blanks are presented in the laboratory certificates of analysis provided in Appendix C.

4.4 RESULTS AND DISCUSSION

The following sections discuss the three mine source flow paths and the two groundwater programs. Each section addresses all three elements required by the WUL: WUL exceedances, AMP triggers and responses (when applicable) as well as long-term water quality trends. All the results from the 2018 monitoring are available in Appendix D.

4.4.1 North Dam Seepage

During operations, tailings were discharged to the North Tailings Impoundment. Currently, there is no ponded water behind the North Tailings Dam. The tailings are saturated within a meter of the surface. Seepage from the toe of the North Dam was routinely monitored at MH-02 as required by the existing WUL QZ16-051. The seepage at MH-02 is tailings porewater that mixes with groundwater from the valley sides and runoff from the North Dam face (SRK 2000).

Seepage from the North Tailings Dam flows throughout the entire year. Flow at MH-02 is highest during freshet and lowest during the winter. The seepage flows above ground for a short distance from the North Dam before infiltrating into the ground. It then flows as groundwater before eventually discharging to North Creek and the headwaters of the East Fork of Tributary E. From the East Fork of Tributary E, the water flows to Tributary E and then to False Canyon Creek. The monitoring stations and conceptual flow path are shown in Figure 4-1 and Figure 4-2.

4.4.1.1 WUL

In April 2018, MH-12 exceeded the receiving water quality standard for total selenium. The total selenium concentration was 0.0026 mg/L, which marginally exceeded the standard of 0.002 mg/L. Following the steps outlined in the AMP, a re-check of the results was requested, and the results were confirmed. A full synoptic event was conducted during the June bi-monthly sampling event and no exceedances were observed.

The five subsequent samples collected at MH-12 returned markedly lower total selenium concentrations (0.00065 to 0.00087 mg/L) that were two to three-fold lower than the water quality standard, suggesting the April 2018 result was anomalous.

The sample was collected from water that had accumulated over a layer of ice and returned several results that were considerably higher than the historic mean. These included:

- TSS (7.4 mg/L) that was 15 times greater than historic results (median 0.5 mg/L);
- The ammonia concentration (0.15 mg/L) was more than 20 times the median (0.007 mg/L);
- The total alkalinity (416 mg/L) was four times greater than the median (164 mg/L);
- The potassium concentration (3.9 mg/L) was almost ten times the mean (0.45 mg/L): and
- Sulphate, total hardness, calcium, magnesium, conductivity and several metals were all at least two times greater than their median.

As such, this sample could be viewed as non-representative of the water quality at this location. Given the subsequent samples that met water quality standards and the anomalous nature of the April 2018 sample, no further action is considered necessary.

The four samples collected in 2018 upstream at MH-22, the Burnick Portal discharge, had total selenium concentrations ranging from 0.009 mg/L to 0.016 mg/L with an annual average of 0.01 mg/L, lower than the historical average of 0.02 mg/L. The mine source total selenium concentrations appear stable as compared to historical concentrations (Appendix E). Downstream of the Burnick portal, at the receiving environment monitoring station MH-15, all the samples collected were well below the WUL standards, with concentrations ranging from 0.00027 mg/L to 0.00078 mg/L. These concentrations are within the historical range of selenium concentrations observed at this location; no upward trend in total selenium is apparent.

None of the other five surface water samples taken at the receiving water collection point in North Creek (MH-12) in 2018 exceeded the receiving water standards prescribed by the WUL.

4.4.1.2 AMP

This section discusses the comparison of AMP water quality data to the specific performance thresholds for the North Dam Seepage mine source flow path. The objective of the AMP for the North Dam seepage is to detect any deterioration in water quality in the tailings dam seepage and manage and mitigate these changes before any effects are observed in the downstream receiving surface waters. AMP monitoring locations include tailings seepage monitoring at MH-02 located at the toe of the dam and surface water monitoring station MH-12 in North Creek.

Monitoring MH-02 would detect any changes in water quality close to the loading source. Downstream of this station, tailings seepage flows as groundwater. Any potential change in surface water quality in the receiving waters would therefore be a function of groundwater reactive transport.

4.4.1.2.1 MH-02 Total Lead, Feb 2018

In February 2018, site MH-02 (North Dam Seepage) exceeded the AMP mine source water quality Specific Threshold 2 (ST2) for total lead (0.013 mg/L vs. 0.007 mg/L ST2 threshold). After review, it was determined that the sample was not representative, as it was collected in a different location than previous samples. Usually the sample is taken directly from the discharge pipe, but in February the pipe was completely frozen, and the sample taken below the pipe in turbid water. Total suspended solids (TSS) measured at 49 mg/L was much higher than that of the historical median which is <4 mg/L. Moreover, the dissolved lead concentration was two orders of magnitude lower at 0.00008 mg/L.

As per the AMP, both a sample and a duplicate sample were taken during the next sampling session, on April 5, 2018. The measured total lead concentration was 0.0015 mg/L, an order of magnitude lower than the sample collected in February. The sample collected in June 2018 also had a significantly lower concentration (0.00020 mg/L).

When an AMP threshold is triggered the AMP also requires the evaluation of the water quality of the receiving environment. In this instance the receiving water quality is monitored at the East Fork of Tributary E (MH-12). The WUL's water quality standard for total lead at MH-12 is calculated based on the hardness of the sample and is also dependent on the TSS concentration. (Appendix A). If the TSS is at or above 4 mg/L, the standard applies to the dissolved lead concentration of the sample. Conversely, if the TSS is below 4 mg/L, the standard applies to the total faction of the metal.

No sample was collected in February 2018 at MH-12, as North Creek was frozen to the ground. The sample collected in April, on the following monitoring event, had a TSS concentration of 7.4 mg/L. The standard therefore applies to dissolved lead. The standard, based on the measured hardness (489 mg/L), is 0.027 mg/L. The dissolved lead concentration in April 2018 was 0.00014 mg/L, which is well below the standard.

The sample taken at MH-12 in June 2018 had a higher concentration of total lead than previous samples. The TSS of this sample was above 4 mg/L and the standard applied to dissolved lead. The measured dissolved lead concentration was 0.00099 mg/L, which is lower than the calculated standard of 0.008 mg/L.

The sample collected in December 2018 at the North Dam Seepage as part of the groundwater surface water interaction study had a total lead concentration of 0.0094 mg/L, which is above both ST1 (0.006 mg/L) and ST2 (0.007 mg/L). Like the February 2018 sampling event, the discharge pipe was frozen in December 2018, and the sample was collected in pooled water below the discharge pipe. The sample returned elevated TSS (18.1 mg/L), well above the historical median (<4 mg/L). Furthermore, the dissolved lead concentration was below detection (<0.00005 mg/L) and at least two orders of magnitude lower than the total lead concentration and both the ST1 and ST2. The total lead concentration measured in the North Creek receiving environment at MH-12 for the December 2018 sampling event (0.000086 mg/L) was 63-fold lower than its hardness-dependent water quality standard (0.0055 mg/L at 153 mg/L hardness). Furthermore, the dissolved lead concentration at MH-12 was below detection (<0.00005 mg/L). As such, no significant risk to the receiving environment was identified.

4.4.1.3 Water Quality Trends

Plots showing historical and current surface and groundwater concentrations are available in Appendix E. Samples collected in the North Dam seepage MH-02 had pH levels ranging from 7.8 to 8.7, with an annual average of 8.0, which is consistent with the historical annual average of 8.1. The pH for the receiving environment monitoring station MH-12 ranged between 7.9 and 8.5 with an annual average of 8.2, which is marginally lower than the previous four years annual average (8.4 to 8.5).

Alkalinity at MH-02 was as high as 450 mg/L in 1996 but has since decreased to approximately 300 mg/L and had an average of 297 mg/L in 2018. In the last year all surface monitoring stations had stable total alkalinity except from MH-12, which has increased from an annual average of 150 mg/L to an annual average of 201 mg/L in 2018. The elevated 2018 average at MH-12 is attributed to the outlier sample collected in April.

Sulphate concentrations at the North Dam seepage (MH-02) have remained stable at approximately 300 mg/L since 2002, with an average concentration of 294 mg/L in 2018. At the receiving water monitoring station (MH-12), sulphate concentrations were considerably lower, with historical averages typically ranging from 9 to 11 mg/L. In 2018, MH-12 had stable sulphate concentrations ranging from 9.9 to 11.1 except for the anomalous sample collected in April.

North Dam Seepage (MH-02) hardness has historically ranged between 403 mg/L and 723 mg/L. In 2018 the North Dam seepage had an average dissolved hardness of 671 mg/L. The receiving environment monitoring location MH-12 had an annual hardness average of 213 mg/L, which is comparable to the historical annual average of 191 mg/L.

Cadmium concentrations at the North Dam seepage (MH-02) and downstream at MH-12 were stable, with annual averages for dissolved cadmium of 0.00002 and 0.00005 mg/L respectively, and annual averages for total cadmium of 0.00006 and 0.00007 mg/L.

Zinc concentrations at the North Dam seepage (MH-02) were stable with an annual average concentration of 0.037 mg/L and showed a slight decrease when compared to the historical average of 0.097 mg/L. However, downstream at the receiving environment monitoring station (MH-12) the annual total zinc average (0.060 mg/L) was higher than previous year's annual averages (0.0030 mg/L in 2017; 0.0036 mg/L in 2016; 0.019 mg/L in 2015 and 0.008 mg/L in 2014). In April and June of 2018, zinc concentrations at MH-12 were the highest recorded since 2015. The four subsequent samples taken at this location were all below the detection limit (0.003 mg/L).

4.4.2 Burnick Portal Discharge

The objective of the AMP for the Burnick Portal discharge is to detect any deterioration in water quality in the drainage flowing from the Burnick Portal and downgradient surface water. AMP monitoring locations include the Burnick portal drainage (MH-22), groundwater monitoring well MW13-06 adjacent to and downgradient of the Burnick portal, and surface water monitoring station MH-15 in the West Fork of Tributary E. The monitoring stations and conceptual flow path are shown in Figure 4-1 and Figure 4-2.

4.4.2.1 WUL

None of the six surface water samples taken at the receiving water collection point in West Fork of Tributary E (MH-15) in 2018 exceeded the receiving water quality standard prescribed by the water license.

Water level monitoring of the mine source groundwater monitoring wells is required under water licence QZ16-051. Water levels at MW13-06 have remained relatively constant throughout 2018 and previous years (Table 4-4). There are no water quality standards for this well outlined in the current water licence; however, AMP thresholds are defined for this well.

Table 4-4: Burnick Portal Groundwater Levels (masl)

Well Water Levels (Masl)								
Well ID	2018 Individual Month					2018 Average	2017 Average	Historical Average[1]
	Mar	Jun	Aug	Oct	Dec			
MW13-06	1,178.4	1,184.0	1,184.0	1,180.0	1,180.2	1,180.8	1,180.1	1,181.6

1 Overall average (without 2018 data)

4.4.2.2 AMP

4.4.2.2.1 MW13-06 Dissolved Zinc

Three consecutive samples collected at MW13-06, downstream from the Burnick Portal, had increasing dissolved zinc concentrations, from 0.070 mg/L in March to 0.11 mg/L in October, triggering the ST1 threshold. The AMP therefore required the evaluation of upstream and receiving water quality results. The closest water quality monitoring location upstream is at the Burnick Portal (MH-22). MH-15, on the West Fork of Tributary E, is the downstream receiving water monitoring station.

Upstream at MH-22, total zinc concentrations exhibited considerable variation, with results ranging from 0.38 to 0.78 mg/L. Two results out of four were slightly above the historical average (0.60 mg/L) but all were well below the ST2 threshold of 2.7 mg/L. Dissolved zinc also showed a large variation, with results ranging from 0.38 to 0.85 mg/L.

Downstream at MH-15, both dissolved and total zinc were below the detection limit of 0.001 mg/L for dissolved and 0.003 mg/L for total zinc for all but one measurement.

Despite the gradual increase in the dissolved zinc concentrations at MW13-06, the results were five-fold lower than the ST2 thresholds, and no increasing trend was observed either upstream or downstream of the well. As such, no further AMP actions were deemed necessary.

The 2017 annual report outlined that dissolved zinc concentrations presented a potential upward trend in the Burnick Portal discharge flow path (MW13-06). There are relatively few data available to confirm any trend

(12 samples including three collected in 2018) and dissolved zinc concentrations were somewhat variable ranging from 0.07 mg/L to 1.46 mg/L, however, no overall increasing trend was apparent since the start of sample collection (Appendix E)

Total zinc concentrations were highest at the 1200 Burnick Portal (MH-22) and ranged from 0.38 to 0.78 mg/L in 2018. The annual average at the portal is 0.62 mg/L, which is comparable to the historical average of 0.060 mg/L. Downstream at MH-15, total zinc levels recorded in 2018 were all below the detection limit of 0.003 mg/L.

4.4.2.3 Water Quality Trends

Long term pH trends have been stable for all stations in the Burnick Portal catchment since 1997. All surface water pH measurements in 2018 were circumneutral, between 7.4 and 8.6, with annual averages between 7.8 and 8.0 for each station. The pH for the receiving environment monitoring station MH-15 ranged between 7.4 and 8.6. Samples collected from the groundwater station downgradient of the portal (MW13-06) were circumneutral (annual pH of 6.9), which is consistent with historical results. Plots showing historical and current surface and groundwater constituents are available in Appendix E.

Alkalinity in the Burnick 1200 Portal discharge (MH-22) has consistently been around 100 mg/L. Total alkalinity concentrations were within historical ranges in 2018 with an annual alkalinity of 107 mg/L. At the receiving environmental station (MH-15) total alkalinity levels have remained stable with annual averages of 202 mg/L.

The monitoring well in the Burnick portal discharge flow path (MW13-06) also had slightly higher total alkalinity this past year as compared to historical data, with a 2018 annual average of 212 mg/L compared to a historical average of 199 mg/L.

At the Burnick 1200 Portal discharge (MH-22) sulphate levels were within historical ranges between 30 and 42 mg/L; and much lower downstream at MH-15 (2.6 to 4.6 mg/L). The sulphate concentration at MW13-06 has remained stable at around 150 mg/L from 2013 to 2018.

Historic dissolved hardness levels were generally between 140 and 205 mg/L at all surface water stations in the Burnick Portal flow path. The Burnick portal discharge waters (MH-22) had an annual average hardness of 142 mg/L in 2018. The receiving station MH-15 had an annual average of 204 mg/L. The monitoring well in the Burnick portal discharge flow path (MW13-06) also had stable hardness in 2018 as compared to historical hardness, with an annual average of 349 mg/L compared to a historical average of 343 mg/L

Total cadmium concentrations at the 1200 Burnick Portal (MH-22) ranged from 0.0029 to 0.0044 mg/L in 2018. Total cadmium concentrations at MH-22 have slowly increased since the early 1990s and the trend continues with a yearly average of 0.038 mg/L as compared to the 2017 average of 0.035 mg/L. Dissolved cadmium levels have remained stable at MH-22 as compared to the annual averages of the past few years (2013 to 2017) with an annual average of 0.0037 mg/L. Dissolved cadmium appears to decline within the expected flow path of the Burnick 1200 Portal (MW13-06). Dissolved cadmium concentrations at MH-15 averaged at 0.000006 mg/L in 2018 as compared to previous annual concentrations (0.000008 mg/L in 2017 and 2016; 0.00001 in 2015, 2014 and 2013).

Despite increasing total cadmium levels at the Burnick portal, the total cadmium concentration at the receiving environment station downstream (MH-15) have decreased slightly from an annual average of 0.00002 mg/L in 2014 to a 2018 annual average of 0.000009 mg/L. Dissolved cadmium also displayed a potential decreasing trend at MH-15 with an annual average of 0.000006 mg/L compared to a historical average of 0.00004 mg/L.

4.4.3 1380 Portal Discharge

The objective of the AMP for the 1380 Portal drainage is to detect any deterioration in the portal drainage water quality within the waste rock dump and monitor for the potential loss of attenuation capacity of the soils upstream of Camp Creek. AMP monitoring locations include the seepage monitoring at station SDH-S2 within the Main Zone waste rock dump, groundwater monitoring at MW13-01, MW13-08, and MW13-13 located downgradient of SDH-S2 and upstream of Camp Creek, and the receiving water surface water monitoring at MH-11 in upper False Canyon Creek.

The three groundwater monitoring stations downstream of the 1380 and Burnick portals are sampled quarterly. Station MW13-01 is located downgradient of 1380 portal in the 1380 Gully. Stations MW13-08 and MW13-13 are also projected to be along the groundwater flow path of 1380 Portal drainage. The monitoring stations and conceptual flow path are shown in Figure 4-1 and Figure 4-2.

4.4.3.1 WUL

None of the seven surface water samples taken at the receiving water collection point in Upper False Creek Canyon (MH-11) during 2018 exceeded the receiving water standards prescribed by the water license.

Water level monitoring of the mine source groundwater monitoring wells is required under water licence QZ16-051. Water levels in the all three mine source monitoring wells have remained relatively constant throughout 2018 and previous years. Table 4-4 provides the well water levels in metres above sea level (masl). There are no water quality standards for these stations outlined in the current water licence; however, there are AMP thresholds for these stations.

Table 4-5 1380 Portal Discharge Groundwater Levels (masl)

Well Water Levels (Masl)								
Well ID	2018 Individual Month					2018 Average	2017 Average	Historical Average[1]
	Mar	Jun	Aug	Oct	Dec			
MW13-13	NV	1,249	1,184.0	1,180.0	1,180.2	1,180.8	1,180.1	1,181.6
MW13-01	1,180.2	1,181.6	1,180.9	1,180.6	1,180.5	1,180.8	1,180.4	1,180.9
MW13-08	1,130.5	1,134.0	1,132.0	1,131.4	NV	1,132.0	1,131.4	1,132.3

NV: Not visited

4.4.3.2 AMP

There was a consistent yet marginal increase of both dissolved cadmium and zinc concentrations in samples collected from monitoring well MW13-01, located downstream of the 1380 Portal. These AMP triggers are discussed below.

4.4.3.2.1 MW13-01 Dissolved Zinc

In 2018, two distinct instances of three consecutive monitoring results with progressively increasing dissolved zinc concentrations (Appendix E) triggered the AMP mine source groundwater quality ST1 at MW13-01. Concentrations of dissolved zinc gradually increased from 0.0036 to 0.033 mg/L from December 2017 to December 2018. Despite the increase, the concentrations remained well below the ST2 (0.5 mg/L). Furthermore, these concentrations are below the historical average dissolved zinc concentrations measured at this location (0.054 mg/L).

The single sample collected in 2018 below the 1380 Portal waste rock dump (SDH-S2) had a total zinc concentration of 10.6 mg/L, which is lower than the average measured historically at the portal seepage (MH-25, 39.5 mg/L average). Downstream at stations MH-04, MH-11 and MH-13, zinc concentrations were congruent with previously recorded concentrations, with annual averages of 0.0076 mg/L, 0.0053 mg/L, and 0.0035 mg/L, respectively.

The previous annual report suggested that dissolved zinc concentration could be showing an increasing trend at all three groundwater monitoring sites in the 1380 portal flow path. In 2018, dissolved zinc levels were marginally lower than those observed historically. MW13-13 had a 2018 average dissolved zinc concentration of 0.021 mg/L compared to a historical average of 0.054 mg/L. Similarly, MW13-01 had an annual average dissolved zinc concentration of 0.025 mg/L as compared to a historical average of 0.044 mg/L. MW13-08, with an annual average of 0.0034 mg/L compared to a historical average of 0.0054 mg/L, also showed a slight decrease in dissolved zinc concentrations.

Despite the gradual increase in the dissolved zinc concentrations at MW13-01, the results were considerably lower than the ST2 thresholds, and no increasing trend was observed either upstream or downstream of the well. As such, no further AMP actions were deemed necessary.

4.4.3.2.2 MW13-01 Dissolved Cadmium

Dissolved cadmium concentrations gradually increased from 0.00011 mg/L in December 2017 to 0.00077 mg/L in December 2018. Despite this increasing trend, the dissolved cadmium concentrations were well below the AMP ST2 concentration of 0.005 mg/L and within the historical range of results measured at this location (0.00008 to 0.0012 mg/L).

When a ST1 AMP threshold is triggered at any downgradient monitoring wells, the AMP requires the evaluation of upstream and receiving water quality results. The closest water quality monitoring location upstream is SDH-S2, the seepage downstream of the 1380 Portal waste rock dump, which is sampled opportunistically. The

seep was dry or inaccessible four out of the five 2018 sampling events. In June 2018, a sample was collected, and both dissolved cadmium (0.10 mg/L) and zinc (9.6 mg/L) were below the mine source water quality ST1 for this monitoring location (0.13 mg/L cadmium and 15.3 mg/L zinc).

Downstream from SDH-S2, at Upper Camp Creek (MH-04), cadmium levels were comparable to historical results, with a 2018 annual average total and dissolved concentration of 0.00028 mg/L and 0.00030 mg/L, respectively. Farther downstream, at the receiving water station (MH-11), the 2018 average total cadmium concentration (0.00008 mg/) was slightly above the average observed between 2013 and 2017 (0.00013 mg/L) but lower than the overall historical average (1991-2017) of 0.0081 mg/L. Farther downstream in False Canyon Creek, concentrations at MH-13 were stable to slightly decreasing with an annual average of 0.00002 mg/L.

The first monitoring well in the 1380 portal flow path (MW13-13) has historically had the highest dissolved cadmium levels, reflecting infiltration of the 1380 portal discharge; however, the concentrations measured in 2018 were lower than both the historical record (2018 annual average of 0.0009 mg/L compared to a historical average of 0.0013 mg/L) and the mine source groundwater quality AMP ST2 trigger (0.02 mg/L). Lower dissolved cadmium concentrations were observed farther downstream in the 1380 portal flow path at stations MW13-01 (2018 average 0.00067 mg/L) and MW13-08 (2018 average 0.00065 mg/L), which were both also below their mine source groundwater quality AMP ST2 trigger (0.005 mg/L).

The increase in cadmium and zinc concentrations observed in groundwater well MW13-01 were not observed in any of the downstream surface water monitoring stations (MH-04, MH-11 and MH-13). Total cadmium and total zinc concentrations were marginally elevated at MH-11 in June 2018 (0.0003 and 0.008 mg/L, respectively) compared with the historical averages (0.0002 and 0.06 mg/L, respectively), concentrations returned to typical concentrations in August, and remained stable for the three subsequent samples collected in 2018 (Appendix E).

Dissolved zinc and cadmium levels in the monitoring well upstream (MW13-13) and downstream (MW13-08) of MW13-01 did not exhibit an increasing trend over the course of the year (Appendix E) and average annual concentrations were consistent with historical annual averages.

In summary, the rising trend observed at MW13-01 in 2018 for dissolved zinc and cadmium was gradual and individual measurements were well within the historical average, and well below the AMP thresholds. Furthermore, both upstream and downstream levels of these metals were stable and below the AMP thresholds. For these reasons, no further action is deemed necessary.

4.4.3.3 Water Quality Trends

Long term pH trends have been stable for all four surface water stations and three groundwater stations downstream of the 1380 Portal. The measured pH was circumneutral, ranging from 7.1 to 7.9, consistent with previous results. Plots showing historical and current surface and groundwater concentrations are available in Appendix E. The receiving surface water monitoring stations (MH-04, MH-11, and MH-13) also had circumneutral pH with a range between 7.7 and 8.4. The single sample collected at SDH-S2 returned a pH of 7.39, which is comparable to the average pH of 7.6 recorded at the 1380 portal discharge (MH-25) between 2001 and 2014.

The 1380 Portal discharge (SDH-S2) has generally had low alkalinity around 50 mg/L since monitoring began at this location and this is consistent with concentrations historically observed at MH-25 (average of 37.4 mg/L). MH-25 was sampled from 2001 to 2014, when it was decommissioned, and SDH-S2 has been sampled since, to monitor 1380 portal discharge. The single sample collected in 2018 at the SDH-S2 had an alkalinity of 54.6 mg/L. The groundwater stations downstream of the 1380 Portal all showed an increase in alkalinity in 2018 as compared to previous years. MW13-13 had an average total alkalinity of 99.7 mg/L in 2018 compared to a historic average of 75.3 mg/L. Similarly, MW13-08 had a 2018 annual alkalinity average of 277 mg/L as compared to a historical average of 226 mg/L. MW13-01 displayed a similar increasing trend with an annual average of 157 mg/L compared to a historic average of 120 mg/L.

In Lower Camp Creek (MH-04) total alkalinity concentrations have generally ranged between 100 and 175 mg/L. Total alkalinity concentrations were within historical ranges in 2018 at these stations with an annual alkalinity of 150 mg/L at MH-04.

Sulphate concentrations at 1380 Portal discharge (SDH-S2) have been around 200 mg/L since monitoring began in 2013 at this station and were consistent with historical concentrations at MH-25 averaging 221 mg/L. The receiving waters below the 1380 portal (MH-11) had sulphate levels consistent with historical results, with an annual average of 15.0 mg/L.

Historic dissolved hardness levels were generally between 165 and 211 mg/L at all surface water station in this catchment. In 2018, hardness has remained stable, with all surface water monitoring stations with annual averages between 163 and 211 mg/L. Dissolved hardness has also been very stable over the years of monitoring at the four wells, with annual averages being comparable to historical averages. MW13-13 had an average dissolved hardness of 126 mg/L in 2018 compared to a historic average of 127 mg/L. Similarly, MW13-08 had a 2018 annual dissolved hardness of 303 mg/L as compared to a historical average of 262 mg/L. MW13-01 was also stable in 2018, with an annual average of 163 mg/L compared to a historic average of 157 mg/L.

The single sample collected below the 1380 Portal waste rock dump (SDH-S2) had a total selenium concentration of 0.0045 mg/L, which exceeds the BCMOE guideline of 0.002 mg/L which is used here for reference purposes only, as this monitoring locations does not have any licensed standards. No BCMOE guideline exceedances were observed for selenium concentrations measured in downstream surface water and groundwater quality monitoring stations in 2018 for this catchment.

The only sample that exceeded the CCME guideline (0.00025 mg/L) for total silver in 2018 was the single sample collected below the 1380 Portal waste rock dump (SDH-S2) with a concentration of 0.00054 mg/L. The dissolved silver concentration was below detection for this sample (<0.000010 mg/L), indicating the silver was primarily particulate bound. Samples taken at MH-25 historically also displayed elevated silver levels with an average of 0.003 mg/L. All receiving stations had total silver concentrations below the guideline and all had silver concentrations below the detection limit of 0.00001 mg/L except for MH-13 where a concentration of 0.000012 mg/L was recorded in the April sample.

4.4.4 Landfill Groundwater Monitoring

Waste from the demolition of the Mill was placed in the existing landfill in 2015. The landfill is located near the former North Creek pump house. The landfill contains waste produced during operations and demolition debris from the Mill Site, former camp and office buildings, and miscellaneous debris from the site. The

objective of the AMP for the Landfill is to detect if there is an increase in the water level such that the landfill would be submerged or detect a change in water quality that might imply that landfill materials are leaching metals or are a source of hydrocarbons. Monitoring of these stations was initiated in mid-2016.

4.4.4.1 AMP

AMP monitoring locations include MW14-02, MW14-03, MW14-04, which would detect any changes in water quality and level close to the source. MW14-01 is a background monitoring station for the landfill that is part of the EMSRP. In addition to physical parameters and dissolved metals, samples collected at these groundwater monitoring stations are also analyzed for hydrocarbons to assess potential mobilization and transport from the landfill.

The water quality results are compared to Schedule 3 of the Yukon Contaminated Sites Regulation (YCSR) Water Quality Guideline for the protection of Freshwater Aquatic Life (Yukon Government, 2002). There were no exceedances of the YCSR water quality guidelines in 2018, nor of any of the AMP specific thresholds.

Quarterly water level monitoring in the landfill groundwater monitoring wells is required under the WUL and the AMP. Individual and average water levels are shown in Table 4-5. Wells MW14-02 and MW14-03 were dry throughout 2018.

Well MW14-01 was dry in the first and second quarters. Levels were consistent with those observed in previous years during the third and fourth quarters. MW14-01 had an average level of 1180.8 masl in 2018, compared to a historical average of 1,180.9 masl.

At the MW14-04 monitoring well the 2018 water levels were consistent with those of previous years. There was little water present in MW14-04 during all four sampling events and the well was slow to recharge after purging. The 2018 annual average water level at MW14-04 (1,017.9 masl) was consistent with the historical average (1,018.3 masl).

The water levels at all stations were lower than 3.5 m from the base of the landfill; none of the AMP specific thresholds were triggered.

Table 4-6 Portal Discharge Groundwater Levels (masl)

Well Water Levels (Masl)								
Well ID	2018 Individual Month					2018 Average	2017 Average	Historical Average[1]
	Mar	Jun	Aug	Oct	Dec			
MW14-01	Dry	Dry	1,015.5	1,014.7	NV	1,015.1	1,150.0	1,021.6
MW14-02	Dry	Dry	Dry	Dry	NV	Dry	1,018.5	1,019.9
MW14-03	Dry	Dry	Dry	Dry	NV	Dry	Dry	1,026.1
MW14-04	1,018.1	1,017.9	1,017.8	1,017.9	NV	1,017.9	Dry	1,018.3

1 Overall average (without 2018 data)
NV: Not visited

4.4.4.2 Water Quality Trends

Due to the small dataset associated with the landfill groundwater monitoring program, water quality trends are difficult to discern, and the data are best used to define baseline conditions. Plots showing historical and current groundwater concentrations are available in Appendix E. pH at the two monitored wells that could be sampled (MW14-01 and MW14-04) ranged from 7.4 to 8.2 which is comparable to the previous year's range of 7.8 to 8.4. Sulphate ranged from 4 mg/L to 15 mg/L. Alkalinity has been stable at MW14-01 and MW14-04 with average concentrations of 230 mg/L and 203 mg/L, respectively. Hardness at both monitored wells was also stable with annual averages of 219 mg/L and 176 mg/L.

Stations MW14-01 and MW14-04 returned dissolved cadmium (0.000037 and 0.000045 mg/L, respectively) and zinc (0.0009 and 0.0038 mg/L, respectively) concentrations that were within the range previously recorded.

4.4.5 Contaminated Sites Groundwater Monitoring

An environmental assessment of the site, conducted between 2011 and 2014, found petroleum hydrocarbon in soil that exceeded the YCSR guidelines in the vicinity of maintenance shops and fuel storage tanks. Similarly, metal concentrations exceeded YCSR guidelines in soils associated with the mine primary activity areas (i.e., sediment ponds, tailings facilities, waste rock piles) and processing areas (i.e., mill area). The hydrogeological assessment conducted has indicated that groundwater quality has not been impacted by the identified hydrocarbons or metals soil contamination, and a remediation plan was executed.

The monitoring plan includes three groundwater wells around the site designed to monitor areas downgradient of where soil contamination has been identified as part of the Contaminated Site Assessment process:

- MW13-05 (Jewelbox/Main Zone);
- MW13-10 (Mill Site); and
- MW13-07 (Tailings Impoundment Area).

MW13-04 is also monitored for the same parameters as the site assessment wells and is considered to reflect baseline conditions. MW13-04 and MW13-05 are located along the main access road and downstream of the mill site, MW13-07 is located just downstream the North Dam and tailings pond area, and MW13-10 is located northeast and downstream of the mill site (Figure 4-1).

Water quality results are compared to Schedule 3 of the Yukon Contaminated Sites Regulation (YCSR) Water Quality Guideline for the protection of Freshwater Aquatic Life (Yukon Government, 2002). Comparison to YCSR water quality guidelines is not a requirement of the water licence but is included in water quality reporting for reference. There were no exceedances of the YCSR water quality guidelines in 2018.

4.4.5.1 AMP

The objective of the AMP for the general CSR groundwater wells is to detect a change in water quality that might imply that metals or hydrocarbons plume is spreading from historical sources near the mill site or tailings pond area. AMP monitoring sites include MW13-10 (Mill Site), MW13-07 (Tailings Pond Area), and MW13-05 (Jewelbox/Main Zone) which are located to detect any changes in water quality and level close to the source.

The thresholds for groundwater quality are based on the Yukon contaminated sites regulations (YCSR) for the protection of aquatic life. The groundwater quality threshold parameters are hydrocarbons and dissolved cadmium, lead and zinc. All samples taken from the AMP monitoring wells in 2018 were below the YCSR guidelines and no AMP triggers were activated.

Water level monitoring of these wells is required under water licence QZ16-051 and water levels at four groundwater monitoring stations have remained constant historically and throughout 2018. Table 4-7 provides the well water levels in metres above sea level (masl), for each site visit in 2018 as well as averages. Water levels were consistent with historical water levels, with 2018 averages being comparable with historical annual averages.

Table 4-7: Contaminated Sites Groundwater levels (masl)

Well Water Levels (Masl)								
Well ID	2018 Individual Month					2018 Average	2017 Average	Historical Average[1]
	Mar	Jun	Aug	Oct	Dec			
MW13-04	Dry	1,192.8	1,182.0	1,180.3	1,180.0	1,183.7	1,180.2	1,183.2
MW13-05	Dry	1,193.7	1,190.7	Dry	Dry	1,192.2	1,190.2	1,191.1
MW13-07	1,092.7	1,094.9	1,094.0	1,093.6	NV	1,093.8	1,093.4	1,094.3
MW13-10	1,115.1	1,117.8	1,115.7	1,115.6	NV	1,016.0	1,115.5	1,115.4

1 Overall average (without 2018 data)
NV: Not visited

4.4.5.2 Water Quality Trends

The historic record for these wells is limited and consists of ten to twelve data points for each well, from 2013 to 2018, with the most frequent sampling occurring from 2017 onward, which limits the interpretation of long term trends in the data.

pH at all four wells were circumneutral, ranging from 7.2 to 7.9, consistent with historical data. Plots showing historical and current concentrations of samples collected in these monitoring wells are available in Appendix E. Sulphate concentrations have remained relatively stable at all four of the stations with a minimum of 3.9 mg/L at station MW13-04 and a maximum of 50.7 mg/L at MW13-07.

Alkalinity has also been stable at approximately 220 mg/L for stations MW13-07 and MW13-10 and at approximately 130 mg/L at stations MW13-04 and MW13-05. Hardness has remained stable for all four monitoring wells with harnesses averages ranging from 160 to 170 mg/L for stations MW13-05, MW13-07 and MW13-10 and at approximately 240 mg/L at MW13-04.

The YCSR dissolved cadmium guideline is hardness dependent and has a range of 0.0001 mg/L to 0.0006 mg/L. The highest 2018 concentrations of dissolved cadmium were recorded at the background well MW13-04 in October (0.0005 mg/L). All the contaminated sites groundwater monitoring stations (MW13-05, MW13-07, and MW13-10) had dissolved cadmium concentrations below the 75% of the YCSR guideline which varied between 0.000045 and 0.000075 mg/L depending on hardness. The highest dissolved cadmium value was recorded at MW13-05 at 0.000077 mg/L. At MW13-07, all results were below the detection limit of 0.00005 mg/L. MW13-10 had a dissolved cadmium annual average of 0.00002 mg/L.

The dissolved zinc YCSR guideline is hardness dependent and varies from 0.06 to 1.8 mg/L. Most dissolved zinc levels measured at MW13-05, MW13-07, and MW13-10 were one levels of magnitude below the lowest threshold. The highest level was recorded at the background monitoring well (MW13-04) in October 2018 at 0.013 mg/L. Zinc levels are comparable to historic levels at all monitoring wells, with annual averages of 0.0098 mg/L at MW13-04, of 0.0038 mg/L at MW13-05, of 0.0015 mg/L at MW13-07 and 0.0016 mg/L at MW13-10.

The YCSR guideline for dissolved lead is hardness dependent varies from 0.04 to 0.16 mg/L. None of the 2018 samples exceeded the guidelines. The annual average dissolved lead for MW13-04 was 0.0004 mg/L. At MW13-07 and MW13-10 annual averages for dissolved lead were 0.00009 and 0.0002 mg/L respectively. At MW13-05, only two samples were collected in 2018, with concentrations ranging from 0.0001 to 0.008 mg/L. Dissolved lead concentration appear to be constant in these wells and are well below the YCSR guideline.

5 SURFACE WATER HYDROLOGY

The surface hydrology of the SDH site was first characterized in 1990 during the permitting stage of the mine (SRK 1990). An update was prepared in 1999 to support the 2000 Decommissioning and Reclamation Plan (Teck 2000). A further update was prepared in 2005 to incorporate site climate and flow data that had been collected over a four-year period from 2000 to 2004. In 2013, another set of updated flow measurement were made for key water sampling locations. The results of the 2013 work were discussed in the 2013 annual water licence report (SRK 2014a).

The most recent hydrology update was generated in 2014. This updated hydrological information was used in SDH's water and load balance model for predicting post-closure surface water quality. A memorandum (SRK 2014b) detailing this update was submitted on September 16, 2014. The following sections provide a summary of the hydrology data collected at the site in 2018.

5.1 METHODOLOGY

As part of the SDH water monitoring program, measurements or field estimates of creek discharge were conducted. Flows during open water were measured using an electromagnetic flow meter and the United States Geological Survey mid-section method. A Marsh-McBirney Flowmate velocity meter were used for open water flow measurements. During the winter months, flows are measured using the salt-dilution gauging method. The dilution gauging procedure method deposits a known amount of salt into the stream and measures the concentration downstream overtime. For MH-22 and MH-02 where a pipe is discharging, the bucket fill method is utilized. A known quantity bucket is filled, and the time is recorded. The process is repeated five times and the average is taken. The measurement period covers the time it takes for the conductivity to respond to the tracer and return to background. The method used at each site for measuring discharge are shown in Table 5-1.

Table 5-1: Hydrology Methods for 2018 sampling events

Site	February	April	June	August	October	December
MH-11	DG	DG	M	M	M	DG
MH-12	DG	DG	M	M	M	DG
MH-15	DG	DG	M	M	M	DG
MH-02	BF	BF	BF	BF	BF	BF
MH-22	BF	BF	BF	BF	BF	BF
MH-13	DG	DG	M	M	M	DG
MH-04	DG	DG	M	M	M	DG
MH-29	DG	DG	M	M	M	DG
MH-30	[1]	[1]	[1]	[1]	[1]	[1]

M= Marsh McBirney Flo-Mate
DG=Dilution Gauging
BF= Bucket-fill
[1] Site has been flooded by beaver activity, unable to conduct flow measurements.

5.2 RESULTS

Results of the 2018 flow monitoring are presented below in (Table 5-2) as well as in Appendix D. No flows were conducted at MH-30 in 2018 due to flooding at the site from beaver activity. Efforts were made to try and find a more suitable channel; however, efforts were unsuccessful.

Table 5-2: Discharge results for 2018 (m3/s)

Site	February	April	June	August	October	December
MH-11	0.0117	0.0112	0.1874	0.0511	0.0449	0.0244
MH-12	1	1	0.1025	0.0253	0.0108	0.0123
MH-15	0.0413	0.0438	0.0345	0.0534	0.047	0.0514
MH-02	2	2	0.0009	0.0002	0.0002	2
MH-22	2	2	0.0056	0.0004	0.0003	0.0002
MH-13	0.0465	0.0445	0.4113	0.1714	0.1553	1
MH-04	0.0062	0.0065	0.055	0.0155	0.0071	0.0058
MH-29	0.0012	1	0.0512	0.0118	0.0071	0.0052
MH-30	3	3	3	3	3	3

[1] Frozen to ground
[2] Pipe frozen
[3] Flooded due to beavers

6 SURFACE WATER AND GROUNDWATER INTERACTION STUDY

Under the Reasons for Decision for the QZ16-051 water license the Board determined that Water Resources did not provide sufficient rationale to warrant a groundwater model, but that Teck did not provide enough clarification as to why a model was unnecessary. As such, the Board determined that a groundwater-surface water interaction study was warranted to assess whether the receiving water stations are appropriately located to capture loadings from the source inputs. Within QZ16-051 Clause 37 and 38 reflect this determination:

Clause 37. Within 90 days of the effective date of this licence, the Licensee shall submit to the Board a plan for the assessment of groundwater-surface water interactions at the site including, but not limited to:

- *a) a review of all monitoring results from all wells on site;*
- *b) predictions of groundwater-surface water interactions; and*
- *c) verification of existing site information including rationale supporting location of receiving water monitoring stations.*

Clause 38. The Licensee shall carryout the assessment according the plan and submit report documenting the results of the program and any recommendations stemming from the study on or before March 31, 2019.

SRK Consulting Ltd (SRK), on behalf of Teck Resources, prepared a Groundwater-Surface Water Interactions Investigation Plan (SRK, 2017) to meet Clause 37, which was submitted to the Water Board on 17 July 2017. Additional characterization identified by the SRK plan was carried out in 2018 by AEG. A detailed version of the report is available in Appendix F.

7 GEOCHEMICAL ASSESSMENT

There were no additional waste rock, ore or tailings sampling programs completed in 2018.

8 PHYSICAL AND GEOTECHNICAL MONITORING

Part G Clauses 44 to 48 of Licence QZ16-051 outlines the physical monitoring program of constructed/engineered structures remaining at the site. Monitoring of earthworks was conducted in 2018 as per the OMS Manual (SRK, 2015) and the Post-Closure Geotechnical Monitoring Plan (SRK, 2014c). Piezometer levels in the North Dam were measured monthly to monitor the phreatic surface within the dam. Piezometric levels in North Dam were reviewed on a regular basis by both Teck and SRK. They are included in the annual geotechnical inspection report provided in Appendix G. The seasonal fluctuations recorded in 2018 in the piezometers are generally consistent with those in previous years and below the maximum safe levels are within acceptable tolerance limits.

A formal geotechnical inspection of the structures and features associated with the Tailings Management Area (TMA) as well as other geotechnical structures was also conducted by SRK on (July 24, 2018). The inspection report is provided in Appendix G. The report presents SRK's observations of the following structures and features:

- The North Dam;
- The decommissioned North Creek Dyke and Second Crossing;
- The relocated Camp Creek Channel;
- The North Channel and South Channel;
- The Sediment Retaining Structure (SRS);
- The Burnick Portals (1200 and 1300) and waste rock dumps; and
- The Jewelbox and Main Zone Waste Rock Dump Areas.

In summary, all the geotechnical structures are stable and are functioning in accordance with the closure design parameters. There were no changes to the structures in 2018.

- The following three deficiencies/recommendations were identified in 2018 and were fulfilled by Teck by the end of 2018: North Dam - 2018-01 NDW-2B and 1A missing caps – Install plastic caps and label – Completed October 18, 2018 - Closed
- North Creek Channel - 2018-02 Beaver Dam at inlet channel – Remove beaver dam channel – Completed July 26, 2018 - Closed
- Jewelbox Waste Rock Dump – 2018-03 Erosion Gully in Northeast corner – Installed additional monitoring pins – Completed July 26, 2018

In addition to the geotechnical inspection, monitoring and maintenance of the roadways is required as part of the QZ16-051. In 2018, maintenance included removing debris from the road culverts.

9 BIOLOGICAL EFFECTS MONITORING

Biological effects monitoring at the site was undertaken by Laberge and Can-Nic-A-Nick Environmental Services from September 13 to September 15, 2018. The work included benthic invertebrate, water quality, stream sediment and fish sampling. Below is a summary of the report, for a more detailed version, please refer to Appendix H.

No anomalies were apparent in the water quality during the 2018 study. Only cadmium concentrations at MH-04 exceeded applicable CCME guidelines for the protection of freshwater aquatic life and is consistent with historical concentrations.

The biological monitoring of only one site, MH-13, is consistent with the previous license. The monitoring program conducted in 2018 represents the first time that licensed requirements for stream sediment and benthic invertebrate monitoring were completed at additional sites. Although the stream sediment data indicates that there could be negative effects on the aquatic biota, the benthic invertebrate communities were diverse and had good representation from the major groups of organisms that are usually present in lotic waters. The presence of Ephemeroptera, Plecoptera and Trichoptera (EPT) at all sites suggest that the metals documented in the sediments are likely not in bioavailable form.

Slimy sculpin continues to be the only fish species captured at MH-13. Numbers have been low at this site during the last three sampling events. While the absolute number of captured fishes varied over time, the species composition continues to be consistent and indicative of a stable fish community. The other licensed fish monitoring site, MH-30, could not be sampled due to flooded conditions as a result of increased beaver activity throughout this reach.

10 SPILL CONTINGENCY PLAN REVIEW

The Spill Contingency Plan was reviewed in March 2018. Based on the review it was determined that the contingency plan had not been updated since closure activities were completed, as such the Spill Contingency Plan was updated on March 26, 2018 to reflect current activities and contacts at the site.

In 2018, there we no spills or unauthorized discharges that occurred.

11 SUMMARY

Decommissioning activities were completed in 2015 and the site is now in permanent closure. Details of the 2015 decommissioning work are provided in AMEC's 2015 Reclamation Activities and As-Built Report, which were submitted by Teck in November 2015. The current water licence QZ16-051 addressing permanent closure came into effect on April 1, 2017.

No freshwater from the on-site water wells was withdrawn for industrial or domestic purposes in 2018. No water was discharged by pumping. The Reclaim Pond Dam has been removed and reclaimed. Water from the South Tailings Pond now freely drains to the downstream environment when water levels reach the level of the South Retaining Structure spillway invert.

In 2018, samples from all of the required water quality monitoring stations met the standards in licence QZ16-051 for all water quality parameters, however, exceedances of the AMP thresholds did occur in 2018 and are discussed in Section 4.2. Based on the review of available water quality data, and information from subsequent sampling events, no additional actions were deemed necessary.

Work at SDH in 2018 included:

- Conducting Surface Water and Groundwater Interaction Study;
- The annual physical and geotechnical inspection and associated earthworks monitoring including monitoring piezometers on the North Dam, which did not uncover any unusual circumstances;
- Monitoring of surface and groundwater quality;
- Environmental Effects Monitoring which included sampling for water quality, benthic invertebrate, fish and stream sediments at MH-04, MH-11, MH-21, MH-13, MH-29 and MH-30; and
- Road maintenance included removing debris from the road culverts.

12 REFERENCES

Alexco 2017. Sä Dena Hes Mine, Post-Reclamation Adaptive Management Plan. Report prepared for Sä Dena Hes Operating Corporation C/O Teck Resources Limited by Alexco Environmental Group, June 28, 2017.

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[SRK] Steffan, Robertson, and Kirsten (Canada) Inc. 1990. Mt. Hundere Development Initial Environmental Evaluation. Report prepared for Curragh Resources. May 1990.

SRK Consulting (Canada) Inc. (SRK). 2000. 2000 Geochemical Studies. Sä Dena Hes Mine. November.

SRK 2014a. Sä Dena Hes 2013 Annual Report Water Licence QZ99-045. Report Prepared for Teck Resources Limited by SRK Consulting (Canada) Inc. March 2014.

SRK 2014b. Sä Dena Hes Hydrology Update. Memorandum prepared for Teck Resources Limited by SRK Consulting (Canada) Inc. September 2014.

SRK 2014c. Proposed Post Reclamation Geotechnical Monitoring Program. Memorandum prepared for Teck Resources Limited by SRK Consulting (Canada) Inc. September 2014.

SRK Consulting (Canada) Inc., (2015). 2015 Operation, Maintenance and Surveillance Manual for the Tailings Management Area at Sä Dena Hes Mine. Report prepared for Teck Resources Limited. 1CT008.055. October 2015.

Teck 2000. Detailed Decomissioning and Reclamation Plan. Report prepared by Teck Resources Limited. 2000.

Teck 2018. Water Licence #QZ16-051 – Sa Dena Hes Mine – Submission of Revised Adaptive Management Plan. Letter from Teck to Yukon Water Board, dated March 7, 2018.

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APPENDIX A

WATER USE LICENCE QZ16-051

YUKON WATER BOARD

Pursuant to the *Waters Act* and *Waters Regulation*, the Yukon Water Board hereby grants a Type B water licence for a quartz mining undertaking to:

Sä Dena Hes Operating Corp.
c/o Teck Resources Limited
3300-550 Burrard Street
Vancouver, BC V6C 0B3

LICENCE NUMBER:	QZ16-051
LICENCE TYPE:	B **UNDERTAKING:** QUARTZ
WATER MANAGEMENT AREA:	01 Liard
LOCATION:	Upper False Canyon Creek and tributaries of False Canyon Creek, Sä Dena Hes Mine Site
MAP CO-ORDINATES:	Max Latitude: 60° 42' 21" N Max Longitude: 129° 11' 38" W Min Latitude: 60° 18' 31" N Max Longitude: 128° 34' 08" W
PURPOSE:	To store/alter flow of water associated with maintenance and decommissioning activities and to deposit a waste to water.
EFFECTIVE DATE:	April 1, 2017
EXPIRY DATE:	December 31, 2040

This licence shall be subject to the restrictions and conditions contained herein and to the restrictions and conditions contained in the *Waters Act* and the *Waters Regulation* made thereunder.

Dated this 30 day of March, 2017

Witness

Approved by:

Chairperson
YUKON WATER BOARD

PART A - DEFINITIONS

"Act" means *Waters Act* and any amendments thereto.

"Adaptive Management Plan" means the *Sä Dena Hes Mine Post-Relcamation Adaptive Management Plan* submitted as part of the Application and included in the Register QZ16-051 as part of exhibit 1.16, and any subsequent revisions.

"Application" means Application QZ16-051, including any additional submissions and/or revisions submitted to the Yukon Water Board by the Licensee, up to the date of the Board's decision.

"Board" means the Yukon Water Board.

"Dam Safety Guidelines" means the most current version of the Dam Safety Guidelines issued by the Canadian Dam Association.

"Detailed Decommissioning and Reclamation Plan" or "DDRP" means the *Detailed Decommissioning and Reclamation Plan* that was submitted as part of the Application and included in Register QZ16-051 as exhibit 1.3 and any subsequent revisions.

"Environmental Monitoring, Surveillance and Reporting Plan" or "EMSRP" means the *Environmental Monitoring, Surveillance and Reporting Plan* submitted as part of the Application and included in Register QZ16-051 as Exhibit 1.24, and any subsequent revisions.

"Freshwater Intake end-of Pipe Fish Screen Guideline" means the most current version of the *Freshwater Intake end-of Pipe Fish Screen Guideline* issued by the Department of Fisheries and Oceans.

"Inspector" means any person designated as an Inspector under the Act.

"Natural Boundary" means the visible high water mark of any lake, river, stream or other body of water where the presence and action of water is so common and usual and so long continued as to mark upon the soil of the bed of the lake, river, stream or other body of water a character distinct from that of the banks thereof, both in respect to vegetation and in respect to the nature of the soil itself. In addition, the best estimates of the edge of dormant or old side channels and marsh areas are considered to be Natural Boundaries.

"Non-Acid Generating and Non-Metal Leaching" means rock with a paste pH $\geq$ 5.0, a Neutralizing Potential: Acid Generation Potential Ratio (NPR) $\geq$ 3:1 and a sulphur content of $<$ 0.3%.

"Post-Closure Geotechnical Monitoring Plan" means *Proposed Post Reclamation Geotechnical Monitoring Program* that was submitted as part of the Application and included in Register QZ16-051 as Appendix D in exhibit 1.24, and any subsequent revisions.

"Regulation" means the *Waters Regulation* made under the Act.

"Spill Contingency Plan" means the *Spill Contingency Plan* that was submitted as part of the Application and included in Register QZ16-051 as exhibit 1.28, and any subsequent revisions.

"Waste" means any substance as defined in the Act.

"Watercourse" means a natural watercourse, body of water or water supply, whether usually containing water or not, and includes groundwater, springs, swamps, and gulches.

"Wetted Perimeter" means the horizontal extent of the present water level while the work is taking place.

PART B – WATER USE AND DEPOSIT OF WASTE

1. The Licensee is hereby authorized to
    a) deposit Waste in the form of;
        i. water from Burnick 1200, via sub-surface flow, to tributaries of False Canyon Creek; and
        ii. water from 1380 Portal, via sub-surface flow, to Upper False Canyon Creek.
        iii. seepage from North dam to Tributary E False Canyon Creek;
        iv. seepage and runoff from the south sediment retaining structure to Upper False Canyon Creek;
        v. collected runoff from the Jewelbox Hill dumps to Upper False Canyon Creek;
        vi. collected runoff from the North Hill dumps to tributaries of False Canyon Creek;
    b) Store and/or alter flow of water associated with the south sediment retention structure;
    c) carry out ongoing site monitoring and maintenance, including culvert maintenance and replacement; and
    d) decommission and reclaim the site road and access road, including culvert removal and bank stabilization,

    as described in the Application, and subject to the conditions of this licence. Where there is a discrepancy between the Application and this licence, the conditions of this licence shall prevail.

PART C – DESIGN AND CONSTRUCTION

2. The Licensee shall submit to the Board final detailed design construction drawings, specifications and quality assurance/quality control procedures for the construction of any works associated with the implementation of the DDRP.

3. The design of all structures and facilities associated with the project shall be carried out using sound engineering practices and shall be completed and sealed by a Professional Engineer licenced to practice in Yukon.

4. The final detailed design construction drawings, specifications and quality assurance/quality control procedures submitted to the Board shall be consistent with the designs in the DDRP.

5. At least ten days prior to the proposed date of commencement of construction of any structure or facility, the Licensee shall submit to the Board a written notification, together with a detailed construction schedule and the name and contact number(s) of the construction superintendent.

6. Where site conditions require minor modification to the designs submitted to the Board, the Licensee shall notify the Board, at least 10 days in advance, of the details of the modifications or variations from final detailed designs, specifications and quality assurance/quality control procedures previously submitted to the Board, provide a detailed construction schedule and the name and contact number(s) of the construction superintendent. The notice shall be in writing and include an explanation of the reasons for the change and an assessment of the potential impact on the performance of the works. The notice shall be sealed by a Professional Engineer licensed to practice in Yukon.

7. As-constructed (record) drawings and construction reports for all structures and facilities shall be submitted to the Board within ninety days of the completion of construction. Each submission shall be sealed by a Professional Engineer licenced to practice in Yukon.

PART D –OPERATING CONDITIONS

8. During the term of this licence, the Licensee shall maintain all works in good order in accordance with sound engineering and environmental practices.

9. The Licensee shall maintain the main access road from June through September in a manner such that heavy equipment can be taken to the site until the site has stabilized.

10. The Licensee shall maintain facilities and structures and undertake all monitoring in accordance with the requirements of this Licence.

11. When conducting any instream works, creek flow must be diverted around the work areas.

12. Where fish are present, the Licensee shall salvage all fish prior to de-watering any work area.

13. All works associated with the undertaking shall be maintained in good repair.

14. Construction and/or maintenance equipment shall be mechanically sound and free of leaks.

15. The tracks and/or wheels of heavy equipment are prohibited from entering the Wetted Perimeter of any Watercourse.

16. Granular bedding and backfill material shall consist of non-frozen material.

17. Except as authorized by this licence, no Waste shall enter any Watercourse as a result of any activities carried out by the Licensee.

18. All disturbed ground surfaces shall be stabilized in such a manner so as to prevent erosion and surface runoff.

Water Pumps

19. All water pumps shall be contained within an impermeable liner/structure that has the capacity to contain 110% of the maximum combined volumetric capacity of the fuel, lubricants and coolants within the engine of the water pump.

20. The Licensee shall provide barriers consisting of fish guards, screens, coverings or nets on all water intakes that are consistent with *Freshwater Intake end-of Pipe Fish Screen Guideline.*

21. The Licensee shall cease pumping or decanting and take remedial action if there is alteration to the bed or bank of the water channel as a result of pumping.

Rip-rap

22. Rip-rap shall be hard, dense, angular, Non-Acid Generating and Non-Metal Leaching quarry stone or boulders, free of seams, cracks, structural defects and contaminants, freeze-thaw resistant, non-slaking and free of fine-grained materials including silt and sand. Rip-rap gradation will conform to the specifications provided in the Application in Register QZ16-051 exhibit 1.15.

Geotextile

23. Specifications of the geotextile material shall comply with those described in the Application in Register QZ16-051 exhibit 1.2.

Culvert Removal

24. When removing culverts, the following procedures shall be followed:

    a) schedule removal of culverts so as to avoid concentrations of fish if such

concentrations exist;

b) install or construct non-erodible cofferdams, silt barriers or other suitable methods to control siltation downstream of the work area;

c) reshape site to conform to grade of adjacent stream bank following removal of the culvert;

d) use rip-rap or other suitable methods, if required, to stabilize the bank at the work site; and

e) remove all silt controls following completion of work and ensure the grade of the drainage course is restored.

25. Culvert placement, removal and channel excavation shall be done in the dry, with the exception of connecting the existing channel to the diversion channel.

Spills and Unauthorized Discharges

26. Where a spill or an unauthorized discharge occurs, that is of a reportable quantity under the Yukon Spills Regulations, the Licensee shall immediately contact the 24-hour Yukon Spill Report number, (867) 667-7244 and implement the Spill Contingency Plan. A detailed written report on any such event including, but not limited to, dates, quantities, parameters, causes and other relevant details and explanations, shall be submitted to the Board not later than 10 days after the occurrence.

27. 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.

28. The Licensee shall maintain a log book of all spill or unauthorized discharge occurrences, including spills that are less than the reportable quantities under the Yukon Spills Regulations. The log book shall be made available at the request of an Inspector. The log book shall include, but not necessarily be limited to:

a) the date and time of the spill or unauthorized discharge occurrence;

b) the substance spilt or discharged;

c) the approximate amount spilt or discharged;

d) the location of the spill;

e) the distance between the spill or discharge and the nearest Watercourse; and

f) remedial measures taken to contain and clean-up the spill area or to cease the unauthorized discharge.

29. The Licensee shall include a summary of all spills or unauthorized discharges that occurred during the year reported, as part of the annual report.

30. All personnel shall be trained in procedures to be followed and the equipment to be used in

the containment of a spill.

31. Prior to the commencement of construction, the Licensee shall update the Spill Contingency Plan and provide the updated plan to the Board.

32. The Spill Contingency Plan shall be posted on site for the duration of the works.

Fuel Transfer and Refueling

33. Fuel, lubricants, hydraulic fluids, coolants and similar substances, with the exception with liquid associated with the water pump engine, shall be transferred a minimum of 30 metres from the Natural Boundary of any Watercourse, in such a way that said substances are not deposited in or allowed to be deposited in waters.

34. Water pumps may be refuelled within the Natural Boundary of any Watercourse. Refueling activities shall adhere to the following:

    a) no refueling shall be conducted within the Wetted Perimeter of any Watercourse;
    b) the fuel transfer shall be visually and continually monitored;
    c) fuel transfer nozzles shall be operated manually and will not be locked in the open position;
    d) spill kits, including absorbent pads shall be maintained in close proximity to the stationary equipment during refuelling operations;
    e) fuel transfers shall be conducted with an operator at each end of the transfer hose;
    f) shall only be conducted during daylight hours; and
    g) fuel transfer equipment components such as pumps, hoses and nozzles shall be visually checked for leaks or damage prior to each refuelling operation.

PART E – PLANS AND STUDIES

EMSRP Update

35. The Licensee shall submit an updated EMSRP to the Board within 90 days of the effective date of this licence. The updated plan shall include, but not be limited to:

    a) The terms and conditions of this licence;
    b) An updated groundwater monitoring program that includes the following:

        i. Quarterly monitoring of the groundwater wells in Schedule A;
        ii. Quarterly reporting of site water monitoring data; and
        iii. Addition of dissolved oxygen and oxidation-reduction potential as field parameters for the groundwater program.

Adaptive Management Plan

36. The Licensee shall submit an updated Adaptive Management Plan to the Board within 90 days of the effective date of this licence. The updated plan shall include, but not be limited to:

    a) the terms and conditions of this licence;

    b) the addition of sulphate to the AMP for mine source flow path water quality and receiving environment surface water quality components of the AMP;

    c) the addition of specific numerical thresholds for the mine source groundwater quality AMP based on scientifically derived thresholds that are proactive and protective of the receiving environment; and

    d) as part of the annual reporting on the AMP, a detailed assessment of the full suite of paramaters being measured at AMP indicators stations and identification of any additional indicator parameters that should be incorporated into the AMP.

Groundwater-Surface Water Interaction Study

37. Within 90 days of the effective date of this licence, the Licensee shall submit to the Board a plan for the assessment of groundwater-surface water interactions at the site including, but not limited to:

    a) a review of all monitoring results from all wells on site;

    b) predictions of groundwater-surface water interactions; and

    c) verification of existing site information including rationale supporting location of receiving water monitoring stations.

38. The Licensee shall carryout the assessment according the plan and submit report documenting the results of the program and any recommendations stemming from the study on or before March 31, 2019.

39. Subject to any required assessments, authorizations or approvals, the Licensee shall implement all plans required by this section of this licence.

PART F –RECEIVING WATER QUALITY STANDARDS

40. All results of grab sample analysis for MH-11, MH-12 and MH-15 shall meet the following receiving water quality standards.

Parameter	Maximum Concentration in a Grab Sample
Aluminum, dissolved	if pH ≥ 6.5 = 0.05 mg/L if pH < 6.5 = e[1.6–3.327(median pH)+0.402(median pH)^2]
Antimony, total	9 µg/L

Parameter	Maximum Concentration in a Grab Sample
Arsenic, total	5 µg/L
Beryllium, total	0.13 µg/L
Cadmium, dissolved	$= e^{[0.736\,x\,\ln(hardnesss)-4.943]}$ in µg/L
Chromium VI, total	1 µg/L
Cobalt, total	4 µg/L
Copper, total[1]	if hardness ≤ 50 mg/L = 2 µg/L if hardness >50 mg/L = 0.04 x (hardness)
Iron, total[2]	1 mg/L
Lead, total[3]	**MH-12/ MH-15** (µg/L) $= \{3.31 + e^{[1.273\ln(hardness)-4.704]}\}$ **MH-11** (µg/L) = $1.928 \times \{3.31 + e^{[1.273\ln(hardness)-4.704]}\}$
Molybdenum, total	0.073 mg/L
Nickel, total	if hardness ≤ 60 mg/L or unknown = 25 µg/L if hardness > 60 mg/L and ≤ 180 mg/L = $[e^{\{0.76[\ln(hardness)]+1.06\}}]$ µg/L if hardness > 180 mg/L= 150 µg/L
Selenium, total	2 µg/L
Silver, total	0.25 µg/L
Sulphate, total	if hardness ≤ 30 mg/L =128 mg/L if hardness > 30 mg/L and ≤ 75 mg/L =218 mg/L if hardness > 75 mg/L and ≤ 180 mg/L =309 mg/L if hardness > 180 mg/L =429 mg/L
Thallium, total	0.8 µg/L
Zinc, total[3]	**MH-12 / MH-15** if hardness ≤ 90 mg/L = 7.5 µg/L if hardness > 90 mg/L $= [7.5 + 0.75(hardness - 90)]$ µg/L **MH-11** if hardness ≤ 90 mg/L = 18.75 µg/L if hardness > 90 mg/L $= 2.5 \times [7.5 + 0.75(hardness - 90)]$µg/L

Hardness is measured in mg/L $CaCO_3$ at monitoring station

[1] Standard for Copper during month of May is 4 µg/L if hardness ≤ 50 mg/L or 0.08 x [hardness] if hardness > 50 mg/L

[2] Standard for Iron during month of May is 3.9 mg/L

[3] Apply to dissolved fraction when TSS is 4 mg/L or higher

PART G - MONITORING AND SURVEILLANCE

41. The Licensee shall comply with the water quality monitoring program and surveillance network program as outlined in the EMSRP and in accordance with Schedule A of this licence and shall submit the data that is compiled as a result of these programs and studies as a component of the required annual reports.

42. Laboratory analyses shall be performed by a laboratory accredited under the International Organization for Standardization ISO/IEC 17025:2005 standard and the accreditation must include the actual tests being performed by the laboratory.

43. Monitoring and sampling shall be carried out in accordance with the procedures and standards described in:

    a) Guidance Document for the Sampling and Analysis of Metal Mining Effluents, April 2001, (Report: EPS 2/MM/5), Minerals and Metals Division, Environment Canada;

    b) Guidance Document for Flow Measurement of Metal Mining Effluents, April 2001, (Report: EPS 2/MM/4), Minerals and Metals Division, Environment Canada;

    c) Standard Guide for Sampling Ground-Water Monitoring Wells, ASTM D4448-01, ASTM International, PA, USA.

Physical Monitoring Program

44. The Licensee shall comply with the physical monitoring program as outlined in the EMSRP and Schedule B of this licence and shall submit the data that is compiled as a result of these programs and studies as a component of the required annual reports.

45. All earthworks and water retaining structures including, but not limited to, open pits, waste dumps, ditches, dams, dykes, weirs and appurtenances shall be inspected by a Professional Engineer licenced to practice in Yukon as per the Post-Closure Geotechnical Monitoring Plan. The results of the inspection, including all problems identified, remedial measures proposed, and remedial measures implemented, shall be compiled in a report that shall be submitted to the Board as part of the annual report.

46. The Licensee shall complete a dam safety review for all water retaining structures, including but not limited to dams, dykes, weirs and appurtenances at least once every ten years, with the first review to be completed no later than 2026. The review shall be conducted in accordance with the most recent Dam Safety Guidelines published by the Canadian Dam Association.

47. Details of any maintenance, inspection and/or surveillance activities undertaken in the previous year in relation to dam safety shall be included in the annual report.

48. The North tailings dam shall be monitored by the use of instrumentation as required by the Engineer of Record in the Post-Closure Geotechnical Monitoring Plan to ensure long term stability.

Fisheries Monitoring Program

49. A fisheries monitoring program shall be conducted in accordance to Schedule A-Part 3 of this licence and the EMSRP. The sample locations shall be marked in the field in a manner that ensures that replicate surveys can be made.

50. The Licensee shall survey sites MH-13, and MH-30 beginning in 2018, to confirm:

    a) a generalized stream bed and substrate characterization and to identify changes since the previous sampling, and

b) through generally accepted methodology, a catch per unit effort and the general implications of any changes observed as compared to prior sampling periods.

51. The results of the fisheries monitoring program shall be included in the Annual Report.

Benthic Invertebrate Monitoring

52. Benthic invertebrate monitoring shall be conducted in accordance with Schedule A-Part 3 of this licence and the EMSRP beginning in 2018.

53. The Licensee shall collect representative samples in accordance to the Canadian Aquatic Biomonitoring Network (CABIN) Field Manual for wadeable streams, and accepted preservation, enumerative and identification procedures.

54. Sample collection, identification, enumeration and data interpretation shall be performed by an individual having qualifications, expertise and experience in the subject.

55. Water sampling shall be conducted at each of the collection sites during the sample period per Schedule A.

56. Results of the benthic invertebrate monitoring and the water sampling and analysis shall be included in the Annual Report.

Sediment Monitoring

57. Sediment monitoring shall be conducted in accordance with Schedule A-Part 3 of this licence and the EMSRP.

58. The timing of the sediment monitoring shall coincide with the benthic invertebrate monitoring program. Triplicate samples shall be collected at each of the five sites indicated in the benthic invertebrate monitoring program.

59. All data collection shall be conducted in accordance to a nationally recognized sampling protocol (e.g. CCME Protocols Manual for Water Quality Sampling in Canada, 2011). The results shall be included in the Annual Report.

PART H – GENERAL CONDITIONS

60. The Licensee shall ensure a copy of this Licence is maintained at the site during operations at all times.

Other Laws

61. No condition of the water use licence limits the applicability of any statutory authority.

62. All construction or installation of works authorized by this licence shall occur on property that the Licensee has the right to enter upon and use for that purpose.

Non-Compliance

63. In the event that the Licensee fails to comply with any provision or condition of this licence, the Board may, subject to the Act, cancel the licence.

Correspondence

64. Where any direction, notice, order or report under this licence is required to be in writing, it shall be given:

a) To the Licensee, if delivered, or mailed by registered mail, to the address identified on page 1 of this licence, and shall be deemed to have been given to the Licensee on the day it was delivered, or 7 days after the day it was mailed, as the case may be; or

b) To the Board, if delivered, faxed or mailed by registered mail, to the following address:

Yukon Water Board
Suite 106, 419 Range Road
Whitehorse YT Y1A 3V1

Fax#: (867) 456-3890

and shall be deemed to have been given to the Board on the day it was delivered or faxed, or 7 days after the day it was mailed, as the case may be.

c) The Board or the Licensee may, by notice in writing, change its address for delivery.

Annual Reports

65. The Licensee shall submit annual reports to the Board on or before March 31 of the year following the year reported. The report shall include the information required by the Regulation including, but not necessarily limited to:

a) summaries of all data generated as a result of the monitoring requirements of this licence, including analysis and interpretation by a qualified individual or firm and a discussion of any variances from baseline conditions or from previous years' data;

b) a detailed record of any major post-reclamation maintenance work carried out on the waste dumps, diversion works, roads or any other aspect on the property that may have an impact on water;

c) documentation of any activities carried out at the site including those carried out under the requirements of the DDRP or Adaptive Management Plan;

d) reporting on the Adaptive Management Plan; and

e) an identification of any recommendations from the physical monitoring program, or from the most recent dam inspections or safety reviews, that were either not implemented, or that did not comply with the schedule proposed in the report, or in the review, including an explanation of why the recommendations was not implemented.

Quarterly Reports

66. Unless otherwise specified in this licence, the Licensee shall forward to the Board a copy of all data collected as part of the monitoring programs of this licence no more than 30 days after the conclusion of each quarterly sampling event in which that data was collected.

Reports

67. The Licensee shall provide to the Board one unbound, single-sided, paper copy of all reports required by this licence. All reports must be reproducible by standard photocopier.

68. The Licensee shall upload electronic copies of all reports required by this licence to the Yukon Water Board's online licensing registry, Waterline. Electronic copies shall be submitted in one of the following formats: MS Word, MS Excel, or Adobe .pdf format.

69. All water quality, water quantity and water level data shall also be submitted in Excel format. Water quality results must be uploaded to Waterline in the format outlined in the most recent version of Yukon's "Laboratory Data Submission Standards for Water Quality". This guide is available on the Yukon Water Board website.

SCHEDULE A – PART 1
SURVEILLANCE MONITORING SITES

Station ID	Station Description	Coordinates	
		Northing	Easting
MH-11	Camp Creek located 2 km downstream of the Reclaim Pond (Upper False Canyon Creek)	6707788	509460
MH-12	East Fork of Tributary E – of False Canyon Creek, approximately 2 km downstream of the north tailings dam	6712755	509688
MH-02	North Dam seepage	6711477	508060
MH-22	Burnick 1200 Portal discharge	6712946	506767
SDH-S2	Drainage from the 1380 Portal, present as a seep in the downslope waste rock dump	6709558	506325
MH-13	False Canyon Creek main channel located 10 km downstream of the mine site	6709113	512541
MH-04	Located near the Camp Creek headwaters above the former Reclaim Pond	6710292	507267
MH-15	West Fork of Tributary E	6718408	510041
MH-29	Access Creek Upstream of Camp Creek	6708895	509146
MH-30	Unnamed Tributary Upstream of False Canyon Creek	6707568	510985
MW13-01	Jewelbox/Main Zone – in 1380 Gully, downgradient of 1380 Portal.	6710202	506635
MW13-04	Main Access Road	6708729	507240
MW13-05	Main Access Road – south of the Mill Site on the Main Access Road.	6709392	507318
MW13-06	Burnick 1200 Portal	6713001	506761
MW13-07	North Dam – north of the North Dam and tailings pond area.	6711502	507904
MW13-10	Mill site - northeast of the Mill Site	6709866	507774
MW13-08	Downgradient of 1380 Portal	6710234	507325
MW13-13	Downgradient of 1380 Portal	6709814	506452
MW14-01	In proximity to the landfill.	6712303	507861
MW14-02	In proximity to the landfill.	6712330	507967
MW14-03	In proximity to the landfill.	6712442	507922
MW14-04	In proximity to the landfill.	6712365	508005

SCHEDULE A – PART 2
WATER MONITORING SURVEILLANCE PROGRAM

Station Category	Station ID	Flow	Water Level	Field Measurements		External Analytical Suite	
				Frequency	Parameters	Frequency	Analytical Suite
Compliance Point	MH-11	BM		BM	C	BM	A
	MH-12	BM		BM	C	BM	A
	MH-15	BM		BM	C	BM	A
Discharge Source	MH-02	BM		BM	C	BM	A
	MH-22	BM		BM	C	BM	A
	SDH-S2	BM		BM	C	BM	A
Additional Surface Water Stations	MH-13	BM		BM	C	BM	A
	MH-04	BM		BM	C	BM	A
	MH-29	BM		BM	C	BM	A
	MH-30	BM		BM	C	BM	A
Groundwater	MW13-01		Q	Q	D	Q	B
	MW13-04		Q	Q	D	Q	B,H
	MW13-05		Q	Q	D	Q	B,H
	MW13-06		Q	Q	D	Q	B
	MW13-07		Q	Q	D	Q	B,H
	MW13-10		Q	Q	D	Q	B,H
	MW13-08		Q	Q	D	Q	B
	MW13-13		Q	Q	D	Q	B
	MW14-01		Q	Q	D	Q	B,H
	MW14-02		Q	Q	D	Q	B,H
	MW14-03		Q	Q	D	Q	B,H
	MW14-04		Q	Q	D	Q	B,H

BM: Bi-monthly; S/F: Spring and Fall (freshet and low flow periods); Q:Quarterly (to include freshet and low flow periods

C: pH, specific conductance, water temperature

D: pH, specific conductance, water temperature, dissolved oxygen, ORP

A: pH, specific conductance, total alkalinity, TSS, TDS, total and dissolved metals, total ammonia-N, nitrate-N, nitrite-N, dissolved sulphate, hardness

B: pH, specific conductance, total alkalinity, dissolved metals, total ammonia-N, nitrate-N, nitrite-N, dissolved sulphate, hardness

H: hydrocarbons including BTEX, LEPH, HEPH, VPH, PAH

SCHEDULE A – PART 3
AQUATIC RESOURCES MONITORING PROGRAM

Station ID	Benthics/ Sediments	Fisheries
MH-11	BA-LFF	
MH-12	BA-LFF	
MH-13	BA-LFF	BA-LFF
MH-04	BA-LFF	
MH-29	BA-LFF	
MH-30	BA-LFF	BA-LFF

BA-LFF: Every two years during the low flow period (August or September)

Benthics: field collection and laboratory taxonomy using CABIN wadeable stream protocol.
Sediment: metals, total organic carbon and particle size
Fisheries: population and fish size

SCHEDULE B – PHYSICAL MONITORING

Inspection of Relevant Mine Components

Year	Frequency
2017- 2026	Annually
2027-2040	Years 2031, 2036, 2040

APPENDIX B

ADAPTIVE MANAGEMENT PLAN

ALEXCO ENVIRONMENTAL GROUP

Sä Dena Hes Mine

Post-Reclamation Adaptive Management Plan

12/02/2018

Prepared for:

SÄ DENA HES OPERATING CORPORATION C/O TECK RESOURCES LIMITED

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1. INTRODUCTION

1.1 OVERVIEW

The Sä Dena Hes (SDH) mine is a lead/zinc mine located 45 km north of Watson Lake in southeastern Yukon within the Traditional Territory of the Kaska First Nation, specifically Liard First Nation (LFN). The SDH mine was constructed in 1991 and operated between August 1991 and December 1992 by Curragh Resources Inc. under Water Licence IN90-002 pursuant to the *Northern Inland Waters Act*. Approximately 700,000 tonnes of ore were mined and processed onsite during the 16-month operation of the mine. The mine has not been in operation since that time.

After 14 years in Temporary Closure, on January 26, 2012, Teck Resources Limited (Teck), on behalf of the Sä Dena Hes Operating Corporation (SDHOC), informed YG of its intention to enter the SDH mine into permanent closure and begin to implement the approved Detailed Decommissioning and Reclamation Plan (DDRP) on January 29, 2013. The decommissioning, closure and reclamation activities to permanently close the SDH mine was conducted from 2013 to 2015 in accordance with the licensed and approved DDRP.

During the 25-year post-reclamation phase, Teck proposes:

- To continue to deposit a waste from the discharges of the Main Zone 1380 Portal, the Burnick 1200 Portal and seepage from the Tailings Management Facility;
- To maintain and replace (if necessary) culverts and crossings on the Main Access Road and Site Access Road; and
- To store/alter water flow (to maintain dry construction conditions) for removal of culverts and back stabilization during decommissioning of the Main Access Road and Site Access Road.

This Adaptive Management Plan (AMP) is a tool used to address uncertainty or conditions in water quality beyond those anticipated in post-reclamation. AMPs outline a range of possible but unexpected outcomes and the responses that will be undertaken to curb possible negative impacts associated with these unexpected situations.

There are several very prescriptive and detailed management plans required for both operational control and regulatory approval for the post-reclamation period. Teck has developed a number of operational management plans which describe the management and response actions for expected conditions at the site. These plans currently include:

- Detailed Decommissioning and Reclamation Plan (Teck, 2015); and,
- Environmental Monitoring, Surveillance, Reporting Plan - EMSRP (Teck, 2017).

This AMP provides a framework for responses to conditions beyond those expected and identified in these decision-based management plans. Consequently, this AMP addresses a limited range of components related to water quality. It is expected that the AMP will be reviewed and revised as the closure measures are evaluated over

time. The AMP has also been updated to reflect the conditions described in Water Use License, QZ16-051, which came into effect April 1, 2017.

1.2 ADAPTIVE MANAGEMENT PLANNING

Adaptive management is an approach to environmental management that is appropriate when a mitigation measure may not function as intended or when broad-scale environmental change is possible. Adaptive management plans are precautionary in nature, and provide a level of security in long term environmental planning. Adaptive management plans also allow for the inclusion of improved science into mitigation measures as they are continually revised.

Adaptive management has been evolving since its emergence in the 1970s. Adaptive approaches include an ability to incorporate knowledge into the management plan as the knowledge is gleaned and circumstances change (Eberhard, et al., 2009). Eberhard, et al., described the categories of knowledge that may trigger changes to water quality management plans; system understanding, measuring progress, and anticipating changes. These categories allow for the inclusion of knowledge and adaptation of management to changed conditions. Embedding adaptation into environmental plans involves thinking about how the results of monitoring will change management actions. Adaptive management plans are a way to accept uncertainties and build a structured framework to respond to changing conditions.

Adaptive management constructs a flexible path with actions to take when specific triggers occur. AMPs are a formalization of a plan for performance monitoring and project re-evaluation in the future. The general structure of adaptive management can be described by the following steps:

1. Identify risk triggers associated with vulnerabilities or uncertainties;
2. Quantify impacts and uncertainties;
3. Develop a monitoring network to understand variability and detect changes in water quality;
3. Evaluate strategies and define implementation path that allows for multiple options at specific triggers;
4. Monitor the performance and critical variables in the system; and
5. Implement or re-evaluate strategies when triggers are reached.

While the nomenclature used in AMPs varies, the steps listed above are representative of typical AMP processes. Within AMPs, triggers provide decision points in a stepwise decision-making framework that identifies how and when management action should be taken. A key characteristic of adaptive management is monitoring, which is used to document and track the status of the system of interest and to adjust management policies in an iterative process. Adaptive management is a rigorous method for addressing uncertainties in natural systems to meet performance objectives.

1.3 ADAPTIVE MANAGEMENT PLAN OBJECTIVES

This document identifies areas of uncertainty within the operational phase of Permanent Closure at Sä Dena Hes Mine and provides an AMP framework for each. The AMP describes monitoring commitments, thresholds, triggers and responses to underperforming elements or emerging risks for water quality. The steps laid out in the AMP framework are proactive, and describe progressively intensifying actions taken before adverse environmental impacts are observed.

Response planning, and results for anticipated, known and/or planned events are contained within site management plans. This AMP provides a framework for responding to a range of future events that are uncertain such as the loss of attenuation capacity, increased rates of metal release or other events that can result in the exceedance of the site water quality objectives.

AMPs do not prescribe specific responses to range of events, which is a function of Management plans. AMPs are designed to expand from monitoring data and must be flexible to do this. It is difficult to predict the specific environmental conditions that may arise which require a response from management and, therefore, the AMP does not provide specific detailed descriptions of responses to a situation. The AMP provides a range of possible responses to use as a guide to respond to specific environmental conditions encountered. Management should use the information provided in the AMP and undertake the appropriate response.

1.4 ADAPTIVE MANAGEMENT PLAN APPROACH

In addition to the conclusions drawn from monitoring, the approach presented in this AMP follows the Environment Canada Environmental Code of Practice for Metal Mines, Section 4.1.17 on Adaptive Management, which states that:

Mine owners/operators should use adaptive management methods to revise and refine the environmental management strategy. Adaptive management should consider a wide range of factors, including:

- results of environmental audits or other evaluation activities;
- results of environmental monitoring;
- results of monitoring of the performance or condition of environmental infrastructure, such as containment structures, water management systems or treatment facilities;
- technological developments; and
- changing environmental conditions. (Environment Canada, 2009)

In addition to the guidance provided by the Environmental Code of Practice for Metal Mines, the AMP meets the Yukon Government's Protocol for the Contaminated Sites Regulation under the Environment Act Protocol 13: Adaptive Management.

1.4.1 AMP FRAMEWORK

This AMP is laid out using a common element approach to consistently implement the AMP protocol as illustrated in Figure 1-1. The common elements are:

1. Description of the site water quality components and associated risk narratives:

- *Description* and understanding of the component leads to risk narrative and specific performance thresholds.
- *Risk Narrative* describes the possible environmental impacts and environmental conditions to water quality that implementation of the AMP will prevent.

2. Monitoring site water quality:

- *Specific Indicators* are the environmental or physical parameters to be monitored and assessed. Specific indicators are measurable or observable, and are indicative of changes from the designed or expected condition, such as select water chemistry parameters and groundwater levels.
- *Monitoring Requirements* describes the monitoring regime for the component including frequency, type of data required, and interpretation of results. The monitoring sites and schedule for the entire SDH mine site during reclamation and closure are already set out in the Environmental Monitoring, Surveillance, Reporting Plan (Teck, 2017). The AMP identifies specific monitoring sites described in the EMSRP that would identify potential changes and uses those sites and monitoring schedule to prompt an appropriate response. One of the possible actions that can come out of the AMP if triggered is to examine the water quality results from appropriate additional monitoring sites described in EMSRP, or to request additional sampling beyond those in the EMSRP.
- *Specific Performance Thresholds* define the conditions, in terms of specific indicators, when action is triggered. Performance thresholds are specific to each AMP component and are staged to accommodate levels of concern and a diversity of actions. To the extent possible, specific performance thresholds will include early warning thresholds.

3. Responding to unexpected conditions of the component:

- *Specific Responses* are staged according to specific performance thresholds and describe the actions to be implemented if those thresholds are crossed.

  The actions to be implemented are the following:

  a) Notification – notify the appropriate parities based on which component and level of specific performance threshold is exceeded.

  b) Review – verification of data appropriate to the level of specific threshold exceeded.

  c) Evaluation – an investigation into the cause of the exceedance appropriate to the level of the specific threshold exceeded. Can include trend analysis, resampling, or a more thorough investigation into root causes.

d) Action – an appropriate response based on the level of the specific threshold exceeded.

4. Annual Reporting and Review:

Annual Reporting would include the rationale for modifying the AMP if site conditions were to change. The AMP should be modified whenever monitoring data demonstrate a sustained deviation from previous trends in the data, the monitoring plan is revised and/or the best available conventional technology or practice to characterize or mitigate the water quality becomes available. The annual review will include a review of the relevant monitored data and AMP elements. Updates, amendments, performance thresholds crossed, and trigger(s) activated will be provided to the appropriate governmental organizations as required and will be part of the annual report.

In year 10 of the EMSRP monitoring schedule, data will be reviewed to evaluate if data variability and trends have been adequately characterized to reduce the monitoring frequency. The AMP will be reviewed and potentially revised such that the AMP is consistent with the proposed monitoring schedule from year 11 and onwards.

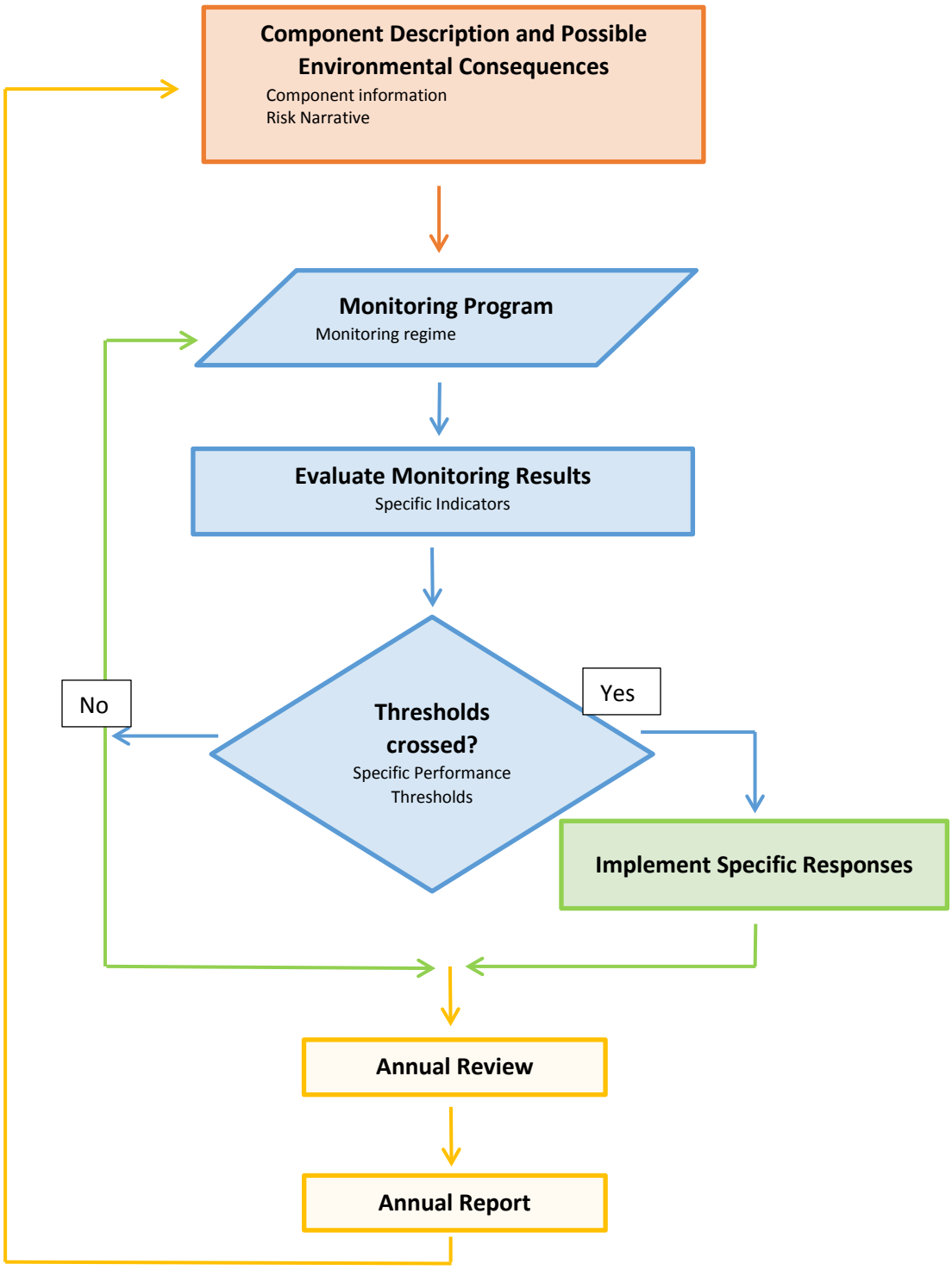


Figure 1-1: Sequential Components of the AMP (Adapted from AECOM 2010).

1.4.2 SITE SPECIFIC LOADING

This AMP was developed to protect water quality in the receiving water (Camp Creek, Tributary E, and False Canyon Creek) downgradient of the site.

This AMP does not consider physical stability or waste covers as mine components requiring AMP triggers and thresholds as the purpose of an AMP is to provide a management framework for facilities and performance that have a relatively high degree of uncertainty. The physical stability of the covers and the engineered geotechnical facilities will be monitored and maintained during post-reclamation according to the *Geotechnical Monitoring Program* (SRK, 2014b), and the *Environmental Monitoring, Surveillance, and Reporting Plan* (Teck, 2017). If during regular monitoring and maintenance further issues are identified they will be dealt with under these two plans. These plans also account for additional inspections that can be triggered by extraordinary circumstances such as after a significant storm or seismic event.

1.5 DESCRIPTION OF AMP LOADING SOURCES AND FLOW PATHS

There are three loading sources (North Dam Seepage, Burnick Portal and 1380 Portal) at SDH. Loadings from these sources infiltrate into the ground near their sources. Loading from the sources would then travel along groundwater flowpaths to surface water features. Constituent loading from the sources has not been observed in the receiving water and the mass loadings have been inferred to be attenuated. This section, adapted from the *Draft Adaptive Management Plan, Sä Dena Hes Mine* (SRK, 2014a) describes each loading source, the geochemical conceptual model and the drainage flow path.

1.5.1 NORTH DAM SEEPAGE

During operations, tailings were discharged to the North Tailings Dam. Currently, there is no ponded water behind the North Tailings Dam. The tailings are saturated within a meter of the surface. Seepage from the toe of the North Dam is routinely monitored at MH-02 as required by the existing WUL QZ15-082 (previously QZ99-045). The seepage at MH-02 is tailings porewater that mixes with groundwater from the valley sides and runoff from the North Dam face (SRK 2000). The seepage quality at MH-02 is routinely in compliance for all WUL parameters.

Seepage from the North Tailings Dam flows throughout the entire year. Flow at MH-02 is highest during freshet and lowest during the winter. The seepage flows above ground for a short distance from the North Dam before infiltrating into the ground. It then flows as groundwater before eventually discharging to North Creek and the headwaters of the East Fork of Tributary E. From the East Fork of Tributary E, the water flows to Tributary E and then to False Canyon Creek. The flow path is shown in Figure 1-2, Figure 1-3, and Figure 1-4.

Metal attenuation along this pathway has not been evaluated. The flowpath between the point of infiltration and discharge to surface water is shorter than the flowpaths at the Burnick Portal and 1380 Portal. For the purposes of the post-reclamation water quality predictions, it was conservatively assumed that the entire constituent load from the seepage discharges to North Creek above MH-12 and that there was no attenuation of metals by the soil (SRK 2014a).

1.5.1.1 Specific Issues

The objective of the AMP for the North Dam seepage is to detect any deterioration in water quality in the tailings dam seepage and manage and mitigate these changes before any effects are observed in the downstream receiving surface waters. AMP monitoring locations include tailings seepage monitoring at MH-02 located at the toe of the dam and surface water monitoring station MH-12 in North Creek.

Monitoring MH-02 would detect any changes in water quality close to the loading source. Downstream of this station, tailings seepage flows as groundwater. Any potential change in surface water quality in the receiving waters would therefore be a function of groundwater reactive transport. Any water quality changes are expected to be slow and would be detected by monitoring over multiple years.

1.5.2 BURNICK PORTAL DISCHARGE

The Burnick Portal is located 3 km from the former SDH mill site and was constructed to access the Burnick Zone ore body. There are two portals (1200 and 1300) at the Burnick Zone. The lower portal previously discharged continuously and has been routinely monitored during temporary closure at MH-22 as part of WUL QZ15-082 (previously QZ99-045). Now discharge from MH-22 is ephemeral (June to November). The discharge water quality exceeds the WUL limits for zinc during low flow months.

MH-22 discharge flows through a buried culvert, cascades over the crest of the Burnick waste rock dump, and then infiltrates under the waste rock dump. It then flows downgradient to the east-northeast as groundwater to the headwaters of the West Fork of Tributary E, which is more than 1.5 km downgradient of the portal, as shown on Figure 1-2, Figure 1-3, and Figure 1-4. The headwaters of the West Fork of Tributary E are marshy and channeled surface flow is intermittent. Surface water flows to the east-northeast from the West Fork of Tributary E into Tributary E at MH-15 and then to False Canyon Creek. There is currently no evidence of the zinc load from the Burnick Portal in Tributary E or False Canyon Creek (SRK 2005). SRK (2000) concluded zinc is attenuated through extensive contact with the soils between the Burnick Portal and the West Fork of Tributary E.

Column experiments using discharge from the Burnick Portal and downstream soils were used to evaluate the attenuation mechanism (SRK 2007). The test work concluded that downgradient soils have the potential to significantly attenuate zinc concentrations at the levels observed in the discharge for much longer than 200 years. Column tests showed the attenuation capacity was not exhausted and no secondary minerals were formed. The studies confirmed that zinc is passively removed by contact with downgradient soils.

Because the zinc attenuation mechanism has more than 200 years of capacity, the attenuation capacity of the soils is considered to last for the duration of the licenced post-reclamation period.

1.5.2.1 Specific Issues

The objective of the AMP for the Burnick Portal discharge is to detect any deterioration in water quality in the drainage flowing from the Burnick Portal and downgradient surface water. AMP monitoring locations include the Burnick portal drainage (MH-22), groundwater monitoring well MW13-06 adjacent to and downgradient of the

Burnick portal and surface water monitoring station MH-15 in the West Fork of Tributary E. The sampling locations and flow path are shown on Figure 1-2 , Figure 1-3, Figure 1-4.

Monitoring at MH-22 and MW13-06 would detect any changes in water quality in the portal drainage. Downstream of these stations, the drainage flows as groundwater. Any potential change in surface water quality in the receiving waters would be a function of reactive transport along the groundwater flowpath. Any changes are expected occur slowly and would be detected by monitoring over time.

1.5.3 1380 PORTAL DISCHARGE

The Main Zone Pit is a box cut located in the headwaters of Camp Creek. The 1380 Portal is located at the south end of the cut. In June 1999, drainage from the portal was observed. The drainage is monitored at MH-25 as part of WUL QZ99-045. MH-25 was sampled for the first time in 1999 to support the closure plan and was found to contain 41 mg/L dissolved zinc. The 1380 Portal was decommissioned in 2014 resulting in the portal drainage (and station MH-25) becoming inaccessible. Currently seepage within the downstream waste rock sump is the closest water quality sample to the 1380 portal drainage and is opportunistically sampled at station SDH-S2[1].

Drainage from the 1380 Portal is ephemeral (June to October) and consistently exceeded the previous WUL QZ99-045 (now QZ15-082) limits for zinc and cadmium and less frequently for lead. The zinc is leached from oxidizing exposed rock and talus around the portal area, which contain sphalerite. The source water is likely shallow groundwater with minor contributions from Jewelbox Pit (SRK 2000).

In 2000, MH-25 was monitored continuously for two months to assess variations in flow and chemistry. SRK (2000) reported that the drainage from the Main Zone pit portal contained elevated zinc, cadmium, and lead concentrations. Flow was estimated at 1 L/s. Flow decreased following freshet, but constituent concentrations were relatively constant. The constituent load associated with this flow was not detected in Camp Creek or False Canyon Creek at any time during the summer, suggesting attenuation along the flow path.

The 1380 Portal drainage flows through the marble Main Zone waste rock dump immediately downstream of the portal. Flow within the waste rock dump is audible but difficult to locate and/or access, resulting in infrequent monitoring. The dissolution of the marble attenuates zinc, cadmium, and lead by precipitation of metal carbonates. This attenuation mechanism of drainage from MH-25 is considered to last in perpetuity. Station SDH-S2 located within the waste rock below the 1380 Portal characterizes concentrations after attenuation by the waste rock. MH-25 and SDH-S2 have similar sulphate levels, but the zinc concentration is approximately four times lower at SDH-S2 than at MH-25, the level of cadmium is approximately five times lower, and the level of lead is approximately 1.5 times lower. Geochemical modelling indicates that that precipitation of zinc, cadmium, and lead carbonates is the probable attenuation mechanism resulting from the interaction of MH-25 drainage with marble waste rock (Day and Bowles 2005).

[1] The dump in its entirety is surveyed monthly for seepage. Samples are collected opportunistically at locations other than SDH-S2 when observed and accessible. Data are screened and reported as SDH-S2 if results are comparable.

After passing through the waste rock dump, the 1380 Portal drainage is further attenuated downstream as groundwater flows through the soils along the flow path to Camp Creek. There may eventually be a loss of attenuation capacity in the soils. The groundwater flow discharges to surface as a spring near the headwaters of Camp Creek. The length of the flow path from the 1380 Portal to the spring near the headwaters of Camp Creek is approximately 900 m. The spring is relatively large and is located where the southern fork of Camp Creek originates which mixes about 100 m downstream with water from a second groundwater spring on the southwestern flank of Mt. Hundere. Camp Creek flows to the south and is a tributary to False Canyon Creek, as shown on Figure 1-2 and Figure 1-3.

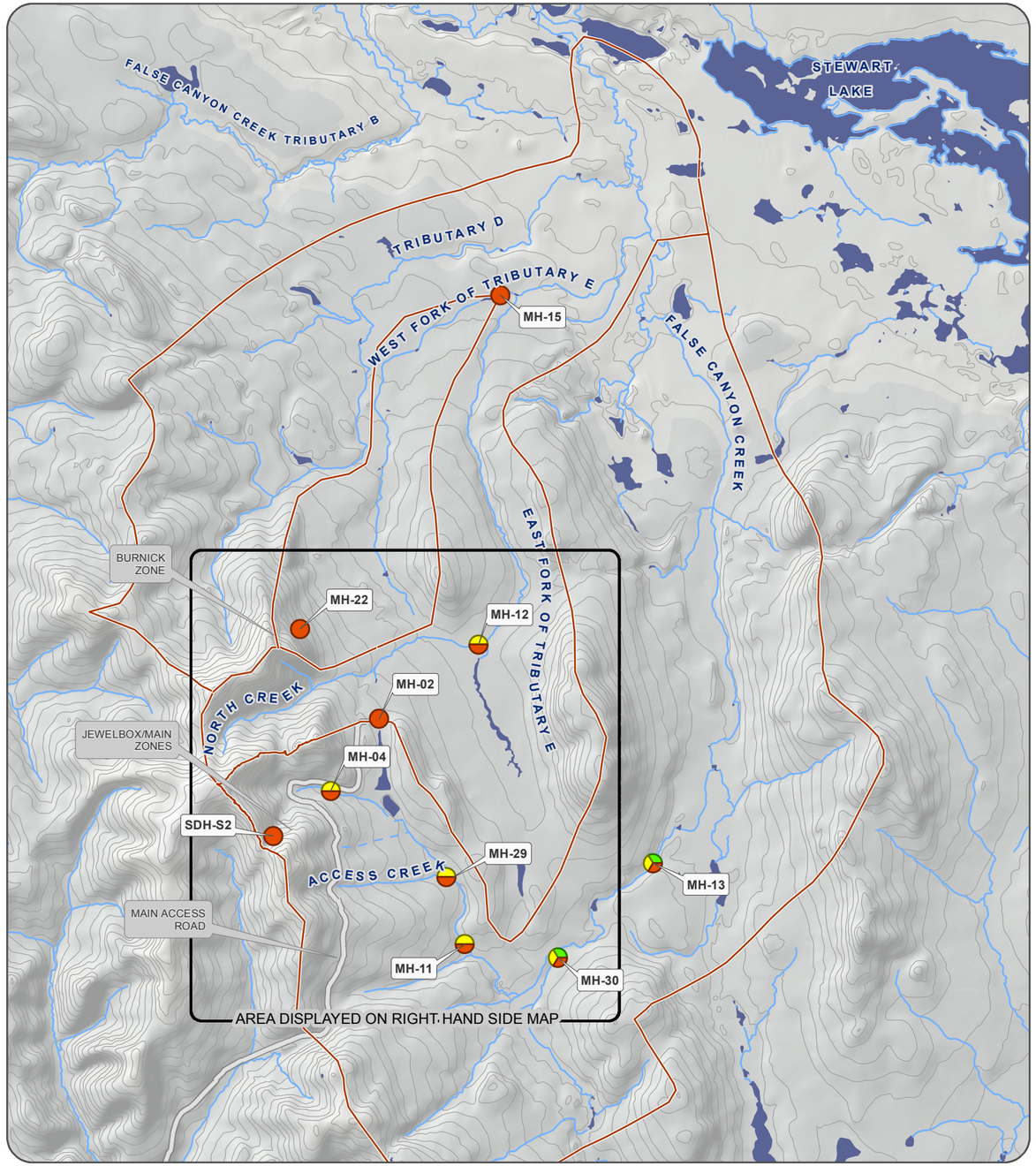
1.5.3.1 Specific Issues

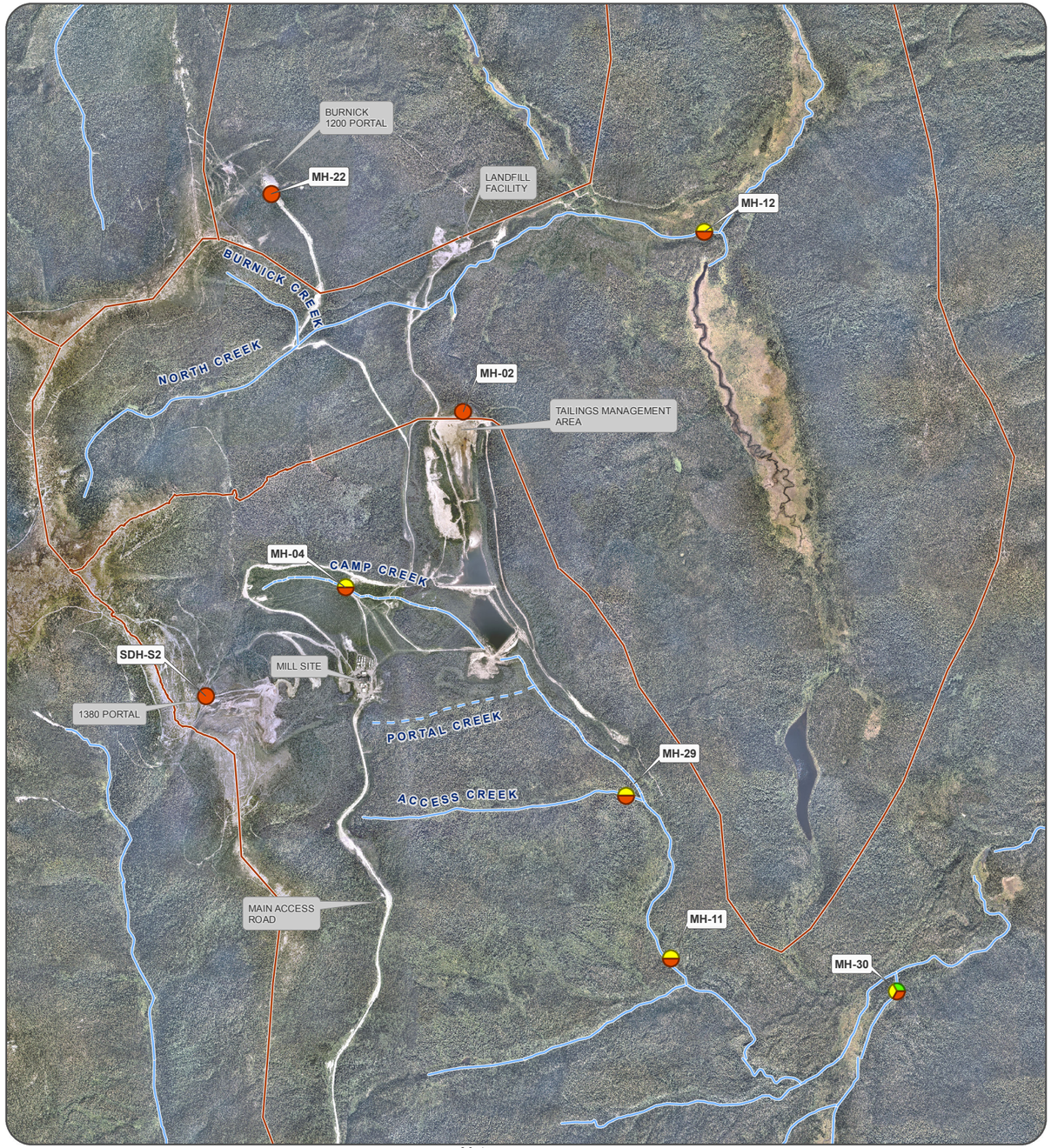
The objective of the AMP for the 1380 Portal drainage is to detect any deterioration in the portal drainage water quality within the waste rock dump and monitor for the potential loss of attenuation capacity of the soils upstream of Camp Creek. AMP monitoring locations include:

- Seepage monitoring at station SDH-S2[1] within the Main Zone waste rock dump,
- Groundwater monitoring at MW13-01, MW13-08, and MW13-13 located downgradient of SDH-S2 and upstream of Camp Creek, and
- Surface water monitoring at MH-11 upper False Canyon Creek.

All the locations are shown on Figure 1-2, Figure 1-3, and Figure 1-4.

Any potential change in surface water quality in the receiving waters would be a function of reactive transport along the groundwater flowpath. Any changes are expected to be slow and would be detected by monitoring over time.





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Post-Reclamation Monitoring Stations

- Fisheries Monitoring
- Benthos/Sediment Monitoring
- Surface Water Quality Monitoring

Catchments Boundaries

Teck

ACCESS

SÄ DENA HES MINE
POST- RECLAMATION PHASE WATER LICENSE APPLICATION

FIGURE 1-2
POST-RECLAMATION SURFACE WATER MONITORING STATIONS

JULY 2015

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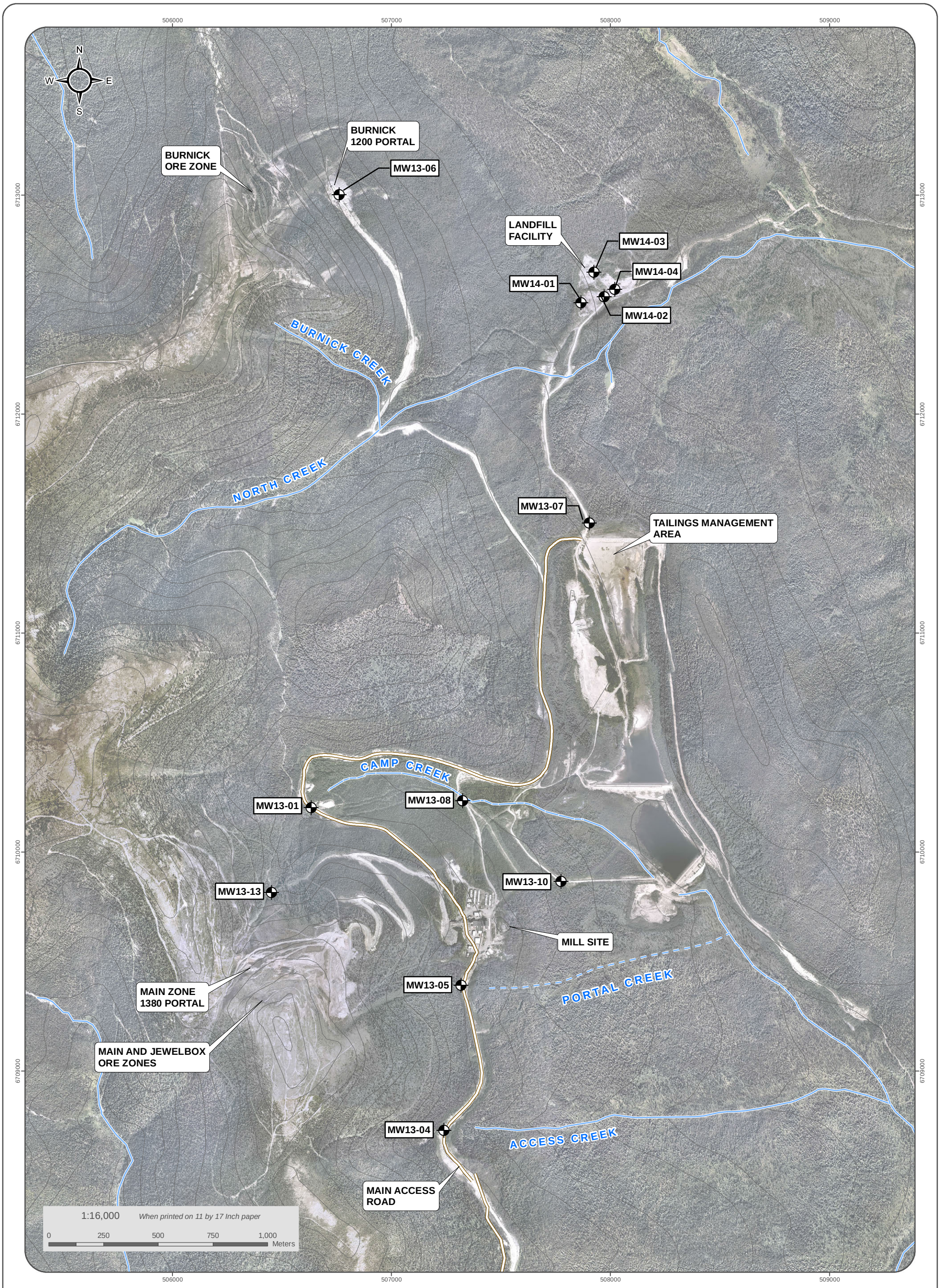

Monitoring Well

Perrenial Stream

Access Road

Ephemeral Stream

Contour

SÄ DENA HES MINE
ADAPTIVE MANAGEMENT PLAN

FIGURE 1-3
POST-RECLAMATION GROUNDWATER MONITORING WELL LOCATIONS

APRIL 2017

National topographic Data Base (NTDB) compiled by Natural Resources Canada at a scale of 1:50,000. Reproduced under license from Her Majesty the Queen, as represented by the Minister of Natural Resources Canada. All rights reserved.
Aerial Imagery Captures in 2012 (Pre-decomissioning and reclamation)

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AEG

Teck

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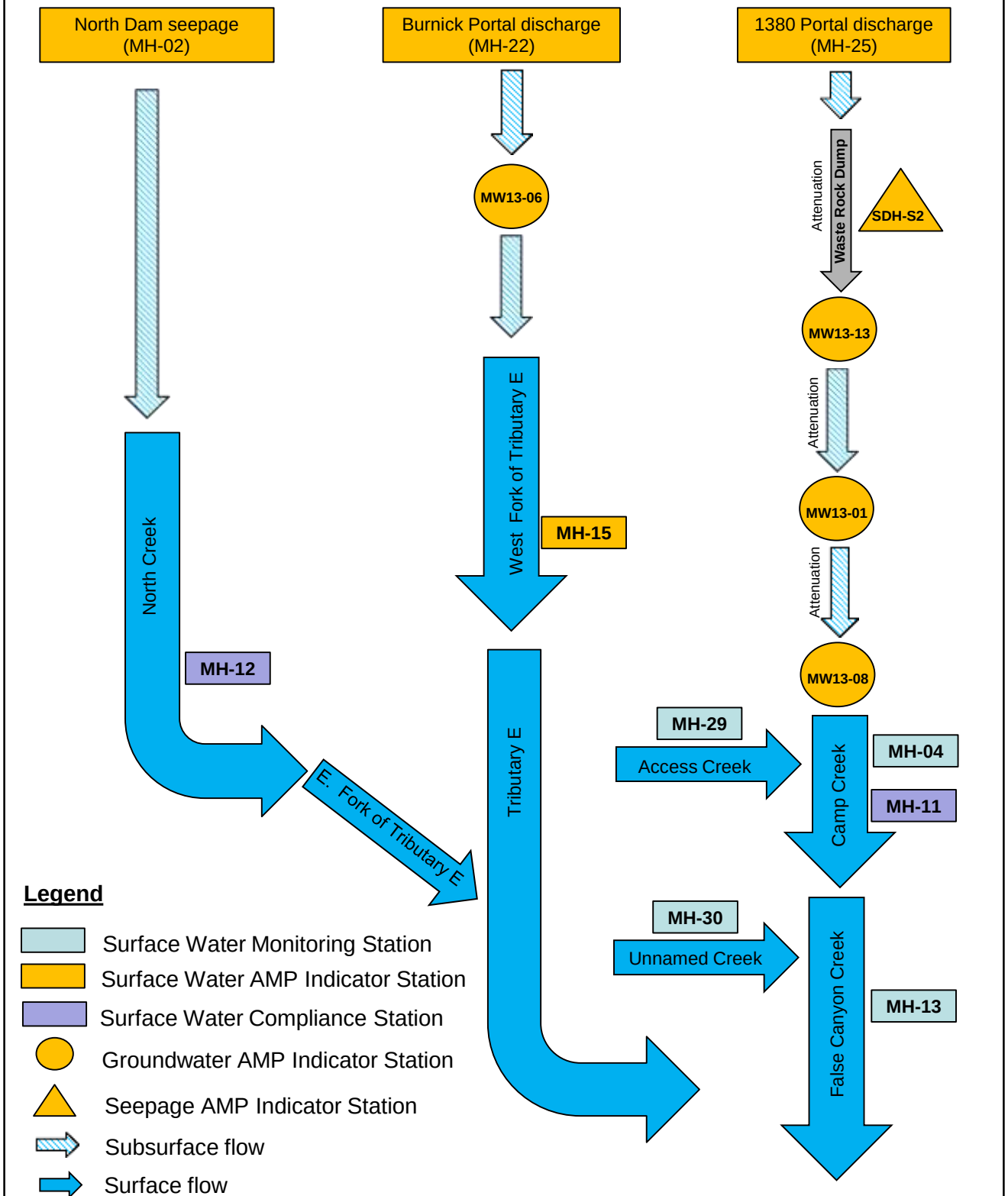

srk consulting	Teck	Adaptive Management Plan
		Conceptual Loading Diagram
Job No: 1CT008.043 Filename: AdaptiveManagementPlanFigures_1CT008.043_Rev01_LMC_LNB.pptx	Sä Dena Hes	Date: Sept 26, 2014 / Approved: LNB / Figure: 1-4

1.6 DESCRIPTION OF AMP LANDFILL COMPONENT AND FLOW PATHS

Waste from the demolition of the Mill was placed in the existing landfill in 2015. The landfill is located near the former North Creek pump house. The landfill contains waste produced during operations and demolition debris from the Mill Site, former camp and office buildings, and miscellaneous debris from the site. The direction of groundwater flow inferred from the potentiometric gradient is east across the site and ultimately discharges along North Creek (Golder, 2015b). Investigation in the vicinity of the landfill found that the groundwater is within a shallow, unconfined aquifer that is composed primarily of unconsolidated sand with silt, gravel, and cobbles (Golder, 2015b). Data collected in September, 2015 estimate the groundwater velocity across the landfill to be approximately 60 m/year, such that groundwater would discharge to North Creek after a two to three-year period (Golder, 2015b).

The groundwater table around the landfill has been generally greater than three meters below the base of the landfill. SDHOC Waste Management Permit (#81-020) for the landfill requires that the base of the landfill cells remain a minimum of three (3) meters higher than observed water table elevations. Water quality is also being monitored around the landfill to detect if any buried materials are leaching metals or are a source of hydrocarbons.

1.6.1 SPECIFIC ISSUES

The objective of the AMP for the Landfill is to detect if there is an increase in the water level such that the landfill would be submerged or detect a change in water quality that might imply that landfill materials are leaching metals or are a source of hydrocarbons. AMP monitoring locations include MW14-02, MW14-03, MW14-04, which would detect any changes in water quality and level close to the source. MW14-01 is a background monitoring station for the landfill that is part of the EMSRP. Any changes in water quality downgradient are expected to be slow and would be detected by monitoring over time.

1.7 DESCRIPTION OF AMP CONTAMINATED SITE GROUNDWATER COMPONENTS AND FLOW PATHS

An environmental assessment was completed by Golder between 2011 and 2014, and identified areas of the site as having concentrations of petroleum hydrocarbons and metals in soil in excess of the Yukon Contaminated Site Regulation (CSR) standards. A conceptual groundwater model for the site, from data collected in September 2015, estimated groundwater flow velocity through the overburden to be 80 m/year from the Mill Site to Camp Creek. The distance between these sites is ~ 800 m so that any contamination that originated at the Mill Site would arrive at Camp Creek within 10 years. The Mill site has been in place for greater than 20 years so it is likely that if any contamination had reached groundwater it would have already been detected.

1.7.1 SPECIFIC ISSUES

The objective of the AMP for the general CSR groundwater wells is to detect a change in water quality that might imply that metals or hydrocarbons plume is spreading from historical sources near the mill site or tailings pond area. AMP monitoring locations include MW13-10 (Mill Site), MW13-07 (Tailings Pond Area), and Jewelbox (13-05)

it would which would detect any changes in water quality and level close to the source. Any changes in water quality downgradient are expected to be slow and would be detected by monitoring over time.

Ultimately, overburden groundwater from these sites would discharge into Camp Creek (MH-11) and North Creek (MH-12).

2. AMP FOR MINE SOURCE FLOWPATH WATER QUALITY

2.1 MINE SOURCE WATER QUALITY

The AMP for the mine source water quality component has been adapted from the Draft Adaptive Management Plan, Sä Dena Hes Mine (SRK, 2014). The geochemical conceptual model and flow paths for each mine loading source are described in Section 1.5.

2.1.1 DESCRIPTION

Water quality monitoring has been conducted as a condition of the current WUL since 1991. As part of the WUL mine related source load water quality is monitored at:

- North Tailings Dam Seepage (MH-02);
- Burnick Portal (MH-22); and
- 1380 Portal (SDH-S2[2] as MH-25 has been decommissioned).

Water from these sources infiltrates to groundwater near the source and then migrates downgradient to areas of groundwater discharge. Monthly and quarterly water quality monitoring results currently meet the permit limits in the WUL at the receiving environment stations.

Water quality will be monitored after reclamation to observe any potential changes indicative of loading from the North Dam, Burnick Portal and 1380 Portal. The monitoring schedule for the source monitoring sites is presented in Table 2-1.

Table 2-1: Mine Source Water Monitoring Schedule

Stations	Monitoring Frequency [3]
MH-02, MH-22, and SDH-S2	Every 2 Months

[2] As discussed in Section 1.5.3, constituent concentrations in the 1380 Portal drainage at SDH-S2 are lower because of attenuation within the waste rock pile

[3] The frequency presented reflects the current water license conditions, which are not intended to remain at this frequency for the duration of the licence. A reduced frequency may be proposed in the future and the water licence subsequently amended.

2.1.2 RISK NARRATIVE

The objective of the AMP is to detect changes from existing conditions and ensure that mine source water quality does not negatively affect receiving aquatic environments. As described in Section 1.5 and shown on Figure 1-2 and Figure 1-3, mine source water does not report to the surface water compliance points (MH-11 and MH-12) directly, but goes to ground and is naturally attenuated upstream of these points. However, an increase in constituent loading from one of the three mine site sources (MH-02, MH-22, and SDH-S2) may result in potential deterioration in water quality at the downgradient surface water monitoring stations (MH-11, MH-12, and MH-15). As such, monitoring the water quality at these loadings sources could provide an early indication for the framework discussed in Section 2.2.

2.1.3 SPECIFIC INDICATORS, PERFORMANCE THRESHOLDS AND RESPONSES

Indicators, specific performance thresholds and responses specific to source water quality and the monitoring program are provided in Table 2-2. The source concentrations (MH-02, MH-22, and SDH-S2) have been relatively stable over the observed period (temporary closure through to current), such that increases of 25% or 50% above the above the maximum observed concentrations would indicate a change worth investigating. However, the contaminant load model suggests that increases in the order of 25% to 50% over the maximum observed concentration at these sources would not likely result in exceedances of site water quality limits downstream. As such, these increase thresholds are considered appropriate indicators for the mine source water quality. Additionally, one of the evaluation responses to Specific Threshold 2 in the Mine Source AMP is to evaluate if the data show an upward trend.

In addition, the AMP for Mine Source Flow Path Water Quality is designed to monitor the potential loss of attenuation capacity downgradient of the mine sources and not the changes in source loads. If source concentrations double or even increase by an order of magnitude, there may still be sufficient attenuation capacity to prevent an exceedance of downstream water quality limits. It is better to monitor for changes along the flowpath not at the source. The rate at which concentrations change downstream is a function of the travel time, dispersion, mixing with other groundwater sources, and the loss of attenuation capacity. The potential increase in downstream concentrations that may occur in response to the increase in source concentrations would occur over years, well within the temporal resolution of the monitoring program. Evaluating changes in concentrations over time (e.g., trend analysis) is an evaluation aspect of the groundwater flowpath AMP and is designed to monitor the potential impact of these changes on downstream water quality.

Table 2-2: Specific Indicators, Performance Thresholds and Responses for Mine Source Water Quality

<table>
<tr><th>Specific Indicators</th><th>Specific Performance Thresholds</th><th>Specific Responses</th></tr>
<tr><td>Concentrations, in mg/L at stations MH-02, MH-22 and SDH-S2 of:
• Cadmium
• Lead
• Zinc
• Sulphate</td><td>Specific Threshold 1 (ST1)

The specific threshold for these constituents is an increase of more than 25% above the maximum observed concentrations. The numerical thresholds are:

<table><tr><th>Parameter</th><th>MH-02</th><th>MH-22</th><th>Parameter</th><th>SDH-S2</th></tr><tr><td>Total Zn</td><td>0.40</td><td>2.3</td><td>Dissolved Zn</td><td>15.3</td></tr><tr><td>Total Cd</td><td>0.014</td><td>0.011</td><td>Dissolved Cd</td><td>0.13</td></tr><tr><td>Total Pb</td><td>0.006</td><td>0.05</td><td>Dissolved Pb</td><td>0.51</td></tr><tr><td>SO_4</td><td>600</td><td>134</td><td>SO_4</td><td>290</td></tr></table>Units are mg/L.</td><td>Notification
• Teck Representative/Environmental Monitor.
• Include in scheduled annual reporting.
Review
• Follow QA/QC investigative protocol:
o Review laboratory QA/QC report
o Validate original result, and re-run lab sample if a laboratory error is suspected
Evaluation
• Compare with appropriate mine source flow path groundwater wells (MW13-13 and MW13-01, or MW13-06) and with the appropriate receiving environment water quality results (MH-11, MH-12, or MH-15).
Action
• During next scheduled sampling event collect a duplicate sample at monitoring site that exceeded ST1.</td></tr>
<tr><td>Concentrations, in mg/L at stations MH-02, MH-22 and SDH-S2 of:
• Cadmium
• Lead
• Zinc
• Sulphate</td><td>Specific Threshold 2 (ST2)

The specific threshold for these constituents is an increase of more than 50% above the maximum observed concentrations. The numerical thresholds are:

<table><tr><th>Parameter</th><th>MH-02</th><th>MH-22</th><th>Parameter</th><th>SDH-S2</th></tr><tr><td>Total Zn</td><td>0.48</td><td>2.7</td><td>Dissolved Zn</td><td>18.3</td></tr><tr><td>Total Cd</td><td>0.016</td><td>0.013</td><td>Dissolved Cd</td><td>0.15</td></tr><tr><td>Total Pb</td><td>0.007</td><td>0.06</td><td>Dissolved Pb</td><td>0.61</td></tr><tr><td>SO_4</td><td>720</td><td>161</td><td>SO_4</td><td>348</td></tr></table>Units are mg/L.</td><td>Notification
• Teck Representative/Environmental Monitor.
• Include in scheduled annual reporting.
Review
• Follow QA/QC investigative protocol:
o Validate original result, or re-run lab sample if a laboratory error is indicated
Evaluation
• Compare with appropriate mine source flow path groundwater wells (MW13-13 and MW13-01, or MW13-06) and with the appropriate receiving environment water quality results (MH-11, MH-12, or MH-15).
• Qualified professional reviews all monitoring data, conducts trend analysis, determines if action is required based on risk narrative, and develops recommendations.
Action
• Conduct recommendations as warranted by qualified professional, if it is determined that there could be an impact downgradient at the compliance points, which could include:
o Increased monitoring frequency, and
o Expanding monitoring network.
• Depending on the findings of the investigation, the water quality model may be revised to re-evaluate potential changes to downstream water quality.</td></tr>
</table>

2.2 GROUNDWATER QUALITY

2.2.1 DESCRIPTION

Several groundwater wells were installed along some of the mine source flows paths to be able to monitor the flow paths of the mine sources when they go to ground. In the case of the 1380 discharge the wells also monitor attenuation capacity (MW13-13, MW13-08, and MW13-01).

The long term groundwater monitoring plan for the mine loading source discharge wells is provided in Table 2-3, and is discussed in the Sa Dena Hes Environmental Monitoring, Surveillance and Report Plan (Teck, 2017).

Table 2-3: Groundwater Monitoring Schedule

Stations	Monitoring Frequency [4]
Mine Loading Source Discharge Wells (MW13-01, MW13-06, MW13-08 & MW13-13)	Quarterly

2.2.2 RISK NARRATIVE

If mine source water quality has deteriorated significantly or has breached or exhausted the attenuation occurring onsite then adverse effects may occur at the receiving environment (MH-11, MH-12, and MH-15). The mine loading source discharge wells (MW13-01, MW13-06, MW13-08, and MW13-13) are along the flow paths from the mine loading sources to the receiving environment and may provide an indication of this potential.

2.2.3 SPECIFIC INDICATORS, PERFORMANCE THRESHOLDS AND RESPONSES

Groundwater chemistry data, collected since the monitoring wells were installed in 2013, show constituent concentrations have varied by more than an order of magnitude in individual wells without effecting downgradient surface water quality. Concentrations in several wells increased an order of magnitude and then decreased an order of magnitude by the next sampling event. As such the most effective thresholds for these groundwater wells is assessing if the concentration increases are consistent and sustained. This first threshold for groundwater chemistry at these wells, which would act as a warning for any potential effect on receiving surface waters, is if three consecutive monitoring events or four of the last six monitoring events show progressively increasing concentrations (ST1). The next threshold (ST2) would be a single exceedance of the concentrations provided in Table 2-4, which are calculated to provide a conservative warning. These concentration limits are based on estimates of the groundwater concentration that could result in an exceedance site water quality limits downstream and anticipated attenuation capacity.

The final threshold (ST3) is a sustained increase in concentration over 3 sampling events that has resulted in a concentration increase greater than the ST2 concentrations. Where ST2 is a single, potentially anomalous

[4] The frequency presented reflects the current water license conditions, which are not intended to remain at this frequency for the duration of the licence. A reduced frequency may be proposed in the future and the water licence subsequently amended.

exceedance of the Table 2-4 concentrations with no forewarning of an increasing trend, as has occurred previously, ST3 is an exceedance of the Table 2-4 concentrations combined with an upward trend in concentrations. The upward trend combined with the exceedance of numeric criteria is cause for greater response than just an exceedance of the two lower thresholds.

Progressively increasing concentrations means each concentration is greater than the subsequent measurement. Changes in groundwater concentrations along the flow path between sources and the receiving water occur slowly because the travel time between the source and receiving water is on the order of years. Furthermore, over twenty years of monitoring data show the sources have not affected surface water quality. As such, assessing changes in concentrations (e.g., increasing trends) over the time scale of groundwater transport (i.e., years) is an appropriate indicator of a risk to downstream water quality. The method to analyze data trends will be selected based on the statistical characteristics of the data and will follow regulatory guidance for conducting trend analysis.

The indicators, performance thresholds and responses specific to groundwater quality, and the monitoring program are provided in Table 2-5.

Table 2-4. Specific Threshold 2 Groundwater Concentrations

	Catchment			
	Camp Creek			West Fork of Tributary E
Parameter	MW13-01	MW13-08	MW13-13	MW13-06
Zn-D	0.5	0.5	0.5	0.5
Cd-D	0.005	0.005	0.02	0.001
Pb-D	0.035	0.035	0.035	0.015
Sulphate	55	55	110	No concentration threshold. The source (MH-22) concentration is less than well (MW13-06) concentration.

*Units are mg/L.

Table 2-5: Specific Indicators, Performance Thresholds and Responses for Mine Source Groundwater Quality

Specific Indicators	Specific Performance Thresholds	Specific Responses
List 1 monitoring wells Aqueous concentrations of parameters for monitoring wells: MW13-01, MW13-06, MW13-08, and MW13-13.	**Specific Threshold 1 (ST1)** (for D-Cd, D-Pb, D-Zn, and SO_4) 3 consecutive monitoring results with progressively increasing concentrations **or** 4 of the last 6 monitoring events show progressively increasing concentrations.	**Notification** • Teck Representative/Environmental Monitor • Include in scheduled annual reporting **Review** • Review laboratory QA/QC report: validate original result or re-run sample in lab if error is indicated. **Evaluation** • Compare with upstream and receiving environment water quality results. **Action** • During next scheduled sampling event conduct a duplicate at monitoring site that exceeded ST1.
	Specific Threshold 2 (ST2) (for D-Cd, D-Pb, D-Zn, and SO_4) Single exceedance of the calculated ST2 concentrations provided in Table 2-4.	**Notification** • Same as Specific Threshold 1 **Review** • Same as Specific Threshold 1 **Evaluation** • A review of the groundwater data by a qualified professional and appropriate recommendations to be developed o Any review must consider the risk narrative (i.e. impact on surface water compliance point MH-11, MH-12, or MH-15) **Action** • Resample within 6 months (if not already part of the monitoring schedule) and appropriate upgradient and downgradient sample sites along the flowpath to evaluate if concentrations remain elevated
	Specific Threshold 3 (ST3) (for D-Cd, D-Pb, D-Zn, and SO_4) A sustained increase in concentration over 3 sampling events that has resulted in a concentration increase greater than the ST2 levels.	**Notification** • Same as Specific Threshold 1 **Review** • Same as Specific Threshold 1 **Evaluation** • A qualified person compares new results with mine source loading results. If comparison indicates that mine loadings are responsible for exceedance, and validation confirms results, then: o Develop investigation plan o Trend analysis and water balance model used to predict if an exceedance of the guideline at the site compliance points downgradient with one year • Resample within 6 months (if not already part of the monitoring schedule) and appropriate upgradient and downgradient sample sites along the flowpath to evaluate if concentrations remain elevated **Action** • Follow recommendations arising from review undertaken by qualified professional, which could include: o Increased monitoring frequency o Begin the development of mitigation alternatives to maintain effluent water quality objectives below effluent quality standards if the water and load balance model results indicate sustained exceedances of water quality objectives. **Examples of Potential Mitigation Actions** If model indicates potential for sustained exceedances of effluent standards at MH-11 or MH-12, then potential mitigation measures could include: • Groundwater extraction and treatment • Source Control, including mine pool treatment

2.3 RECEIVING ENVIRONMENT SURFACE WATER QUALITY

2.3.1 DESCRIPTION

The monitoring points where the AMP for receiving environment water quality is applicable are MH-11, MH-12, and MH-15. The AMP for these monitoring points is the final management component of the protection of the receiving environment (Camp Creek, North Creek, and ultimately False Canyon Creek) from the impact of mine sources. The monitoring for MH-11, MH-12, and MH-15 is outlined in the Environmental Monitoring, Surveillance and Reporting Plan (Teck, 2017), as well provided in Table 2-6.

There are three mine site drainage source loads: 1380 Portal, the Burnick Portal, and seepage from the North Dam of the tailings impoundment. Discharge from both the 1380 Portal and Burnick Portal flow through the downgradient waste rock dumps, after which the flow infiltrates into the ground and is naturally attenuated. Groundwater from these sources ultimately discharges to False Canyon Creek. There will be no on site water collection or treatment during the post-reclamation time period. Only neutral mine water will be naturally discharged during this time.

Table 2-6: Receiving Surface Water Monitoring Schedule

Stations	Monitoring Frequency[5]
MH-11,MH-12, and MH-15	Every 2 Months

[5] The frequency presented reflects the current water license conditions, which are not intended to remain at this frequency for the duration of the licence. A reduced frequency may be proposed in the future and the water licence subsequently amended.

2.3.2 RISK NARRATIVE

There are two different surface water receiving environment risks associated with the reclamation and closure of the mine site:

- An increase in metal contaminant loading from mine sources and reporting to the compliance points would mean a potential negative impact on the receiving environment; and
- An increase in suspended solids due to erosion and sedimentation from the reclaimed mine site could negatively effect the aquatic receiving environment in the years immediately following the completion of closure activities.

2.3.3 SPECIFIC INDICATORS, PERFORMANCE THRESHOLDS, AND RESPONSES

The applicable water quality guidelines were adopted from the most recently updated guidelines between CCME and BC MOE as the permit limits for most constituents. In the case of lead and zinc, alternative methods were used to develop permit limits for MH-11, MH-12, and MH-15 (Azimuth, 2016). The indicator parameters selected for the receiving environment AMP are dissolved cadmium, total and dissolved lead, and total and dissolved zinc with the corresponding proposed effluent quality standards provided for these parameters in Table 2-7. Table 2-8 provides the adaptive management framework to monitoring and response to concentrations of key metal contaminants reporting to the site receiving environment.

Zinc, cadmium, and lead have been shown to be attenuated along the groundwater flowpath from the source areas to the receiving environment. As previously mentioned, the purpose of the adaptive management plan is to monitor the change in the attenuation capacity along the groundwater flowpath. Although sulphate is another constituent associated with the mine source areas, sulphate is not attenuated along the groundwater flowpath and is not included as an indicator parameter within the receiving environment.

Table 2-7: Surface Water AMP Specific Thresholds

Parameters, water	UNITS	WUL Effluent Quality Standards	Specific Threshold 1 (ST1)	Specific Threshold 2 (ST2)
Cadmium, Dissolved				
$Cd = e^{[0.736*\ln(hardness) - 4.943]}$	µg/L	Calculated	75% of Calculated EQS	90% of Calculated EQS
Lead[1]				
Site MH-12 and MH-15, use $Pb_{MH-12} = 3.31 + e^{[1.273*\ln(hardness) - 4.704]}$	µg/L	Calculated	75% of Calculated EQS	90% of Calculated EQS
Site MH-11, use $Pb_{MH-11} = 1.928* (3.31 + e^{[1.273*\ln(hardness) - 4.704]})$	µg/L	Calculated	75% of Calculated EQS	90% of Calculated EQS
Zinc[1]				
Site MH-12 and MH-15, Hardness ≥ 90 use, Zn = 7.5 + 0.75*(hardness – 90)	µg/L	Calculated	75% of Calculated	90% of Calculated EQS
Site MH-11, Hardness ≥ 90 use, Zn = 7.5 + 1.875*(hardness – 90)	µg/L	Calculated	75% of Calculated EQS	90% of Calculated EQS
Sulphate				
Hardness: >75 and ≤ 180 mg/L	mg/L	309	278	232
Hardness: >180 mg/L	mg/L	429	386	322

* Where standards are hardness based. The unit is µg $CaCO_3$/L, unless otherwise specified

[1]When TSS is >4, apply standard to dissolved fraction, otherwise apply to total fraction.

Table 2-9 provides the AMP for erosion and sedimentation potential related to reclamation activities at the site. The highest likelihood of this effect is in the years immediately following the completion of the reclamation activities. As such, the TSS AMP applies only during Year 1 to Year 4 of the post-closure schedule, which coincides with the period of more frequent monitoring so that Teck can respond to any excursions from expected conditions.

The TSS AMP thresholds are based on CCME TSS guidelines. The background used to calculate the site specific guideline is determined by the reference monitoring site, MH-30. A synoptic sampling result from MH-30 sets the guideline for the indicator sites MH-11, MH-12, and MH-15 for that monitoring event. The thresholds are steps up to the guideline level.

Table 2-8: Specific Indicators, Performance Thresholds and Responses for Receiving Environment Surface Water Quality, related to Risk from Metal Contaminant Loading

Specific Indicators	Specific Performance Thresholds	Specific Responses
(for D-Cd, T-Pb & D-Pb, T-Zn & D-Zn, and SO_4) • Aqueous concentrations at surface water monitoring stations MH-11, MH-12, and MH-15. See Table 2-6 for specific threshold values.	**Specific Threshold 1** Exceedance of 75% of the concentration of the standards in Table 2.11 at MH-11, MH-12, or MH-15.	**Notification** • Teck Representative/Environmental Monitor • Include in scheduled annual reporting **Review** • Review laboratory QA/QC report, validate original result, or re-run lab sample if a laboratory error is indicated **Evaluation** • Compare with upstream monitoring stations. **Action** • During next scheduled sampling event conduct a duplicate at monitoring site that exceeded ST1.
	Specific Threshold 2 Table 2.6 Greater than 75% of the concentration of the standards for two (2) consecutive sampling events (scheduled or resample) OR greater than 90% of the standards for a single event at MH11, MH-12, or MH-15.	**Notification** • Same as Specific Threshold 1 **Review** • Same as Specific Threshold 1 **Evaluation** • A qualified professional compares results with appropriate upgradient samples along the mine source loading flow path. o Evaluate causes for load contributions and develop investigation plan o Trend analysis is conducted by a qualified person to evaluate if there is a trend and if it is likely to result in an exceedance of effluent standards within a one-year period. **Action** • Implement investigation plan, including at a minimum: o Re-sample the site that triggered ST2 within 6 months (if not already scheduled), and also sample the appropriate mine source flow path monitoring sites (i.e., a synoptic event of MH-11, M13-01, MW13-13, and SDH-S2, OR MH-12 and MH-02). o Site investigation of candidate load contributions. • Review results of investigation and prepare recommendations if appropriate, based on risk narrative
	Specific Threshold 3 Table 2.6 Greater than 90% of the concentration of the standards for two (2) consecutive sampling events (scheduled or resample) OR a single exceedance of the standards at MH11, MH-12, or MH-15.	**Notification** • Same as Specific Threshold 1, • plus, notification of YG Inspector if a single exceedance of a standard **Review** • Same as Specific Threshold 1 **Evaluation** • A qualified professional compares results with appropriate up gradient samples along the mine south loading flow path. If comparison indicates that mine loadings are responsible for exceedance, and lab validation confirms results, then: o Evaluate causes for load contributions and develop investigation plan o Trend analysis is conducted by a qualified person to determine if upward trend is likely to increase passed the effluent standards more than once in a one-year period. **Action** • Conduct recommendations as put forward by the qualified professional • Re-sample the site that triggered ST2 with 6 months (if not already scheduled), and also sample the appropriate mine source flow path monitoring sites (i.e. a synoptic event of MH-11, M13-01, MW13-13, and SDH-S2, OR MH-12 and MH-02).
	Specific Threshold 4 Table 2.6 Two (2) consecutive exceedances (scheduled or resample) of the effluent standards in Table 2.6 at MH11, MH-12, or MH-15, where evaluation confirmed mine loading was responsible for the first exceedance.	**Notification** • Same as Specific Threshold 3 • Plus, Liard First Nation **Review** • Same as Specific Threshold 1 **Evaluation** • A qualified professional compares results with appropriate upgradient samples along the mine south loading flow path. If comparison indicates that mine loadings are responsible for exceedance, and lab validation confirms results, then: o Evaluate causes for load contributions and develop investigation plan o Trend analysis is conducted by a qualified person. **Action** • Conduct recommendations as put forward by the qualified professional, may include impact study or an aquatic survey • Actions will continue until specific threshold values are no longer exceeded, such as those listed in Potential Mitigation Actions. **Examples of Potential Mitigation Actions** • Mitigation measures could include groundwater extraction and treatment and permeable reactive barriers, source control such as mine pool treatment, and/or passive treatment alternatives such as bioreactors or constructed wetland treatment systems.

Table 2-9: Specific Indicators, Performance Thresholds and Responses for Receiving Environment Surface Water Quality, related to Risk from Erosion

Specific Indicators	Specific Performance Thresholds	Specific Responses
Total Suspended Solids at stations MH-11, MH-12, and MH-15 Applies to the first 4 years of post-closure monitoring (Years 1 to 4).	**Specific Threshold 1** MH-30 TSS mg/L + 10 mg/L	**Notification** • Teck Representative/Environmental Monitor • Include in scheduled annual reporting **Review** • Review laboratory QA/QC report: validate original result or re-run sample in lab if error is indicated. **Evaluation** • Review monitoring data upstream of compliance point that exceeded the ST1. **Action** • Collect duplicate at site that exceeded the ST1 during the next scheduled monitoring event.
	Specific Threshold 2 MH-30 TSS result + 20 mg/L	**Notification** • Same as Specific Threshold 1 **Review** • Same as Specific Threshold 1 **Evaluation** • Evaluation from ST1, and resample the station that exceeded ST2 within 10 days of getting original lab result (if not already scheduled), collect duplicate TSS sample at the site that exceeded the ST2 (if the original lab result was validated) **Action** • Inspect mine site catchment upgradient of compliance site that exceeded – look for signs of erosion and sedimentation from reclamation activities and conduct necessary maintenance as required.
	Specific Threshold 3 MH-30 TSS result + 25 mg/L	**Notification** • Same as Specific Threshold 1 • Plus, notification of YG Inspector and Liard First Nation **Review** • Same as Specific Threshold 1 **Evaluation** • Evaluation from ST1 and ST2 **Action** • Inspect mine site catchment upgradient of compliance site that exceeded – look for signs of erosion and sedimentation from reclamation activities and conduct necessary maintenance as required. • Have qualified professional assess stability of reclaimed mine site for long term trend of erosion or sedimentation from mine site and provide recommendations to mitigate issues. • Implement recommendations from qualified professional until TSS has dropped below the ST1 Threshold. These may include runoff control, additional revegetation, soil stabilization with natural or synthetic materials, and/or aggressive sediment control if runoff and erosion control measures are not effective enough

3. AMP FOR LANDFILL AND GENERAL SITE WATER QUALITY

3.1 LANDFILL GROUNDWATER MONITORING

3.1.1 DESCRIPTION

The landfill contains waste produced during operations and demolition debris from the Mill Site, former camp and office buildings, and miscellaneous debris from the site. The purpose of post-closure monitoring is to monitor the water levels and quality around the landfill to detect if any changes occur over time. The AMP is used to provide responses if water levels in the landfill monitoring wells (MW14-02, MW14-03, and MW-14-04) get too high around the landfill or the water quality in those same wells indicates metal leaching or a hydrocarbon plume is coming from the facility. The EMSRP provides the monitoring schedule for these wells, but is also summarized in Table 3-1.

Table 3-1: Landfill Monitoring Schedule

Stations	Monitoring Frequency [6]
Landfill Wells (MW14-01, MW14-02, MW14-03, & MW-14-04)	Quarterly

3.1.2 RISK NARRATIVE

The risk if metals or hydrocarbons are detected leaching from the landfill is that they would flow through the shallow groundwater system and would ultimately enter North Creek and could potentially be an adverse impact on the receiving environment water quality (MH-12). Additionally, if water levels should rise within 3.0 meters of the base of the landfill, the landfill would be out of compliance of the landfill permit.

3.1.3 SPECIFIC INDICATORS, PERFORMANCE THRESHOLDS AND RESPONSES

The thresholds for groundwater quality are based on the Yukon Contaminated Sites Regulations for the protection of aquatic life. The groundwater quality threshold parameters are hydrocarbons and dissolved Cadmium, Lead and Zinc. Indicators, performance thresholds and responses specific to groundwater quality and quantity, which are detailed in Table 3-2 and Table 3-3.

The groundwater table around the landfill has been generally greater than three meters below the base of the landfill. SDHOC Waste Management Permit (#81-020) for the landfill requires that the base of the landfill cells remain a minimum of three (3) meters higher than observed water table elevations. Water quality is also being monitored around the landfill to detect if any buried materials are leaching metals or are a source of hydrocarbons.

[6] The frequency presented reflects the current water license conditions, which are not intended to remain at this frequency for the duration of the licence. A reduced frequency may be proposed in the future and the water licence subsequently amended.

The AMP Table describing the specific indicators, thresholds, and responses for landfill water quality is Table 3-4, and the AMP for the landfill water levels is Table 3-5.

Table 3-2: Groundwater Metals Concentrations

Parameters, water	UNITS	SCHEDULE 3 - GENERIC NUMERICAL WATER STANDARDS - AQUATIC LIFE (AW)	90% (ST2)	75% (ST1)
Cadmium Dissolved *				
Cadmium Hardness < 30	µg/L	0.1	0.09	0.075
Cadmium Hardness = 30 - < 90	µg/L	0.3	0.27	0.225
Cadmium Hardness = 90 - < 150	µg/L	0.5	0.45	0.375
Cadmium Hardness = 150 - < 210	µg/L	0.6	0.54	0.45
Lead Dissolved*				
Lead Hardness < 50	µg/L	40	36	30
Lead Hardness = 50 - < 100	µg/L	50	45	37.5
Lead Hardness = 100 - < 200	µg/L	60	54	45
Lead Hardness = 200 - < 300	µg/L	110	99	82.5
Lead Hardness ≥ 300	µg/L	160	144	120
Zinc Dissolved *				
Zinc Hardness < 90	µg/L	75	67.5	56.25
Zinc Hardness = 90 - < 100	µg/L	150	135	112.5
Zinc Hardness = 100 - < 200	µg/L	900	810	675
Zinc Hardness = 2000 - < 300	µg/L	1,650	1485	1237.5
Zinc Hardness = 300 - < 400	µg/L	2,400	2160	1800
Yukon Contaminated Sites Regulation Standards are for the protection of FRESHWATER aquatic life, based on 2002 version. These guidelines should be updated as new versions are issued by Yukon Environment.				

Table 3-3: Groundwater Hydrocarbon Concentrations

	UNITS	SCHEDULE 3 - GENERIC NUMERICAL WATER STANDARDS - AQUATIC LIFE (AW)	90% (ST2)	75% (ST1)
Volatiles – Water				
VPHs (VHs6-10 minus BTEX)	µg/L	1,500	1,350	1,125
Benzene	µg/L	4,000	3,600	3,000
Toluene	µg/L	390	351	293
Ethylbenzene	µg/L	2,000	1,800	1,500
Polycyclic Aromatic Hydrocarbons – Water				
Acenaphthene	µg/L	60	54	45
Acridine	µg/L	0.5	0.45	0.38
Anthracene	µg/L	1	0.9	0.75
Benzo(a)anthracene	µg/L	1	0.9	0.75
Benzo(a)pyrene	µg/L	0.1	0.09	0.08
Fluoranthene	µg/L	2	1.8	1.5
Fluorene	µg/L	120	108	90
Naphthalene	µg/L	10	9	7.5
Phenanthrene	µg/L	3	2.7	2.25
Pyrene	µg/L	0.2	0.18	0.15
Quinoline	µg/L	34	30.6	25.5
Extractable Petroleum Hydrocarbons - Water				
LEPHs (C10-C19 less PAH)	µg/L	500	450	375
EPH (C10-C19)	µg/L	5,000	4,500	3,750
Yukon Contaminated Sites Regulation Standards are for the protection of FRESHWATER aquatic life, based on 2002 version. These guidelines should be updated as new versions are issued by Yukon Environment.				

Table 3-4: Specific Indicators, Performance Thresholds and Responses for Landfill Groundwater Quality

Specific Indicators	Specific Performance Thresholds	Specific Responses
Aqueous concentrations of parameters described in Table 3-2 and Table 3-3 for monitoring wells: MW14-02, -03, and -04	**Specific Threshold 1** • Exceedance of 75% of the guideline concentrations provided in Table 3-2 and Table 3-3 in 2 consecutive samples collected from any of the indicator wells.	**Notification** • Teck Representative/Environmental Monitor • Include in scheduled annual reporting **Review** • Review laboratory QA/QC report: validate original result or re-run sample in lab if error is indicated. **Evaluation** • Compare results with past results with all landfill wells monitored. **Action** • During next scheduled sampling event conduct a duplicate at monitoring site that exceeded ST1.
	Specific Threshold 2 • Exceedance of 90% of the guideline concentrations provided in Table 3-2 and Table 3-3 in 2 consecutive samples collected (scheduled or re-sampled) from any of the indicator wells.	**Notification** • Same as Specific Threshold 1 **Review** • Same as Specific Threshold 1 **Evaluation** • A review of the landfill groundwater data by a qualified professional and appropriate recommendations to be developed, which must consider the risk narrative. o Evaluate causes for load contributions and develop investigation plan **Action** • Follow recommendations arising from review undertaken by qualified professional. • Resample appropriate wells within 6 months (unless monitoring schedule calls for sampling within the period already); collect duplicate samples at the indicator wells that exceeded ST2, and sample surface water monitoring station MH-12 for metals and hydrocarbons. • Review all newly collected sample data within two weeks of receiving the results.
	Specific Threshold 3 • Exceedance of the guideline concentrations provided in Table 3-2 and Table 3-3 collected during a single sampling event (scheduled or re-sampled) collected from any of the indicator wells.	**Notification** • Same as Specific Threshold 1 • Plus, Inspector and Liard First Nation **Review** • Same as Specific Threshold 1 **Evaluation** • A review of the landfill groundwater data by a qualified professional and appropriate recommendations to be developed, which must consider the risk narrative. o Data review is conducted by a qualified person to determine if exceedance is an anomaly or a trend that will continue and need to be addressed. **Action** • Follow recommendations arising from review undertaken by qualified professional.

Table 3-5: Specific Indicators, Performance Thresholds and Responses for Landfill Groundwater Elevation

Specific Indicators	Specific Performance Thresholds	Specific Responses
Groundwater elevation below landfill determined by monitoring wells: MW14-02, -03, and -04	**Specific Threshold 1** • Water table measurements are **within 3.5 m** of the base of the landfill for 2 sampling event at one or both of the indicator wells.	**Notification** • Teck Representative/Environmental Monitor • Include in scheduled annual reporting **Review** • Confirm groundwater level data: validate original result. **Evaluation** • Compare groundwater elevations to base of landfill and nearby well in regular EMSRP **Action** • Collect additional water levels with 6 months (if not already scheduled) of ST1 being exceeded, at all 4 landfill wells, not just the indicator wells.
	Specific Threshold 2 • Water table measurements are **within 3.5 m** of the base of the landfill for 3 consecutive sampling events (scheduled or re-sampled) at all of the indicator wells.	**Notification** • Same as Specific Threshold 1 **Review** • Same as Specific Threshold 1 **Evaluation** • A review of the groundwater elevation data and trend analysis by a qualified professional and appropriate recommendations to be developed, which must consider the risk narrative. **Action** • Collect additional water levels with 6 months (if not already scheduled) of the ST2 being exceeded, at all 4 landfill wells (MW14-01,02,03, and 04). • Install a water level datalogger within one of the indicator wells to collect continuous water level data. • Follow recommendations of qualified professional.
	Specific Threshold 3 • Water table measurements are **within 3.0 m** of the base of the landfill for 1 sampling event (scheduled or re-sampled) at all of the indicator wells.	**Notification** • Same as Specific Threshold 1 • Inspector and Liard First Nation **Review** • Same as Specific Threshold 1 **Evaluation** • A review of the all of groundwater elevation data by a qualified professional and appropriate recommendations to be developed, which must consider the risk narrative. • Investigation into root cause of elevated groundwater levels and if they will continue to remain elevated. **Action** • Review remedial options proposed by qualified professional with regulators and LFN and develop implementation plan and schedule. **Examples of Mitigation Actions** • Construction of additional drainage features, placement of lower permeability cover material to further reduce surface infiltration in the vicinity of the landfill.

3.2 CSR GROUNDWATER MONITORING

3.2.1 DESCRIPTION

Between 2011 and 2014, Golder conducted an environmental site assessment of the site, which found petroleum hydrocarbon and metal concentrations in soil that exceeded the Yukon Contaminated Site Regulations at the vicinity of maintenance shops and fuel storage tanks, and metals associated with the mine primary activity areas (i.e., sediment ponds, tailings facilities, waste rock piles) and processing areas (i.e., mill area). The hydrogeological assessment conducted has indicated that groundwater quality has not been impacted by the identified hydrocarbons or metals soil contamination. The remediation plan for the hydrocarbon and metal impacted areas was to cover the areas with fill material to reduce the pathway and exposure to ecological receptors[7].

The EMSRP includes three groundwater wells around the site designed to monitor areas downgradient of where soil contamination has been identified as part of the Contaminated Site Assessment process MW13-05, MW13-10, and MW13-07 as described in Table 3-6. MW13-04 is considered a background conditions well and is monitored for the same parameters as the site assessment wells.

Table 3-6: Groundwater Monitoring Schedule

Stations	Monitoring Frequency [8]
MW13-04, MW13-05, MW13-10, & MW13-07	Quarterly

3.2.2 RISK NARRATIVE

If a hydrocarbon plume or metal leaching was detected in one of the indicator wells for the Tailings Reclaim Pond Site (MW13-07), Mill site (MW13-10), or the Jewelbox (13-05) it would eventually flow into Camp Creek or North Creek, ultimately, impacting surface water quality prior to compliance sites MH-11 and MH-12.

3.2.3 SPECIFIC INDICATORS, PERFORMANCE THRESHOLDS AND RESPONSES

The thresholds for groundwater quality are based on the Yukon contaminated sites regulations for the protection of aquatic life. The groundwater quality threshold parameters are hydrocarbons, and dissolved cadmium, lead and zinc, which are detailed in Table 3-2 and Table 3-3. Indicators, performance thresholds and responses specific to groundwater quality and quantity, and the monitoring program are provided below in Table 3-7.

As discussed in Section 1.7, the estimated groundwater flow velocity through the overburden is approximately 80 m/year from the Mill Site to Camp Creek. The distance between these sites is approximately 800 m so that any contamination that originated at the Mill Site would arrive at Camp Creek within 10 years. The Mill site has been in place for greater than 20 years. If contamination had migrated along the groundwater flowpath without attenuation, it would have already been detected in surface water. The proposed sampling frequency provides sufficient time to identify and react, as necessary, when AMP thresholds are triggered.

[7] Although most of the metal impacted areas were covered, a few areas were not covered due to very steep terrain limiting access.

[8] The frequency presented reflects the current water license conditions, which are not intended to remain at this frequency for the duration of the licence. A reduced frequency may be proposed in the future and the water licence subsequently amended.

Table 3-7: Specific Indicators, Performance Thresholds and Responses for General Site Groundwater Quality

Specific Indicators	Specific Performance Thresholds	Specific Responses
Aqueous concentrations of parameters described in Table 3-2 and 3-3 in monitoring wells: MW13-05, MW13-07 & MW13-10.	**Specific Threshold 1** • Exceedance of 75% of the guideline concentrations provided in Table 3-2 and 3-3 in two (2) consecutive samples collected from the indicator wells	**Notification** • Teck Representative/Environmental Monitor • Include in scheduled annual reporting **Review** • Review laboratory QA/QC report: validate original result or re-run sample in lab if error is indicated. **Evaluation** • Review groundwater data trends for all stations to assess for potential systematic contamination due to sampling. **Action** • During next scheduled sampling event conduct a duplicate at monitoring site that exceeded ST1.
	Specific Threshold 2 • Exceedance of 90% of the guideline concentrations provided Table 3-2 and 3-3 in two (2) consecutive collected (scheduled or re-sampled) from the indicator wells	**Notification** • Same as Specific Threshold 1 **Review** • Same as Specific Threshold 1 **Evaluation** • A review of the appropriate general site condition groundwater well data and a qualified professional conducts a trend analysis in order to develop appropriate recommendations, which must consider the risk narrative. o Evaluate causes for load contributions and develop investigation plan **Action** • Follow recommendations arising from review undertaken by qualified professional. • Resample appropriate wells within 6 months (unless monitoring schedule calls for sampling within the period already) collect duplicate samples at the indicator wells that exceeded ST2.
	Specific Threshold 3 • Exceedance of the guideline concentrations provided in Table 3-2 and 3-3 collected during a single sampling event (scheduled or re-sampled) from the indicator wells	**Notification** • Same as Specific Threshold 1 **Review** • Same as Specific Threshold 1 **Evaluation** • A review of the relevant groundwater data by a qualified professional and appropriate recommendations to be developed, which must consider the risk narrative. o Trend analysis is conducted by a qualified person to determine if exceedance is an anomaly or a trend that will continue and needs to be addressed. o anomaly or a trend that will continue and need to be addressed. **Action** • Follow recommendations arising from review undertaken by qualified professional.

4. REPORTING

The reporting associated with AMP will part of the annual Quartz Mining License and Water Use Licence report and will include:

- Summary of monitoring data collected as part of the AMP;
- Trend analysis in water quality in at compliance points MH-11, MH12- and MH-15;
- Trend analysis in mine source water quality stations;
- Trend analysis for groundwater quantity and quality;
- A detailed assessment of the full suite of parameters being measured at AMP indicators stations;
- Identification of any additional indicator parameters that should be incorporated into the AMP;
- Summary of any thresholds exceeded and any activities undertaken in relation the AMP; and
- Proposed updates and revisions to the AMP.

5. REFERENCES

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APPENDIX C

LAB REPORTS

TECK METALS LTD.
ATTN: Michelle Unger
601 Knightton Road
KIMBERLEY BC V1A 3E1

Date Received: 23-FEB-18
Report Date: 05-MAR-18 17:27 (MT)
Version: FINAL

Client Phone: 250-427-8404

Certificate of Analysis

Lab Work Order #: L2060278

Project P.O. #: NOT SUBMITTED
Job Reference: TECK-18-01
C of C Numbers: 1 of 1
Legal Site Desc:

Can Dang
Senior Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2060278-1	L2060278-2	L2060278-3	L2060278-4	L2060278-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	20-FEB-18	21-FEB-18	21-FEB-18	21-FEB-18	22-FEB-18
	Sampled Time	14:35	12:35	14:15	15:20	10:25
	Client ID	MH-04	MH-11	MH-29	MH-02	MH-13
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	309	409	392	1170	409
	Hardness (as CaCO3) (mg/L)	170	257	234	723	243
	pH (pH)	8.24	8.07	8.01	7.83	8.13
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	49.1	<1.0
	Total Dissolved Solids (mg/L)	188	256	233	902	245
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	152	211	217	339	217
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	0.0068	0.0075
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.25 DLDS	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<2.5 DLDS	<0.50
	Fluoride (F) (mg/L)	0.153	0.093	0.044	<0.10 DLDS	0.063
	Nitrate (as N) (mg/L)	0.247	0.0861	0.0168	<0.025 DLDS	0.126
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0050 DLDS	<0.0010
	Sulfate (SO4) (mg/L)	14.9	14.5	5.47	374	10.6
Total Metals	Aluminum (Al)-Total (mg/L)	0.0037	0.0060	0.0032	0.389	0.0046
	Antimony (Sb)-Total (mg/L)	0.00017	0.00015	0.00018	0.00016	0.00013
	Arsenic (As)-Total (mg/L)	0.00038	0.00037	0.00038	0.00381	0.00031
	Barium (Ba)-Total (mg/L)	0.0232	0.0841	0.0553	0.0921	0.166
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.000212	0.0000411	0.0000498	0.000208	0.0000148
	Calcium (Ca)-Total (mg/L)	61.0	73.4	72.4	230	65.1
	Chromium (Cr)-Total (mg/L)	0.00011	0.00024	<0.00010	0.00066	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	0.00196	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	0.00135	<0.00050
	Iron (Fe)-Total (mg/L)	<0.010	0.054	0.018	1.84	0.134
	Lead (Pb)-Total (mg/L)	0.000117	0.000138	<0.000050	0.0134	<0.000050
	Lithium (Li)-Total (mg/L)	0.0014	0.0017	0.0014	0.0018	0.0013
	Magnesium (Mg)-Total (mg/L)	3.39	8.93	8.06	20.7	15.9
	Manganese (Mn)-Total (mg/L)	0.00026	0.0131	0.00473	2.40	0.0115
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.000025 DLM	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000773	0.000794	0.000339	0.000438	0.00120
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	0.00189	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.37	0.49	0.32	1.80	0.41
	Selenium (Se)-Total (mg/L)	0.000896	0.000593	0.000331	0.000125	0.000725
	Silicon (Si)-Total (mg/L)	3.33	4.10	4.17	5.79	3.49

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2060278-6 Water 22-FEB-18 12:05 MH-30	L2060278-7 Water 22-FEB-18 13:30 MH-15	L2060278-8 Water 20-FEB-18 DUP	L2060278-9 Water 20-FEB-18 FB	L2060278-10 Water 20-FEB-18 TRIP BLANK
WATER						
Physical Tests	Conductivity (uS/cm)	401	366	311	<2.0	<2.0
	Hardness (as CaCO3) (mg/L)	232	211	179	<0.50	<0.50 HTC
	pH (pH)	8.06	8.14	8.24	5.40	5.43
	Total Suspended Solids (mg/L)	1.3	2.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	232	215	195	<10	<10
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	218	197	153	<1.0	<1.0
	Ammonia, Total (as N) (mg/L)	0.0143	0.0149	<0.0050	<0.0050	0.0136 RRV
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.062	0.096	0.152	<0.020	<0.020
	Nitrate (as N) (mg/L)	0.113	0.0947	0.246	<0.0050	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	0.0011	<0.0010	<0.0010	<0.0010
	Sulfate (SO4) (mg/L)	10.3	4.33	14.9	<0.30	<0.30
Total Metals	Aluminum (Al)-Total (mg/L)	0.0078	0.0103	0.0073	<0.0030	<0.0030
	Antimony (Sb)-Total (mg/L)	0.00013	0.00014	0.00015	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00039	0.00038	0.00038	<0.00010	<0.00010
	Barium (Ba)-Total (mg/L)	0.160	0.189	0.0217	<0.000050	<0.000050
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.0000452	0.0000115	0.000231	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	58.6	58.0	63.0	<0.050	<0.050
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	0.00013	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.336	0.298	0.020	<0.010	<0.010
	Lead (Pb)-Total (mg/L)	0.000111	<0.000050	0.000242	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	0.0013	0.0011	0.0016	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	13.9	12.0	3.23	<0.10	<0.10
	Manganese (Mn)-Total (mg/L)	0.0306	0.0228	0.00062	<0.00010	<0.00010
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.00125	0.00205	0.000739	<0.000050	<0.000050
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.37	0.39	0.35	<0.10	<0.10
	Selenium (Se)-Total (mg/L)	0.000696	0.000765	0.000854	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	3.27	4.17	3.26	<0.10	<0.10

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2060278-1	L2060278-2	L2060278-3	L2060278-4	L2060278-5
Description	Water	Water	Water	Water	Water
Sampled Date	20-FEB-18	21-FEB-18	21-FEB-18	21-FEB-18	22-FEB-18
Sampled Time	14:35	12:35	14:15	15:20	10:25
Client ID	MH-04	MH-11	MH-29	MH-02	MH-13
Grouping / **Analyte**					
WATER					
Total Metals Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	0.000028	<0.000010
Sodium (Na)-Total (mg/L)	0.893	1.42	1.14	11.6	1.05
Strontium (Sr)-Total (mg/L)	0.213	0.286	0.262	0.761	0.222
Sulfur (S)-Total (mg/L)	4.75	4.81	1.59	127	3.31
Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	0.00024	<0.00010
Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	0.00695	<0.00030
Uranium (U)-Total (mg/L)	0.00105	0.00144	0.000773	0.00207	0.00188
Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	0.00088	<0.00050
Zinc (Zn)-Total (mg/L)	0.0040	0.0050	<0.0030	0.101	<0.0030
Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved (mg/L)	0.0013	0.0012	0.0017	<0.0010	<0.0010
Antimony (Sb)-Dissolved (mg/L)	0.00013	0.00013	0.00012	<0.00010	<0.00010
Arsenic (As)-Dissolved (mg/L)	0.00040	0.00038	0.00038	0.00045	0.00024
Barium (Ba)-Dissolved (mg/L)	0.0237	0.0872	0.0576	0.0645	0.160
Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved (mg/L)	0.000226	0.0000427	0.0000573	0.0000588	0.0000117
Calcium (Ca)-Dissolved (mg/L)	62.9	86.4	80.2	255	69.4
Chromium (Cr)-Dissolved (mg/L)	0.00011	<0.00010	<0.00010	0.00012	<0.00010
Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	0.00069	<0.00010
Copper (Cu)-Dissolved (mg/L)	<0.00020	<0.00020	0.00033	0.00047	<0.00020
Iron (Fe)-Dissolved (mg/L)	<0.010	0.019	0.015	0.012	0.012
Lead (Pb)-Dissolved (mg/L)	0.000052	<0.000050	<0.000050	0.000082	<0.000050
Lithium (Li)-Dissolved (mg/L)	0.0012	0.0016	<0.0010	<0.0010	<0.0010
Magnesium (Mg)-Dissolved (mg/L)	3.21	10.0	8.27	20.6	17.0
Manganese (Mn)-Dissolved (mg/L)	0.00014	0.0126	0.00480	1.22	0.00891
Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)	0.000650	0.000694	0.000292	0.000284	0.00104
Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	0.00087	<0.00050
Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved (mg/L)	0.38	0.56	0.35	1.90	0.42
Selenium (Se)-Dissolved (mg/L)	0.000901	0.000620	0.000312	0.000055	0.000750
Silicon (Si)-Dissolved (mg/L)	3.12	4.09	4.05	4.88	3.35

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2060278-6	L2060278-7	L2060278-8	L2060278-9	L2060278-10
Description	Water	Water	Water	Water	Water
Sampled Date	22-FEB-18	22-FEB-18	20-FEB-18	20-FEB-18	20-FEB-18
Sampled Time	12:05	13:30			
Client ID	MH-30	MH-15	DUP	FB	TRIP BLANK
Grouping / **Analyte**					
WATER					
Total Metals Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total (mg/L)	0.963	1.05	0.841	<0.050	<0.050
Strontium (Sr)-Total (mg/L)	0.212	0.181	0.211	<0.00020	<0.00020
Sulfur (S)-Total (mg/L)	3.07	1.30	4.73	<0.50	<0.50
Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium (U)-Total (mg/L)	0.00189	0.000977	0.00103	<0.000010	<0.000010
Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	0.0039	<0.0030	<0.0030
Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	
Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	
Aluminum (Al)-Dissolved (mg/L)	<0.0010	0.0010	0.0012	<0.0010	
Antimony (Sb)-Dissolved (mg/L)	0.00010	0.00012	0.00013	<0.00010	
Arsenic (As)-Dissolved (mg/L)	0.00027	0.00021	0.00036	<0.00010	
Barium (Ba)-Dissolved (mg/L)	0.170	0.186	0.0222	<0.000050	
Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	
Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	
Cadmium (Cd)-Dissolved (mg/L)	0.0000398	<0.0000050	0.000219	<0.0000050	
Calcium (Ca)-Dissolved (mg/L)	66.5	64.0	66.4	<0.050	
Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
Copper (Cu)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	
Iron (Fe)-Dissolved (mg/L)	0.040	0.035	<0.010	<0.010	
Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	0.000140	<0.000050	
Lithium (Li)-Dissolved (mg/L)	<0.0010	0.0010	0.0014	<0.0010	
Magnesium (Mg)-Dissolved (mg/L)	16.1	12.5	3.14	<0.10	
Manganese (Mn)-Dissolved (mg/L)	0.0327	0.0138	0.00011	<0.00010	
Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
Molybdenum (Mo)-Dissolved (mg/L)	0.00112	0.00182	0.000685	<0.000050	
Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	
Potassium (K)-Dissolved (mg/L)	0.42	0.43	0.37	<0.10	
Selenium (Se)-Dissolved (mg/L)	0.000780	0.000763	0.000884	<0.000050	
Silicon (Si)-Dissolved (mg/L)	3.27	3.91	3.08	<0.050	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2060278-1 Water 20-FEB-18 14:35 MH-04	L2060278-2 Water 21-FEB-18 12:35 MH-11	L2060278-3 Water 21-FEB-18 14:15 MH-29	L2060278-4 Water 21-FEB-18 15:20 MH-02	L2060278-5 Water 22-FEB-18 10:25 MH-13
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.859	1.51	1.12	11.7	1.06
	Strontium (Sr)-Dissolved (mg/L)	0.211	0.318	0.274	0.772	0.225
	Sulfur (S)-Dissolved (mg/L)	4.37	4.45	1.40	125	3.05
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	0.00023	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.000901	0.00134	0.000681	0.00176	0.00168
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0040	0.0051	0.0013	0.0608	0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2060278-6 Water 22-FEB-18 12:05 MH-30	L2060278-7 Water 22-FEB-18 13:30 MH-15	L2060278-8 Water 20-FEB-18 DUP	L2060278-9 Water 20-FEB-18 FB	L2060278-10 Water 20-FEB-18 TRIP BLANK
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Dissolved (mg/L)	1.04	1.06	0.848	<0.050	
	Strontium (Sr)-Dissolved (mg/L)	0.225	0.190	0.216	<0.00020	
	Sulfur (S)-Dissolved (mg/L)	2.77	0.88	3.87	<0.50	
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	
	Uranium (U)-Dissolved (mg/L)	0.00181	0.000891	0.000941	<0.000010	
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Dissolved (mg/L)	0.0023	<0.0010	0.0038	<0.0010	
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	

Reference Information

Qualifiers for Individual Samples Listed:

Sample Number	Client Sample ID	Qualifier	Description
L2060278-6	MH-30	WSMT	Water sample(s) for total mercury analysis was not submitted in glass or PTFE container with HCl preservative. Results may be biased low.

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2060278-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2060278-9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2060278-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2060278-9
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2060278-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2060278-9
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2060278-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2060278-9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2060278-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2060278-9
Matrix Spike	Barium (Ba)-Total	MS-B	L2060278-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L2060278-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2060278-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Total	MS-B	L2060278-1, -10, -2, -3, -4, -5, -6, -7, -8, -9

Qualifiers for Individual Parameters Listed:

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).
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". 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.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.			
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.			
F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			

Reference Information

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water 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-VA	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-VA	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.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
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.

** 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
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

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.

Chain of Custody / Analytica
Canada Toll Free: 1 80
www.alsglobal.c

L2060278-COFC

COC # _____

Page 1 of 1

Report To		Report Format / Distribution		Service Requested (Rush for routine analysis subject to availability)
Company:	Alexco Environmental Group	☑ Standard ☐ Other		◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Scott Keesey	☑ PDF ☑ Excel ☐ Digital ☐ Fax		○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	#3 Calcite Business Centre, 151 Industrial Road	Email 1:	scott@accessconsulting.ca, chenry@accesscons	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Whitehorse., YT, Y1A 2V3	Email 2:	mducharme@accessconsulting.ca	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	867-668-6463 Fax: 867-633-4882	Email 3:	amacphail@accessconsulting.ca	
Invoice To	Same as Report ? ☑ Yes ☐ No	**Client / Project Information**		**Analysis Request**
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	TECK-18-01	Please indicate below Filtered, Preserved or both (F, P, F/P)
Company:		PO / AFE:		
Contact:		LSD:		
Address:				
Phone:	Fax:	Quote #:		

Lab Work Order # (lab use only)		ALS Contact:	Jesse McCord	Sampler:	Catherine Henry

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals (low level) + Hg	Dissolved Metals (low level) +	General (pH, SPC, alkalinity,	Ammonia, Nitrate, Nitrite	TSS, TDS								Number of Containers
	MH-04	20-Feb-18	14:35	Water	x	x	x	x	x								6
	MH-11	21-Feb-18	12:35	Water	x	x	x	x	x								6
	MH-29	21-Feb-18	14:15	Water	x	x	x	x	x								6
	MH-02	21-Feb-18	15:20	Water	x	x	x	x	x								6
	MH-13	22-Feb-18	10:25	Water	x	x	x	x	x								6
	MH-30	22-Feb-18	12:05	Water	x	x	x	x	x								6
	MH-15	22-Feb-18	13:30	Water	x	x	x	x	x								6
	Dup	n/a	n/a	Water	x	x	x	x	x								6
	FB	n/a	n/a	Water	x	x	x	x	x								6
	Trip Blank	n/a	n/a	Water	x	x	x	x	x								6

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

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:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Catherine Henry	Feb 23 2018	15:00	E1F	23 Feb 2018	15:00	7.0 °C				

Tue Feb 27 2018 14:20 7.6°C

GENF 18.01 Front

TECK METALS LTD.
ATTN: Michelle Unger
601 Knightton Road
KIMBERLEY BC V1A 3E1

Date Received: 02-APR-18
Report Date: 12-APR-18 17:49 (MT)
Version: FINAL

Client Phone: 250-427-8404

Certificate of Analysis

Lab Work Order #: L2074591

Project P.O. #: 9179
Job Reference: TECK-18-01
C of C Numbers:
Legal Site Desc:

Can Dang
Senior Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2074591-1	L2074591-2	L2074591-3	L2074591-4	L2074591-5
Description	GROUNDWATER	GROUNDWATER	GROUNDWATER	GROUNDWATER	GROUNDWATER
Sampled Date	27-MAR-18	29-MAR-18	28-MAR-18	28-MAR-18	28-MAR-18
Sampled Time	15:20	11:30	15:10	17:20	12:55
Client ID	MW13-01 (LP)	MW13-06 (LP)	MW13-07 (LP)	MW13-08 (LP)	MW14-04 (LP)
Grouping / **Analyte**					
WATER					
Physical Tests Conductivity (uS/cm)	320	660	474	437	328
Hardness (as CaCO3) (mg/L)	179	358	244	361	182
pH (pH)	8.33	8.50	8.54	7.99	8.42
Anions and Nutrients Alkalinity, Total (as CaCO3) (mg/L)	168	215	230	249	180
Ammonia, Total (as N) (mg/L)	0.0110	0.0125	0.199	0.0554	0.0071
Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl) (mg/L)	<0.50	0.81	0.59	<0.50	2.74
Fluoride (F) (mg/L)	0.349	0.633	0.384	0.054	0.046
Nitrate (as N) (mg/L)	0.385	<0.0050	<0.0050	0.0513	0.0714
Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Sulfate (SO4) (mg/L)	11.1	167	45.7	17.6	15.2
Dissolved Metals Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved (mg/L)	0.0021	0.0019	0.0039	0.150	0.0046
Antimony (Sb)-Dissolved (mg/L)	0.00015	0.00011	<0.00010	0.00021	0.00017
Arsenic (As)-Dissolved (mg/L)	0.00046	0.0587	0.00315	0.00074	0.00041
Barium (Ba)-Dissolved (mg/L)	0.0229	0.0275	0.0270	0.282	0.131
Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved (mg/L)	<0.010	0.013	0.022	<0.010	<0.010
Cadmium (Cd)-Dissolved (mg/L)	0.000588	<0.000040 DLM	<0.0000050	0.0000651	0.0000177
Calcium (Ca)-Dissolved (mg/L)	64.6	129	70.0	123	62.3
Chromium (Cr)-Dissolved (mg/L)	0.00027	0.00020	0.00022	0.00030	0.00103
Cobalt (Co)-Dissolved (mg/L)	<0.00010	0.00322	0.00075	0.00066	<0.00010
Copper (Cu)-Dissolved (mg/L)	0.00035	0.00033	<0.00020	0.00062	0.00626
Iron (Fe)-Dissolved (mg/L)	<0.010	0.752	2.15	0.278	<0.010
Lead (Pb)-Dissolved (mg/L)	0.000978	<0.000050	0.000244	0.000539	0.000130
Lithium (Li)-Dissolved (mg/L)	0.0018	0.0088	0.0083	0.0022	0.0012
Magnesium (Mg)-Dissolved (mg/L)	4.34	8.45	16.9	13.3	6.46
Manganese (Mn)-Dissolved (mg/L)	0.00154	0.435	1.12	0.0253	0.00057
Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)	0.000681	0.0433	0.00400	0.000803	0.000954
Nickel (Ni)-Dissolved (mg/L)	<0.00050	0.0270	0.00416	0.00100	<0.00050
Phosphorus (P)-Dissolved (mg/L)	<0.050	0.192	0.119	<0.050	<0.050
Potassium (K)-Dissolved (mg/L)	0.70	2.12	3.34	0.82	0.75
Selenium (Se)-Dissolved (mg/L)	0.00148	<0.000050	<0.000050	0.00103	0.000127
Silicon (Si)-Dissolved (mg/L)	3.55	16.3	7.38	4.64	3.49

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2074591-6	L2074591-7			
	Description	GROUNDWATER	GROUNDWATER			
	Sampled Date	28-MAR-18				
	Sampled Time	15:20				
	Client ID	MW-GW (LQR)	TRIP BLANK (LQTB)			
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	477	<2.0			
	Hardness (as CaCO3) (mg/L)	242	<0.50			
	pH (pH)	8.56	5.47			
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	230	<1.0			
	Ammonia, Total (as N) (mg/L)	0.196	<0.0050			
	Bromide (Br) (mg/L)	<0.050	<0.050			
	Chloride (Cl) (mg/L)	0.60	<0.50			
	Fluoride (F) (mg/L)	0.386	<0.020			
	Nitrate (as N) (mg/L)	<0.0050	<0.0050			
	Nitrite (as N) (mg/L)	<0.0010	<0.0010			
	Sulfate (SO4) (mg/L)	45.6	<0.30			
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD			
	Dissolved Metals Filtration Location	FIELD	FIELD			
	Aluminum (Al)-Dissolved (mg/L)	0.0030	<0.0010			
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010			
	Arsenic (As)-Dissolved (mg/L)	0.00324	<0.00010			
	Barium (Ba)-Dissolved (mg/L)	0.0284	<0.000050			
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020			
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050			
	Boron (B)-Dissolved (mg/L)	0.022	<0.010			
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050			
	Calcium (Ca)-Dissolved (mg/L)	68.7	<0.050			
	Chromium (Cr)-Dissolved (mg/L)	0.00016	<0.00010			
	Cobalt (Co)-Dissolved (mg/L)	0.00079	<0.00010			
	Copper (Cu)-Dissolved (mg/L)	<0.00020	<0.00020			
	Iron (Fe)-Dissolved (mg/L)	2.20	<0.010			
	Lead (Pb)-Dissolved (mg/L)	0.000091	<0.000050			
	Lithium (Li)-Dissolved (mg/L)	0.0081	<0.0010			
	Magnesium (Mg)-Dissolved (mg/L)	17.1	<0.10			
	Manganese (Mn)-Dissolved (mg/L)	1.18	<0.00010			
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Dissolved (mg/L)	0.00376	<0.000050			
	Nickel (Ni)-Dissolved (mg/L)	0.00437	<0.00050			
	Phosphorus (P)-Dissolved (mg/L)	0.105	<0.050			
	Potassium (K)-Dissolved (mg/L)	3.35	<0.10			
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050			
	Silicon (Si)-Dissolved (mg/L)	7.49	<0.050			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2074591-1	L2074591-2	L2074591-3	L2074591-4	L2074591-5
Description	GROUNDWATER	GROUNDWATER	GROUNDWATER	GROUNDWATER	GROUNDWATER
Sampled Date	27-MAR-18	29-MAR-18	28-MAR-18	28-MAR-18	28-MAR-18
Sampled Time	15:20	11:30	15:10	17:20	12:55
Client ID	MW13-01 (LP)	MW13-06 (LP)	MW13-07 (LP)	MW13-08 (LP)	MW14-04 (LP)
Grouping / **Analyte**					
WATER					
Dissolved Metals					
Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved (mg/L)	0.897	14.0	15.3	1.40	1.12
Strontium (Sr)-Dissolved (mg/L)	0.206	0.443	0.492	0.415	0.216
Sulfur (S)-Dissolved (mg/L)	3.95	57.2	15.5	6.18	4.71
Thallium (Tl)-Dissolved (mg/L)	<0.000010	0.000016	<0.000010	<0.000010	<0.000010
Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	0.00013	<0.00010	<0.00010
Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	0.00545	<0.00030
Uranium (U)-Dissolved (mg/L)	0.00107	0.0187	0.00721	0.00222	0.000556
Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved (mg/L)	0.0206	0.0698	0.0014	0.0028	0.0051
Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Volatile Organic Compounds					
Benzene (mg/L)			<0.00050		<0.00050
Ethylbenzene (mg/L)			<0.00050		<0.00050
Methyl t-butyl ether (MTBE) (mg/L)			<0.00050		<0.00050
Styrene (mg/L)			<0.00050		<0.00050
Toluene (mg/L)			<0.00045		<0.00045
ortho-Xylene (mg/L)			<0.00050		<0.00050
meta- & para-Xylene (mg/L)			<0.00050		<0.00050
Xylenes (mg/L)			<0.00075		<0.00075
Surrogate: 4-Bromofluorobenzene (SS) (%)			96.2		100.4
Surrogate: 1,4-Difluorobenzene (SS) (%)			96.5		92.6
Hydrocarbons					
EPH10-19 (mg/L)			<0.25		<0.25
EPH19-32 (mg/L)			<0.25		<0.25
LEPH (mg/L)			<0.25		<0.25
HEPH (mg/L)			<0.25		<0.25
Volatile Hydrocarbons (VH6-10) (mg/L)			<0.10		<0.10
VPH (C6-C10) (mg/L)			<0.10		<0.10
Surrogate: 2-Bromobenzotrifluoride (%)			86.4		75.2
Surrogate: 3,4-Dichlorotoluene (SS) (%)			103.0		61.9 SURR-ND
Polycyclic Aromatic Hydrocarbons					
Acenaphthene (mg/L)			<0.000010		<0.000010
Acenaphthylene (mg/L)			<0.000010		<0.000010
Acridine (mg/L)			<0.000010		<0.000010
Anthracene (mg/L)			<0.000010		<0.000010
Benz(a)anthracene (mg/L)			<0.000010		<0.000010
Benzo(a)pyrene (mg/L)			<0.0000050		<0.0000050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2074591-6	L2074591-7			
	Description	GROUNDWATER	GROUNDWATER			
	Sampled Date	28-MAR-18				
	Sampled Time	15:20				
	Client ID	MW-GW (LQR)	TRIP BLANK (LQTB)			
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Dissolved (mg/L)	15.9	<0.050			
	Strontium (Sr)-Dissolved (mg/L)	0.478	<0.00020			
	Sulfur (S)-Dissolved (mg/L)	15.0	<0.50			
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010			
	Tin (Sn)-Dissolved (mg/L)	0.00013	<0.00010			
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030			
	Uranium (U)-Dissolved (mg/L)	0.00713	<0.000010			
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Dissolved (mg/L)	0.0014	<0.0010			
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030			
Volatile Organic Compounds	Benzene (mg/L)	<0.00050	<0.00050			
	Ethylbenzene (mg/L)	<0.00050	<0.00050			
	Methyl t-butyl ether (MTBE) (mg/L)	<0.00050	<0.00050			
	Styrene (mg/L)	<0.00050	<0.00050			
	Toluene (mg/L)	<0.00045	<0.00045			
	ortho-Xylene (mg/L)	<0.00050	<0.00050			
	meta- & para-Xylene (mg/L)	<0.00050	<0.00050			
	Xylenes (mg/L)	<0.00075	<0.00075			
	Surrogate: 4-Bromofluorobenzene (SS) (%)	88.8	88.2			
	Surrogate: 1,4-Difluorobenzene (SS) (%)	91.3	93.1			
Hydrocarbons	EPH10-19 (mg/L)	<0.25	<0.25			
	EPH19-32 (mg/L)	<0.25	<0.25			
	LEPH (mg/L)	<0.25	<0.25			
	HEPH (mg/L)	<0.25	<0.25			
	Volatile Hydrocarbons (VH6-10) (mg/L)	<0.10	<0.10			
	VPH (C6-C10) (mg/L)	<0.10	<0.10			
	Surrogate: 2-Bromobenzotrifluoride (%)	66.3	62.8			
	Surrogate: 3,4-Dichlorotoluene (SS) (%)	SURR-ND 51.7	SURR-ND 54.9			
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)	<0.000010	<0.000010			
	Acenaphthylene (mg/L)	<0.000010	<0.000010			
	Acridine (mg/L)	<0.000010	<0.000010			
	Anthracene (mg/L)	<0.000010	<0.000010			
	Benz(a)anthracene (mg/L)	<0.000010	<0.000010			
	Benzo(a)pyrene (mg/L)	<0.0000050	<0.0000050			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2074591-1	L2074591-2	L2074591-3	L2074591-4	L2074591-5
Description	GROUNDWATER	GROUNDWATER	GROUNDWATER	GROUNDWATER	GROUNDWATER
Sampled Date	27-MAR-18	29-MAR-18	28-MAR-18	28-MAR-18	28-MAR-18
Sampled Time	15:20	11:30	15:10	17:20	12:55
Client ID	MW13-01 (LP)	MW13-06 (LP)	MW13-07 (LP)	MW13-08 (LP)	MW14-04 (LP)
Grouping / **Analyte**					
WATER					
Polycyclic Aromatic Hydrocarbons / Benzo(b&j)fluoranthene (mg/L)			<0.000010		<0.000010
Benzo(b+j+k)fluoranthene (mg/L)			<0.000015		<0.000015
Benzo(g,h,i)perylene (mg/L)			<0.000010		<0.000010
Benzo(k)fluoranthene (mg/L)			<0.000010		<0.000010
Chrysene (mg/L)			<0.000010		<0.000010
Dibenz(a,h)anthracene (mg/L)			<0.0000050		<0.0000050
Fluoranthene (mg/L)			<0.000010		<0.000010
Fluorene (mg/L)			<0.000010		<0.000010
Indeno(1,2,3-c,d)pyrene (mg/L)			<0.000010		<0.000010
1-Methylnaphthalene (mg/L)			<0.000050		<0.000050
2-Methylnaphthalene (mg/L)			<0.000050		<0.000050
Naphthalene (mg/L)			<0.000050		<0.000050
Phenanthrene (mg/L)			<0.000020		<0.000020
Pyrene (mg/L)			<0.000010		<0.000010
Quinoline (mg/L)			<0.000050		<0.000050
Surrogate: Acridine d9 (%)			90.1		87.4
Surrogate: Chrysene d12 (%)			81.5		82.3
Surrogate: Naphthalene d8 (%)			97.6		89.4
Surrogate: Phenanthrene d10 (%)			113.4		107.7

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2074591-6	L2074591-7			
	Description	GROUNDWATER	GROUNDWATER			
	Sampled Date	28-MAR-18				
	Sampled Time	15:20				
	Client ID	MW-GW (LQR)	TRIP BLANK (LQTB)			
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Benzo(b&j)fluoranthene (mg/L)	<0.000010	<0.000010			
	Benzo(b+j+k)fluoranthene (mg/L)	<0.000015	<0.000015			
	Benzo(g,h,i)perylene (mg/L)	<0.000010	<0.000010			
	Benzo(k)fluoranthene (mg/L)	<0.000010	<0.000010			
	Chrysene (mg/L)	<0.000010	<0.000010			
	Dibenz(a,h)anthracene (mg/L)	<0.0000050	<0.0000050			
	Fluoranthene (mg/L)	<0.000010	<0.000010			
	Fluorene (mg/L)	<0.000010	<0.000010			
	Indeno(1,2,3-c,d)pyrene (mg/L)	<0.000010	<0.000010			
	1-Methylnaphthalene (mg/L)	<0.000050	<0.000050			
	2-Methylnaphthalene (mg/L)	<0.000050	<0.000050			
	Naphthalene (mg/L)	<0.000050	<0.000050			
	Phenanthrene (mg/L)	<0.000020	<0.000020			
	Pyrene (mg/L)	<0.000010	<0.000010			
	Quinoline (mg/L)	<0.000050	<0.000050			
	Surrogate: Acridine d9 (%)	92.0	83.4			
	Surrogate: Chrysene d12 (%)	77.2	79.5			
	Surrogate: Naphthalene d8 (%)	85.9	85.1			
	Surrogate: Phenanthrene d10 (%)	113.7	108.8			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2074591-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2074591-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2074591-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2074591-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Potassium (K)-Dissolved	MS-B	L2074591-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2074591-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2074591-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2074591-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Uranium (U)-Dissolved	MS-B	L2074591-1, -2, -3, -4, -5, -6, -7

Qualifiers for Individual Parameters Listed:

Qualifier	Description
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.
SURR-ND	Surrogate recovery marginally exceeded ALS DQO. Reported non-detect results for associated samples were deemed to be unaffected.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". 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.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

EPH-ME-FID-VA	Water	EPH in Water	BC Lab Manual

EPH is extracted from water using a hexane micro-extraction technique, with analysis by GC-FID, as per the BC Lab Manual. EPH results include PAHs and are therefore not equivalent to LEPH or HEPH.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

LEPH/HEPH-CALC-VA	Water	LEPHs and HEPHs	BC MOE LEPH/HEPH

LEPHw and HEPHw are measures of Light and Heavy Extractable Petroleum Hydrocarbons in water. Results are calculated by subtraction of applicable PAH concentrations from EPH10-19 and EPH19-32, as per the BC Lab Manual LEPH/HEPH calculation procedure.
LEPHw = EPH10-19 minus Acenaphthene, Acridine, Anthracene, Fluorene, Naphthalene and Phenanthrene.
HEPH = EPH19-32 minus Benz(a)anthracene, Benzo(a)pyrene, Fluoranthene, and Pyrene.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Reference Information

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water 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-VA	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-VA	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.

PAH-ME-MS-VA	Water	PAHs in Water	EPA 3511/8270D (mod)

PAHs are extracted from water using a hexane micro-extraction technique, with analysis by GC/MS. Because the two isomers cannot be readily separated chromatographically, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

VH-HSFID-VA	Water	VH in Water by Headspace GCFID	BC Env. Lab Manual (VH in Water)

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Compounds eluting between n-hexane and n-decane are measured and summed together using flame-ionization detection.

VH-SURR-FID-VA	Water	VH Surrogates for Waters	BC Env. Lab Manual (VH in Solids)
VOC7-HSMS-VA	Water	BTEX/MTBE/Styrene by Headspace GCMS	EPA 5021A/8260C

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

VOC7/VOC-SURR-MS-VA	Water	VOC7 and/or VOC Surrogates for Waters	EPA 5035A/5021A/8260C
VPH-CALC-VA	Water	VPH is VH minus select aromatics	BC MOE VPH

VPHw measures Volatile Petroleum Hydrocarbons in water. Results are calculated by subtraction of specific Monocyclic Aromatic Hydrocarbons from VH6-10, as per the BC Lab Manual VPH calculation procedure.
VPHw = VH6-10 minus Benzene, Toluene, Ethylbenzene, Xylenes, and Styrene

XYLENES-CALC-VA	Water	Sum of Xylene Isomer Concentrations	CALCULATION

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** 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
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

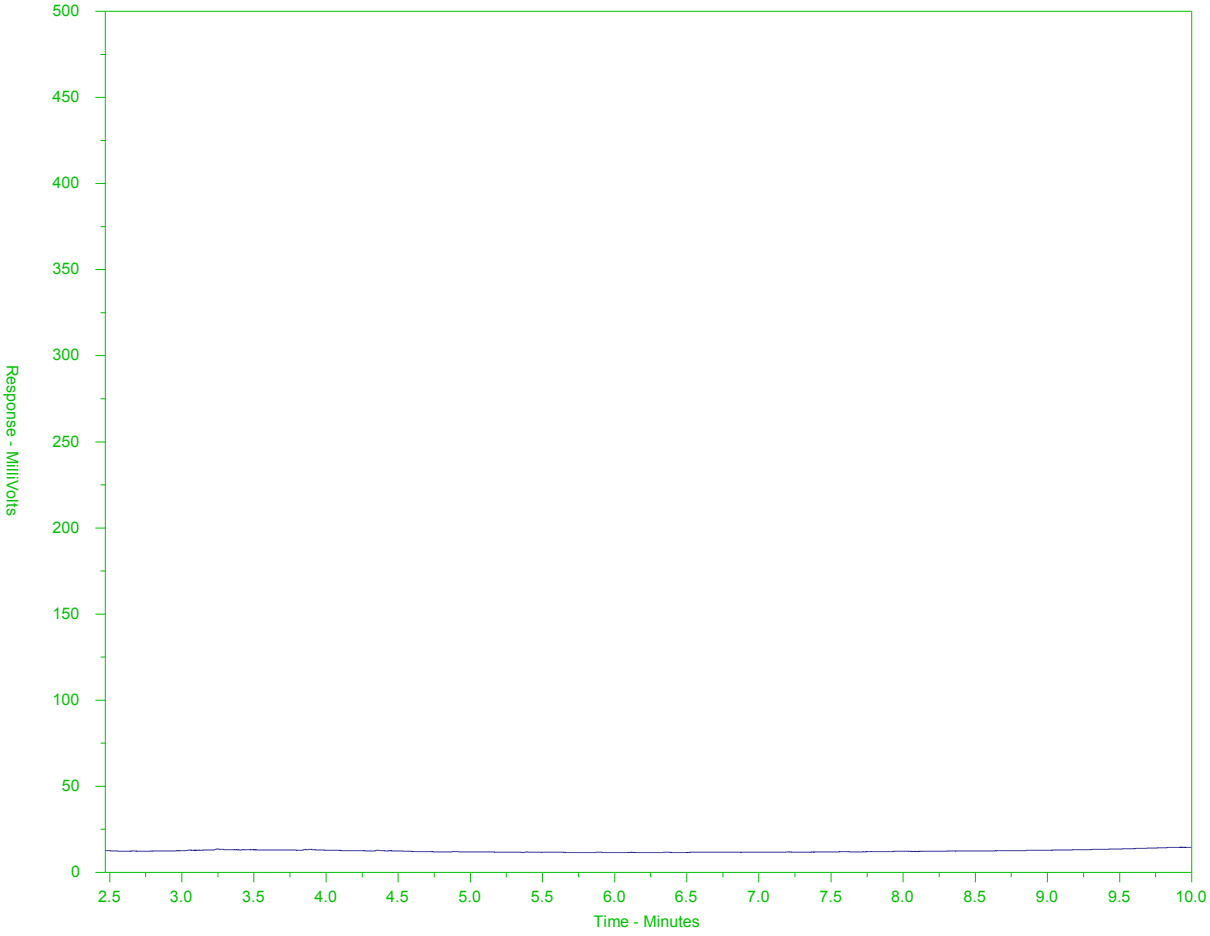
GLOSSARY OF REPORT TERMS

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.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2074591-3
Client Sample ID: MW13-07 (LP)



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

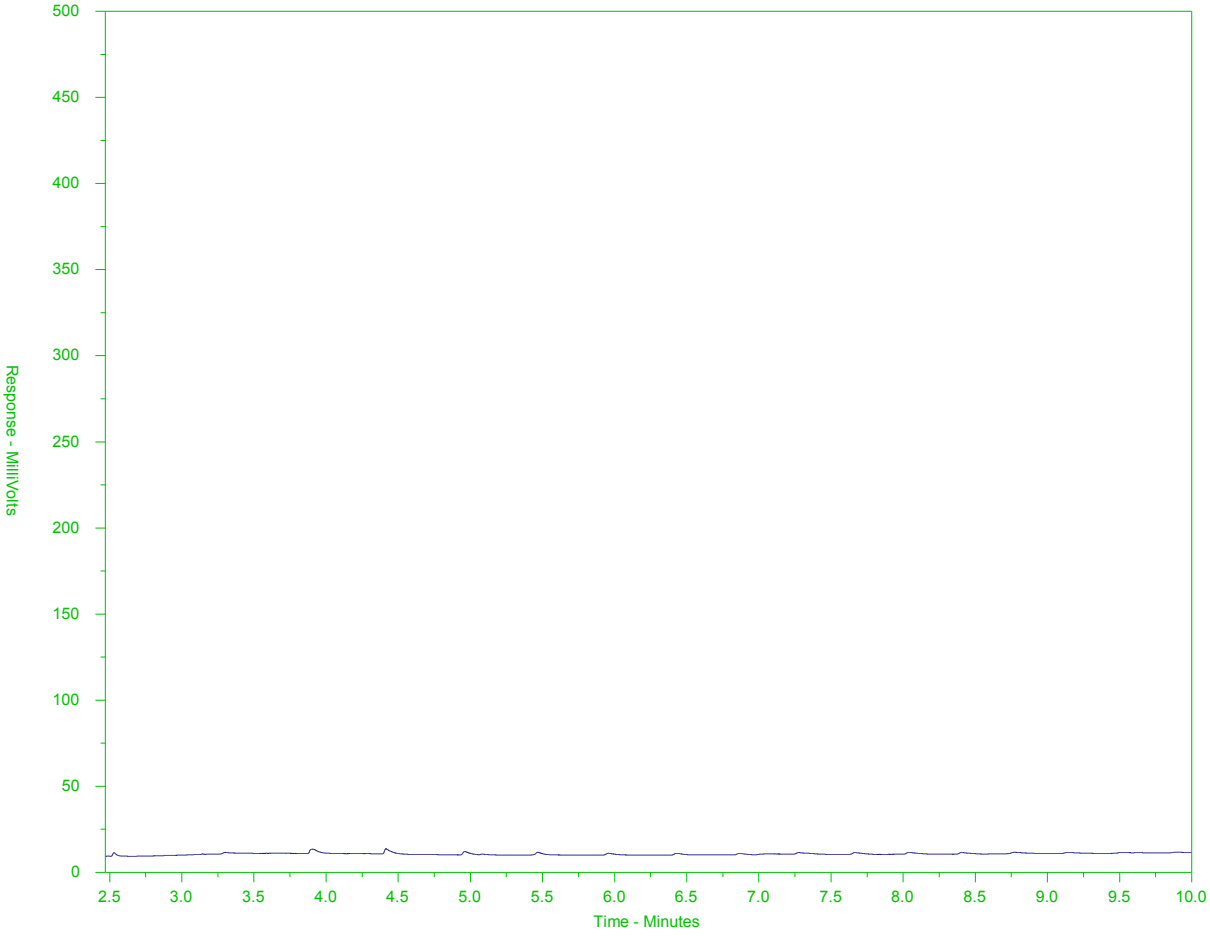
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2074591-5
Client Sample ID: MW14-04 (LP)



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

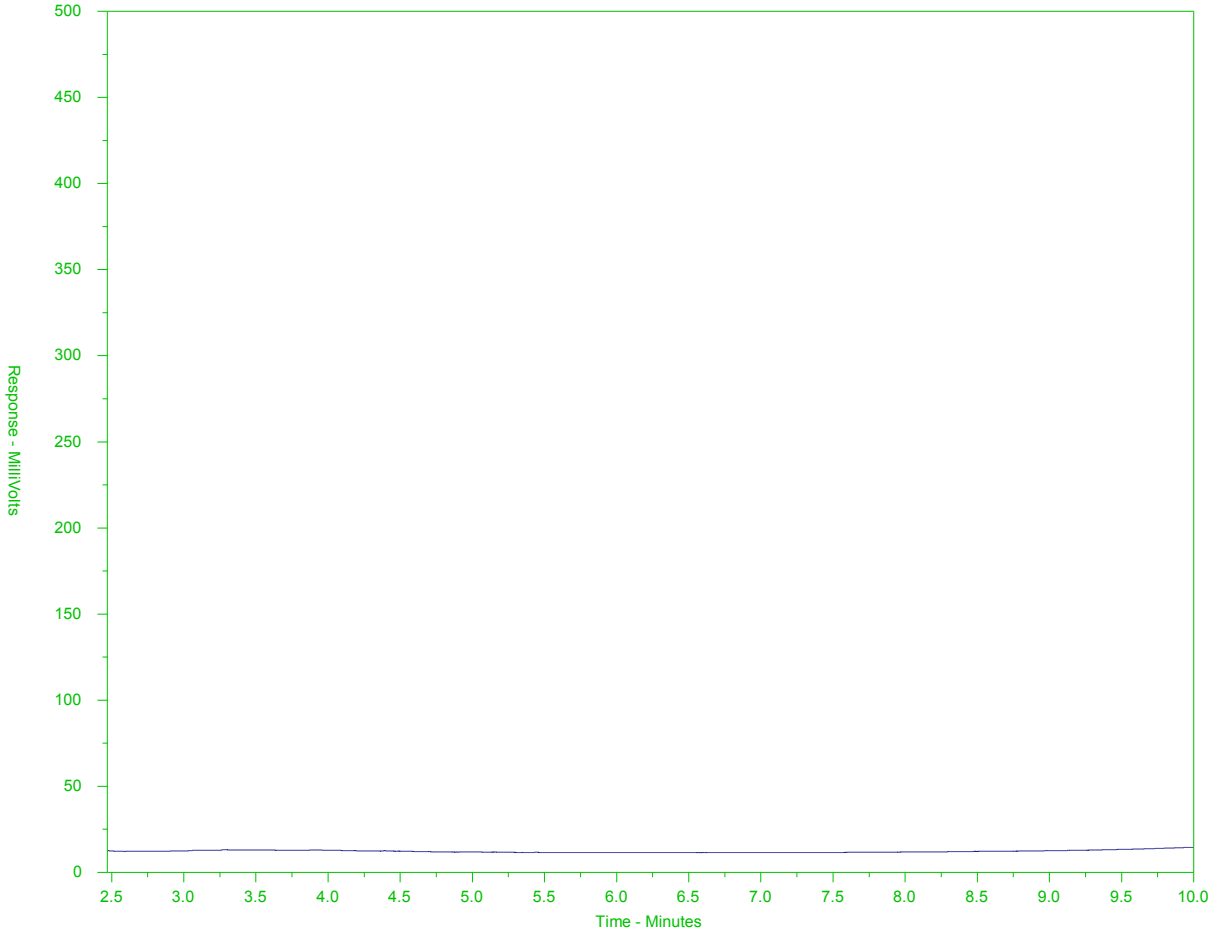
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2074591-6
Client Sample ID: MW-GW (LQR)



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

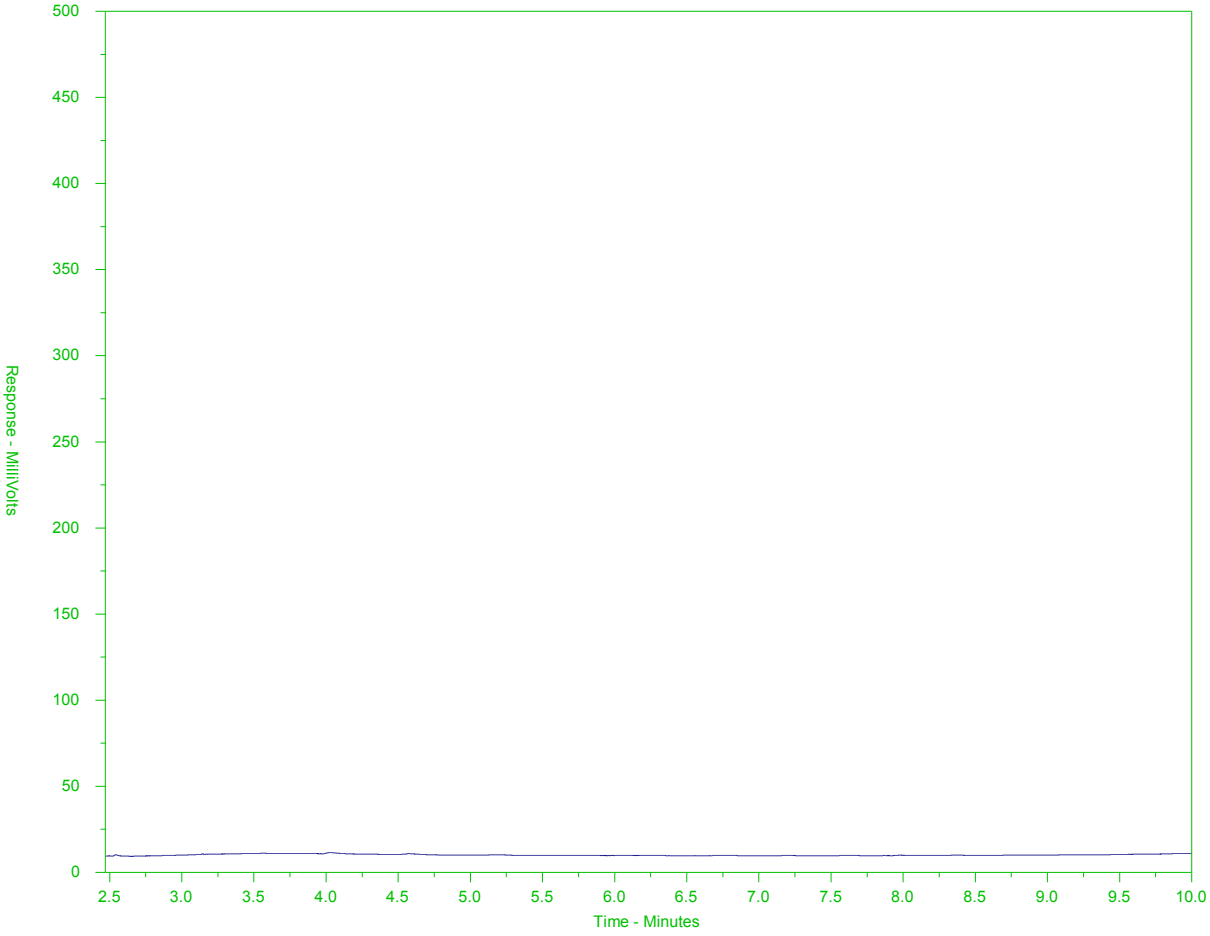
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2074591-7
Client Sample ID: TRIP BLANK (LQTB)



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

ALS Environmental

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

COC #

Report To			
Company:	TECK Metals Ltd		
Contact:	Michelle Unger		
Address:	601 Knightton Road		
	Kimberly, BC		
Phone:	250-427-8422	Fax:	
Invoice To	Same as Report ?	☑ Yes	☐ No
Hardcopy of Invoice with Report?		☐ Yes	☑ No
Company:			
Contact:			
Address:			
Phone:			

L2074591-COFC

Report Format / Distribution			
☑ Standard	☐ Other		
☑ PDF	☑ Excel	☑ Digital	☐ Fax
Email 1:	scott@accessconsulting.ca, chenry@accessconsu		
Email 2:	amacphail@accessconsulting.ca, marieducharme		
Email 3:	michelle.unger@teck.com		

Client / Project Information	
Job #:	TECK-18-01
PO / AFE:	
LSD:	
Quote #:	Q62635
ALS Contact:	Can Dang
Sampler:	A. MacPhail

Service Requested (Rush for routine analysis subject to availability)

- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	(This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	pH, SPC, alkalinity, hardness	F/P dissolved metals low level +Hg	Anions (nitrate, nitrite, sulphate, Cl, F, Br)	P Ammonia	P BTEX, LEPH, HEPH	P VPH, PAH	Number of Containers
	MW13-01 (LP)	27-Mar-18	15:20	Groundwater	X	X	X	X			
	MW13-06 (LP)	29-Mar-18	11:30	Groundwater	X	X	X	X			
	MW13-07 (LP)	28-Mar-18	15:10	Groundwater	X	X	X	X	X	X	
	MW13-08 (LP)	28-Mar-18	17:20	Groundwater	X	X	X	X			
	MW14-04 (LP)	28-Mar-18	12:55	Groundwater	X	X	X	X	X	X	
	~~MW-FB (LQFB)~~	~~29-Mar-18~~	~~13:40~~	~~Groundwater~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	
	MW-GW (LQR)	28-Mar-18	15:20	Groundwater	X	X	X	X	X	X	
	Trip Blank (LQTB)			Groundwater	X	X	X	X	X	X	

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Yukon EQWin and ACC200 digital formats. General A: pH, EC, TSS (low) **General B:** pH, EC, TSS (low), anions-all
General C: pH, EC, TSS (low), anions-all, ion balance, alkalinity **General D:** pH, EC, TSS (low), SO4, ion balance, alkalinity **General E:** pH, EC, TSS (low), SO4, ion balance

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:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Obse Observations: Yes , Yes / No ? If Ye: If Yes add SIF
Andrew MacPhail	30-Mar-18	12:30	WAM	2nd Apr 2018	10:20	2.9 °C				

TECK METALS LTD.
ATTN: Michelle Unger
601 Knightton Road
KIMBERLEY BC V1A 3E1

Date Received: 06-APR-18
Report Date: 18-APR-18 18:01 (MT)
Version: FINAL

Client Phone: 250-427-8404

Certificate of Analysis

Lab Work Order #: L2076802

Project P.O. #: NOT SUBMITTED
Job Reference: TECK-18-1
C of C Numbers: 1 of 1
Legal Site Desc:

Can Dang
Senior Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2076802-1	L2076802-2	L2076802-3	L2076802-4	L2076802-5
Description	Water	Water	Water	Water	Water
Sampled Date	03-APR-18	05-APR-18	03-APR-18	05-APR-18	04-APR-18
Sampled Time	14:10	11:00	15:30	10:00	11:45
Client ID	MH-12 (LP)	MH-04 (LP)	MH-11 (LP)	MH-02 (LP)	MH-13 (LP)
Grouping / **Analyte**					
WATER					
Physical Tests Conductivity (uS/cm)	716	298	386	1120	389
Hardness (as CaCO3) (mg/L)	464	167	225	673	218
Hardness (from Totals) (mg/L)	489	174	222	682	231
pH (pH)	8.30	8.36	8.44	8.13	8.42
Total Suspended Solids (mg/L)	7.4	13.2	<1.0	2.6	1.1
Total Dissolved Solids (mg/L)	504	185	235	878	227
Anions and Nutrients Alkalinity, Total (as CaCO3) (mg/L)	416	161	217	340	224
Ammonia, Total (as N) (mg/L)	0.150	<0.0050	0.0060	0.0051	0.0099
Bromide (Br) (mg/L)	<0.25 DLDS	<0.050	<0.050	<0.25 DLDS	<0.050
Chloride (Cl) (mg/L)	<2.5 DLDS	<0.50	<0.50	<2.5 DLDS	<0.50
Fluoride (F) (mg/L)	0.25	0.155	0.094	<0.10 DLDS	0.065
Nitrate (as N) (mg/L)	0.420	0.243	0.0862	<0.025 DLDS	0.126
Nitrite (as N) (mg/L)	<0.0050 DLDS	<0.0010	<0.0010	<0.0050 DLDS	<0.0010
Sulfate (SO4) (mg/L)	36.6	14.6	13.5	376	10.5
Total Metals Aluminum (Al)-Total (mg/L)	0.0228	0.0312	0.0048	0.0423	0.0066
Antimony (Sb)-Total (mg/L)	0.00062	0.00016	0.00013	<0.00010	0.00011
Arsenic (As)-Total (mg/L)	0.00227	0.00047	0.00040	0.00094	0.00040
Barium (Ba)-Total (mg/L)	0.184	0.0242	0.0784	0.0684	0.165
Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Total (mg/L)	0.000109	0.000244	0.0000442	0.0000572	0.0000218
Calcium (Ca)-Total (mg/L)	162	63.8	73.4	239	65.0
Chromium (Cr)-Total (mg/L)	0.00097	0.00025	<0.00010	0.00032	0.00053
Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	0.00113	<0.00010
Copper (Cu)-Total (mg/L)	0.00294	0.00053	<0.00050	<0.00050	<0.00050
Iron (Fe)-Total (mg/L)	0.104	0.036	0.039	0.363	0.163
Lead (Pb)-Total (mg/L)	0.000904	0.000761	0.000127	0.00150	0.000180
Lithium (Li)-Total (mg/L)	0.0039	0.0015	0.0017	0.0012	0.0013
Magnesium (Mg)-Total (mg/L)	20.9	3.48	9.46	20.4	16.7
Manganese (Mn)-Total (mg/L)	0.00864	0.00138	0.0114	1.52	0.0101
Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Total (mg/L)	0.00410	0.000767	0.000778	0.000288	0.00123
Nickel (Ni)-Total (mg/L)	0.00184	<0.00050	<0.00050	0.00317	0.00055
Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Total (mg/L)	3.91	0.40	0.49	1.87	0.43
Selenium (Se)-Total (mg/L)	0.00260	0.00100	0.000528	0.000074	0.000751

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2076802-6 Water 04-APR-18 10:35 MH-30 (LP)	L2076802-7 Water 04-APR-18 13:30 MH-15 (LP)	L2076802-8 Water 05-APR-18 10:15 MH-SW (LQR)	L2076802-9 Water 04-APR-18 10:45 MH-FB (LQFB)	L2076802-10 Water TRIP BLANK (LQTB)
WATER						
Physical Tests	Conductivity (uS/cm)	353	347	1120	<2.0	<2.0
	Hardness (as CaCO3) (mg/L)	205	205	673	<0.50	<0.50 HTC
	Hardness (from Totals) (mg/L)	209	206	701	<0.50	<0.50
	pH (pH)	8.38	8.46	8.15	5.49	5.49
	Total Suspended Solids (mg/L)	1.8	1.6	3.6	<1.0	<1.0
	Total Dissolved Solids (mg/L)	207	211	866	<10	<10
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	210	205	333	<1.0	<1.0
	Ammonia, Total (as N) (mg/L)	0.0302	0.0143	0.0063	0.0070 RRV	<0.026 RRV
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.25 DLDS	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<2.5 DLDS	<0.50	<0.50
	Fluoride (F) (mg/L)	0.057	0.100	<0.10 DLDS	<0.020	<0.020
	Nitrate (as N) (mg/L)	0.0903	0.102	<0.025 DLDS	<0.0050	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0050 DLDS	<0.0010	<0.0010
	Sulfate (SO4) (mg/L)	6.48	4.29	377	<0.30	<0.30
Total Metals	Aluminum (Al)-Total (mg/L)	0.0118	0.0144	0.0401	<0.0030	<0.0030
	Antimony (Sb)-Total (mg/L)	0.00012	0.00013	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00037	0.00041	0.00100	<0.00010	<0.00010
	Barium (Ba)-Total (mg/L)	0.246	0.204	0.0697	<0.00010	<0.00010
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.0000504	0.0000138	0.0000633	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	53.2	62.0	245	<0.050	<0.050
	Chromium (Cr)-Total (mg/L)	0.00021	0.00013	0.00025	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	0.00014	<0.00010	0.00118	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	0.00075	<0.00050	0.00063	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.713	0.271	0.358	<0.010	<0.010
	Lead (Pb)-Total (mg/L)	0.000354	0.000063	0.00154	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	0.0012	0.0012	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	18.3	12.5	21.5	<0.10	<0.10
	Manganese (Mn)-Total (mg/L)	0.0409	0.0166	1.52	<0.00010	<0.00010
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.00181	0.00224	0.000274	<0.000050	<0.000050
	Nickel (Ni)-Total (mg/L)	0.00134	<0.00050	0.00250	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.44	0.45	1.92	<0.10	<0.10
	Selenium (Se)-Total (mg/L)	0.000617	0.000780	0.000078	<0.000050	<0.000050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2076802-1	L2076802-2	L2076802-3	L2076802-4	L2076802-5
Description	Water	Water	Water	Water	Water
Sampled Date	03-APR-18	05-APR-18	03-APR-18	05-APR-18	04-APR-18
Sampled Time	14:10	11:00	15:30	10:00	11:45
Client ID	MH-12 (LP)	MH-04 (LP)	MH-11 (LP)	MH-02 (LP)	MH-13 (LP)
Grouping / **Analyte**					
WATER					
Total Metals Silicon (Si)-Total (mg/L)	12.5	3.38	4.12	5.42	3.49
Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	0.000012
Sodium (Na)-Total (mg/L)	4.15	0.966	1.42	11.5	1.12
Strontium (Sr)-Total (mg/L)	0.599	0.213	0.293	0.738	0.204
Sulfur (S)-Total (mg/L)	13.6	5.45	5.05	137	3.94
Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total (mg/L)	0.00047	0.00049	<0.00030	0.00084	<0.00030
Uranium (U)-Total (mg/L)	0.00297	0.00107	0.00137	0.00186	0.00193
Vanadium (V)-Total (mg/L)	0.00071	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total (mg/L)	0.321	0.0099	0.0045	0.0768	0.0037
Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved (mg/L)	0.0023	0.0059	0.0013	<0.0010	0.0011
Antimony (Sb)-Dissolved (mg/L)	0.00056	0.00012	0.00012	<0.00010	0.00010
Arsenic (As)-Dissolved (mg/L)	0.00211	0.00039	0.00033	0.00057	0.00024
Barium (Ba)-Dissolved (mg/L)	0.176	0.0230	0.0801	0.0677	0.170
Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved (mg/L)	0.0000890	0.000191	0.0000398	0.0000315	0.0000146
Calcium (Ca)-Dissolved (mg/L)	152	61.1	75.4	235	60.5
Chromium (Cr)-Dissolved (mg/L)	0.00044	0.00014	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	0.00100	<0.00010
Copper (Cu)-Dissolved (mg/L)	0.00153	<0.00020	<0.00020	0.00024	0.00023
Iron (Fe)-Dissolved (mg/L)	<0.010	0.012	0.020	0.165	0.011
Lead (Pb)-Dissolved (mg/L)	0.000141	0.000065	<0.000050	0.000108	<0.000050
Lithium (Li)-Dissolved (mg/L)	0.0040	0.0014	0.0017	<0.0010	0.0010
Magnesium (Mg)-Dissolved (mg/L)	20.3	3.42	8.93	20.7	16.2
Manganese (Mn)-Dissolved (mg/L)	0.00569	0.00027	0.0100	1.46	0.00737
Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)	0.00387	0.000756	0.000791	0.000276	0.00124
Nickel (Ni)-Dissolved (mg/L)	0.00140	<0.00050	<0.00050	0.00213	<0.00050
Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved (mg/L)	3.74	0.38	0.47	1.85	0.42
Selenium (Se)-Dissolved (mg/L)	0.00260	0.000942	0.000583	0.000070	0.000678

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2076802-6	L2076802-7	L2076802-8	L2076802-9	L2076802-10
Description	Water	Water	Water	Water	Water
Sampled Date	04-APR-18	04-APR-18	05-APR-18	04-APR-18	
Sampled Time	10:35	13:30	10:15	10:45	
Client ID	MH-30 (LP)	MH-15 (LP)	MH-SW (LQR)	MH-FB (LQFB)	TRIP BLANK (LQTB)
Grouping / **Analyte**					
WATER					
Total Metals Silicon (Si)-Total (mg/L)	3.49	4.26	5.40	<0.10	<0.10
Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total (mg/L)	0.877	1.14	11.9	<0.050	<0.050
Strontium (Sr)-Total (mg/L)	0.133	0.181	0.747	<0.00020	<0.00020
Sulfur (S)-Total (mg/L)	2.48	1.54	134	<0.50	<0.50
Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total (mg/L)	0.00033	<0.00030	0.00087	<0.00030	<0.00030
Uranium (U)-Total (mg/L)	0.00223	0.00103	0.00192	<0.000010	<0.000010
Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total (mg/L)	0.0256	<0.0030	0.0776	<0.0030	<0.0030
Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	
Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	
Aluminum (Al)-Dissolved (mg/L)	0.0014	0.0017	0.0015	<0.0010	
Antimony (Sb)-Dissolved (mg/L)	<0.00010	0.00013	<0.00010	<0.00010	
Arsenic (As)-Dissolved (mg/L)	0.00025	0.00024	0.00060	<0.00010	
Barium (Ba)-Dissolved (mg/L)	0.241	0.188	0.0689	<0.00010	
Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	
Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	
Cadmium (Cd)-Dissolved (mg/L)	0.0000227	0.0000100	0.0000330	<0.0000050	
Calcium (Ca)-Dissolved (mg/L)	51.8	61.9	236	<0.050	
Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
Cobalt (Co)-Dissolved (mg/L)	0.00014	<0.00010	0.00102	<0.00010	
Copper (Cu)-Dissolved (mg/L)	0.00034	<0.00020	0.00042	<0.00020	
Iron (Fe)-Dissolved (mg/L)	0.180	0.038	0.169	<0.010	
Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	0.000148	<0.000050	
Lithium (Li)-Dissolved (mg/L)	<0.0010	0.0012	0.0010	<0.0010	
Magnesium (Mg)-Dissolved (mg/L)	18.5	12.2	20.5	<0.10	
Manganese (Mn)-Dissolved (mg/L)	0.0403	0.00810	1.46	<0.00010	
Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
Molybdenum (Mo)-Dissolved (mg/L)	0.00176	0.00221	0.000258	<0.000050	
Nickel (Ni)-Dissolved (mg/L)	0.00088	<0.00050	0.00210	<0.00050	
Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	
Potassium (K)-Dissolved (mg/L)	0.43	0.42	1.87	<0.10	
Selenium (Se)-Dissolved (mg/L)	0.000658	0.000716	<0.000050	<0.000050	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2076802-1	L2076802-2	L2076802-3	L2076802-4	L2076802-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	03-APR-18	05-APR-18	03-APR-18	05-APR-18	04-APR-18
	Sampled Time	14:10	11:00	15:30	10:00	11:45
	Client ID	MH-12 (LP)	MH-04 (LP)	MH-11 (LP)	MH-02 (LP)	MH-13 (LP)
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silicon (Si)-Dissolved (mg/L)	12.1	3.25	4.00	5.15	3.33
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	3.82	0.933	1.35	11.3	1.06
	Strontium (Sr)-Dissolved (mg/L)	0.609	0.222	0.311	0.794	0.215
	Sulfur (S)-Dissolved (mg/L)	13.0	4.97	4.84	134	3.44
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.00300	0.00106	0.00143	0.00195	0.00199
	Vanadium (V)-Dissolved (mg/L)	0.00056	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.136	0.0036	0.0039	0.0719	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals	Chromium (III)-Total (mg/L)	<0.00072	0.00025	<0.00010	0.00032	0.00053
	Hexavalent Chromium (mg/L)	0.0010	<0.0010	<0.0010	<0.0010	<0.0010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2076802-6	L2076802-7	L2076802-8	L2076802-9	L2076802-10
Description	Water	Water	Water	Water	Water
Sampled Date	04-APR-18	04-APR-18	05-APR-18	04-APR-18	
Sampled Time	10:35	13:30	10:15	10:45	
Client ID	MH-30 (LP)	MH-15 (LP)	MH-SW (LQR)	MH-FB (LQFB)	TRIP BLANK (LQTB)
Grouping / **Analyte**					
WATER					
Dissolved Metals Silicon (Si)-Dissolved (mg/L)	3.25	4.03	5.04	<0.050	
Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
Sodium (Na)-Dissolved (mg/L)	0.825	1.04	11.1	<0.050	
Strontium (Sr)-Dissolved (mg/L)	0.139	0.197	0.782	<0.00020	
Sulfur (S)-Dissolved (mg/L)	2.04	1.43	132	<0.50	
Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	
Uranium (U)-Dissolved (mg/L)	0.00222	0.00105	0.00203	<0.000010	
Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
Zinc (Zn)-Dissolved (mg/L)	0.0142	<0.0010	0.0767	<0.0010	
Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	
Speciated Metals Chromium (III)-Total (mg/L)	0.00021	0.00013	0.00025		
Hexavalent Chromium (mg/L)	<0.0010	<0.0010	<0.0010		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Laboratory Control Sample	Molybdenum (Mo)-Dissolved	MES	L2076802-1, -2, -8
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2076802-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2076802-1, -2, -8
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2076802-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2076802-1, -2, -8
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2076802-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2076802-1, -2, -8
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L2076802-1, -2, -8
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2076802-1, -2, -8
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2076802-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2076802-1, -2, -8
Matrix Spike	Aluminum (Al)-Total	MS-B	L2076802-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Aluminum (Al)-Total	MS-B	L2076802-9
Matrix Spike	Barium (Ba)-Total	MS-B	L2076802-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Total	MS-B	L2076802-9
Matrix Spike	Cadmium (Cd)-Total	MS-B	L2076802-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L2076802-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L2076802-9
Matrix Spike	Cobalt (Co)-Total	MS-B	L2076802-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2076802-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2076802-9
Matrix Spike	Manganese (Mn)-Total	MS-B	L2076802-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Manganese (Mn)-Total	MS-B	L2076802-9
Matrix Spike	Nickel (Ni)-Total	MS-B	L2076802-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Potassium (K)-Total	MS-B	L2076802-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Silicon (Si)-Total	MS-B	L2076802-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Sodium (Na)-Total	MS-B	L2076802-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Sodium (Na)-Total	MS-B	L2076802-9
Matrix Spike	Strontium (Sr)-Total	MS-B	L2076802-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Total	MS-B	L2076802-9
Matrix Spike	Sulfur (S)-Total	MS-B	L2076802-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Sulfur (S)-Total	MS-B	L2076802-9
Matrix Spike	Thallium (Tl)-Total	MS-B	L2076802-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Zinc (Zn)-Total	MS-B	L2076802-1, -10, -2, -3, -4, -5, -6, -7, -8, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
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).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". 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.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Reference Information

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-VA Water Bromide in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CL-IC-N-VA Water Chloride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CR-CR3-TOT-CALC-ED Water Total Trivalent Chromium in Water CALCULATION

Chromium (III)-Total is calculated as the difference between the total chromium and the total hexavalent chromium (Cr(VI)) results.The Limit of Reporting for Chromium (III) varies as a function of the test results.

CR-CR6-ED Water Chromium, Hexavalent (Cr +6) APHA 3500-Cr C (Ion Chromatography)

This analysis is carried out using procedures adapted from method 3500-Cr C in "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1636 published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution.
Results are based on an un-filtered, field-preserved sample.

EC-PCT-VA Water Conductivity (Automated) APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA Water Conductivity Screen (Internal Use Only) APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water 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-VA 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-VA 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.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

Reference Information

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
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.

VIC100-T-HARDNESS-VA	Water	Hardness from Total Metals	APHA 2340B

Custom Calculation for Hardness. Client is requesting when Total Metals are run, only Total metals are used for hardness calculation.

** 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
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, 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.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

L2076802-COFC

COC Number: 15 -

Page 1 of 1

Report To	Contact and company name below will appear on the final report
Company:	TECK Metals Ltd
Contact:	Michelle Unger
Phone:	250-4278422
	Company address below will appear on the final report
Street:	601 Knightton Road
City/Province:	Kimberly, BC
Postal Code:	V1A 3E1
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	
Contact:	

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: scott@accessconsulting.ca, chenry@accessconsu

Email 2: amacphail@accessconsulting.ca,mducharme@acc

Email 3: Michelle.unger@teck.com

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: Michelle.unger@teck.com

Email 2: roxanne.menear@teck.com

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 #:	Q62635	AFE/Cost Center:	PO#:
Job #:	TECK-18-1	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	

ALS Lab Work Order # (lab use only):

ALS Contact: Can Dang **Sampler:** A. MacPhail

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 (low level) + Hg (P)	Dissolved Metals (low level) +Hg (F/P)	pH, SPC, alkalinity, hardness	Anions(Nitrate, Nitrite, Sulphate, Cl, F, Br) (P)	Ammonia (P)	TDS, TSS(low)	Chromium Speciation (P)	Number of Containers
	MH-12 (LP)	3-Apr-18	14:10	Water	R	R	R	R	R	R	R	7
	MH-04 (LP)	5-Apr-18	11:00	Water	R	R	R	R	R	R	R	7
3	MH-11 (LP)	3-Apr-18	15:30	Water	R	R	R	R	R	R	R	7
	~~MH-29 (LP)~~			Water	R	R	R	R	R	R	R	7
4	MH-02 (LP)	5-Apr-18	10:00	Water	R	R	R	R	R	R	R	7
5	MH-13 (LP)	4-Apr-18	11:45	Water	R	R	R	R	R	R	R	7
6	MH-30 (LP)	4-Apr-18	10:35	Water	R	R	R	R	R	R	R	7
7	MH-15 (LP)	4-Apr-18	13:30	Water	R	R	R	R	R	R	R	7
8	MH-SW (LQR)	5-Apr-18	10:15	Water	R	R	R	R	R	R	R	7
9	MH-FB (LQFB)	4-Apr-18	10:45	Water	R	R	R	R	R	R		6
10	Trip Blank (LQTB)	n/a	n/a	Water	R	R	R	R	R	R		6
	~~SDH-82~~			Water	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		
3°C	3°C		4		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Andrew MacPhail	Date: 6-Apr-18	Time: 9:30	Received by:	Date: APR 6/18	Time: 09:35	Received by: JC	Date: 4/7/18	Time: 0850

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**.

TECK METALS LTD.
ATTN: Michelle Unger
601 Knightton Road
KIMBERLEY BC V1A 3E1

Date Received: 06-APR-18
Report Date: 17-APR-18 17:26 (MT)
Version: FINAL

Client Phone: 250-427-8404

Certificate of Analysis

Lab Work Order #: L2076891

Project P.O. #: 9179
Job Reference: TECK-18-01
C of C Numbers: 1 of 1
Legal Site Desc:

Can Dang
Senior Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2076891-1				
	Description	Groundwater				
	Sampled Date	04-APR-18				
	Sampled Time	09:45				
	Client ID	MW13-10 (LP)				
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	393				
	Hardness (as CaCO3) (mg/L)	245				
	pH (pH)	8.20				
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	190				
	Ammonia, Total (as N) (mg/L)	0.0216				
	Bromide (Br) (mg/L)	<0.050				
	Chloride (Cl) (mg/L)	<0.50				
	Fluoride (F) (mg/L)	0.063				
	Nitrate (as N) (mg/L)	0.517				
	Nitrite (as N) (mg/L)	<0.0010				
	Sulfate (SO4) (mg/L)	35.0				
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD				
	Dissolved Metals Filtration Location	FIELD				
	Aluminum (Al)-Dissolved (mg/L)	0.0060				
	Antimony (Sb)-Dissolved (mg/L)	0.00014				
	Arsenic (As)-Dissolved (mg/L)	0.00111				
	Barium (Ba)-Dissolved (mg/L)	0.00852				
	Beryllium (Be)-Dissolved (mg/L)	<0.000020				
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050				
	Boron (B)-Dissolved (mg/L)	<0.010				
	Cadmium (Cd)-Dissolved (mg/L)	0.0000184				
	Calcium (Ca)-Dissolved (mg/L)	84.3				
	Chromium (Cr)-Dissolved (mg/L)	0.00022				
	Cobalt (Co)-Dissolved (mg/L)	<0.00010				
	Copper (Cu)-Dissolved (mg/L)	0.00026				
	Iron (Fe)-Dissolved (mg/L)	0.025				
	Lead (Pb)-Dissolved (mg/L)	0.000177				
	Lithium (Li)-Dissolved (mg/L)	0.0011				
	Magnesium (Mg)-Dissolved (mg/L)	8.32				
	Manganese (Mn)-Dissolved (mg/L)	0.00042				
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050				
	Molybdenum (Mo)-Dissolved (mg/L)	0.00197				
	Nickel (Ni)-Dissolved (mg/L)	<0.00050				
	Phosphorus (P)-Dissolved (mg/L)	<0.050				
	Potassium (K)-Dissolved (mg/L)	1.20				
	Selenium (Se)-Dissolved (mg/L)	0.00169				
	Silicon (Si)-Dissolved (mg/L)	3.90				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2076891-1				
	Description	Groundwater				
	Sampled Date	04-APR-18				
	Sampled Time	09:45				
	Client ID	MW13-10 (LP)				
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010				
	Sodium (Na)-Dissolved (mg/L)	1.92				
	Strontium (Sr)-Dissolved (mg/L)	0.392				
	Sulfur (S)-Dissolved (mg/L)	11.8				
	Thallium (Tl)-Dissolved (mg/L)	<0.000010				
	Tin (Sn)-Dissolved (mg/L)	<0.00010				
	Titanium (Ti)-Dissolved (mg/L)	0.00032				
	Uranium (U)-Dissolved (mg/L)	0.00294				
	Vanadium (V)-Dissolved (mg/L)	<0.00050				
	Zinc (Zn)-Dissolved (mg/L)	0.0015				
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030				
Volatile Organic Compounds	Benzene (mg/L)	<0.00050				
	Ethylbenzene (mg/L)	<0.00050				
	Methyl t-butyl ether (MTBE) (mg/L)	<0.00050				
	Styrene (mg/L)	<0.00050				
	Toluene (mg/L)	<0.00045				
	ortho-Xylene (mg/L)	<0.00050				
	meta- & para-Xylene (mg/L)	<0.00050				
	Xylenes (mg/L)	<0.00075				
	Surrogate: 4-Bromofluorobenzene (SS) (%)	84.0				
	Surrogate: 1,4-Difluorobenzene (SS) (%)	96.2				
Hydrocarbons	EPH10-19 (mg/L)	<0.25				
	EPH19-32 (mg/L)	<0.25				
	LEPH (mg/L)	<0.25				
	HEPH (mg/L)	<0.25				
	Volatile Hydrocarbons (VH6-10) (mg/L)	<0.10				
	VPH (C6-C10) (mg/L)	<0.10				
	Surrogate: 2-Bromobenzotrifluoride (%)	99.5				
	Surrogate: 3,4-Dichlorotoluene (SS) (%)	79.5				
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)	<0.000010				
	Acenaphthylene (mg/L)	<0.000010				
	Acridine (mg/L)	<0.000010				
	Anthracene (mg/L)	<0.000010				
	Benz(a)anthracene (mg/L)	<0.000010				
	Benzo(a)pyrene (mg/L)	<0.0000050				
	Benzo(b&j)fluoranthene (mg/L)	<0.000010				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2076891-1				
	Description	Groundwater				
	Sampled Date	04-APR-18				
	Sampled Time	09:45				
	Client ID	MW13-10 (LP)				
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Benzo(b+j+k)fluoranthene (mg/L)	<0.000015				
	Benzo(g,h,i)perylene (mg/L)	<0.000010				
	Benzo(k)fluoranthene (mg/L)	<0.000010				
	Chrysene (mg/L)	<0.000010				
	Dibenz(a,h)anthracene (mg/L)	<0.0000050				
	Fluoranthene (mg/L)	<0.000010				
	Fluorene (mg/L)	<0.000010				
	Indeno(1,2,3-c,d)pyrene (mg/L)	<0.000010				
	1-Methylnaphthalene (mg/L)	<0.000050				
	2-Methylnaphthalene (mg/L)	<0.000050				
	Naphthalene (mg/L)	0.000061				
	Phenanthrene (mg/L)	<0.000020				
	Pyrene (mg/L)	<0.000010				
	Quinoline (mg/L)	<0.000050				
	Surrogate: Acridine d9 (%)	78.4				
	Surrogate: Chrysene d12 (%)	65.4				
	Surrogate: Naphthalene d8 (%)	96.2				
	Surrogate: Phenanthrene d10 (%)	92.4				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2076891-1
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2076891-1
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2076891-1
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2076891-1

Qualifiers for Individual Parameters Listed:

Qualifier	Description
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**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". 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.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

EPH-ME-FID-VA	Water	EPH in Water	BC Lab Manual

EPH is extracted from water using a hexane micro-extraction technique, with analysis by GC-FID, as per the BC Lab Manual. EPH results include PAHs and are therefore not equivalent to LEPH or HEPH.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

LEPH/HEPH-CALC-VA	Water	LEPHs and HEPHs	BC MOE LEPH/HEPH

LEPHw and HEPHw are measures of Light and Heavy Extractable Petroleum Hydrocarbons in water. Results are calculated by subtraction of applicable PAH concentrations from EPH10-19 and EPH19-32, as per the BC Lab Manual LEPH/HEPH calculation procedure.
LEPHw = EPH10-19 minus Acenaphthene, Acridine, Anthracene, Fluorene, Naphthalene and Phenanthrene.
HEPH = EPH19-32 minus Benz(a)anthracene, Benzo(a)pyrene, Fluoranthene, and Pyrene.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water 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-VA	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.

Reference Information

NO3-L-IC-N-VA	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.

PAH-ME-MS-VA	Water	PAHs in Water	EPA 3511/8270D (mod)

PAHs are extracted from water using a hexane micro-extraction technique, with analysis by GC/MS. Because the two isomers cannot be readily separated chromatographically, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

VH-HSFID-VA	Water	VH in Water by Headspace GCFID	BC Env. Lab Manual (VH in Water)

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Compounds eluting between n-hexane and n-decane are measured and summed together using flame-ionization detection.

VH-SURR-FID-VA	Water	VH Surrogates for Waters	BC Env. Lab Manual (VH in Solids)
VOC7-HSMS-VA	Water	BTEX/MTBE/Styrene by Headspace GCMS	EPA 5021A/8260C

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

VOC7/VOC-SURR-MS-VA	Water	VOC7 and/or VOC Surrogates for Waters	EPA 5035A/5021A/8260C
VPH-CALC-VA	Water	VPH is VH minus select aromatics	BC MOE VPH

VPHw measures Volatile Petroleum Hydrocarbons in water. Results are calculated by subtraction of specific Monocyclic Aromatic Hydrocarbons from VH6-10, as per the BC Lab Manual VPH calculation procedure.
VPHw = VH6-10 minus Benzene, Toluene, Ethylbenzene, Xylenes, and Styrene

XYLENES-CALC-VA	Water	Sum of Xylene Isomer Concentrations	CALCULATION

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** 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
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

1 of 1

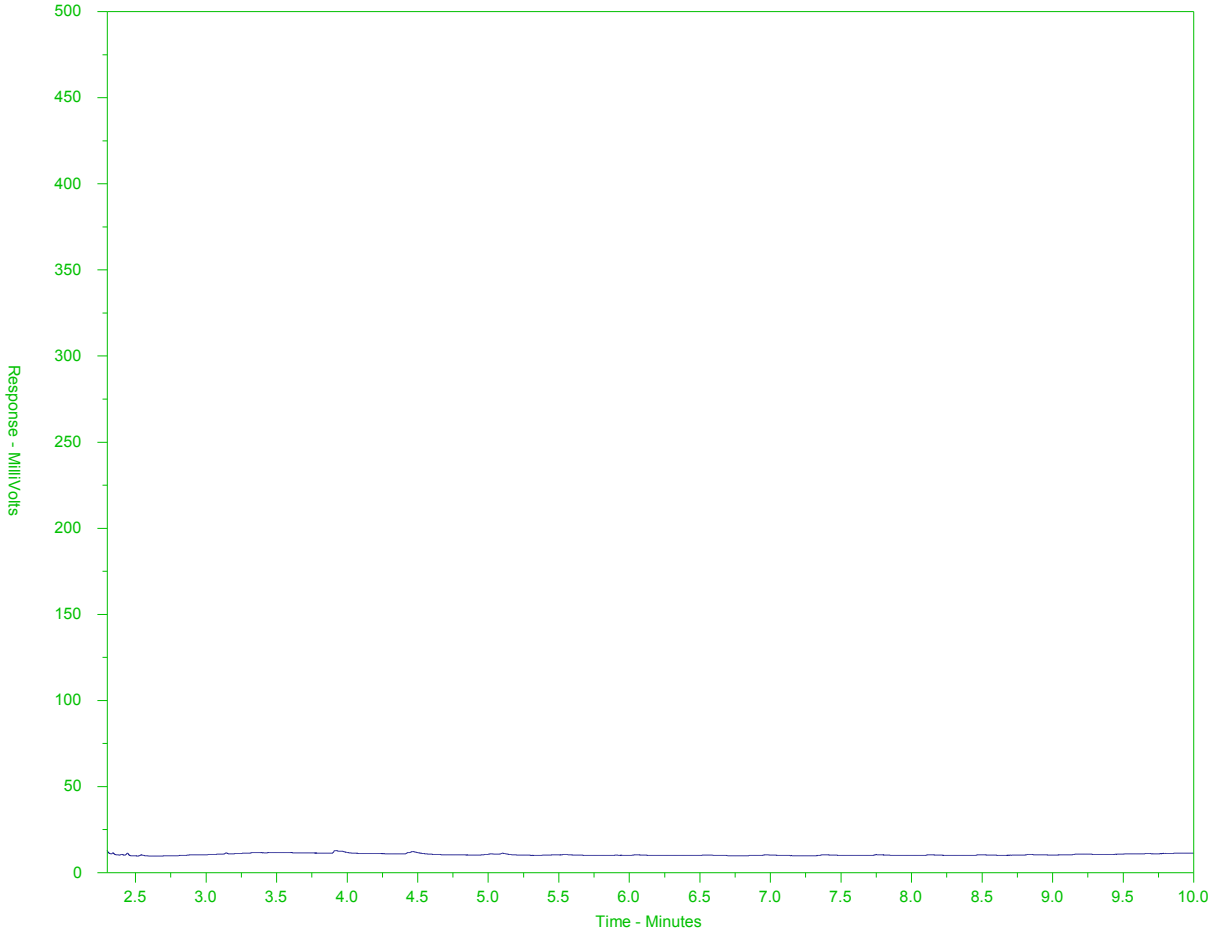
GLOSSARY OF REPORT TERMS

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.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2076891-1
Client Sample ID: MW13-10



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

L2076891-COFC

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:	TECK Metals Ltd	☑ Standard ☐ Other	◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Michelle Unger	☑ PDF ☑ Excel ☑ Digital ☐ Fax	○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	601 Knightton Road	Email 1: scott@accessconsulting.ca, chenry@accesscons	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Kimberly, BC	Email 2: amacphail@accessconsulting.ca, marieducharme	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	250-427-8422 Fax:	Email 3: michelle.unger@teck.com	
Invoice To	Same as Report ? ☑ Yes ☐ No	**Client / Project Information**	
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #: TECK-18-01	
Company:		PO / AFE:	
Contact:		LSD:	
Address:			
Phone:		Quote #: Q62635	
Lab Work Order # (lab use only)		**ALS Contact:** Can Dang **Sampler:** A. MacPhail	

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	pH, SPC, alkalinity, hardness	dissolved metals low level +Hg (F/P)	Anions (nitrate, nitrite, sulphate, Cl, F, Br)	Ammonia (P)	BTEX, LEPH, HEPH (P)	VPH, PAH (P)	Number of Containers
	MW13-10 (LP)	04-Apr-18	9:45	Groundwater	X	X	X	X	X	X	

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Yukon EQWin and ACC200 digital formats. General A: pH, EC, TSS (low) **General B:** pH, EC, TSS (low), anions-all
General C: pH, EC, TSS (low), anions-all, ion balance, alkalinity **General D:** pH, EC, TSS (low), SO4, ion balance, alkalinity **General E:** pH, EC, TSS (low), SO4, ion balance

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: Andrew MacPhail	Date (dd-mmm-yy) 6-Apr-18	Time (hh-mm) 9:30	Received by:	Date: APR 6/18	Time: 09:35	Temperature: 3 °C	Verified by:	Date:	Time:	Obse Observations: Yes , Yes / No ? If Ye If Yes add SIF

JC 4/7/18 10Sc/Rm 4°C

GENF 20.00 Front

TECK METALS LTD.
ATTN: Michelle Unger
601 Knightton Road
KIMBERLEY BC V1A 3E1

Date Received: 07-JUN-18
Report Date: 25-JUN-18 13:09 (MT)
Version: FINAL

Client Phone: 250-427-8404

Certificate of Analysis

Lab Work Order #: L2108231

Project P.O. #: NOT SUBMITTED
Job Reference: TECK-18-1
C of C Numbers: 1 of 1
Legal Site Desc:

Comments: ADDITIONAL 22-JUN-18 16:17

Can Dang
Senior Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2108231-1	L2108231-2	L2108231-3	L2108231-4	L2108231-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	04-JUN-18	06-JUN-18	05-JUN-18	05-JUN-18	04-JUN-18
	Sampled Time	14:00	11:45	11:05	11:35	15:35
	Client ID	MH-12	MH-04	MH-11	MH-29	MH-02
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	261	284	332	300	724
	Hardness (as CaCO3) (mg/L)	155	158	188	166	403
	pH (pH)	8.24	8.27	8.34	8.32	8.38
	Total Suspended Solids (mg/L)	29.7	1.9	2.1	2.2	<1.0
	Total Dissolved Solids (mg/L)	176	191	215	188	529
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	134	137	221	205	313
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.100	0.129	0.075	0.045	0.075
	Nitrate (as N) (mg/L)	0.129	0.280	0.199	0.153	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sulfate (SO4) (mg/L)	9.92	15.3	15.0	3.97	189
Total Metals	Aluminum (Al)-Total (mg/L)	0.393	0.0254	0.0226	0.0268	<0.0030
	Antimony (Sb)-Total (mg/L)	0.00032	0.00016	0.00017	0.00022	0.00014
	Arsenic (As)-Total (mg/L)	0.00175	0.00041	0.00041	0.00083	0.00038
	Barium (Ba)-Total (mg/L)	0.0670	0.0205	0.0208	0.0402	0.0438
	Beryllium (Be)-Total (mg/L)	0.000025	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.000170	0.000324	0.000327	0.0000788	0.0000082
	Calcium (Ca)-Total (mg/L)	50.3	56.3	56.0	55.9	137
	Chromium (Cr)-Total (mg/L)	0.00103	0.00222	0.00225	0.00019	0.00026
	Cobalt (Co)-Total (mg/L)	0.00032	<0.00010	<0.00010	<0.00010	0.00032
	Copper (Cu)-Total (mg/L)	0.00140	<0.00050	<0.00050	0.00054	<0.00050
	Iron (Fe)-Total (mg/L)	0.679	0.024	0.040	0.045	0.019
	Lead (Pb)-Total (mg/L)	0.0146	0.000718	0.000733	0.000215	0.000196
	Lithium (Li)-Total (mg/L)	0.0018	0.0014	0.0014	0.0013	0.0011
	Magnesium (Mg)-Total (mg/L)	4.75	3.08	3.10	4.65	10.8
	Manganese (Mn)-Total (mg/L)	0.0412	0.00177	0.00199	0.00556	0.0316
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.00130	0.000619	0.000669	0.000680	0.000528
	Nickel (Ni)-Total (mg/L)	0.00123	0.00067	0.00067	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.64	0.46	0.45	0.41	1.66
	Selenium (Se)-Total (mg/L)	0.000865	0.000729	0.000739	0.000763	0.000214
	Silicon (Si)-Total (mg/L)	4.37	3.20	3.15	3.80	4.10

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2108231-6	L2108231-7	L2108231-8	L2108231-9	L2108231-10
Description	Water	Water	Water	Water	Water
Sampled Date	05-JUN-18	04-JUN-18	06-JUN-18		06-JUN-18
Sampled Time	15:39	14:15	12:00		13:57
Client ID	MH-22	MH-SW	MH-FB	TRIP BLANK	SDH-S2
Grouping / **Analyte**					
WATER					
Physical Tests					
Conductivity (uS/cm)	248	276	<2.0	<2.0	432
Hardness (as CaCO3) (mg/L)	121	143	<0.50	<0.50 HTC	204
pH (pH)	7.98	8.27	5.45	5.51	7.27
Total Suspended Solids (mg/L)	<1.0	28.6	<1.0	<1.0	12.1
Total Dissolved Solids (mg/L)	160	176	<10	<10	307
Anions and Nutrients					
Alkalinity, Total (as CaCO3) (mg/L)	89.4	169	<1.0	<1.0	54.6
Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.015 RRV	<0.0050
Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
Fluoride (F) (mg/L)	0.989	0.101	<0.020	<0.020	0.104
Nitrate (as N) (mg/L)	0.160	0.130	<0.0050	<0.0050	0.492
Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Sulfate (SO4) (mg/L)	30.4	9.97	<0.30	<0.30	159
Total Metals					
Aluminum (Al)-Total (mg/L)	<0.0030	0.405	<0.0030	<0.0030	0.0888
Antimony (Sb)-Total (mg/L)	0.00253	0.00035	<0.00010	<0.00010	0.00100
Arsenic (As)-Total (mg/L)	0.00423	0.00176	<0.00010	<0.00010	0.00045
Barium (Ba)-Total (mg/L)	0.0126	0.0666	<0.00010	<0.00010	0.0168
Beryllium (Be)-Total (mg/L)	<0.000020	0.000023	<0.000020	<0.000020	0.000028
Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	0.000388
Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Total (mg/L)	0.00286	0.000172	<0.0000050	<0.0000050	0.106
Calcium (Ca)-Total (mg/L)	39.5	49.3	<0.050	<0.050	76.9
Chromium (Cr)-Total (mg/L)	0.00023	0.00101	<0.00010	<0.00010	0.00052
Cobalt (Co)-Total (mg/L)	<0.00010	0.00032	<0.00010	<0.00010	0.00056
Copper (Cu)-Total (mg/L)	<0.00050	0.00137	<0.00050	<0.00050	0.00149
Iron (Fe)-Total (mg/L)	<0.010	0.696	<0.010	<0.010	0.391
Lead (Pb)-Total (mg/L)	0.000392	0.0144	<0.000050	<0.000050	0.906
Lithium (Li)-Total (mg/L)	0.0050	0.0019	<0.0010	<0.0010	0.0015
Magnesium (Mg)-Total (mg/L)	5.33	4.77	<0.10	<0.10	2.94
Manganese (Mn)-Total (mg/L)	0.00389	0.0396	<0.00010	<0.00010	0.0422
Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Total (mg/L)	0.0104	0.00129	<0.000050	<0.000050	0.000723
Nickel (Ni)-Total (mg/L)	0.00423	0.00128	<0.00050	<0.00050	0.00171
Phosphorus (P)-Total (mg/L)	<0.050	0.055	<0.050	<0.050	<0.050
Potassium (K)-Total (mg/L)	0.50	0.64	<0.10	<0.10	0.75
Selenium (Se)-Total (mg/L)	0.00937	0.000812	<0.000050	<0.000050	0.00447
Silicon (Si)-Total (mg/L)	4.64	4.42	<0.10	<0.10	2.73

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2108231-1	L2108231-2	L2108231-3	L2108231-4	L2108231-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	04-JUN-18	06-JUN-18	05-JUN-18	05-JUN-18	04-JUN-18
	Sampled Time	14:00	11:45	11:05	11:35	15:35
	Client ID	MH-12	MH-04	MH-11	MH-29	MH-02
Grouping	**Analyte**					
WATER						
Total Metals	Silver (Ag)-Total (mg/L)	0.000020	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.819	0.807	0.812	0.757	6.79
	Strontium (Sr)-Total (mg/L)	0.186	0.199	0.199	0.192	0.464
	Sulfur (S)-Total (mg/L)	3.66	5.75	5.57	1.48	72.5
	Thallium (Tl)-Total (mg/L)	0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	0.0128	<0.00090	0.00130	<0.00090 DLM	<0.00030
	Uranium (U)-Total (mg/L)	0.000927	0.000821	0.000819	0.000726	0.00155
	Vanadium (V)-Total (mg/L)	0.00183	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	0.0255	0.0075	0.0079	<0.0030	0.0032
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0060	0.0029	0.0046	0.0042	0.0012
	Antimony (Sb)-Dissolved (mg/L)	0.00022	0.00013	0.00019	0.00020	0.00012
	Arsenic (As)-Dissolved (mg/L)	0.00102	0.00037	0.00058	0.00076	0.00033
	Barium (Ba)-Dissolved (mg/L)	0.0670	0.0227	0.0558 DTMF	0.0436	0.0466
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	0.0000404	0.000287	0.0000491	0.0000480	0.0000055
	Calcium (Ca)-Dissolved (mg/L)	53.6	57.9	64.4	58.5	143
	Chromium (Cr)-Dissolved (mg/L)	0.00049	0.00043	0.00020	0.00031	0.00015
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00029
	Copper (Cu)-Dissolved (mg/L)	0.00046	0.00030	0.00078	0.00054	0.00033
	Iron (Fe)-Dissolved (mg/L)	0.013	<0.010	0.021	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	0.000386	0.000208	0.000369	<0.000050	0.000095
	Lithium (Li)-Dissolved (mg/L)	0.0014	0.0014	0.0014	0.0013	0.0011
	Magnesium (Mg)-Dissolved (mg/L)	5.10	3.28	6.65 DTMF	4.92	11.1
	Manganese (Mn)-Dissolved (mg/L)	0.00168	0.00021	0.00286 DTMF	0.00114	0.0329
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.00130	0.000668	0.000895	0.000623	0.000516
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.63	0.47	0.55	0.43	1.66
	Selenium (Se)-Dissolved (mg/L)	0.000788	0.000729	0.000790	0.000611	0.000281
	Silicon (Si)-Dissolved (mg/L)	3.64	3.02	3.48	3.55	3.93

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2108231-6	L2108231-7	L2108231-8	L2108231-9	L2108231-10
Description	Water	Water	Water	Water	Water
Sampled Date	05-JUN-18	04-JUN-18	06-JUN-18		06-JUN-18
Sampled Time	15:39	14:15	12:00		13:57
Client ID	MH-22	MH-SW	MH-FB	TRIP BLANK	SDH-S2
Grouping / **Analyte**					
WATER					
Total Metals Silver (Ag)-Total (mg/L)	<0.000010	0.000024	<0.000010	<0.000010	0.000538
Sodium (Na)-Total (mg/L)	0.843	0.827	<0.050	<0.050	0.492
Strontium (Sr)-Total (mg/L)	0.210	0.190	<0.00020	<0.00020	0.0913
Sulfur (S)-Total (mg/L)	10.6	3.67	<0.50	<0.50	59.4
Thallium (Tl)-Total (mg/L)	0.000016	<0.000010	<0.000010	<0.000010	0.000029
Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total (mg/L)	<0.00030	0.0112	<0.00030	<0.00030	0.00276
Uranium (U)-Total (mg/L)	0.00277	0.000925	<0.000010	<0.000010	0.000225
Vanadium (V)-Total (mg/L)	<0.00050	0.00181	<0.00050	<0.00050	0.00061
Zinc (Zn)-Total (mg/L)	0.375	0.0248	<0.0030	<0.0030	10.6
Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD		FIELD
Dissolved Metals Filtration Location	FIELD	FIELD	FIELD		FIELD
Aluminum (Al)-Dissolved (mg/L)	0.0055	0.0055	<0.0010		<0.0010
Antimony (Sb)-Dissolved (mg/L)	0.00246	0.00022	<0.00010		0.00032
Arsenic (As)-Dissolved (mg/L)	0.00429	0.00099	<0.00010		<0.00010
Barium (Ba)-Dissolved (mg/L)	0.0142	0.0613	<0.00010		0.0160
Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020		<0.000020
Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050		<0.000050
Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010		<0.010
Cadmium (Cd)-Dissolved (mg/L)	0.00285	0.0000347	<0.0000050		0.101
Calcium (Ca)-Dissolved (mg/L)	39.8	49.5	<0.050		77.1
Chromium (Cr)-Dissolved (mg/L)	0.00023	0.00038	<0.00010		<0.00010
Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		0.00031
Copper (Cu)-Dissolved (mg/L)	0.00074	0.00044	<0.00020		0.00052
Iron (Fe)-Dissolved (mg/L)	0.027	0.012	<0.010		<0.010
Lead (Pb)-Dissolved (mg/L)	0.000849 DTMF	0.000386	<0.000050		0.0870
Lithium (Li)-Dissolved (mg/L)	0.0050	0.0013	<0.0010		0.0014
Magnesium (Mg)-Dissolved (mg/L)	5.39	4.63	<0.10		2.82
Manganese (Mn)-Dissolved (mg/L)	0.00568 DTMF	0.00159	<0.00010		0.00504
Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050		<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)	0.0103	0.00117	<0.000050		0.000684
Nickel (Ni)-Dissolved (mg/L)	0.00422	<0.00050	<0.00050		0.00091
Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050		<0.050
Potassium (K)-Dissolved (mg/L)	0.56	0.59	<0.10		0.73
Selenium (Se)-Dissolved (mg/L)	0.00947	0.000701	<0.000050		0.00394
Silicon (Si)-Dissolved (mg/L)	4.45	3.69	<0.050		2.21

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2108231-1	L2108231-2	L2108231-3	L2108231-4	L2108231-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	04-JUN-18	06-JUN-18	05-JUN-18	05-JUN-18	04-JUN-18
	Sampled Time	14:00	11:45	11:05	11:35	15:35
	Client ID	MH-12	MH-04	MH-11	MH-29	MH-02
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.856	0.831	0.956	0.772	6.69
	Strontium (Sr)-Dissolved (mg/L)	0.197	0.203	0.233	0.196	0.457
	Sulfur (S)-Dissolved (mg/L)	3.11	5.05	5.19	1.40	66.3
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.000956	0.000848	0.00112 DTMF	0.000733	0.00155
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0015	0.0059	0.0035	<0.0010	0.0032
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals	Chromium (III)-Total (mg/L)	0.00103	0.00222	0.00225	0.00019	0.00026
	Hexavalent Chromium (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2108231-6	L2108231-7	L2108231-8	L2108231-9	L2108231-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	05-JUN-18	04-JUN-18	06-JUN-18		06-JUN-18
	Sampled Time	15:39	14:15	12:00		13:57
	Client ID	MH-22	MH-SW	MH-FB	TRIP BLANK	SDH-S2
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010		<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.906	0.808	<0.050		0.474
	Strontium (Sr)-Dissolved (mg/L)	0.207	0.181	<0.00020		0.0929
	Sulfur (S)-Dissolved (mg/L)	10.2	3.21	<0.50		50.7
	Thallium (Tl)-Dissolved (mg/L)	0.000018	<0.000010	<0.000010		0.000019
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030		<0.00030
	Uranium (U)-Dissolved (mg/L)	0.00276	0.000902	<0.000010		0.000196
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.375	0.0016	<0.0010		9.63
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030		<0.00030
Speciated Metals	Chromium (III)-Total (mg/L)	0.00023	0.00101			0.00052
	Hexavalent Chromium (mg/L)	<0.00050	<0.00050			<0.00050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Selenium (Se)-Total	MB-LOR	L2108231-9
Method Blank	Silver (Ag)-Total	MB-LOR	L2108231-2
Method Blank	Thallium (Tl)-Total	MB-LOR	L2108231-9
Matrix Spike	Aluminum (Al)-Dissolved	MS-B	L2108231-1, -10, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Arsenic (As)-Dissolved	MS-B	L2108231-1, -10, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2108231-1, -10, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2108231-1, -10, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2108231-1, -10, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Aluminum (Al)-Total	MS-B	L2108231-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Barium (Ba)-Total	MS-B	L2108231-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Barium (Ba)-Total	MS-B	L2108231-9
Matrix Spike	Boron (B)-Total	MS-B	L2108231-9
Matrix Spike	Calcium (Ca)-Total	MS-B	L2108231-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Calcium (Ca)-Total	MS-B	L2108231-9
Matrix Spike	Copper (Cu)-Total	MS-B	L2108231-9
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2108231-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2108231-9
Matrix Spike	Manganese (Mn)-Total	MS-B	L2108231-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Manganese (Mn)-Total	MS-B	L2108231-9
Matrix Spike	Molybdenum (Mo)-Total	MS-B	L2108231-9
Matrix Spike	Potassium (K)-Total	MS-B	L2108231-9
Matrix Spike	Selenium (Se)-Total	MS-B	L2108231-9
Matrix Spike	Sodium (Na)-Total	MS-B	L2108231-9
Matrix Spike	Strontium (Sr)-Total	MS-B	L2108231-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Strontium (Sr)-Total	MS-B	L2108231-9
Matrix Spike	Sulfur (S)-Total	MS-B	L2108231-9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
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.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". 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.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Reference Information

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CR-CR3-TOT-CALC-ED	Water	Total Trivalent Chromium in Water	CALCULATION

Chromium (III)-Total is calculated as the difference between the total chromium and the total hexavalent chromium (Cr(VI)) results.The Limit of Reporting for Chromium (III) varies as a function of the test results.

CR-CR6-ED	Water	Chromium, Hexavalent (Cr +6)	APHA 3500-Cr C (Ion Chromatography)

This analysis is carried out using procedures adapted from method 3500-Cr C in "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1636 published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution.
Results are based on an un-filtered, field-preserved sample.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water 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-VA	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-VA	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.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC

Reference Information

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TSS-LOW-VA Water Total Suspended Solids by Grav. (1 mg/L) APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
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.

** 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
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, 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.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

L2108231-COFC

COC Number: 15 -

Page 1 of 1

Report To	Contact and company name below will appear on the final report
Company:	TECK Metals Ltd
Contact:	Michelle Unger
Phone:	250-4278422
	Company address below will appear on the final report
Street:	601 Knightton Road
City/Province:	Kimberly, BC
Postal Code:	V1A 3E1
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	
Contact:	

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: chenry@accessconsulting.ca

Email 2: amacphail@accessconsulting.ca,mducharme@acc

Email 3: Michelle.unger@teck.com

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: Michelle.unger@teck.com

Email 2: roxanne.menear@teck.com

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: dd-mmm-yy hh:mm

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 #:	Q62635	AFE/Cost Center:	PO#:
Job #:	TECK-18-1	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)		ALS Contact: Can Dang	Sampler: A. MacPhail

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 (low level) + Hg (P)	Dissolved Metals (low level) +Hg (F/P)	pH, SPC, alkalinity, hardness (P)	Anions(Nitrate, Nitrite, Sulphate, Cl, F, Br) (P)	Ammonia (P)	TDS, TSS(low) (P)	Chromium Speciation (P)	Number of Containers
	MH-12 (LP)	4-Jun-18	14:00	Water	R	R	R	R	R	R	R	8
	MH-04 (LP)	6-Jun-18	11:45	Water	R	R	R	R	R	R	R	8
	MH-11 (LP)	5-Jun-18	11:05	Water	R	R	R	R	R	R	R	8
	MH-29 (LP)	5-Jun-18	11:35	Water	R	R	R	R	R	R	R	8
	MH-02 (LP)	4-Jun-18	15:35	Water	R	R	R	R	R	R	R	8
	MH-22 (LP)	5-Jun-18	15:39	Water	R	R	R	R	R	R	R	8
	MH-SW (LQR)	4-Jun-18	14:15	Water	R	R	R	R	R	R	R	8
	MH-FB (LQFB)	6-Jun-18	12:00	Water	R	R	R	R	R	R		6
	Trip Blank (LQTB)	n/a	n/a	Water	R	R	R	R	R	R		6
	SDH-S2	6-Jun-18	13:57	Water	R	R	R	R	R	R	R	8

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		
7.0		8		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Andrew MacPhail	Date: 7-June-18	Time: 6:15	Received by: EHF	Date: 7 June 2018	Time: 13:00	Received by: HA	Date: 6/8	Time: 11:15a

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**.

TECK METALS LTD.
ATTN: Michelle Unger
601 Knightton Road
KIMBERLEY BC V1A 3E1

Date Received: 07-JUN-18
Report Date: 25-JUN-18 16:53 (MT)
Version: FINAL

Client Phone: 250-427-8404

Certificate of Analysis

Lab Work Order #: L2108271

Project P.O. #: NOT SUBMITTED
Job Reference: TECK-18-1
C of C Numbers: 1 of 1
Legal Site Desc:

Can Dang
Senior Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2108271-1	L2108271-2	L2108271-3	L2108271-4	L2108271-5
Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Sampled Date	04-JUN-18	06-JUN-18	06-JUN-18	05-JUN-18	05-JUN-18
Sampled Time	16:33	17:10	15:30	16:55	13:24
Client ID	MW13-01	MW13-04	MW13-05	MW13-06	MW13-07
Grouping / **Analyte**					
WATER					
Physical Tests					
Conductivity (uS/cm)	282	244	334	616	493
Hardness (as CaCO3) (mg/L)	151	131	171	338	248
pH (pH)	8.07	8.22	8.28	7.62	8.19
Anions and Nutrients					
Alkalinity, Total (as CaCO3) (mg/L)	143	154	146	196	232
Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	0.0147	0.171
Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	0.72
Fluoride (F) (mg/L)	0.319	0.060	0.062	0.620	0.412
Nitrate (as N) (mg/L)	0.360	0.343	1.53	<0.0050	<0.0050
Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Sulfate (SO4) (mg/L)	11.6	5.58	48.2	142	50.7
Dissolved Metals					
Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved (mg/L)	0.0028	0.0046	0.0036	0.0015	0.0029
Antimony (Sb)-Dissolved (mg/L)	0.00015	0.00028	0.00031	0.00018	<0.00010
Arsenic (As)-Dissolved (mg/L)	0.00050	0.00071	0.00060	0.0476	0.00357
Barium (Ba)-Dissolved (mg/L)	0.0198	0.0338	0.0556	0.0237	0.0268
Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	0.012	0.024
Cadmium (Cd)-Dissolved (mg/L)	0.000642	0.000447	0.0000771	<0.000060 DLM	<0.0000050
Calcium (Ca)-Dissolved (mg/L)	54.7	47.8	62.7	122	71.2
Chromium (Cr)-Dissolved (mg/L)	0.00019	0.00028	0.00039	0.00080	<0.00010
Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	0.00288	0.00061
Copper (Cu)-Dissolved (mg/L)	0.00028	0.00062	0.00151	0.00031	<0.00020
Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	0.572	2.95
Lead (Pb)-Dissolved (mg/L)	0.000701	0.000674	0.000768	<0.000050	<0.000050
Lithium (Li)-Dissolved (mg/L)	0.0017	0.0015	0.0016	0.0087	0.0081
Magnesium (Mg)-Dissolved (mg/L)	3.57	2.83	3.58	7.96	17.0
Manganese (Mn)-Dissolved (mg/L)	0.00266	0.00034	0.00085	0.343	1.23
Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)	0.000750	0.000618	0.000784	0.0433	0.00368
Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	0.0271	0.00186
Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	0.134	0.121
Potassium (K)-Dissolved (mg/L)	0.60	0.45	0.64	1.92	3.24
Selenium (Se)-Dissolved (mg/L)	0.00101	0.000992	0.00236	<0.000050	<0.000050
Silicon (Si)-Dissolved (mg/L)	3.18	3.61	4.40	15.7	7.25

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2108271-6	L2108271-7	L2108271-8	L2108271-9	L2108271-10
Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Sampled Date	06-JUN-18	06-JUN-18	06-JUN-18	06-JUN-18	04-JUN-18
Sampled Time	11:35	10:50	15:00	09:46	13:45
Client ID	MW13-08	MW13-10	MW13-13	MW14-04	MW-GW
Grouping / **Analyte**					
WATER					
Physical Tests Conductivity (uS/cm)	414	418	219	313	486
Hardness (as CaCO3) (mg/L)	259	238	110	173	238
pH (pH)	7.80	8.02	8.08	8.07	7.85
Anions and Nutrients Alkalinity, Total (as CaCO3) (mg/L)	236	204	78.8	200	229
Ammonia, Total (as N) (mg/L)	0.0254	0.0188	<0.0050	0.0327	0.162
Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl) (mg/L)	<0.50	0.56	<0.50	2.50	0.66
Fluoride (F) (mg/L)	0.056	0.053	0.117	0.062	0.413
Nitrate (as N) (mg/L)	0.292	0.617	0.370	0.0420	<0.0050
Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Sulfate (SO4) (mg/L)	9.97	30.8	32.4	7.07	47.8
Dissolved Metals Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved (mg/L)	0.0034	0.0034	0.0117	0.0049	0.0024
Antimony (Sb)-Dissolved (mg/L)	0.00014	0.00012	0.00011	0.00027	<0.00010
Arsenic (As)-Dissolved (mg/L)	0.00025	0.00110	0.00051	0.00050	0.00314
Barium (Ba)-Dissolved (mg/L)	0.136	0.0114	0.0126	0.112	0.0261
Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	0.023
Cadmium (Cd)-Dissolved (mg/L)	0.0000647	0.0000212	0.00182	0.0000766	<0.0000050
Calcium (Ca)-Dissolved (mg/L)	88.8	81.7	41.5	59.2	69.3
Chromium (Cr)-Dissolved (mg/L)	0.00039	0.00098	0.00010	0.00035	<0.00010
Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00053
Copper (Cu)-Dissolved (mg/L)	<0.00020	0.00121	0.00079	0.00276	<0.00020
Iron (Fe)-Dissolved (mg/L)	<0.010	0.014	0.018	<0.010	2.75
Lead (Pb)-Dissolved (mg/L)	<0.000050	0.000292	0.00152	0.000768	<0.000050
Lithium (Li)-Dissolved (mg/L)	0.0014	0.0015	<0.0010	0.0014	0.0078
Magnesium (Mg)-Dissolved (mg/L)	8.93	8.36	1.53	6.18	15.9
Manganese (Mn)-Dissolved (mg/L)	0.00042	0.00052	0.00045	0.00108	1.16
Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)	0.000855	0.00170	0.000193	0.00337	0.00346
Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	0.00054	0.00167
Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	0.110
Potassium (K)-Dissolved (mg/L)	0.64	1.09	0.46	1.25	3.05
Selenium (Se)-Dissolved (mg/L)	0.000889	0.00147	0.000860	0.000174	<0.000050
Silicon (Si)-Dissolved (mg/L)	3.82	3.81	1.78	3.26	7.08

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2108271-1	L2108271-2	L2108271-3	L2108271-4	L2108271-5
Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Sampled Date	04-JUN-18	06-JUN-18	06-JUN-18	05-JUN-18	05-JUN-18
Sampled Time	16:33	17:10	15:30	16:55	13:24
Client ID	MW13-01	MW13-04	MW13-05	MW13-06	MW13-07
Grouping / **Analyte**					
WATER					
Dissolved Metals					
Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved (mg/L)	0.697	0.621	1.01	8.73	17.6
Strontium (Sr)-Dissolved (mg/L)	0.179	0.112	0.179	0.395	0.488
Sulfur (S)-Dissolved (mg/L)	3.29	1.63	14.9	43.8	15.0
Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	0.000014	<0.000010
Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium (U)-Dissolved (mg/L)	0.000909	0.000590	0.000789	0.0156	0.00733
Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved (mg/L)	0.0230	0.0138	0.0066	0.0884	<0.0010
Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Volatile Organic Compounds					
Benzene (mg/L)		<0.00050	<0.00050		<0.00050
Ethylbenzene (mg/L)		<0.00050	<0.00050		<0.00050
Methyl t-butyl ether (MTBE) (mg/L)		<0.00050	<0.00050		<0.00050
Styrene (mg/L)		<0.00050	<0.00050		<0.00050
Toluene (mg/L)		<0.00045	<0.00045		0.00636
ortho-Xylene (mg/L)		<0.00050	<0.00050		<0.00050
meta- & para-Xylene (mg/L)		<0.00050	<0.00050		<0.00050
Xylenes (mg/L)		<0.00075	<0.00075		<0.00075
Surrogate: 4-Bromofluorobenzene (SS) (%)		96.9	88.3		95.2
Surrogate: 1,4-Difluorobenzene (SS) (%)		101.6	101.8		81.4
Hydrocarbons					
EPH10-19 (mg/L)		<0.25	<0.25		<0.25
EPH19-32 (mg/L)		<0.25	<0.25		<0.25
LEPH (mg/L)		<0.25	<0.25		<0.25
HEPH (mg/L)		<0.25	<0.25		<0.25
Volatile Hydrocarbons (VH6-10) (mg/L)		<0.10	<0.10		<0.10
VPH (C6-C10) (mg/L)		<0.10	<0.10		<0.10
Surrogate: 2-Bromobenzotrifluoride (%)		115.6	117.8		116.8
Surrogate: 3,4-Dichlorotoluene (SS) (%)		83.4	51.5 SURR-ND		89.7
Polycyclic Aromatic Hydrocarbons					
Acenaphthene (mg/L)		<0.000010	<0.000010		<0.000010
Acenaphthylene (mg/L)		<0.000010	<0.000010		<0.000010
Acridine (mg/L)		<0.000010	<0.000010		<0.000010
Anthracene (mg/L)		<0.000010	<0.000010		<0.000010
Benz(a)anthracene (mg/L)		<0.000010	<0.000010		<0.000010
Benzo(a)pyrene (mg/L)		<0.0000050	<0.0000050		<0.0000050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2108271-6	L2108271-7	L2108271-8	L2108271-9	L2108271-10
Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Sampled Date	06-JUN-18	06-JUN-18	06-JUN-18	06-JUN-18	04-JUN-18
Sampled Time	11:35	10:50	15:00	09:46	13:45
Client ID	MW13-08	MW13-10	MW13-13	MW14-04	MW-GW
Grouping / **Analyte**					
WATER					
Dissolved Metals Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved (mg/L)	1.19	1.97	0.469	1.52	13.7
Strontium (Sr)-Dissolved (mg/L)	0.286	0.355	0.0679	0.200	0.467
Sulfur (S)-Dissolved (mg/L)	2.89	9.55	9.49	1.98	13.2
Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	0.00040	<0.00030	<0.00030
Uranium (U)-Dissolved (mg/L)	0.00143	0.00254	0.000268	0.000587	0.00702
Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved (mg/L)	<0.0010	0.0020	0.0463	0.0048	<0.0010
Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Volatile Organic Compounds Benzene (mg/L)		<0.00050		<0.00050	<0.00050
Ethylbenzene (mg/L)		<0.00050		<0.00050	<0.00050
Methyl t-butyl ether (MTBE) (mg/L)		<0.00050		<0.00050	<0.00050
Styrene (mg/L)		<0.00050		<0.00050	<0.00050
Toluene (mg/L)		<0.00045		<0.00045	0.00616
ortho-Xylene (mg/L)		<0.00050		<0.00050	<0.00050
meta- & para-Xylene (mg/L)		<0.00050		<0.00050	<0.00050
Xylenes (mg/L)		<0.00075		<0.00075	<0.00075
Surrogate: 4-Bromofluorobenzene (SS) (%)		89.1		96.4	94.3
Surrogate: 1,4-Difluorobenzene (SS) (%)		87.3		88.0	79.8
Hydrocarbons EPH10-19 (mg/L)		<0.25		<0.25	<0.25
EPH19-32 (mg/L)		<0.25		<0.25	<0.25
LEPH (mg/L)		<0.25		<0.25	<0.25
HEPH (mg/L)		<0.25		<0.25	<0.25
Volatile Hydrocarbons (VH6-10) (mg/L)		<0.10		<0.10	<0.10
VPH (C6-C10) (mg/L)		<0.10		<0.10	<0.10
Surrogate: 2-Bromobenzotrifluoride (%)		112.4		107.5	109.1
Surrogate: 3,4-Dichlorotoluene (SS) (%)		62.0 SURR-ND		80.6	75.1
Polycyclic Aromatic Hydrocarbons Acenaphthene (mg/L)		<0.000010		<0.000010	<0.000010
Acenaphthylene (mg/L)		<0.000010		<0.000010	<0.000010
Acridine (mg/L)		<0.000010		<0.000010	<0.000010
Anthracene (mg/L)		<0.000010		<0.000010	<0.000010
Benz(a)anthracene (mg/L)		<0.000010		<0.000010	<0.000010
Benzo(a)pyrene (mg/L)		<0.0000050		<0.0000050	<0.0000050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2108271-1	L2108271-2	L2108271-3	L2108271-4	L2108271-5
Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Sampled Date	04-JUN-18	06-JUN-18	06-JUN-18	05-JUN-18	05-JUN-18
Sampled Time	16:33	17:10	15:30	16:55	13:24
Client ID	MW13-01	MW13-04	MW13-05	MW13-06	MW13-07
Grouping / **Analyte**					
WATER					
Polycyclic Aromatic Hydrocarbons					
Benzo(b&j)fluoranthene (mg/L)		<0.000010	<0.000010		<0.000010
Benzo(b+j+k)fluoranthene (mg/L)		<0.000015	<0.000015		<0.000015
Benzo(g,h,i)perylene (mg/L)		<0.000010	<0.000010		<0.000010
Benzo(k)fluoranthene (mg/L)		<0.000010	<0.000010		<0.000010
Chrysene (mg/L)		<0.000010	<0.000010		<0.000010
Dibenz(a,h)anthracene (mg/L)		<0.0000050	<0.0000050		<0.0000050
Fluoranthene (mg/L)		<0.000010	<0.000010		<0.000010
Fluorene (mg/L)		<0.000010	<0.000010		<0.000010
Indeno(1,2,3-c,d)pyrene (mg/L)		<0.000010	<0.000010		<0.000010
1-Methylnaphthalene (mg/L)		<0.000050	<0.000050		<0.000050
2-Methylnaphthalene (mg/L)		<0.000050	<0.000050		<0.000050
Naphthalene (mg/L)		<0.000050	<0.000050		<0.000050
Phenanthrene (mg/L)		<0.000020	<0.000020		<0.000020
Pyrene (mg/L)		<0.000010	<0.000010		<0.000010
Quinoline (mg/L)		<0.000050	<0.000050		<0.000050
Surrogate: Acridine d9 (%)		73.8	87.5		78.3
Surrogate: Chrysene d12 (%)		62.6	75.1		61.1
Surrogate: Naphthalene d8 (%)		96.3	96.4		91.1
Surrogate: Phenanthrene d10 (%)		93.3	94.3		91.3

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2108271-6	L2108271-7	L2108271-8	L2108271-9	L2108271-10
Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Sampled Date	06-JUN-18	06-JUN-18	06-JUN-18	06-JUN-18	04-JUN-18
Sampled Time	11:35	10:50	15:00	09:46	13:45
Client ID	MW13-08	MW13-10	MW13-13	MW14-04	MW-GW
Grouping / **Analyte**					
WATER					
Polycyclic Aromatic Hydrocarbons					
Benzo(b&j)fluoranthene (mg/L)		<0.000010		<0.000010	<0.000010
Benzo(b+j+k)fluoranthene (mg/L)		<0.000015		<0.000015	<0.000015
Benzo(g,h,i)perylene (mg/L)		<0.000010		<0.000010	<0.000010
Benzo(k)fluoranthene (mg/L)		<0.000010		<0.000010	<0.000010
Chrysene (mg/L)		<0.000010		<0.000010	<0.000010
Dibenz(a,h)anthracene (mg/L)		<0.0000050		<0.0000050	<0.0000050
Fluoranthene (mg/L)		<0.000010		<0.000010	<0.000010
Fluorene (mg/L)		<0.000010		<0.000010	<0.000010
Indeno(1,2,3-c,d)pyrene (mg/L)		<0.000010		<0.000010	<0.000010
1-Methylnaphthalene (mg/L)		<0.000050		<0.000050	<0.000050
2-Methylnaphthalene (mg/L)		<0.000050		<0.000050	<0.000050
Naphthalene (mg/L)		<0.000050		<0.000050	<0.000050
Phenanthrene (mg/L)		<0.000020		<0.000020	<0.000020
Pyrene (mg/L)		<0.000010		<0.000010	<0.000010
Quinoline (mg/L)		<0.000050		<0.000050	<0.000050
Surrogate: Acridine d9 (%)		77.5		73.4	71.7
Surrogate: Chrysene d12 (%)		65.1		61.9	63.9
Surrogate: Naphthalene d8 (%)		93.7		86.3	78.6
Surrogate: Phenanthrene d10 (%)		93.7		86.1	82.9

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Fluoride (F)	MS-B	L2108271-1, -10, -5

Qualifiers for Individual Parameters Listed:

Qualifier	Description
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.
SURR-ND	Surrogate recovery marginally exceeded ALS DQO. Reported non-detect results for associated samples were deemed to be unaffected.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". 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.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

EPH-ME-FID-VA	Water	EPH in Water	BC Lab Manual

EPH is extracted from water using a hexane micro-extraction technique, with analysis by GC-FID, as per the BC Lab Manual. EPH results include PAHs and are therefore not equivalent to LEPH or HEPH.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

LEPH/HEPH-CALC-VA	Water	LEPHs and HEPHs	BC MOE LEPH/HEPH

LEPHw and HEPHw are measures of Light and Heavy Extractable Petroleum Hydrocarbons in water. Results are calculated by subtraction of applicable PAH concentrations from EPH10-19 and EPH19-32, as per the BC Lab Manual LEPH/HEPH calculation procedure.
LEPHw = EPH10-19 minus Acenaphthene, Acridine, Anthracene, Fluorene, Naphthalene and Phenanthrene.
HEPH = EPH19-32 minus Benz(a)anthracene, Benzo(a)pyrene, Fluoranthene, and Pyrene.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water 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-VA	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.

Reference Information

NO3-L-IC-N-VA	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.

PAH-ME-MS-VA	Water	PAHs in Water	EPA 3511/8270D (mod)

PAHs are extracted from water using a hexane micro-extraction technique, with analysis by GC/MS. Because the two isomers cannot be readily separated chromatographically, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

VH-HSFID-VA	Water	VH in Water by Headspace GCFID	BC Env. Lab Manual (VH in Water)

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Compounds eluting between n-hexane and n-decane are measured and summed together using flame-ionization detection.

VH-SURR-FID-VA	Water	VH Surrogates for Waters	BC Env. Lab Manual (VH in Solids)
VOC7-HSMS-VA	Water	BTEX/MTBE/Styrene by Headspace GCMS	EPA 5021A/8260C

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

VOC7/VOC-SURR-MS-VA	Water	VOC7 and/or VOC Surrogates for Waters	EPA 5035A/5021A/8260C
VPH-CALC-VA	Water	VPH is VH minus select aromatics	BC MOE VPH

VPHw measures Volatile Petroleum Hydrocarbons in water. Results are calculated by subtraction of specific Monocyclic Aromatic Hydrocarbons from VH6-10, as per the BC Lab Manual VPH calculation procedure.
VPHw = VH6-10 minus Benzene, Toluene, Ethylbenzene, Xylenes, and Styrene

XYLENES-CALC-VA	Water	Sum of Xylene Isomer Concentrations	CALCULATION

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** 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
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

1 of 1

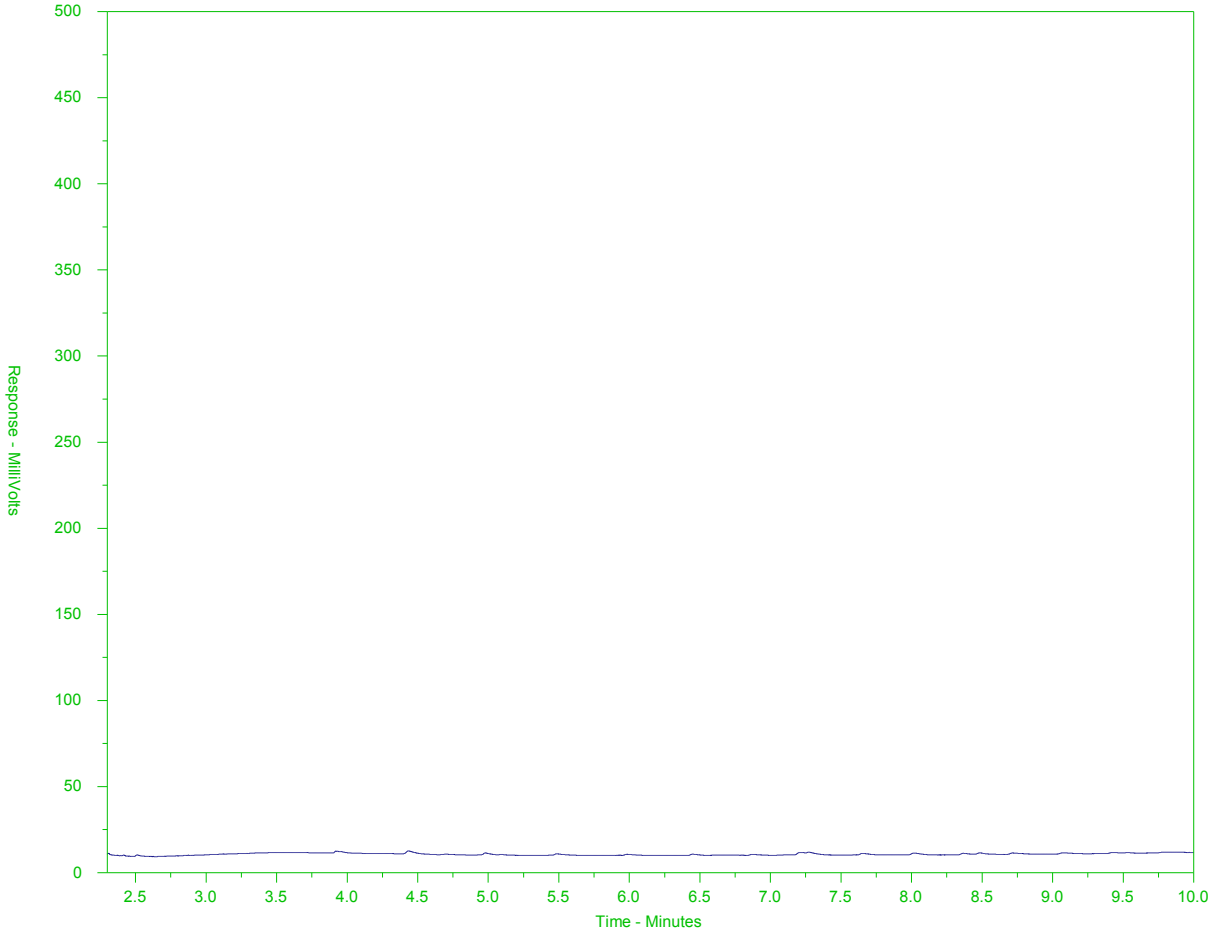
GLOSSARY OF REPORT TERMS

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.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2108271-2
Client Sample ID: MW13-04



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

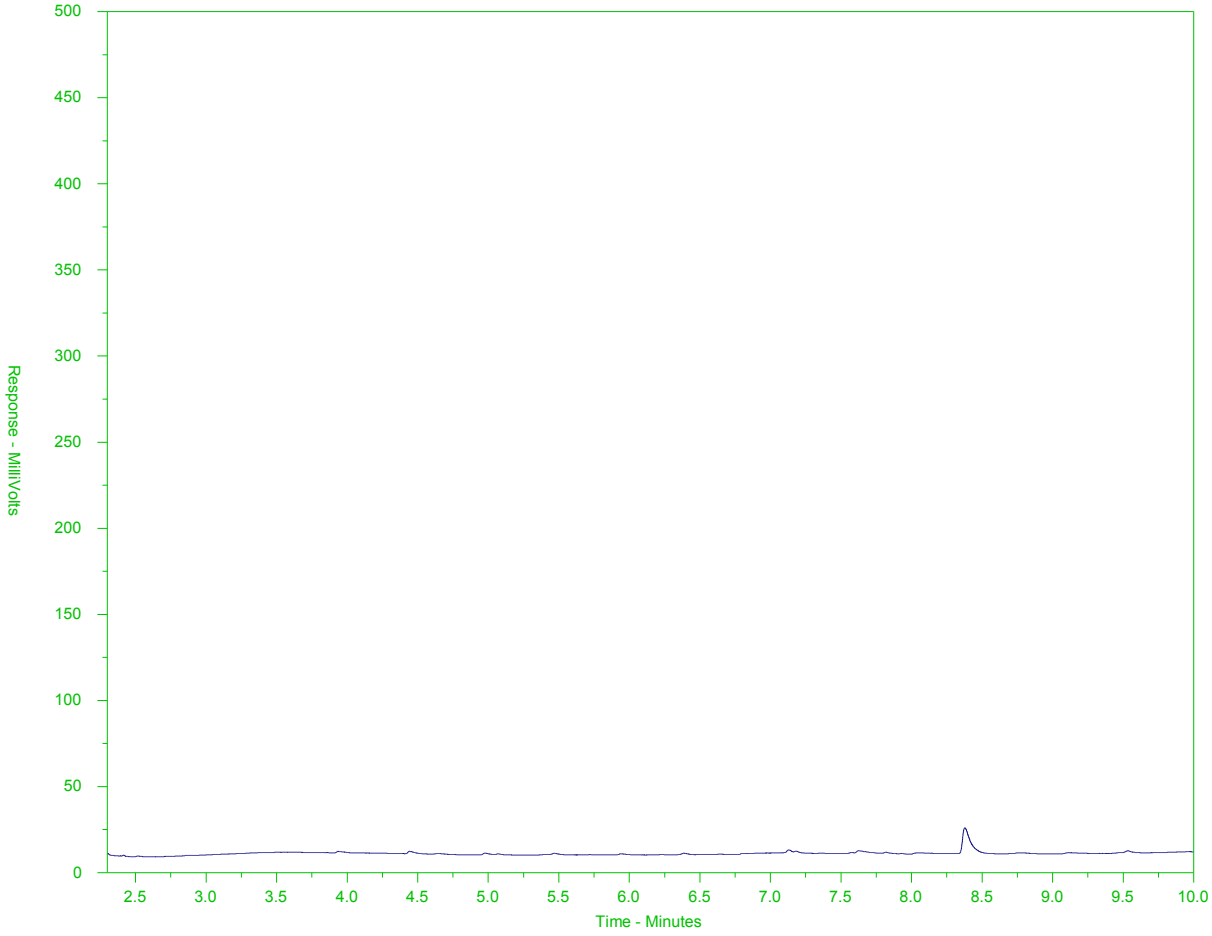
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2108271-3
Client Sample ID: MW13-05



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

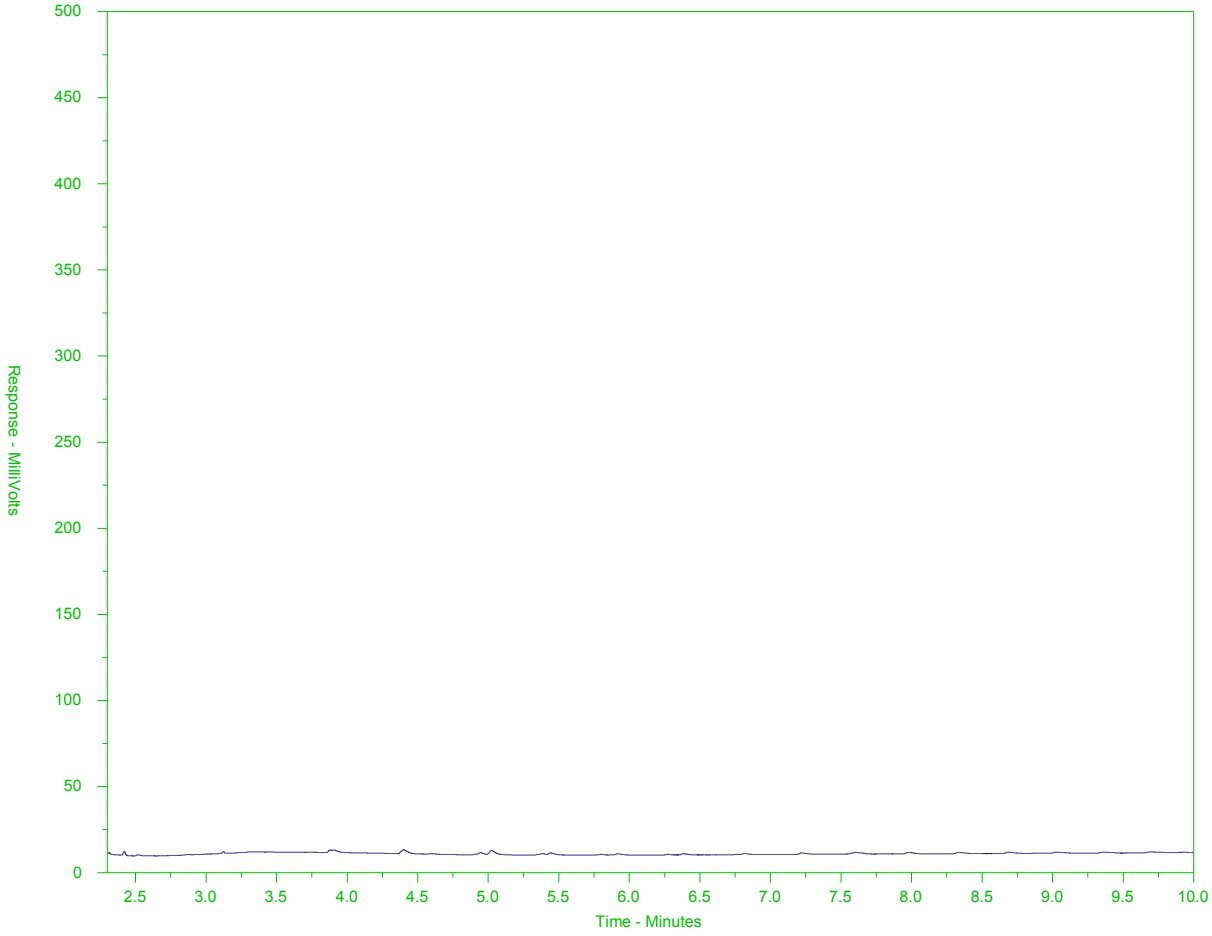
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2108271-5
Client Sample ID: MW13-07



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

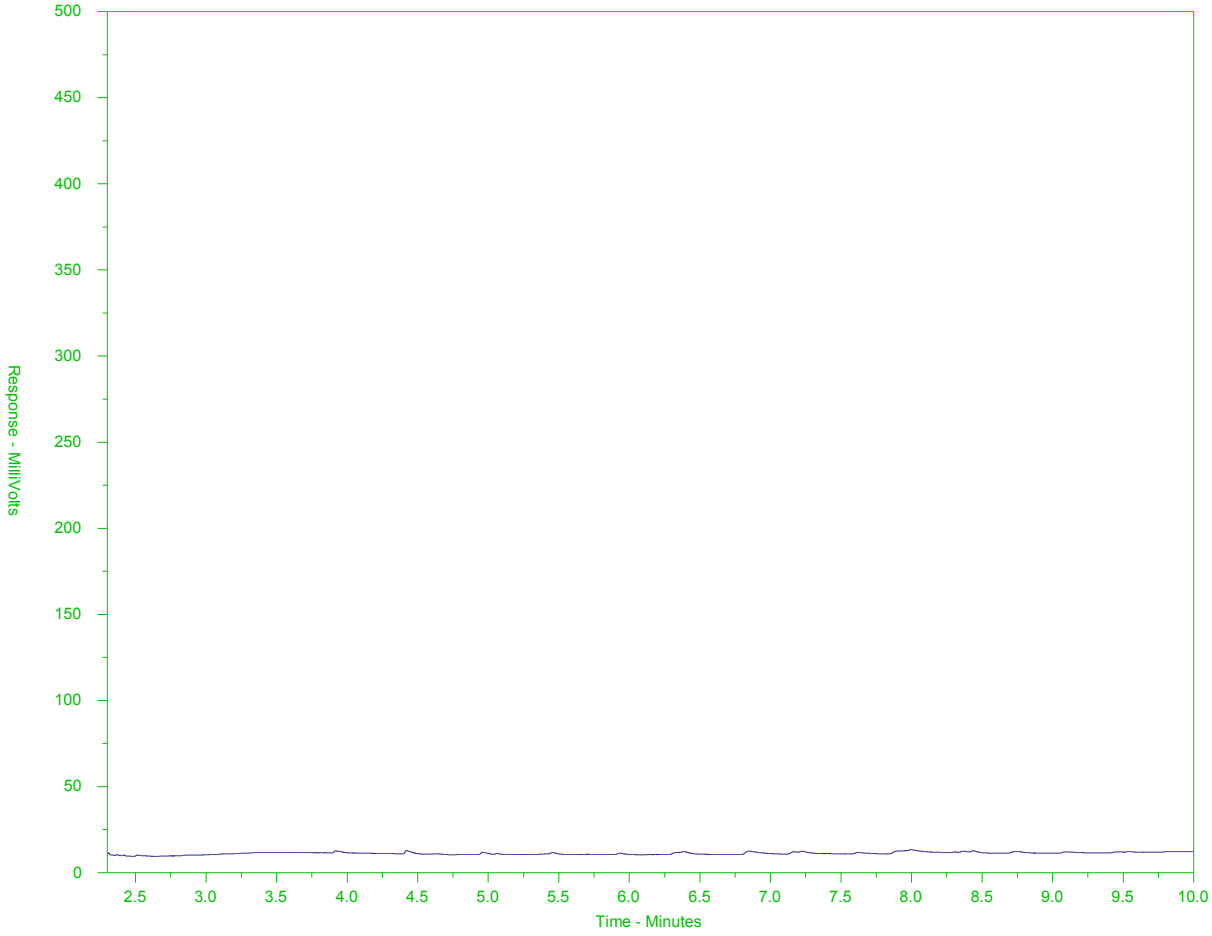
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2108271-7
Client Sample ID: MW13-10



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

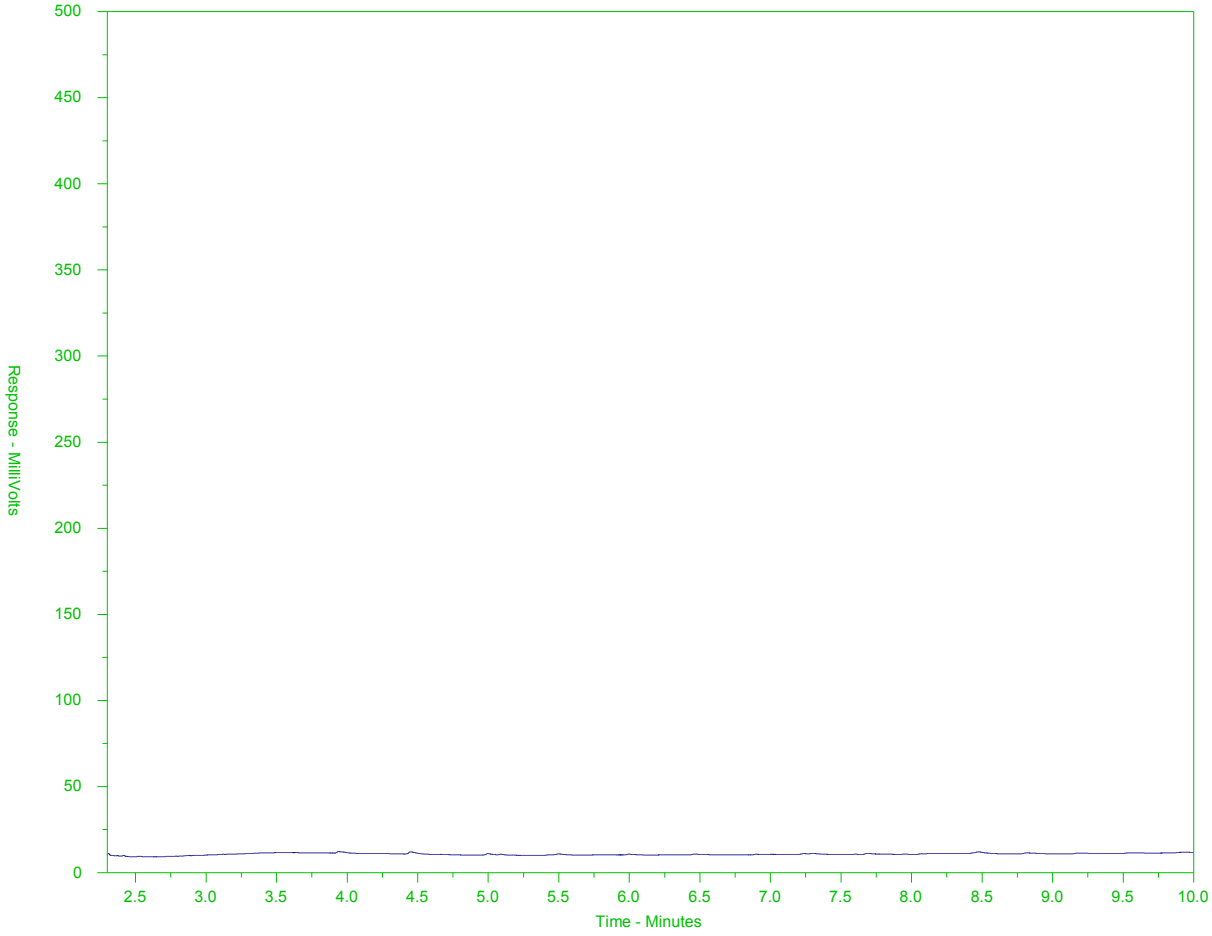
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2108271-9
Client Sample ID: MW14-04



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

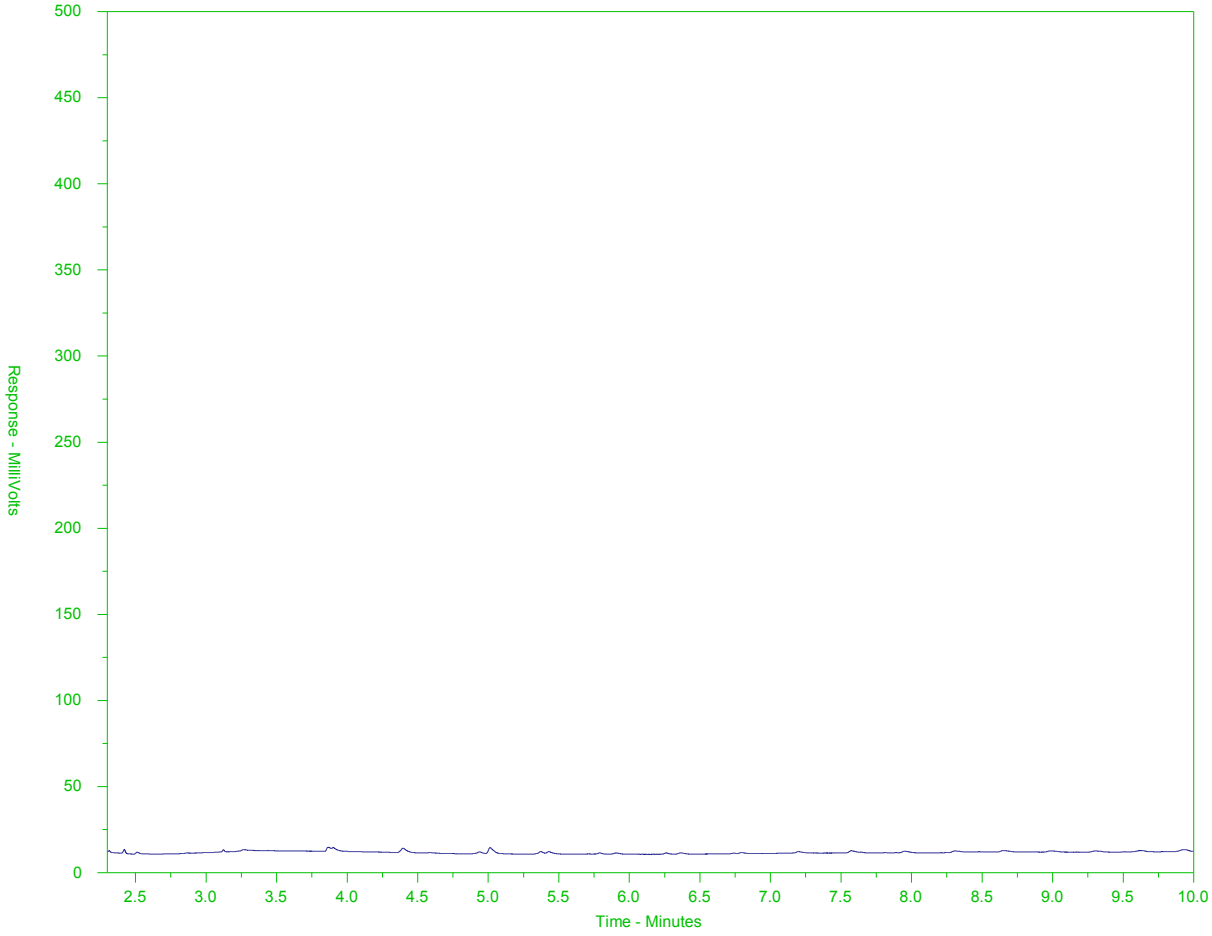
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2108271-10
Client Sample ID: MW-GW



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

L2108271-COFC

ALS Environmental

Chain of Custody / Ana
Canada Toll Free:
www.alsglobal.com

COC #

Page 1 of 1

Report To			**Report Format / Distribution**				**Service Requested** (Rush for routine analysis subject to availability)
Company:	TECK Metals Ltd		☑ Standard	☐ Other			◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Michelle Unger		☑ PDF	☑ Excel	☑ Digital	☐ Fax	○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	601 Knightton Road		Email 1:	chenry@accessconsulting.ca			○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Kimberly, BC		Email 2:	amacphail@accessconsulting.ca, marieducharme			○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	250-427-8422	Fax:	Email 3:	michelle.unger@teck.com			**Analysis Request**
Invoice To	Same as Report ?	☑ Yes ☐ No	**Client / Project Information**				Please indicate below Filtered, Preserved or both (F, P, F/P)
Hardcopy of Invoice with Report?		☐ Yes ☑ No	Job #:	TECK-18-01			
Company:			PO / AFE:				
Contact:			LSD:				
Address:							
Phone:			Quote #:	Q62635			
Lab Work Order # (lab use only)			**ALS Contact:**	Can Dang	**Sampler:**	A. MacPhail	

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	pH, SPC, alkalinity, hardness	F/P dissolved metals low level +Hg	Anions (nitrate, nitrite, sulphate, Cl, F, Br)	P Ammonia	P BTEX, LEPH, HEPH	P VPH, PAH	Number of Containers
	MW13-01 (LP)	04-Jun-18	16:33	Groundwater	X	X	X	X			
	MW13-04 (LP)	06-Jun-18	17:10	Groundwater	X	X	X	X	X	X	
	MW13-05 (LP)	06-Jun-18	15:30	Groundwater	X	X	X	X	X	X	
	MW13-06 (LP)	05-Jun-18	16:55	Groundwater	X	X	X	X			
	MW13-07 (LP)	05-Jun-18	13:24	Groundwater	X	X	X	X	X	X	
	MW13-08 (LP)	06-Jun-18	11:35	Groundwater	X	X	X	X			
	MW13-10 (LP)	06-Jun-18	10:50	Groundwater	X	X	X	X	X	X	
	MW13-13 (LP)	06-Jun-18	15:00	Groundwater	X	X	X	X			
	MW14-04 (LP)	06-Jun-18	9:46	Groundwater	X	X	X	X	X	X	
	MW-GW (LQR)	05-Jun-18	13:45	Groundwater	X	X	X	X	X	X	

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Yukon EQWin and ACC200 digital formats. General A: pH, EC, TSS (low) **General B:** pH, EC, TSS (low), anions-all
General C: pH, EC, TSS (low), anions-all, ion balance, alkalinity **General D:** pH, EC, TSS (low), SO4, ion balance, alkalinity **General E:** pH, EC, TSS (low), SO4, ion balance

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: Andrew MacPhail	Date (dd-mmm-yy) 7-Jun-18	Time (hh-mm) 13:15	Received by: EHF	Date: 7 June 2018	Time: 13:00	Temperature: 7.0 °C	Verified by: HA	Date: C/6	Time: 17:15 P	Obse Observations: Yes . Yes / No ? If Ye If Yes add SIF

GENF 20.00 Front

8

TECK METALS LTD.
ATTN: Michelle Unger
601 Knightton Road
KIMBERLEY BC V1A 3E1

Date Received: 20-JUN-18
Report Date: 04-JUL-18 18:04 (MT)
Version: FINAL

Client Phone: 250-427-8404

Certificate of Analysis

Lab Work Order #: L2115462

Project P.O. #: 9179
Job Reference: TECK-18-1
C of C Numbers:
Legal Site Desc:

Can Dang
Senior Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2115462-1	L2115462-2	L2115462-3		
	Description	Water	Water	Water		
	Sampled Date	19-JUN-18	19-JUN-18	19-JUN-18		
	Sampled Time	10:10	09:15	11:20		
	Client ID	MH-13 (LP)	MH-30 (LP)	MH-15 (LP)		
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	304	217	347		
	Hardness (as CaCO3) (mg/L)	168	114	194		
	pH (pH)	8.41	8.23	8.48		
	Total Suspended Solids (mg/L)	1.8	<1.0	1.3		
	Total Dissolved Solids (mg/L)	182	124	204		
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	165	117	205		
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050		
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050		
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50		
	Fluoride (F) (mg/L)	0.059	0.048	0.098		
	Nitrate (as N) (mg/L)	0.0594	0.0091	0.0124		
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010		
	Sulfate (SO4) (mg/L)	7.81	4.49	3.78		
Total Metals	Aluminum (Al)-Total (mg/L)	0.0249	0.0062	0.0101		
	Antimony (Sb)-Total (mg/L)	0.00018	0.00012	0.00015		
	Arsenic (As)-Total (mg/L)	0.00049	0.00019	0.00039		
	Barium (Ba)-Total (mg/L)	0.117	0.137	0.184		
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020		
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050		
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010		
	Cadmium (Cd)-Total (mg/L)	0.0000192	0.0000167	0.0000093		
	Calcium (Ca)-Total (mg/L)	49.2	29.5	56.6		
	Chromium (Cr)-Total (mg/L)	0.00010	<0.00010	<0.00010		
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Copper (Cu)-Total (mg/L)	0.00052	<0.00050	<0.00050		
	Iron (Fe)-Total (mg/L)	0.198	0.135	0.118		
	Lead (Pb)-Total (mg/L)	0.000174	<0.000050	<0.000050		
	Lithium (Li)-Total (mg/L)	0.0012	<0.0010	0.0014		
	Magnesium (Mg)-Total (mg/L)	9.90	9.59	12.9		
	Manganese (Mn)-Total (mg/L)	0.00945	0.00584	0.0102		
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050		
	Molybdenum (Mo)-Total (mg/L)	0.00107	0.00112	0.00219		
	Nickel (Ni)-Total (mg/L)	0.00072	0.00063	<0.00050		
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050		
	Potassium (K)-Total (mg/L)	0.36	0.29	0.35		
	Selenium (Se)-Total (mg/L)	0.000636	0.000513	0.000375		
	Silicon (Si)-Total (mg/L)	2.73	2.26	3.28		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2115462-1	L2115462-2	L2115462-3		
	Description	Water	Water	Water		
	Sampled Date	19-JUN-18	19-JUN-18	19-JUN-18		
	Sampled Time	10:10	09:15	11:20		
	Client ID	MH-13 (LP)	MH-30 (LP)	MH-15 (LP)		
Grouping	**Analyte**					
WATER						
Total Metals	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010		
	Sodium (Na)-Total (mg/L)	0.784	0.600	0.974		
	Strontium (Sr)-Total (mg/L)	0.180	0.0874	0.186		
	Sulfur (S)-Total (mg/L)	2.95	1.75	1.54		
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010		
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Titanium (Ti)-Total (mg/L)	0.00045	<0.00030	<0.00030		
	Uranium (U)-Total (mg/L)	0.00121	0.000860	0.000878		
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030		
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030		
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD		
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD		
	Aluminum (Al)-Dissolved (mg/L)	0.0042	0.0094	0.0019		
	Antimony (Sb)-Dissolved (mg/L)	0.00018	0.00011	0.00014		
	Arsenic (As)-Dissolved (mg/L)	0.00048	0.00025	0.00040		
	Barium (Ba)-Dissolved (mg/L)	0.120	0.142	0.190		
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020		
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050		
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010		
	Cadmium (Cd)-Dissolved (mg/L)	0.0000174	0.0000167	0.0000059		
	Calcium (Ca)-Dissolved (mg/L)	50.2	30.1	57.2		
	Chromium (Cr)-Dissolved (mg/L)	0.00015	<0.00010	0.00016		
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Copper (Cu)-Dissolved (mg/L)	0.00040	0.00042	0.00023		
	Iron (Fe)-Dissolved (mg/L)	0.096	0.181	0.052		
	Lead (Pb)-Dissolved (mg/L)	0.000065	<0.000050	<0.000050		
	Lithium (Li)-Dissolved (mg/L)	0.0011	<0.0010	0.0013		
	Magnesium (Mg)-Dissolved (mg/L)	10.2	9.46	12.3		
	Manganese (Mn)-Dissolved (mg/L)	0.00540	0.00610	0.00391		
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050		
	Molybdenum (Mo)-Dissolved (mg/L)	0.00105	0.00112	0.00221		
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	0.00063	0.00063		
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050		
	Potassium (K)-Dissolved (mg/L)	0.37	0.29	0.34		
	Selenium (Se)-Dissolved (mg/L)	0.000705	0.000532	0.000424		
	Silicon (Si)-Dissolved (mg/L)	2.41	1.99	2.77		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2115462-1	L2115462-2	L2115462-3		
	Description	Water	Water	Water		
	Sampled Date	19-JUN-18	19-JUN-18	19-JUN-18		
	Sampled Time	10:10	09:15	11:20		
	Client ID	MH-13 (LP)	MH-30 (LP)	MH-15 (LP)		
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010		
	Sodium (Na)-Dissolved (mg/L)	0.804	0.577	0.923		
	Strontium (Sr)-Dissolved (mg/L)	0.178	0.0879	0.188		
	Sulfur (S)-Dissolved (mg/L)	2.76	1.64	1.48		
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010		
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030		
	Uranium (U)-Dissolved (mg/L)	0.00115	0.000825	0.000842		
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030		
Speciated Metals	Chromium (III)-Total (mg/L)	0.00010	<0.00010	<0.00010		
	Hexavalent Chromium (mg/L)	<0.00050	<0.00050	<0.00050		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Barium (Ba)-Total	MS-B	L2115462-1, -2, -3
Matrix Spike	Calcium (Ca)-Total	MS-B	L2115462-1, -2, -3
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2115462-1, -2, -3
Matrix Spike	Sodium (Na)-Total	MS-B	L2115462-1, -2, -3
Matrix Spike	Strontium (Sr)-Total	MS-B	L2115462-1, -2, -3

Qualifiers for Individual Parameters Listed:

Qualifier	Description
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**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". 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.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CR-CR3-TOT-CALC-ED	Water	Total Trivalent Chromium in Water	CALCULATION

Chromium (III)-Total is calculated as the difference between the total chromium and the total hexavalent chromium (Cr(VI)) results.The Limit of Reporting for Chromium (III) varies as a function of the test results.

CR-CR6-ED	Water	Chromium, Hexavalent (Cr +6)	APHA 3500-Cr C (Ion Chromatography)

This analysis is carried out using procedures adapted from method 3500-Cr C in "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1636 published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution.
Results are based on an un-filtered, field-preserved sample.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Reference Information

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water 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-VA	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-VA	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.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
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.

** 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
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, 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.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2115462-COFC

COC Number: 15 -

Page 1 of 1

Report To	Contact and company name below will appear on the final report
Company:	TECK Metals Ltd
Contact:	Michelle Unger
Phone:	250-4278422
	Company address below will appear on the final report
Street:	601 Knightton Road
City/Province:	Kimberly, BC
Postal Code:	V1A 3E1
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	
Contact:	

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	scott@accessconsulting.ca, chenry@accessconsu
Email 2	amacphail@accessconsulting.ca,mducharme@acc
Email 3	Michelle.unger@teck.com
Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	Michelle.unger@teck.com
Email 2	roxanne.menear@teck.com

Project Information	
ALS Account # / Quote #:	Q62635
Job #:	TECK-18-1
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: Can Dang

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: dd-mmm-yy hh:mm

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	Total Metals (low level) + Hg (P)	Dissolved Metals (low level) +Hg (F/P)	pH, SPC, alkalinity, hardness	Anions(Nitrate, Nitrite, Sulphate, Cl, F, Br) (P)	Ammonia (P)	TDS, TSS(low)	Chromium Speciation (P)	Number of Containers
	MH-13 (LP)	19-Jun-18	10:10	Water	R	R	R	R	R	R	R	8
	MH-30 (LP)	19-Jun-18	9:15	Water	R	R	R	R	R	R	R	8
	MH-15 (LP)	19-Jun-18	11:20	Water	R	R	R	R	R	R	R	8

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		
2.0		8			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Andrew MacPhail	Date: 20-June-18	Time: 9:00	Received by: EHF	Date: 20 June 2018	Time: 09:10	Received by: HA	Date: 6/21	Time: 3:30P

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.

TECK METALS LTD.
ATTN: Michelle Unger
601 Knightton Road
KIMBERLEY BC V1A 3E1

Date Received: 20-AUG-18
Report Date: 28-AUG-18 14:49 (MT)
Version: FINAL

Client Phone: 250-427-8404

Certificate of Analysis

Lab Work Order #: L2149780

Project P.O. #: 9179
Job Reference: TECK-18-1
C of C Numbers:
Legal Site Desc:

Can Dang
Senior Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2149780-1	L2149780-2	L2149780-3	L2149780-4	L2149780-5
Description	Water	Water	Water	Water	Water
Sampled Date	13-AUG-18	15-AUG-18	14-AUG-18	14-AUG-18	13-AUG-18
Sampled Time	14:45	12:25	12:50	13:16	07:04
Client ID	MH-12(LP)	MH-04(LP)	MH-11(LP)	MH-29(LP)	MH-02(LP)
Grouping / **Analyte**					
WATER					
Physical Tests Conductivity (uS/cm)	312	289	354	330	928
Hardness (as CaCO3) (mg/L)	164	158	196	183	533
pH (pH)	8.42	8.32	8.36	8.35	8.20
Total Suspended Solids (mg/L)	1.0	1.3	<1.0	<1.0	<1.0
Total Dissolved Solids (mg/L)	187	178	214	208	680
Anions and Nutrients Alkalinity, Total (as CaCO3) (mg/L)	164	146	187	185	257
Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	0.0074	<0.0050	<0.0050
Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.25 DLDS
Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<2.5 DLDS
Fluoride (F) (mg/L)	0.116	0.146	0.089	0.054	<0.10 DLDS
Nitrate (as N) (mg/L)	0.0146	0.186	0.0568	0.0202	<0.025 DLDS
Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050
Sulfate (SO4) (mg/L)	10.7	16.4	13.7	3.75	293
Total Metals Aluminum (Al)-Total (mg/L)	0.0184	0.0111	0.0082	0.0076	<0.0030
Antimony (Sb)-Total (mg/L)	0.00022	0.00015	0.00016	0.00020	<0.00010
Arsenic (As)-Total (mg/L)	0.00088	0.00041	0.00065	0.00082	0.00046
Barium (Ba)-Total (mg/L)	0.0741	0.0215	0.0663	0.0513	0.0501
Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Total (mg/L)	0.0000504	0.000292	0.0000499	0.0000529	<0.0000050
Calcium (Ca)-Total (mg/L)	48.2	49.0	59.3	56.0	155
Chromium (Cr)-Total (mg/L)	0.00027	0.00023	0.00016	0.00013	<0.00010
Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00057
Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron (Fe)-Total (mg/L)	0.031	0.017	0.064	0.013	0.029
Lead (Pb)-Total (mg/L)	0.000913	0.000525	0.000236	<0.000050	0.000053
Lithium (Li)-Total (mg/L)	0.0014	0.0015	0.0016	0.0014	0.0013
Magnesium (Mg)-Total (mg/L)	5.71	3.24	7.49	5.32	18.3
Manganese (Mn)-Total (mg/L)	0.00317	0.00100	0.00828	0.00251	0.0701
Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Total (mg/L)	0.00129	0.000721	0.000884	0.000700	0.000438
Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Total (mg/L)	0.42	0.39	0.37	0.25	2.10
Selenium (Se)-Total (mg/L)	0.000710	0.000834	0.000476	0.000470	0.000059
Silicon (Si)-Total (mg/L)	4.02	3.19	3.57	3.83	4.60

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2149780-6 Water 15-AUG-18 10:45 MH-22(LP)	L2149780-7 Water 16-AUG-18 14:20 MH-30(LP)	L2149780-8 Water 16-AUG-18 10:33 MH-15(LP)	L2149780-9 Water 14-AUG-18 13:00 MH-SW(LQR)	L2149780-10 Water 15-AUG-18 12:35 MH-FB(LQFB)
Sample ID						
Description						
Sampled Date						
Sampled Time						
Client ID						
WATER						
Physical Tests	Conductivity (uS/cm)	280	270	361	358	<2.0
	Hardness (as CaCO3) (mg/L)	146	154	212	197	<0.50
	pH (pH)	8.17	8.24	8.40	8.37	5.54
	Total Suspended Solids (mg/L)	<1.0	1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	179	157	207	216	<10
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	110	147	207	182	<1.0
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	1.19	0.052	0.101	0.086	<0.020
	Nitrate (as N) (mg/L)	0.141	<0.0050	<0.0050	0.0577	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	0.0014
	Sulfate (SO4) (mg/L)	37.5	4.32	2.16	13.4	<0.30
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0030	0.0073	0.0057	0.0086	<0.0030
	Antimony (Sb)-Total (mg/L)	0.00235	<0.00010	<0.00010	0.00015	<0.00010
	Arsenic (As)-Total (mg/L)	0.00396	0.00033	0.00057	0.00067	<0.00010
	Barium (Ba)-Total (mg/L)	0.0162	0.199	0.190	0.0665	<0.00010
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.00360	0.0000245	0.0000055	0.0000498	<0.0000050
	Calcium (Ca)-Total (mg/L)	38.4	33.9	50.3	59.0	<0.050
	Chromium (Cr)-Total (mg/L)	0.00016	<0.00010	<0.00010	0.00020	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	<0.010	0.300	0.184	0.067	<0.010
	Lead (Pb)-Total (mg/L)	0.000299	<0.000050	<0.000050	0.000227	<0.000050
	Lithium (Li)-Total (mg/L)	0.0047	<0.0010	0.0011	0.0015	<0.0010
	Magnesium (Mg)-Total (mg/L)	6.28	13.1	13.7	7.54	<0.10
	Manganese (Mn)-Total (mg/L)	0.00030	0.0106	0.0131	0.00824	<0.00010
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.00846	0.00134	0.00186	0.000902	<0.000050
	Nickel (Ni)-Total (mg/L)	0.00361	0.00068	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.54	0.26	0.27	0.36	<0.10
	Selenium (Se)-Total (mg/L)	0.0117	0.000380	0.000272	0.000487	<0.000050
	Silicon (Si)-Total (mg/L)	4.25	2.50	3.75	3.62	<0.10

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2149780-12 Water 16-AUG-18 15:20 MH-13(LP)	L2149780-13 Water 16-AUG-18 13:25 TRIBEWF01	L2149780-15 Water 16-AUG-18 12:08 TRIBEWF03	L2149780-16 Water 15-AUG-18 13:15 PH-01	L2149780-17 Water 15-AUG-18 13:38 CC-01
WATER						
Physical Tests	Conductivity (uS/cm)	348	314	348	306	243
	Hardness (as CaCO3) (mg/L)	195	179	200	159	130
	pH (pH)	8.38	8.21	8.32	8.19	8.26
	Total Suspended Solids (mg/L)	<1.0	<1.0	1.6	<1.0	<1.0
	Total Dissolved Solids (mg/L)	204	182	217	187	145
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	193	178	200	131	127
	Ammonia, Total (as N) (mg/L)	0.0066	0.0052	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.061	0.087	0.095	0.225	0.058
	Nitrate (as N) (mg/L)	0.0105	<0.0050	0.0149	0.419	0.102
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sulfate (SO4) (mg/L)	7.77	0.90	2.64	31.8	7.79
Total Metals	Aluminum (Al)-Total (mg/L)	0.0083	0.0047	0.0154	<0.0030	<0.0030
	Antimony (Sb)-Total (mg/L)	0.00012	<0.00010	0.00012	0.00014	0.00013
	Arsenic (As)-Total (mg/L)	0.00053	0.00209	0.00074	0.00060	0.00038
	Barium (Ba)-Total (mg/L)	0.145	0.175	0.205	0.0184	0.0117
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.0000138	0.0000055	0.0000213	0.000752	0.0000882
	Calcium (Ca)-Total (mg/L)	47.4	44.1	50.6	58.1	41.2
	Chromium (Cr)-Total (mg/L)	<0.00010	0.00014	0.00011	0.00017	0.00032
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.198	0.565	0.347	<0.010	<0.010
	Lead (Pb)-Total (mg/L)	0.000059	<0.000050	0.000143	0.00112	0.000254
	Lithium (Li)-Total (mg/L)	0.0011	0.0011	0.0011	0.0018	0.0010
	Magnesium (Mg)-Total (mg/L)	13.1	11.1	12.6	3.87	2.09
	Manganese (Mn)-Total (mg/L)	0.00655	0.0300	0.0283	0.00019	0.00020
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.00112	0.00171	0.00222	0.00100	0.000620
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.34	0.17	0.42	0.52	0.29
	Selenium (Se)-Total (mg/L)	0.000461	0.000237	0.000555	0.00149	0.000308
	Silicon (Si)-Total (mg/L)	3.18	3.98	3.61	3.06	2.65

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2149780-18 Water 14-AUG-18 13:50 MH-27	L2149780-19 Water 14-AUG-18 14:50 MH-28	L2149780-20 Water 13-AUG-18 16:30 MH-23	L2149780-21 Water 13-AUG-18 15:20 NC-01	L2149780-22 Water 13-AUG-18 14:04 NC-02
WATER						
Physical Tests	Conductivity (uS/cm)	354	336	265	306	316
	Hardness (as CaCO3) (mg/L)	202	189	145	170	168
	pH (pH)	8.36	8.34	8.44	8.46	8.19
	Total Suspended Solids (mg/L)	1.1	1.5	1.2	1.7	<1.0
	Total Dissolved Solids (mg/L)	232	211	175	200	198
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	183	171	147	165	170
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.099	0.115	0.131	0.117	0.115
	Nitrate (as N) (mg/L)	0.0723	0.114	0.0180	0.0358	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sulfate (SO4) (mg/L)	17.0	18.3	4.80	10.8	8.21
Total Metals	Aluminum (Al)-Total (mg/L)	0.0075	0.0141	0.0202	0.0201	0.0031
	Antimony (Sb)-Total (mg/L)	0.00015	0.00015	0.00023	0.00024	0.00015
	Arsenic (As)-Total (mg/L)	0.00066	0.00060	0.00127	0.00099	0.00050
	Barium (Ba)-Total (mg/L)	0.0612	0.0481	0.0568	0.0728	0.0708
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.0000500	0.000119	0.0000520	0.0000531	0.0000069
	Calcium (Ca)-Total (mg/L)	57.1	55.2	42.7	50.4	53.0
	Chromium (Cr)-Total (mg/L)	0.00011	0.00024	0.00028	0.00032	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.098	0.186	0.063	0.046	0.066
	Lead (Pb)-Total (mg/L)	0.000287	0.00111	0.00216	0.00153	<0.000050
	Lithium (Li)-Total (mg/L)	0.0015	0.0014	0.0015	0.0015	0.0013
	Magnesium (Mg)-Total (mg/L)	7.01	5.65	4.66	5.58	5.44
	Manganese (Mn)-Total (mg/L)	0.0126	0.0256	0.0214	0.00573	0.0163
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000950	0.00100	0.00132	0.00129	0.00111
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.39	0.45	0.30	0.40	0.30
	Selenium (Se)-Total (mg/L)	0.000516	0.000699	0.000468	0.000739	0.000217
	Silicon (Si)-Total (mg/L)	3.54	3.27	4.16	4.17	4.17

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2149780-23				
	Description	Water				
	Sampled Date	15-AUG-18				
	Sampled Time	11:15				
	Client ID	MH-08				
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	274				
	Hardness (as CaCO3) (mg/L)	145				
	pH (pH)	8.28				
	Total Suspended Solids (mg/L)	9.5				
	Total Dissolved Solids (mg/L)	170				
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	146				
	Ammonia, Total (as N) (mg/L)	<0.0050				
	Bromide (Br) (mg/L)	<0.050				
	Chloride (Cl) (mg/L)	<0.50				
	Fluoride (F) (mg/L)	0.294				
	Nitrate (as N) (mg/L)	0.0784				
	Nitrite (as N) (mg/L)	<0.0010				
	Sulfate (SO4) (mg/L)	5.36				
Total Metals	Aluminum (Al)-Total (mg/L)	0.0065				
	Antimony (Sb)-Total (mg/L)	0.00038				
	Arsenic (As)-Total (mg/L)	0.00212				
	Barium (Ba)-Total (mg/L)	0.0414				
	Beryllium (Be)-Total (mg/L)	<0.000020				
	Bismuth (Bi)-Total (mg/L)	<0.000050				
	Boron (B)-Total (mg/L)	<0.010				
	Cadmium (Cd)-Total (mg/L)	0.0000803				
	Calcium (Ca)-Total (mg/L)	44.5				
	Chromium (Cr)-Total (mg/L)	0.00076				
	Cobalt (Co)-Total (mg/L)	<0.00010				
	Copper (Cu)-Total (mg/L)	<0.00050				
	Iron (Fe)-Total (mg/L)	<0.010				
	Lead (Pb)-Total (mg/L)	<0.000050				
	Lithium (Li)-Total (mg/L)	0.0026				
	Magnesium (Mg)-Total (mg/L)	5.14				
	Manganese (Mn)-Total (mg/L)	0.00039				
	Mercury (Hg)-Total (mg/L)	<0.0000050				
	Molybdenum (Mo)-Total (mg/L)	0.000691				
	Nickel (Ni)-Total (mg/L)	<0.00050				
	Phosphorus (P)-Total (mg/L)	<0.050				
	Potassium (K)-Total (mg/L)	0.45				
	Selenium (Se)-Total (mg/L)	0.00188				
	Silicon (Si)-Total (mg/L)	6.04				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2149780-1	L2149780-2	L2149780-3	L2149780-4	L2149780-5
Description	Water	Water	Water	Water	Water
Sampled Date	13-AUG-18	15-AUG-18	14-AUG-18	14-AUG-18	13-AUG-18
Sampled Time	14:45	12:25	12:50	13:16	07:04
Client ID	MH-12(LP)	MH-04(LP)	MH-11(LP)	MH-29(LP)	MH-02(LP)
Grouping / **Analyte**					
WATER					
Total Metals Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total (mg/L)	1.03	0.845	1.14	0.947	11.4
Strontium (Sr)-Total (mg/L)	0.206	0.193	0.244	0.214	0.605
Sulfur (S)-Total (mg/L)	3.37	5.32	4.70	0.91	98.2
Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total (mg/L)	0.00040	<0.00030	<0.00030	<0.00030	<0.00030
Uranium (U)-Total (mg/L)	0.000932	0.000852	0.00111	0.000701	0.00139
Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total (mg/L)	<0.0030	0.0057	0.0037	<0.0030	<0.0030
Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved (mg/L)	0.0028	0.0017	0.0027	0.0033	<0.0010
Antimony (Sb)-Dissolved (mg/L)	0.00023	0.00015	0.00017	0.00020	0.00010
Arsenic (As)-Dissolved (mg/L)	0.00098	0.00039	0.00063	0.00078	0.00041
Barium (Ba)-Dissolved (mg/L)	0.0733	0.0211	0.0646	0.0486	0.0458
Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved (mg/L)	0.0000424	0.000263	0.0000393	0.0000506	0.0000058
Calcium (Ca)-Dissolved (mg/L)	56.6	58.3	66.2	64.6	186
Chromium (Cr)-Dissolved (mg/L)	0.00028	0.00012	0.00011	0.00011	<0.00010
Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00050
Copper (Cu)-Dissolved (mg/L)	0.00026	<0.00020	0.00031	0.00041	<0.00020
Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	0.024	<0.010	<0.010
Lead (Pb)-Dissolved (mg/L)	0.000409	0.000143	0.000053	<0.000050	<0.000050
Lithium (Li)-Dissolved (mg/L)	0.0015	0.0015	0.0016	0.0015	0.0014
Magnesium (Mg)-Dissolved (mg/L)	5.59	3.09	7.32	5.26	17.0
Manganese (Mn)-Dissolved (mg/L)	0.00123	0.00032	0.00524	0.00153	0.0651
Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)	0.00125	0.000719	0.000882	0.000677	0.000451
Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved (mg/L)	0.43	0.39	0.37	0.27	2.04
Selenium (Se)-Dissolved (mg/L)	0.000671	0.000788	0.000471	0.000469	0.000081
Silicon (Si)-Dissolved (mg/L)	3.78	2.94	3.33	3.71	4.27

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2149780-6	L2149780-7	L2149780-8	L2149780-9	L2149780-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	15-AUG-18	16-AUG-18	16-AUG-18	14-AUG-18	15-AUG-18
	Sampled Time	10:45	14:20	10:33	13:00	12:35
	Client ID	MH-22(LP)	MH-30(LP)	MH-15(LP)	MH-SW(LQR)	MH-FB(LQFB)
Grouping	**Analyte**					
WATER						
Total Metals	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.836	0.702	1.06	1.14	<0.050
	Strontium (Sr)-Total (mg/L)	0.214	0.109	0.184	0.240	<0.00020
	Sulfur (S)-Total (mg/L)	11.7	1.39	0.62	4.52	<0.50
	Thallium (Tl)-Total (mg/L)	0.000021	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Total (mg/L)	0.00357	0.00118	0.000699	0.00108	<0.000010
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	0.555	<0.0030	<0.0030	0.0037	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0015	0.0033	0.0015	0.0028	<0.0010
	Antimony (Sb)-Dissolved (mg/L)	0.00253	<0.00010	<0.00010	0.00016	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00395	0.00027	0.00044	0.00061	<0.00010
	Barium (Ba)-Dissolved (mg/L)	0.0155	0.190	0.187	0.0639	<0.00010
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	0.00359	0.0000151	0.0000070	0.0000431	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	47.7	39.8	61.4	66.6	<0.050
	Chromium (Cr)-Dissolved (mg/L)	0.00014	<0.00010	<0.00010	0.00012	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00026	0.00031	<0.00020	0.00036	<0.00020
	Iron (Fe)-Dissolved (mg/L)	<0.010	0.202	0.085	0.025	<0.010
	Lead (Pb)-Dissolved (mg/L)	0.000254	<0.000050	<0.000050	0.000062	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0056	<0.0010	0.0012	0.0016	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	6.41	13.2	14.2	7.43	<0.10
	Manganese (Mn)-Dissolved (mg/L)	0.00030	0.00951	0.00690	0.00528	<0.00010
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.00836	0.00127	0.00176	0.000875	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	0.00376	0.00068	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.57	0.28	0.31	0.36	<0.10
	Selenium (Se)-Dissolved (mg/L)	0.0122	0.000336	0.000298	0.000592	<0.000050
	Silicon (Si)-Dissolved (mg/L)	4.24	2.27	3.65	3.34	<0.050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2149780-12	L2149780-13	L2149780-15	L2149780-16	L2149780-17
Description	Water	Water	Water	Water	Water
Sampled Date	16-AUG-18	16-AUG-18	16-AUG-18	15-AUG-18	15-AUG-18
Sampled Time	15:20	13:25	12:08	13:15	13:38
Client ID	MH-13(LP)	TRIBEWF01	TRIBEWF03	PH-01	CC-01
Grouping / **Analyte**					
WATER					
Total Metals Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total (mg/L)	0.973	1.04	1.16	0.746	0.812
Strontium (Sr)-Total (mg/L)	0.197	0.167	0.173	0.145	0.186
Sulfur (S)-Total (mg/L)	2.56	<0.50	0.62	10.7	2.53
Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	0.00037	<0.00030	<0.00030
Uranium (U)-Total (mg/L)	0.00142	0.000430	0.000862	0.000943	0.000714
Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	0.0130	0.0038
Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved (mg/L)	0.0022	0.0016	0.0022	<0.0010	<0.0010
Antimony (Sb)-Dissolved (mg/L)	0.00013	<0.00010	0.00012	0.00015	0.00014
Arsenic (As)-Dissolved (mg/L)	0.00042	0.00148	0.00055	0.00059	0.00037
Barium (Ba)-Dissolved (mg/L)	0.142	0.172	0.202	0.0177	0.0118
Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved (mg/L)	0.0000124	0.0000060	0.0000063	0.000705	0.0000800
Calcium (Ca)-Dissolved (mg/L)	56.9	53.1	59.3	57.6	48.7
Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	0.00011	0.00025	0.00025
Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved (mg/L)	0.00035	<0.00020	<0.00020	<0.00020	<0.00020
Iron (Fe)-Dissolved (mg/L)	0.060	0.142	0.094	<0.010	<0.010
Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	0.00102	0.000236
Lithium (Li)-Dissolved (mg/L)	0.0011	0.0012	0.0012	0.0019	0.0011
Magnesium (Mg)-Dissolved (mg/L)	12.8	11.2	12.6	3.65	2.07
Manganese (Mn)-Dissolved (mg/L)	0.00390	0.0290	0.0262	<0.00010	0.00015
Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)	0.00109	0.00168	0.00216	0.000968	0.000598
Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved (mg/L)	0.34	0.18	0.37	0.55	0.30
Selenium (Se)-Dissolved (mg/L)	0.000534	0.000247	0.000523	0.00160	0.000397
Silicon (Si)-Dissolved (mg/L)	2.97	3.91	3.44	3.15	2.48

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2149780-18	L2149780-19	L2149780-20	L2149780-21	L2149780-22
Description	Water	Water	Water	Water	Water
Sampled Date	14-AUG-18	14-AUG-18	13-AUG-18	13-AUG-18	13-AUG-18
Sampled Time	13:50	14:50	16:30	15:20	14:04
Client ID	MH-27	MH-28	MH-23	NC-01	NC-02
Grouping / **Analyte**					
WATER					
Total Metals Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total (mg/L)	1.13	1.04	0.834	1.00	1.02
Strontium (Sr)-Total (mg/L)	0.257	0.247	0.177	0.206	0.209
Sulfur (S)-Total (mg/L)	6.21	5.96	1.18	3.23	2.39
Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	0.00045	0.00069	<0.00030
Uranium (U)-Total (mg/L)	0.00109	0.00109	0.000610	0.000911	0.000659
Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total (mg/L)	0.0048	0.0102	0.0044	0.0036	<0.0030
Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved (mg/L)	0.0028	0.0022	0.0027	0.0030	0.0011
Antimony (Sb)-Dissolved (mg/L)	0.00016	0.00015	0.00024	0.00022	0.00014
Arsenic (As)-Dissolved (mg/L)	0.00062	0.00049	0.00115	0.00092	0.00042
Barium (Ba)-Dissolved (mg/L)	0.0611	0.0498	0.0607	0.0744	0.0765
Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved (mg/L)	0.0000471	0.0000796	0.0000389	0.0000388	0.0000062
Calcium (Ca)-Dissolved (mg/L)	69.3	65.9	50.0	58.7	58.0
Chromium (Cr)-Dissolved (mg/L)	0.00019	<0.00010	0.00013	0.00017	<0.00010
Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved (mg/L)	0.00033	0.00029	0.00022	0.00024	<0.00020
Iron (Fe)-Dissolved (mg/L)	0.042	0.067	0.019	<0.010	0.032
Lead (Pb)-Dissolved (mg/L)	0.000133	0.000285	0.000378	0.000248	<0.000050
Lithium (Li)-Dissolved (mg/L)	0.0017	0.0015	0.0015	0.0015	0.0013
Magnesium (Mg)-Dissolved (mg/L)	7.07	5.96	4.85	5.66	5.61
Manganese (Mn)-Dissolved (mg/L)	0.00940	0.0226	0.0179	0.00224	0.0122
Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)	0.000926	0.000951	0.00128	0.00124	0.00104
Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved (mg/L)	0.42	0.48	0.30	0.42	0.30
Selenium (Se)-Dissolved (mg/L)	0.000609	0.000611	0.000466	0.000646	0.000275
Silicon (Si)-Dissolved (mg/L)	3.26	2.80	3.60	3.54	3.63

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2149780-23				
	Description	Water				
	Sampled Date	15-AUG-18				
	Sampled Time	11:15				
	Client ID	MH-08				
Grouping	**Analyte**					
WATER						
Total Metals	Silver (Ag)-Total (mg/L)	<0.000010				
	Sodium (Na)-Total (mg/L)	0.831				
	Strontium (Sr)-Total (mg/L)	0.163				
	Sulfur (S)-Total (mg/L)	1.46				
	Thallium (Tl)-Total (mg/L)	<0.000010				
	Tin (Sn)-Total (mg/L)	<0.00010				
	Titanium (Ti)-Total (mg/L)	<0.00030				
	Uranium (U)-Total (mg/L)	0.000742				
	Vanadium (V)-Total (mg/L)	<0.00050				
	Zinc (Zn)-Total (mg/L)	<0.0030				
	Zirconium (Zr)-Total (mg/L)	<0.00030				
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD				
	Dissolved Metals Filtration Location	FIELD				
	Aluminum (Al)-Dissolved (mg/L)	0.0015				
	Antimony (Sb)-Dissolved (mg/L)	0.00038				
	Arsenic (As)-Dissolved (mg/L)	0.00187				
	Barium (Ba)-Dissolved (mg/L)	0.0431				
	Beryllium (Be)-Dissolved (mg/L)	<0.000020				
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050				
	Boron (B)-Dissolved (mg/L)	<0.010				
	Cadmium (Cd)-Dissolved (mg/L)	0.0000825				
	Calcium (Ca)-Dissolved (mg/L)	49.6				
	Chromium (Cr)-Dissolved (mg/L)	0.00054				
	Cobalt (Co)-Dissolved (mg/L)	<0.00010				
	Copper (Cu)-Dissolved (mg/L)	<0.00020				
	Iron (Fe)-Dissolved (mg/L)	<0.010				
	Lead (Pb)-Dissolved (mg/L)	<0.000050				
	Lithium (Li)-Dissolved (mg/L)	0.0026				
	Magnesium (Mg)-Dissolved (mg/L)	5.22				
	Manganese (Mn)-Dissolved (mg/L)	<0.00010				
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050				
	Molybdenum (Mo)-Dissolved (mg/L)	0.000672				
	Nickel (Ni)-Dissolved (mg/L)	<0.00050				
	Phosphorus (P)-Dissolved (mg/L)	<0.050				
	Potassium (K)-Dissolved (mg/L)	0.46				
	Selenium (Se)-Dissolved (mg/L)	0.00173				
	Silicon (Si)-Dissolved (mg/L)	5.18				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2149780-1	L2149780-2	L2149780-3	L2149780-4	L2149780-5
Description	Water	Water	Water	Water	Water
Sampled Date	13-AUG-18	15-AUG-18	14-AUG-18	14-AUG-18	13-AUG-18
Sampled Time	14:45	12:25	12:50	13:16	07:04
Client ID	MH-12(LP)	MH-04(LP)	MH-11(LP)	MH-29(LP)	MH-02(LP)
Grouping / **Analyte**					
WATER					
Dissolved Metals Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved (mg/L)	1.02	0.827	1.11	0.923	10.7
Strontium (Sr)-Dissolved (mg/L)	0.210	0.194	0.248	0.216	0.642
Sulfur (S)-Dissolved (mg/L)	3.34	5.44	4.69	1.38	96.6
Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium (U)-Dissolved (mg/L)	0.000910	0.000823	0.000992	0.000662	0.00134
Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved (mg/L)	0.0015	0.0051	0.0031	<0.0010	0.0025
Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals Chromium (III)-Total (mg/L)	0.00027	0.00023	0.00016	0.00013	<0.00010
Hexavalent Chromium (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2149780-6 Water 15-AUG-18 10:45 MH-22(LP)	L2149780-7 Water 16-AUG-18 14:20 MH-30(LP)	L2149780-8 Water 16-AUG-18 10:33 MH-15(LP)	L2149780-9 Water 14-AUG-18 13:00 MH-SW(LQR)	L2149780-10 Water 15-AUG-18 12:35 MH-FB(LQFB)
Sample ID						
Description						
Sampled Date						
Sampled Time						
Client ID						
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.865	0.705	1.09	1.10	<0.050
	Strontium (Sr)-Dissolved (mg/L)	0.220	0.113	0.190	0.249	<0.00020
	Sulfur (S)-Dissolved (mg/L)	12.1	1.59	0.83	4.53	<0.50
	Thallium (Tl)-Dissolved (mg/L)	0.000017	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.00346	0.00113	0.000687	0.000989	<0.000010
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.584	<0.0010	<0.0010	0.0031	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals	Chromium (III)-Total (mg/L)	0.00016	<0.00010	<0.00010	0.00020	
	Hexavalent Chromium (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2149780-12	L2149780-13	L2149780-15	L2149780-16	L2149780-17
	Description	Water	Water	Water	Water	Water
	Sampled Date	16-AUG-18	16-AUG-18	16-AUG-18	15-AUG-18	15-AUG-18
	Sampled Time	15:20	13:25	12:08	13:15	13:38
	Client ID	MH-13(LP)	TRIBEWF01	TRIBEWF03	PH-01	CC-01
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.946	1.05	1.07	0.742	0.797
	Strontium (Sr)-Dissolved (mg/L)	0.202	0.172	0.175	0.144	0.188
	Sulfur (S)-Dissolved (mg/L)	2.61	<0.50	0.89	10.4	2.59
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.00130	0.000425	0.000832	0.000948	0.000706
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	0.0135	0.0037
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals	Chromium (III)-Total (mg/L)	<0.00010	0.00014	0.00011	0.00017	0.00032
	Hexavalent Chromium (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2149780-18	L2149780-19	L2149780-20	L2149780-21	L2149780-22
Description	Water	Water	Water	Water	Water
Sampled Date	14-AUG-18	14-AUG-18	13-AUG-18	13-AUG-18	13-AUG-18
Sampled Time	13:50	14:50	16:30	15:20	14:04
Client ID	MH-27	MH-28	MH-23	NC-01	NC-02
Grouping / **Analyte**					
WATER					
Dissolved Metals Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved (mg/L)	1.16	1.06	0.833	1.00	1.02
Strontium (Sr)-Dissolved (mg/L)	0.266	0.250	0.178	0.207	0.209
Sulfur (S)-Dissolved (mg/L)	5.77	5.69	1.31	3.16	2.48
Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium (U)-Dissolved (mg/L)	0.00108	0.00102	0.000603	0.000856	0.000589
Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved (mg/L)	0.0041	0.0083	0.0029	0.0017	<0.0010
Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals Chromium (III)-Total (mg/L)	0.00011	0.00024	0.00028	0.00032	<0.00010
Hexavalent Chromium (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2149780-23				
	Description	Water				
	Sampled Date	15-AUG-18				
	Sampled Time	11:15				
	Client ID	MH-08				
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010				
	Sodium (Na)-Dissolved (mg/L)	0.807				
	Strontium (Sr)-Dissolved (mg/L)	0.158				
	Sulfur (S)-Dissolved (mg/L)	1.34				
	Thallium (Tl)-Dissolved (mg/L)	<0.000010				
	Tin (Sn)-Dissolved (mg/L)	<0.00010				
	Titanium (Ti)-Dissolved (mg/L)	<0.00030				
	Uranium (U)-Dissolved (mg/L)	0.000664				
	Vanadium (V)-Dissolved (mg/L)	<0.00050				
	Zinc (Zn)-Dissolved (mg/L)	0.0020				
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030				
Speciated Metals	Chromium (III)-Total (mg/L)	<0.00072				
	Hexavalent Chromium (mg/L)	0.00060 RRV				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Conductivity	B	L2149780-10, -12, -13, -15, -16, -17, -18, -19, -2, -3, -4, -5, -6, -7, -8, -9
Laboratory Control Sample	Sulfur (S)-Total	MES	L2149780-1, -10, -12, -13, -15, -17, -18, -19, -2, -20, -21, -22, -23, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2149780-1, -10, -12, -13, -15, -16, -17, -18, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2149780-19, -20, -21, -22, -23
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2149780-1, -10, -12, -13, -15, -16, -17, -18, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2149780-19, -20, -21, -22, -23
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2149780-1, -10, -12, -13, -15, -16, -17, -18, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2149780-19, -20, -21, -22, -23
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2149780-19, -20, -21, -22, -23
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2149780-1, -10, -12, -13, -15, -16, -17, -18, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2149780-19, -20, -21, -22, -23
Matrix Spike	Barium (Ba)-Total	MS-B	L2149780-1, -10, -12, -13, -15, -17, -18, -19, -2, -20, -21, -22, -23, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L2149780-1, -10, -12, -13, -15, -17, -18, -19, -2, -20, -21, -22, -23, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L2149780-16
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2149780-1, -10, -12, -13, -15, -17, -18, -19, -2, -20, -21, -22, -23, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Sodium (Na)-Total	MS-B	L2149780-16
Matrix Spike	Strontium (Sr)-Total	MS-B	L2149780-1, -10, -12, -13, -15, -17, -18, -19, -2, -20, -21, -22, -23, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Total	MS-B	L2149780-16

Qualifiers for Individual Parameters Listed:

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.
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).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". 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.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CR-CR3-TOT-CALC-ED	Water	Total Trivalent Chromium in Water	CALCULATION

Reference Information

Chromium (III)-Total is calculated as the difference between the total chromium and the total hexavalent chromium (Cr(VI)) results.The Limit of Reporting for Chromium (III) varies as a function of the test results.

CR-CR6-ED Water Chromium, Hexavalent (Cr +6) APHA 3500-Cr C (Ion Chromatography)

This analysis is carried out using procedures adapted from method 3500-Cr C in "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1636 published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution.
Results are based on an un-filtered, field-preserved sample.

EC-PCT-VA Water Conductivity (Automated) APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA Water Conductivity Screen (Internal Use Only) APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water 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-VA 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-VA 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.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TSS-LOW-VA Water Total Suspended Solids by Grav. (1 mg/L) APHA 2540D

Reference Information

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
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.

** 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
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, 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.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2149780-COFC

COC Number: 15 -

Page 1 of 2

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:	TECK Metals Ltd	Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)	Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply
Contact:	Michelle Unger	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:	250-4278422	☐ 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	Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm
Street:	601 Knightton Road	Email 1 or Fax: chenry@accessconsulting.ca	For tests that can not be performed according to the service level selected, you will be contacted.
City/Province:	Kimberly, BC	Email 2: amacphail@accessconsulting.ca,mducharme@acc	
Postal Code:	V1A 3E1	Email 3: Michelle.unger@teck.com	
Invoice To	Same as Report To ☑ YES ☐ NO	**Invoice Distribution**	
	Copy of Invoice with Report ☐ YES ☑ NO	Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	
Company:		Email 1 or Fax: Michelle.unger@teck.com	
Contact:		Email 2: roxanne.menear@teck.com	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:	Q62635	AFE/Cost Center:	PO#:
Job #:	TECK-18-1	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)		ALS Contact: Can Dang	Sampler: A. MacPhail

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 (low level) + Hg	Dissolved Metals (low level) +Hg	pH, SPC, alkalinity, hardness	Anions(Nitrate, Nitrite, Sulphate, Cl, F, Br)	Ammonia	TDS, TSS(low)	Chromium Speciation	Number of Containers
					P	F/P		P	P		P	
	MH-12 (LP)	13-Aug-18	14:45	Water	R	R	R	R	R	R	R	8
	MH-04 (LP)	15-Aug-18	12:25	Water	R	R	R	R	R	R	R	8
	MH-11 (LP)	14-Aug-18	12:50	Water	R	R	R	R	R	R	R	8
	MH-29 (LP)	14-Aug-18	13:16	Water	R	R	R	R	R	R	R	8
	MH-02 (LP)	13-Aug-18	17:04	Water	R	R	R	R	R	R	R	8
	MH-22 (LP)	15-Aug-18	10:45	Water	R	R	R	R	R	R	R	8
	MH-30 (LP)	16-Aug-18	14:20	Water	R	R	R	R	R	R	R	8
	MH-15 (LP)	16-Aug-18	10:33	Water	R	R	R	R	R	R	R	8
	MH-SW (LQR)	14-Aug-18	13:00	Water	R	R	R	R	R	R	R	8
	MH-FB (LQFB)	15-Aug-18	12:35	Water	R	R	R	R	R	R		6
	~~Trip Blank (LQTB)~~			~~Water~~	R	R	R	R	R	R		~~8~~
	SDH-S2 (LP)			Water	R	R	R	R	R	R	R	8

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		
		5			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Andrew MacPhail	Date: ~~7-June-18~~ 17-Aug-18	Time: 15:00	Received by:	Date:	Time:	Received by: HA	Date: 8/20	Time: 12:20

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.

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

L2149780-COFC

COC Number: 15 -

Report To	Contact and company name below will appear on the final report
Company:	TECK Metals Ltd
Contact:	Michelle Unger
Phone:	250-4278422
	Company address below will appear on the final report
Street:	601 Knightton Road
City/Province:	Kimberly, BC
Postal Code:	V1A 3E1
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	
Contact:	

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	chenry@accessconsulting.ca
Email 2	amacphail@accessconsulting.ca,mducharme@acc
Email 3	Michelle.unger@teck.com

Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	Michelle.unger@teck.com
Email 2	roxanne.menear@teck.com

Project Information	
ALS Account # / Quote #:	Q62635
Job #:	TECK-18-1
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: Can Dang **Sampler:** A. MacPhail

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: dd-mmm-yy hh:mm

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	Total Metals (low level) + Hg	Dissolved Metals (low level) +Hg	pH, SPC, alkalinity, hardness	Anions(Nitrate, Nitrite, Sulphate, Cl, F, Br)	Ammonia	TDS, TSS(low)	Chromium Speciation	Number of Containers
					P	F/P		P	P		P	
	MH-13 (LP)	16-Aug-18	15:20	Water	R	R	R	R	R	R	R	8
	TRIBEWF01	16-Aug-18	13:25	Water	R	R	R	R	R	R	R	8
	TRIBEWF02			Water	R	R	R	R	R	R	R	8
	TRIBEWF03	16-Aug-18	12:08	Water	R	R	R	R	R	R	R	8
	PH-01	15-Aug-18	13:15	Water	R	R	R	R	R	R	R	8
	CC-01	15-Aug-18	13:38	Water	R	R	R	R	R	R	R	8
	MH-27	14-Aug-18	13:50	Water	R	R	R	R	R	R	R	8
	MH-28	14-Aug-18	14:50	Water	R	R	R	R	R	R	R	8
	MH-23	13-Aug-18	16:30	Water	R	R	R	R	R	R	R	8
	NC-01	13-Aug-18	15:20	Water	R	R	R	R	R	R	R	6
	NC-02	13-Aug-18	14:04	Water	R	R	R	R	R	R	R	6
	MH-08	15-Aug-18	11:15	Water	R	R	R	R	R	R	R	8

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: Andrew MacPhail	Date: ~~7-June-18~~ 17-Aug-18	Time: 18:00	Received by:	Date:	Time:	Received by: HA	Date: 8/20	Time: 12:20p

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.**

TECK METALS LTD.
ATTN: Michelle Unger
601 Knightton Road
KIMBERLEY BC V1A 3E1

Date Received: 20-AUG-18
Report Date: 04-SEP-18 12:35 (MT)
Version: FINAL

Client Phone: 250-427-8404

Certificate of Analysis

Lab Work Order #: L2149783

Project P.O. #: 9179
Job Reference: TECK-18-01
C of C Numbers:
Legal Site Desc:

Can Dang
Senior Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2149783-1	L2149783-2	L2149783-3	L2149783-5	L2149783-6
Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Sampled Date	14-AUG-18	17-AUG-18	15-AUG-18	14-AUG-18	15-AUG-18
Sampled Time	09:50	11:00	16:15	11:55	12:15
Client ID	MW13-01 (LP)	MW13-04 (LP)	MW13-05 (LP)	MW13-07 (LP)	MW13-08 (LP)
Grouping / **Analyte**					
WATER					
Physical Tests					
Conductivity (uS/cm)	301	263	337	509	506
Hardness (as CaCO3) (mg/L)	146	132	167	226	264
pH (pH)	7.97	8.12	7.96	8.01	7.94
Anions and Nutrients					
Alkalinity, Total (as CaCO3) (mg/L)	152	133	117	233	276
Ammonia, Total (as N) (mg/L)	<0.0050	0.0211	0.0337	0.177	0.0251
Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	0.61	<0.50
Fluoride (F) (mg/L)	0.352	0.055	0.071	0.394	0.050
Nitrate (as N) (mg/L)	0.357	0.400	1.51	<0.0050	0.303
Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Sulfate (SO4) (mg/L)	10.2	5.45	48.1	47.2	10.1
Dissolved Metals					
Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved (mg/L)	0.0029	0.0123	0.0084	0.0026	0.0039
Antimony (Sb)-Dissolved (mg/L)	0.00012	0.00026	0.00032	<0.00010	0.00016
Arsenic (As)-Dissolved (mg/L)	0.00036	0.00057	0.00074	0.00339	0.00028
Barium (Ba)-Dissolved (mg/L)	0.0212	0.0583	0.0552	0.0270	0.166
Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	0.023	<0.010
Cadmium (Cd)-Dissolved (mg/L)	0.000658	0.000159	0.0000454	<0.0000050	0.0000756
Calcium (Ca)-Dissolved (mg/L)	52.7	46.8	61.3	63.1	89.9
Chromium (Cr)-Dissolved (mg/L)	0.00020	0.00029	0.00019	<0.00010	0.00023
Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	0.00057	0.00031
Copper (Cu)-Dissolved (mg/L)	<0.00020	0.00093	0.00051	<0.00020	0.00049
Iron (Fe)-Dissolved (mg/L)	<0.010	0.014	0.015	2.68	0.014
Lead (Pb)-Dissolved (mg/L)	0.00152	0.000253	0.000135	0.000070	0.000174
Lithium (Li)-Dissolved (mg/L)	0.0013	0.0014	0.0015	0.0076	0.0016
Magnesium (Mg)-Dissolved (mg/L)	3.61	3.68	3.48	16.6	9.58
Manganese (Mn)-Dissolved (mg/L)	0.00116	0.00055	0.00023	1.15	0.0100
Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)	0.000624	0.000684	0.000733	0.00342	0.000628
Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	0.00178	0.00058
Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	0.132	<0.050
Potassium (K)-Dissolved (mg/L)	0.63	0.55	0.48	3.39	0.65
Selenium (Se)-Dissolved (mg/L)	0.000939	0.00101	0.00236	<0.000050	0.00113
Silicon (Si)-Dissolved (mg/L)	3.21	3.78	3.98	7.15	3.81

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2149783-7	L2149783-8	L2149783-9	L2149783-13	L2149783-14
Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Sampled Date	14-AUG-18	15-AUG-18	14-AUG-18	15-AUG-18	
Sampled Time	16:01	15:30	10:30	15:35	
Client ID	MW13-10 (LP)	MW13-13 (LP)	MW14-01 (LP)	MW-GW (LQR)	TRIP BLANK (LQTB)
Grouping / **Analyte**					
WATER					
Physical Tests Conductivity (uS/cm)	450	277	423	280	<2.0
Hardness (as CaCO3) (mg/L)	225	121	212	138	<0.50
pH (pH)	8.09	8.08	8.15	8.06	5.52
Anions and Nutrients Alkalinity, Total (as CaCO3) (mg/L)	207	87.1	226	87.3	<1.0
Ammonia, Total (as N) (mg/L)	0.0176	0.0070	0.0277	0.0070	<0.020
Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
Fluoride (F) (mg/L)	0.059	0.146	0.093	0.144	<0.020
Nitrate (as N) (mg/L)	0.527	0.604	0.329	0.619	<0.0050
Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Sulfate (SO4) (mg/L)	34.4	49.8	6.71	52.5	<0.30
Dissolved Metals Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved (mg/L)	0.0081	0.0129	0.0177	0.0118	<0.0010
Antimony (Sb)-Dissolved (mg/L)	0.00012	0.00014	0.00015	0.00012	<0.00010
Arsenic (As)-Dissolved (mg/L)	0.00108	0.00037	0.00029	0.00040	<0.00010
Barium (Ba)-Dissolved (mg/L)	0.00776	0.0130	0.123	0.0147	<0.00010
Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved (mg/L)	0.0000195	0.000725	0.0000346	0.00160	<0.0000050
Calcium (Ca)-Dissolved (mg/L)	76.2	44.8	66.8	52.0	<0.050
Chromium (Cr)-Dissolved (mg/L)	0.00037	0.00017	0.00057	<0.00010	<0.00010
Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved (mg/L)	0.00052	0.00070	0.00052	0.00076	<0.00020
Iron (Fe)-Dissolved (mg/L)	0.013	0.016	0.028	0.012	<0.010
Lead (Pb)-Dissolved (mg/L)	0.000247	0.000882	0.000233	0.000728	<0.000050
Lithium (Li)-Dissolved (mg/L)	0.0016	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium (Mg)-Dissolved (mg/L)	8.34	2.08	11.0	2.02	<0.10
Manganese (Mn)-Dissolved (mg/L)	0.00104	0.00045	0.00164	0.00052	<0.00010
Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)	0.00190	0.000337	0.00213	0.000232	<0.000050
Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved (mg/L)	1.21	0.71	0.80	0.62	<0.10
Selenium (Se)-Dissolved (mg/L)	0.00144	0.00108	0.000873	0.00114	<0.000050
Silicon (Si)-Dissolved (mg/L)	3.89	2.26	4.57	1.92	<0.050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2149783-1	L2149783-2	L2149783-3	L2149783-5	L2149783-6
Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Sampled Date	14-AUG-18	17-AUG-18	15-AUG-18	14-AUG-18	15-AUG-18
Sampled Time	09:50	11:00	16:15	11:55	12:15
Client ID	MW13-01 (LP)	MW13-04 (LP)	MW13-05 (LP)	MW13-07 (LP)	MW13-08 (LP)
Grouping / **Analyte**					
WATER					
Dissolved Metals					
Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved (mg/L)	0.781	1.02	0.828	15.7	1.05
Strontium (Sr)-Dissolved (mg/L)	0.163	0.117	0.168	0.471	0.303
Sulfur (S)-Dissolved (mg/L)	3.00	1.47	14.3	14.9	2.93
Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	0.00039	<0.00010	<0.00010
Titanium (Ti)-Dissolved (mg/L)	<0.00030	0.00053	0.00038	<0.00030	<0.00030
Uranium (U)-Dissolved (mg/L)	0.000957	0.000643	0.000720	0.00762	0.00154
Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved (mg/L)	0.0247	0.0053	<0.0010	0.0010	0.0011
Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Volatile Organic Compounds					
Benzene (mg/L)		<0.00050	<0.00050	<0.00050	
Ethylbenzene (mg/L)		<0.00050	<0.00050	<0.00050	
Methyl t-butyl ether (MTBE) (mg/L)		<0.00050	<0.00050	<0.00050	
Styrene (mg/L)		<0.00050	<0.00050	<0.00050	
Toluene (mg/L)		<0.00045	<0.00045	<0.00045	
ortho-Xylene (mg/L)		<0.00050	<0.00050	<0.00050	
meta- & para-Xylene (mg/L)		<0.00050	<0.00050	<0.00050	
Xylenes (mg/L)		<0.00075	<0.00075	<0.00075	
Surrogate: 4-Bromofluorobenzene (SS) (%)		93.2	88.3	98.5	
Surrogate: 1,4-Difluorobenzene (SS) (%)		97.2	97.5	104.0	
Hydrocarbons					
EPH10-19 (mg/L)		<0.25	<0.25	<0.25	
EPH19-32 (mg/L)		<0.25	<0.25	<0.25	
LEPH (mg/L)		<0.25	<0.25	<0.25	
HEPH (mg/L)		<0.25	<0.25	<0.25	
Volatile Hydrocarbons (VH6-10) (mg/L)		<0.10	<0.10	<0.10	
VPH (C6-C10) (mg/L)		<0.10	<0.10	<0.10	
Surrogate: 2-Bromobenzotrifluoride (%)		108.2	109.8	107.7	
Surrogate: 3,4-Dichlorotoluene (SS) (%)		87.4	80.4	89.1	
Polycyclic Aromatic Hydrocarbons					
Acenaphthene (mg/L)		<0.000010	<0.000010	<0.000010	
Acenaphthylene (mg/L)		<0.000010	<0.000010	<0.000010	
Acridine (mg/L)		<0.000010	<0.000010	<0.000010	
Anthracene (mg/L)		<0.000010	<0.000010	<0.000010	
Benz(a)anthracene (mg/L)		<0.000010	<0.000010	<0.000010	
Benzo(a)pyrene (mg/L)		<0.0000050	<0.0000050	<0.0000050	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2149783-7	L2149783-8	L2149783-9	L2149783-13	L2149783-14
Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Sampled Date	14-AUG-18	15-AUG-18	14-AUG-18	15-AUG-18	
Sampled Time	16:01	15:30	10:30	15:35	
Client ID	MW13-10 (LP)	MW13-13 (LP)	MW14-01 (LP)	MW-GW (LQR)	TRIP BLANK (LQTB)
Grouping / **Analyte**					
WATER					
Dissolved Metals					
Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved (mg/L)	1.95	0.691	2.63	0.648	<0.050
Strontium (Sr)-Dissolved (mg/L)	0.369	0.0843	0.236	0.0871	<0.00020
Sulfur (S)-Dissolved (mg/L)	11.4	15.0	1.94	15.9	<0.50
Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Dissolved (mg/L)	<0.00010	0.00014	<0.00010	0.00011	<0.00010
Titanium (Ti)-Dissolved (mg/L)	0.00039	0.00035	0.00048	0.00032	<0.00030
Uranium (U)-Dissolved (mg/L)	0.00302	0.000711	0.000862	0.000426	<0.000010
Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved (mg/L)	0.0015	0.0178	0.0013	0.0443	0.0012 RRV
Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Volatile Organic Compounds					
Benzene (mg/L)	<0.00050		<0.00050		<0.00050
Ethylbenzene (mg/L)	<0.00050		<0.00050		<0.00050
Methyl t-butyl ether (MTBE) (mg/L)	<0.00050		<0.00050		<0.00050
Styrene (mg/L)	<0.00050		<0.00050		<0.00050
Toluene (mg/L)	<0.00045		<0.00045		<0.00045
ortho-Xylene (mg/L)	<0.00050		<0.00050		<0.00050
meta- & para-Xylene (mg/L)	<0.00050		<0.00050		<0.00050
Xylenes (mg/L)	<0.00075		<0.00075		<0.00075
Surrogate: 4-Bromofluorobenzene (SS) (%)	99.9		78.2		73.4
Surrogate: 1,4-Difluorobenzene (SS) (%)	89.1		99.2		98.2
Hydrocarbons					
EPH10-19 (mg/L)	<0.25		<0.25		<0.25
EPH19-32 (mg/L)	<0.25		<0.25		<0.25
LEPH (mg/L)	<0.25		<0.25		<0.25
HEPH (mg/L)	<0.25		<0.25		<0.25
Volatile Hydrocarbons (VH6-10) (mg/L)	<0.10		<0.10		<0.10
VPH (C6-C10) (mg/L)	<0.10		<0.10		<0.10
Surrogate: 2-Bromobenzotrifluoride (%)	104.2		105.8		105.2
Surrogate: 3,4-Dichlorotoluene (SS) (%)	85.5		91.6		58.4 SURR-ND
Polycyclic Aromatic Hydrocarbons					
Acenaphthene (mg/L)	<0.000010		<0.000010		<0.000010
Acenaphthylene (mg/L)	<0.000010		<0.000010		<0.000010
Acridine (mg/L)	<0.000010		<0.000010		<0.000010
Anthracene (mg/L)	<0.000010		<0.000010		<0.000010
Benz(a)anthracene (mg/L)	<0.000010		<0.000010		<0.000010
Benzo(a)pyrene (mg/L)	<0.0000050		<0.0000050		<0.0000050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2149783-1	L2149783-2	L2149783-3	L2149783-5	L2149783-6
Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Sampled Date	14-AUG-18	17-AUG-18	15-AUG-18	14-AUG-18	15-AUG-18
Sampled Time	09:50	11:00	16:15	11:55	12:15
Client ID	MW13-01 (LP)	MW13-04 (LP)	MW13-05 (LP)	MW13-07 (LP)	MW13-08 (LP)
Grouping / **Analyte**					
WATER					
Polycyclic Aromatic Hydrocarbons					
Benzo(b&j)fluoranthene (mg/L)		<0.000010	<0.000010	<0.000010	
Benzo(b+j+k)fluoranthene (mg/L)		<0.000015	<0.000015	<0.000015	
Benzo(g,h,i)perylene (mg/L)		<0.000010	<0.000010	<0.000010	
Benzo(k)fluoranthene (mg/L)		<0.000010	<0.000010	<0.000010	
Chrysene (mg/L)		<0.000010	<0.000010	<0.000010	
Dibenz(a,h)anthracene (mg/L)		<0.0000050	<0.0000050	<0.0000050	
Fluoranthene (mg/L)		<0.000010	<0.000010	<0.000010	
Fluorene (mg/L)		<0.000010	<0.000010	<0.000010	
Indeno(1,2,3-c,d)pyrene (mg/L)		<0.000010	<0.000010	<0.000010	
1-Methylnaphthalene (mg/L)		<0.000050	<0.000050	<0.000050	
2-Methylnaphthalene (mg/L)		<0.000050	<0.000050	<0.000050	
Naphthalene (mg/L)		<0.000050	<0.000050	<0.000050	
Phenanthrene (mg/L)		<0.000020	<0.000020	<0.000020	
Pyrene (mg/L)		<0.000010	<0.000010	<0.000010	
Quinoline (mg/L)		<0.000050	<0.000050	<0.000050	
Surrogate: Acridine d9 (%)		86.5	80.4	85.7	
Surrogate: Chrysene d12 (%)		74.1	72.9	78.2	
Surrogate: Naphthalene d8 (%)		98.9	90.4	93.1	
Surrogate: Phenanthrene d10 (%)		97.2	95.2	96.2	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2149783-7	L2149783-8	L2149783-9	L2149783-13	L2149783-14
	Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
	Sampled Date	14-AUG-18	15-AUG-18	14-AUG-18	15-AUG-18	
	Sampled Time	16:01	15:30	10:30	15:35	
	Client ID	MW13-10 (LP)	MW13-13 (LP)	MW14-01 (LP)	MW-GW (LQR)	TRIP BLANK (LQTB)
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Benzo(b&j)fluoranthene (mg/L)	<0.000010		<0.000010		<0.000010
	Benzo(b+j+k)fluoranthene (mg/L)	<0.000015		<0.000015		<0.000015
	Benzo(g,h,i)perylene (mg/L)	<0.000010		<0.000010		<0.000010
	Benzo(k)fluoranthene (mg/L)	<0.000010		<0.000010		<0.000010
	Chrysene (mg/L)	<0.000010		<0.000010		<0.000010
	Dibenz(a,h)anthracene (mg/L)	<0.0000050		<0.0000050		<0.0000050
	Fluoranthene (mg/L)	<0.000010		<0.000010		<0.000010
	Fluorene (mg/L)	<0.000010		<0.000010		<0.000010
	Indeno(1,2,3-c,d)pyrene (mg/L)	<0.000010		<0.000010		<0.000010
	1-Methylnaphthalene (mg/L)	<0.000050		<0.000050		<0.000050
	2-Methylnaphthalene (mg/L)	<0.000050		<0.000050		<0.000050
	Naphthalene (mg/L)	<0.000050		<0.000050		<0.000050
	Phenanthrene (mg/L)	<0.000020		<0.000020		<0.000020
	Pyrene (mg/L)	<0.000010		<0.000010		<0.000010
	Quinoline (mg/L)	<0.000050		<0.000050		<0.000050
	Surrogate: Acridine d9 (%)	80.9		81.4		91.1
	Surrogate: Chrysene d12 (%)	78.3		72.8		97.8
	Surrogate: Naphthalene d8 (%)	92.6		87.6		95.4
	Surrogate: Phenanthrene d10 (%)	94.0		91.7		102.9

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Magnesium (Mg)-Dissolved	B	L2149783-1, -2, -5, -6, -7, -8, -9
Laboratory Control Sample	Sulfur (S)-Dissolved	MES	L2149783-1, -2, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2149783-13, -14, -3
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2149783-14
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2149783-1, -2, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2149783-13, -14, -3
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2149783-14
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2149783-1, -2, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2149783-13, -14, -3
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2149783-14
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2149783-13, -14, -3
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2149783-14
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2149783-1, -2, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2149783-13, -14, -3
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2149783-14

Qualifiers for Individual Parameters Listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
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).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis
SURR-ND	Surrogate recovery marginally exceeded ALS DQO. Reported non-detect results for associated samples were deemed to be unaffected.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". 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.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.			
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.			
EPH-ME-FID-VA	Water	EPH in Water	BC Lab Manual
EPH is extracted from water using a hexane micro-extraction technique, with analysis by GC-FID, as per the BC Lab Manual. EPH results include PAHs and are therefore not equivalent to LEPH or HEPH.			
F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			

Reference Information

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

LEPH/HEPH-CALC-VA	Water	LEPHs and HEPHs	BC MOE LEPH/HEPH

LEPHw and HEPHw are measures of Light and Heavy Extractable Petroleum Hydrocarbons in water. Results are calculated by subtraction of applicable PAH concentrations from EPH10-19 and EPH19-32, as per the BC Lab Manual LEPH/HEPH calculation procedure.
LEPHw = EPH10-19 minus Acenaphthene, Acridine, Anthracene, Fluorene, Naphthalene and Phenanthrene.
HEPH = EPH19-32 minus Benz(a)anthracene, Benzo(a)pyrene, Fluoranthene, and Pyrene.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water 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-VA	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-VA	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.

PAH-ME-MS-VA	Water	PAHs in Water	EPA 3511/8270D (mod)

PAHs are extracted from water using a hexane micro-extraction technique, with analysis by GC/MS. Because the two isomers cannot be readily separated chromatographically, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

VH-HSFID-VA	Water	VH in Water by Headspace GCFID	BC Env. Lab Manual (VH in Water)

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Compounds eluting between n-hexane and n-decane are measured and summed together using flame-ionization detection.

VH-SURR-FID-VA	Water	VH Surrogates for Waters	BC Env. Lab Manual (VH in Solids)
VOC7-HSMS-VA	Water	BTEX/MTBE/Styrene by Headspace GCMS	EPA 5021A/8260C

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

VOC7/VOC-SURR-MS-VA	Water	VOC7 and/or VOC Surrogates for Waters	EPA 5035A/5021A/8260C
VPH-CALC-VA	Water	VPH is VH minus select aromatics	BC MOE VPH

VPHw measures Volatile Petroleum Hydrocarbons in water. Results are calculated by subtraction of specific Monocyclic Aromatic Hydrocarbons from VH6-10, as per the BC Lab Manual VPH calculation procedure.
VPHw = VH6-10 minus Benzene, Toluene, Ethylbenzene, Xylenes, and Styrene

XYLENES-CALC-VA	Water	Sum of Xylene Isomer Concentrations	CALCULATION

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** 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
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

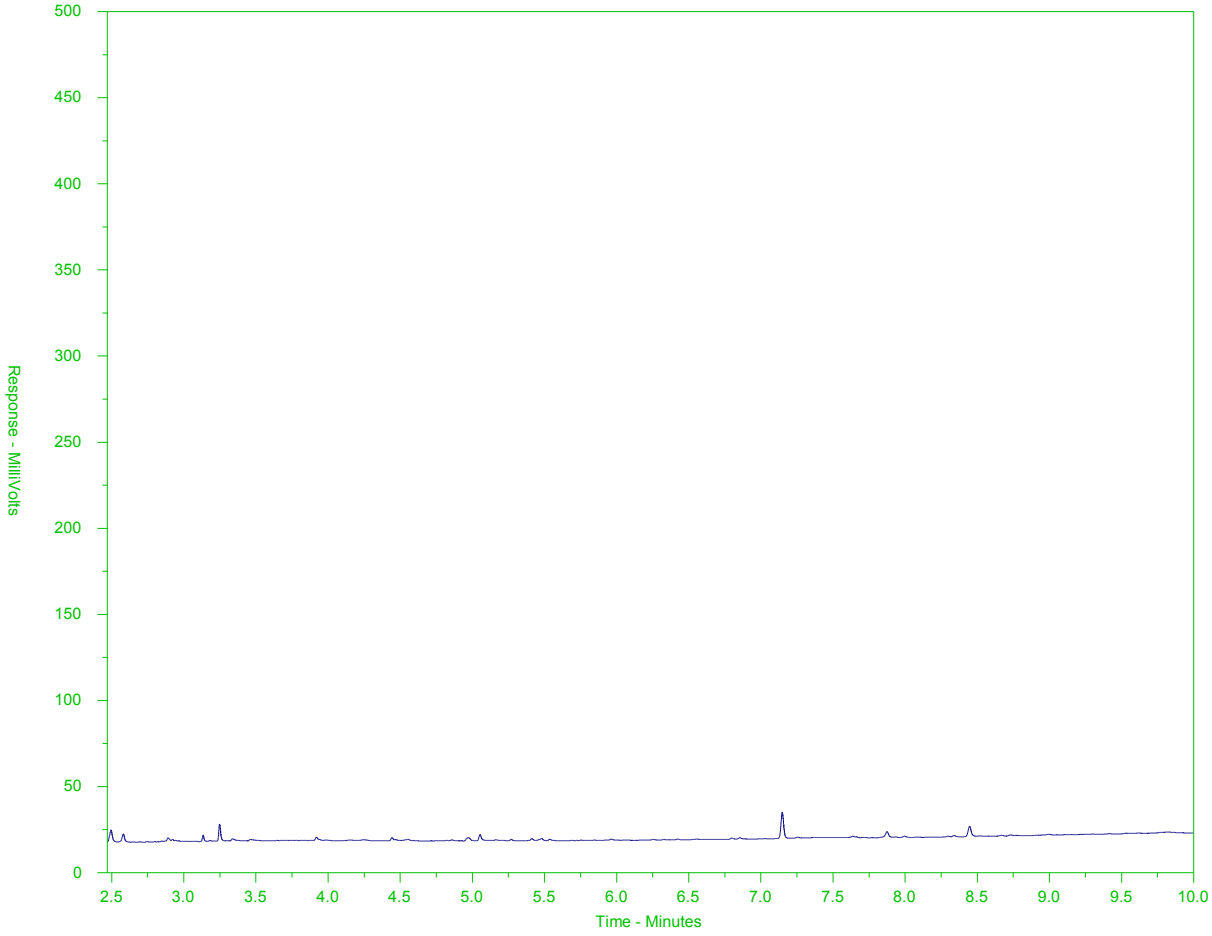
GLOSSARY OF REPORT TERMS

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.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2149783-2
Client Sample ID: MW13-04 (LP)



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

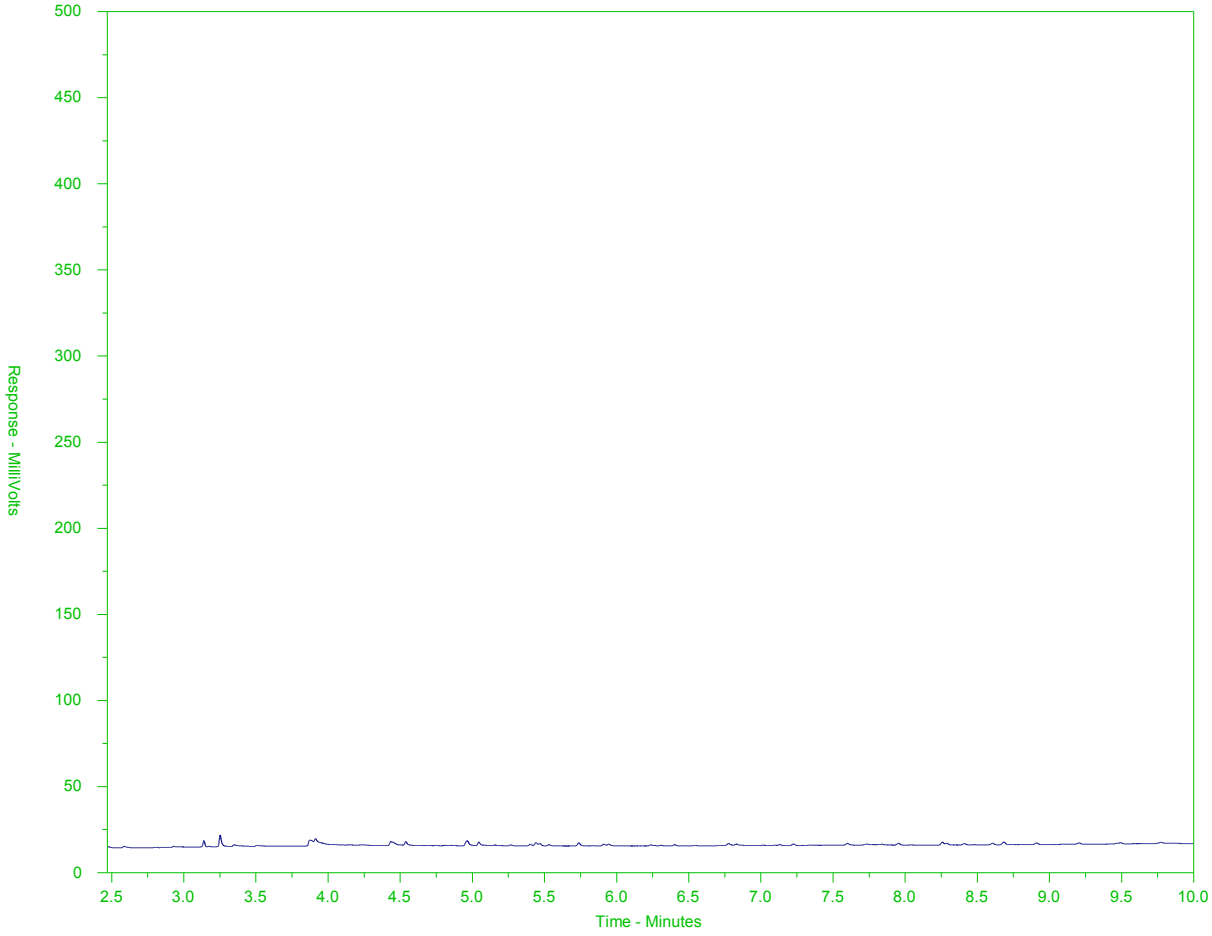
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2149783-3
Client Sample ID: MW13-05 (LP)



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

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The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

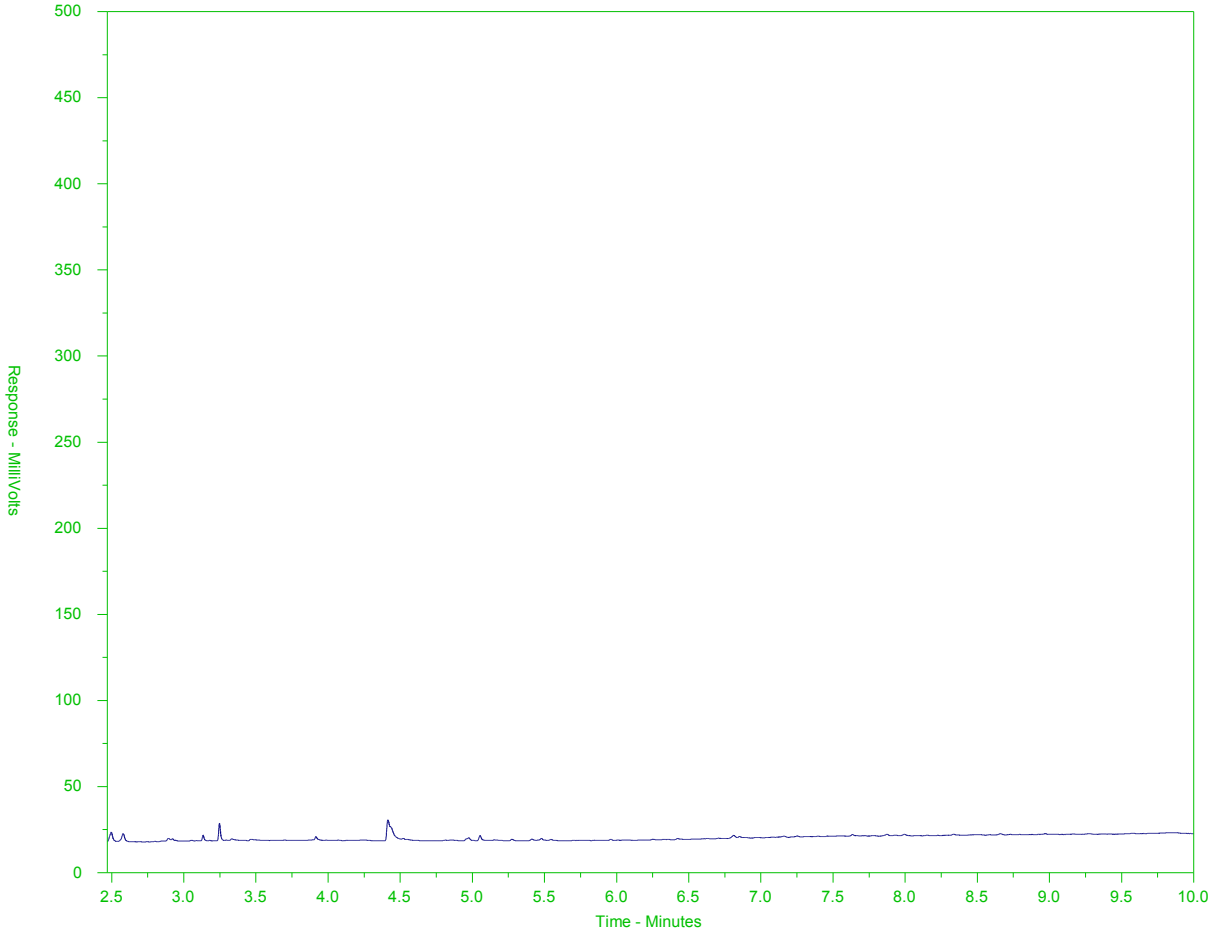
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2149783-5
Client Sample ID: MW13-07 (LP)



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

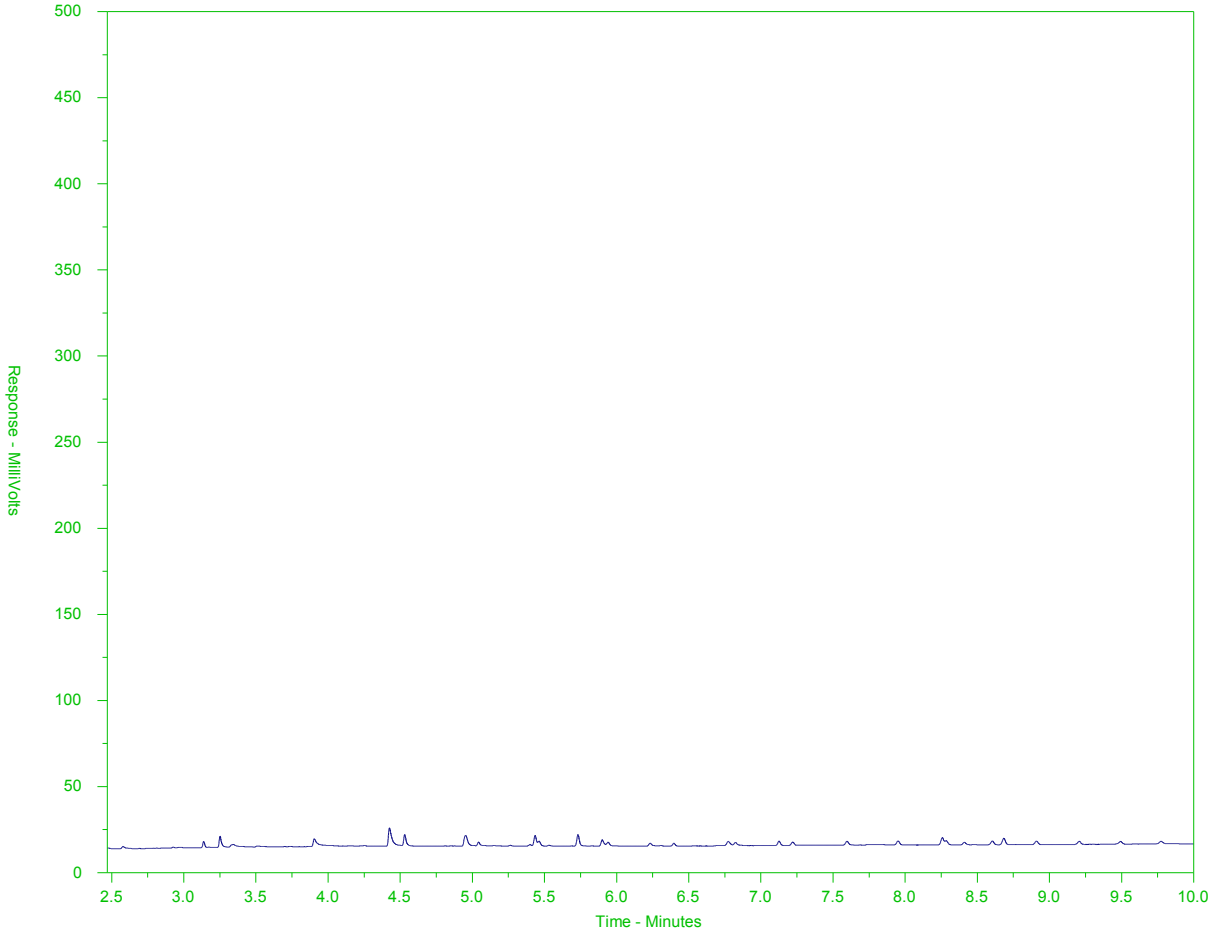
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2149783-7
Client Sample ID: MW13-10 (LP)



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

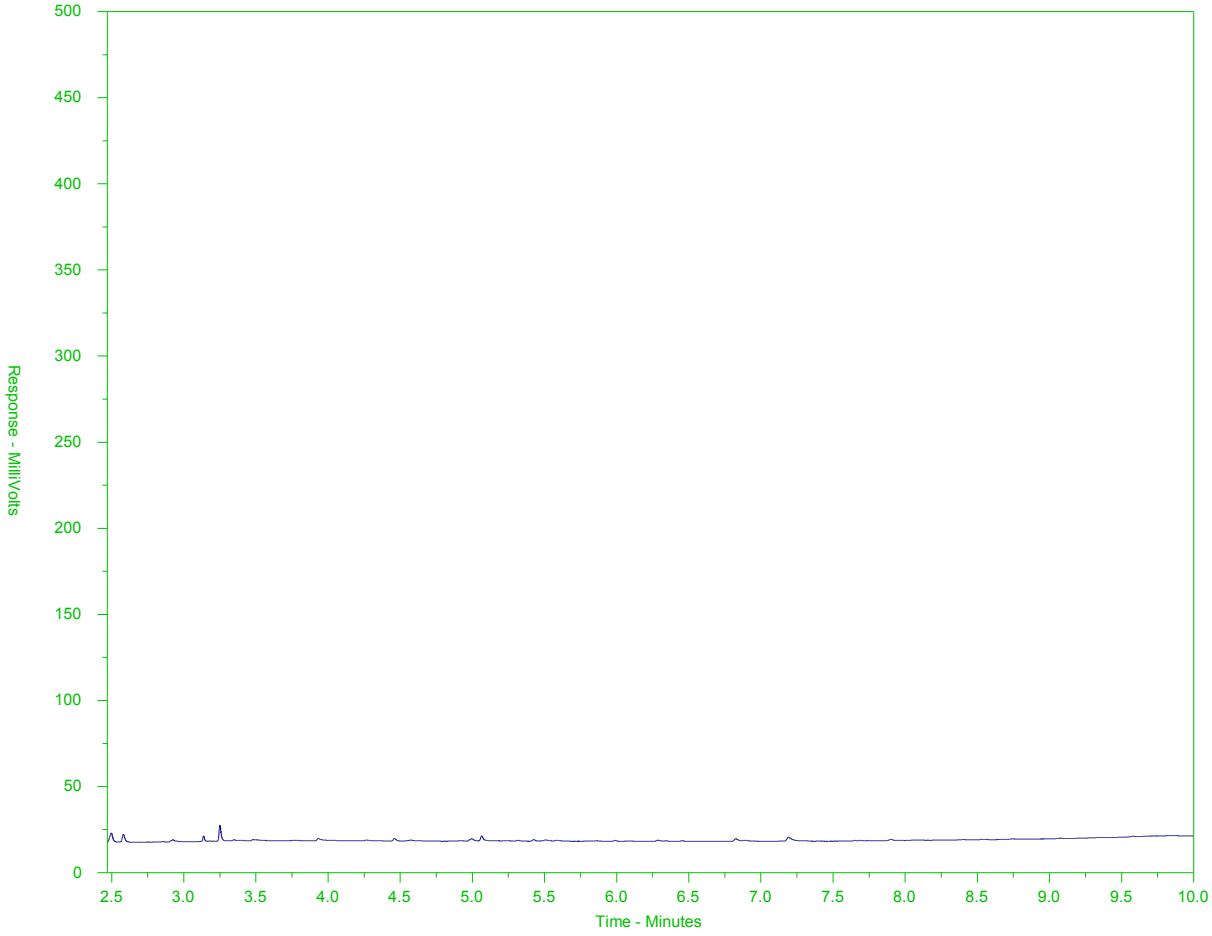
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2149783-9
Client Sample ID: MW14-01 (LP)



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

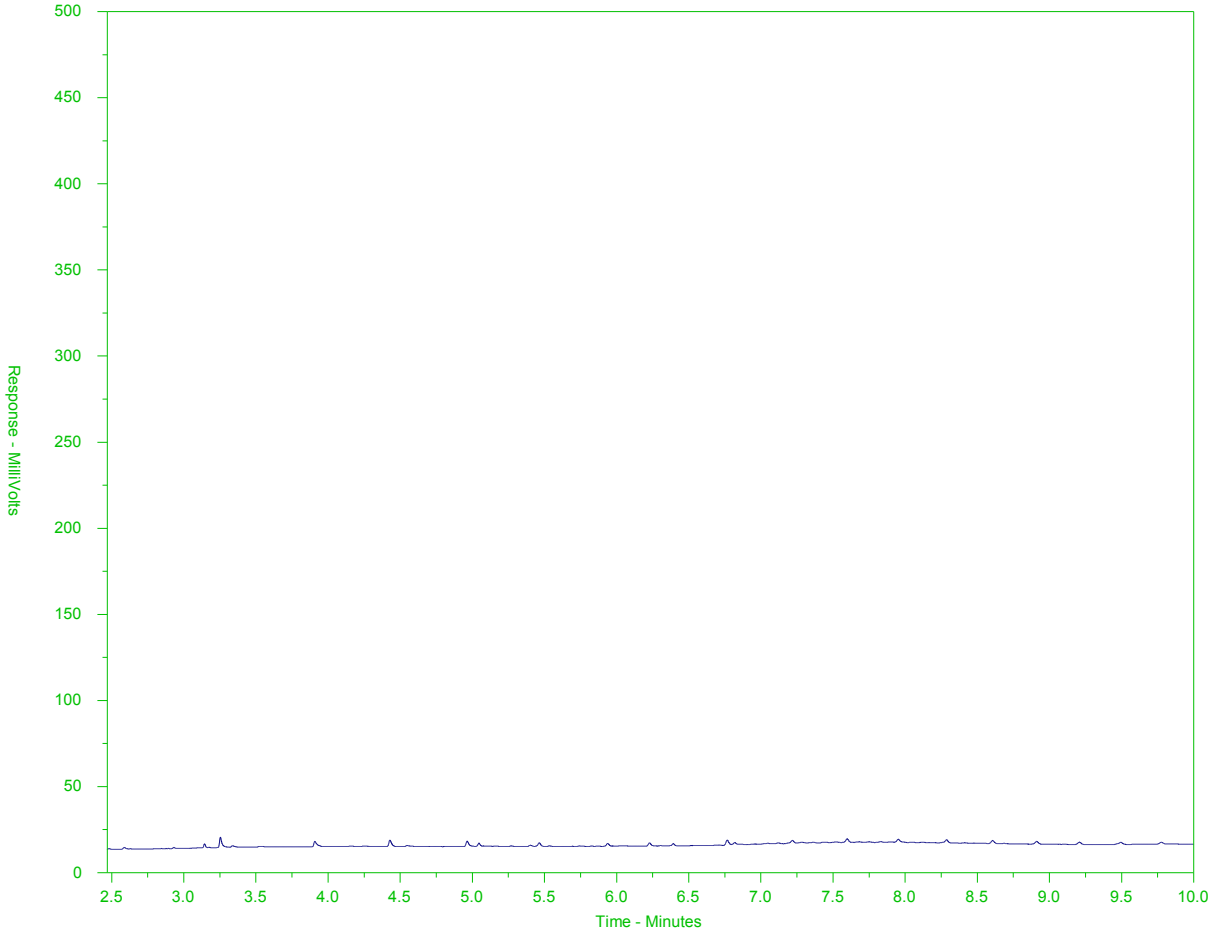
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2149783-14
Client Sample ID: TRIP BLANK (LQTB)



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

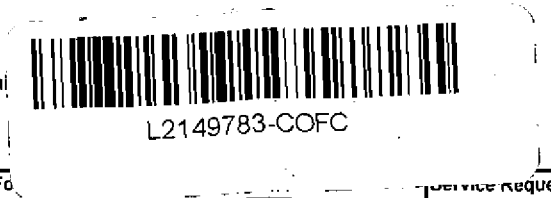
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

ALS Environmental

Chai



COC #

Report To		Report Fo	Service Requested (Rush for routine analysis subject to availability)
Company:	TECK Metals Ltd	☑ Standard ☐ Other	◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Michelle Unger	☑ PDF ☑ Excel ☑ Digital ☐ Fax	○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	601 Knightlon Road	Email 1: amacphail@accessconsulting.ca	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Kimberly, BC	Email 2: marieducharme@accessconsulting.ca	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	250-427-8422 Fax:	Email 3: michelle.unger@teck.com	
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information	Analysis Request
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #: TECK-18-01	Please indicate below Filtered, Preserved or both (F, P, F/P)
Company:		PO / AFE:	
Contact:		LSD:	
Address:			
Phone:		Quote #: Q62635	
Lab Work Order # (lab use only)		ALS Contact: Can Dang	Sampler: AM

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	pH, SPC, alkalinity, hardness	dissolved metals low level +Hg (F/P)	Anions (nitrate, nitrite, sulphate, Cl, F, Br)	Ammonia (P)	BTEX, LEPH, HEPH (P)	VPH, PAH (P)	Number of Containers
	MW13-01 (LP)	14-Aug-18	9:50	Groundwater	X	X	X	X			5
	MW13-04 (LP)	17-Aug-18	11:00	Groundwater	X	X	X	X	X	X	9
	MW13-05 (LP)	15-Aug-18	16:15	Groundwater	X	X	X	X	X	X	9
	MW13-06 (LP)			Groundwater	X	X	X	X			5
	MW13-07 (LP)	14-Aug-18	11:55	Groundwater	X	X	X	X	X	X	9
	MW13-08 (LP)	15-Aug-18	12:15	Groundwater	X	X	X	X			5
	MW13-10 (LP)	14-Aug-18	16:01	Groundwater	X	X	X	X	X	X	9
	MW13-13 (LP)	15-Aug-18	15:30	Groundwater	X	X	X	X			5
	MW14-01 (LP)	14-Aug-18	10:30	Groundwater	X	X	X	X	X	X	9
	MW14-02 (LP)			Groundwater	X	X	X	X	X	X	9
	MW14-03 (LP)			Groundwater	X	X	X	X	X	X	9
	MW14-04 (LP)			Groundwater	X	X	X	X	X	X	9
	MW-GW (LQR)	15-Aug-18	15:35	Groundwater	X	X	X	X	X	X	9
	Trip Blank CLQTB				X	X	X	X	X	X	9

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Yukon EQWin and ACC200 digital formats. General A: pH, EC, TSS (low) **General B:** pH, EC, TSS (low), anions-all
General C: pH, EC, TSS (low), anions-all, ion balance, alkalinity **General D:** pH, EC, TSS (low), SO4, ion balance, alkalinity **General E:** pH, EC, TSS (low), SO4, ion balance

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:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Obs Observations: Yes, Yes / No ? If Ye If Yes add SIF
Andrew MacPhail	17-Aug-18	18:00	MA	8/20	12:20 P	5 °C				

Ice Packed

TECK METALS LTD.
ATTN: Michelle Unger
601 Knightton Road
KIMBERLEY BC V1A 3E1

Date Received: 17-SEP-18
Report Date: 26-OCT-18 17:31 (MT)
Version: FINAL

Client Phone: 250-427-8404

Certificate of Analysis

Lab Work Order #: L2165391

Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers: 17-653852
Legal Site Desc:

Can Dang
Senior Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2165391-8	L2165391-9	L2165391-10	L2165391-11	L2165391-12
Description	Sediment	Sediment	Sediment	Sediment	Sediment
Sampled Date	14-SEP-18	14-SEP-18	13-SEP-18	13-SEP-18	14-SEP-18
Sampled Time					
Client ID	MH-04	MH-11	MH-12	MH-13	MH-29
Grouping / **Analyte**					
SOIL					
Physical Tests pH (1:2 soil:water) (pH)	7.74	8.37	7.94	7.59	8.13
Particle Size % Gravel (>2mm) (%)	16.9	11.8	13.2	<1.0	14.0
% Sand (2.0mm - 0.063mm) (%)	60.7	85.0	70.3	12.0	79.4
% Silt (0.063mm - 4um) (%)	16.9	1.8	13.9	79.8	4.9
% Clay (<4um) (%)	5.6	1.4	2.6	8.2	1.7
Texture	Sandy loam	Sand	Loamy sand	Silt	Sand
Organic / Inorganic Carbon Total Organic Carbon (%)	3.74	0.463	1.51	7.84	1.08
Metals Aluminum (Al) (mg/kg)	13900	12400	10300	10000	13100
Antimony (Sb) (mg/kg)	1.44	1.35	1.78	1.11	0.95
Arsenic (As) (mg/kg)	14.3	20.1	16.4	11.0	18.8
Barium (Ba) (mg/kg)	76.2	111	151	325	136
Beryllium (Be) (mg/kg)	0.58	0.39	0.44	0.45	0.41
Bismuth (Bi) (mg/kg)	0.20	<0.20	<0.20	<0.20	<0.20
Boron (B) (mg/kg)	<5.0	<5.0	<5.0	<5.0	<5.0
Cadmium (Cd) (mg/kg)	6.63	1.78	2.40	2.25	3.59
Calcium (Ca) (mg/kg)	8320	10600	10900	10500	11000
Chromium (Cr) (mg/kg)	23.2	19.5	19.3	17.5	19.5
Cobalt (Co) (mg/kg)	10.3	9.26	8.00	8.66	9.33
Copper (Cu) (mg/kg)	20.3	13.6	21.0	23.7	13.7
Iron (Fe) (mg/kg)	23400	26600	20500	21600	25200
Lead (Pb) (mg/kg)	199	140	150	34.0	43.7
Lithium (Li) (mg/kg)	30.0	25.3	21.6	15.3	27.7
Magnesium (Mg) (mg/kg)	8740	9400	7170	5050	9660
Manganese (Mn) (mg/kg)	586	1240	530	500	1180
Mercury (Hg) (mg/kg)	0.0255	0.0120	0.0329	0.0953	0.0244
Molybdenum (Mo) (mg/kg)	0.99	1.50	2.28	0.95	0.82
Nickel (Ni) (mg/kg)	25.3	24.4	27.3	27.8	23.3
Phosphorus (P) (mg/kg)	606	855	1050	962	667
Potassium (K) (mg/kg)	570	470	560	810	480
Selenium (Se) (mg/kg)	1.09	0.38	1.44	2.38	0.95
Silver (Ag) (mg/kg)	0.25	0.14	0.33	0.41	0.19
Sodium (Na) (mg/kg)	<50	<50	63	62	53
Strontium (Sr) (mg/kg)	38.0	44.1	39.9	47.2	42.0
Sulfur (S) (mg/kg)	<1000	<1000	<1000	<1000	<1000
Thallium (Tl) (mg/kg)	0.115	0.069	0.102	0.127	0.076
Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium (Ti) (mg/kg)	483	312	305	131	253

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2165391-8 Sediment 14-SEP-18 MH-04	L2165391-9 Sediment 14-SEP-18 MH-11	L2165391-10 Sediment 13-SEP-18 MH-12	L2165391-11 Sediment 13-SEP-18 MH-13	L2165391-12 Sediment 14-SEP-18 MH-29
Sample ID						
Description						
Sampled Date						
Sampled Time						
Client ID						
SOIL						
Metals	Tungsten (W) (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
	Uranium (U) (mg/kg)	0.976	0.632	0.896	1.12	0.523
	Vanadium (V) (mg/kg)	29.7	27.5	32.5	29.2	24.0
	Zinc (Zn) (mg/kg)	376	346	322	208	203
	Zirconium (Zr) (mg/kg)	1.1	3.3	1.3	1.8	1.0

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2165391-1 H2O 14-SEP-18 09:15 MH-04	L2165391-2 H2O 14-SEP-18 12:40 MH-11	L2165391-3 H2O 13-SEP-18 18:00 MH-12	L2165391-4 H2O 13-SEP-18 15:50 MH-13	L2165391-5 H2O 14-SEP-18 13:50 MH-29
WATER						
Physical Tests	Conductivity (uS/cm)	312	377	322	371	344
	Hardness (as CaCO3) (mg/L)	164	202	176	211	188
	pH (pH)	8.29	8.36	8.38	8.38	8.36
	Total Suspended Solids (mg/L)	<1.0	<1.0	1.2	<1.0	2.5
	Total Dissolved Solids (mg/L)	199	245	209	232	215
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	150	194	168	201	189
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Nitrate (as N) (mg/L)	0.216	0.0773	0.0154	<0.0050	0.0330
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sulfate (SO4) (mg/L)	18.7	15.5	11.1	9.17	4.50
Total Metals	Aluminum (Al)-Total (mg/L)	0.0068	0.0068	0.0098	0.0039	0.106
	Antimony (Sb)-Total (mg/L)	0.00013	0.00015	0.00021	0.00011	0.00016
	Arsenic (As)-Total (mg/L)	0.00042	0.00054	0.00082	0.00051	0.00092
	Barium (Ba)-Total (mg/L)	0.0218	0.0603	0.0714	0.143	0.0486
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.000283	0.0000376	0.0000434	0.0000122	0.000152
	Calcium (Ca)-Total (mg/L)	58.2	66.4	57.1	57.3	64.9
	Chromium (Cr)-Total (mg/L)	0.00021	<0.00010	0.00018	0.00020	0.00027
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	0.00070
	Iron (Fe)-Total (mg/L)	0.010	0.058	0.017	0.179	0.196
	Lead (Pb)-Total (mg/L)	0.000348	0.000167	0.000336	<0.000050	0.000870
	Lithium (Li)-Total (mg/L)	0.0016	0.0016	0.0014	0.0012	0.0016
	Magnesium (Mg)-Total (mg/L)	3.16	7.48	5.72	13.3	5.49
	Manganese (Mn)-Total (mg/L)	0.00084	0.00935	0.00176	0.0109	0.0326
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000712	0.000836	0.00127	0.00105	0.000414
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.39	0.42	0.43	0.37	0.30
	Selenium (Se)-Total (mg/L)	0.000859	0.000514	0.000681	0.000478	0.000419
	Silicon (Si)-Total (mg/L)	3.14	3.40	3.77	2.91	3.77
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.816	1.11	0.996	0.930	0.915
	Strontium (Sr)-Total (mg/L)	0.203	0.258	0.216	0.205	0.227

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2165391-6	L2165391-7			
	Description	H2O	H2O			
	Sampled Date					
	Sampled Time					
	Client ID	DUP	FIELD BLANK: FB			
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	310	<2.0			
	Hardness (as CaCO3) (mg/L)	166	<0.50			
	pH (pH)	8.32	5.56			
	Total Suspended Solids (mg/L)	<1.0	<1.0			
	Total Dissolved Solids (mg/L)	207	<10			
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	151	<1.0			
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050			
	Nitrate (as N) (mg/L)	0.217	<0.0050			
	Nitrite (as N) (mg/L)	<0.0010	<0.0010			
	Sulfate (SO4) (mg/L)	18.9	<0.30			
Total Metals	Aluminum (Al)-Total (mg/L)	0.0065	<0.0030			
	Antimony (Sb)-Total (mg/L)	0.00013	<0.00010			
	Arsenic (As)-Total (mg/L)	0.00039	<0.00010			
	Barium (Ba)-Total (mg/L)	0.0212	<0.00010			
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020			
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050			
	Boron (B)-Total (mg/L)	<0.010	<0.010			
	Cadmium (Cd)-Total (mg/L)	0.000272	<0.0000050			
	Calcium (Ca)-Total (mg/L)	57.6	<0.050			
	Chromium (Cr)-Total (mg/L)	0.00022	<0.00010			
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010			
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050			
	Iron (Fe)-Total (mg/L)	<0.010	<0.010			
	Lead (Pb)-Total (mg/L)	0.000281	<0.000050			
	Lithium (Li)-Total (mg/L)	0.0015	<0.0010			
	Magnesium (Mg)-Total (mg/L)	3.08	<0.10			
	Manganese (Mn)-Total (mg/L)	0.00080	<0.00010			
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Total (mg/L)	0.000691	<0.000050			
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050			
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050			
	Potassium (K)-Total (mg/L)	0.38	<0.10			
	Selenium (Se)-Total (mg/L)	0.000784	<0.000050			
	Silicon (Si)-Total (mg/L)	3.08	<0.10			
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Total (mg/L)	0.806	<0.050			
	Strontium (Sr)-Total (mg/L)	0.203	<0.00020			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2165391-1	L2165391-2	L2165391-3	L2165391-4	L2165391-5
Description	H2O	H2O	H2O	H2O	H2O
Sampled Date	14-SEP-18	14-SEP-18	13-SEP-18	13-SEP-18	14-SEP-18
Sampled Time	09:15	12:40	18:00	15:50	13:50
Client ID	MH-04	MH-11	MH-12	MH-13	MH-29
Grouping / **Analyte**					
WATER					
Total Metals Sulfur (S)-Total (mg/L)	6.38	5.30	3.58	3.12	1.53
Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	0.00245
Uranium (U)-Total (mg/L)	0.000828	0.00104	0.000897	0.00136	0.000655
Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	0.00061
Zinc (Zn)-Total (mg/L)	0.0061	0.0035	<0.0030	<0.0030	0.0061
Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved (mg/L)	0.0016	0.0020	0.0015	0.0016	0.0022
Antimony (Sb)-Dissolved (mg/L)	0.00012	0.00014	0.00020	<0.00010	0.00017
Arsenic (As)-Dissolved (mg/L)	0.00036	0.00048	0.00080	0.00041	0.00068
Barium (Ba)-Dissolved (mg/L)	0.0229	0.0633	0.0747	0.147	0.0467
Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved (mg/L)	0.000264	0.0000334	0.0000430	0.0000100	0.0000409
Calcium (Ca)-Dissolved (mg/L)	60.5	68.6	60.8	62.3	66.4
Chromium (Cr)-Dissolved (mg/L)	0.00014	0.00016	0.00014	<0.00010	<0.00010
Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved (mg/L)	<0.00020	0.00025	0.00024	0.00027	0.00032
Iron (Fe)-Dissolved (mg/L)	<0.010	0.027	<0.010	0.059	<0.010
Lead (Pb)-Dissolved (mg/L)	0.000100	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Dissolved (mg/L)	0.0015	0.0016	0.0015	0.0012	0.0013
Magnesium (Mg)-Dissolved (mg/L)	3.21	7.50	5.90	13.5	5.35
Manganese (Mn)-Dissolved (mg/L)	0.00044	0.00729	0.00053	0.0112	0.00247
Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)	0.000747	0.000872	0.00124	0.00108	0.000643 DTMF
Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved (mg/L)	0.41	0.43	0.44	0.38	0.27
Selenium (Se)-Dissolved (mg/L)	0.000930	0.000673	0.000746	0.000582	0.000488
Silicon (Si)-Dissolved (mg/L)	3.23	3.54	3.98	3.07	3.69
Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved (mg/L)	0.836	1.11	1.03	0.959	0.915
Strontium (Sr)-Dissolved (mg/L)	0.211	0.265	0.212	0.217	0.231

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2165391-6	L2165391-7			
	Description	H2O	H2O			
	Sampled Date					
	Sampled Time					
	Client ID	DUP	FIELD BLANK: FB			
Grouping	**Analyte**					
WATER						
Total Metals	Sulfur (S)-Total (mg/L)	6.29	<0.50			
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010			
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030			
	Uranium (U)-Total (mg/L)	0.000829	<0.000010			
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Total (mg/L)	0.0053	<0.0030			
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030			
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD			
	Dissolved Metals Filtration Location	FIELD	FIELD			
	Aluminum (Al)-Dissolved (mg/L)	0.0014	<0.0010			
	Antimony (Sb)-Dissolved (mg/L)	0.00012	<0.00010			
	Arsenic (As)-Dissolved (mg/L)	0.00039	<0.00010			
	Barium (Ba)-Dissolved (mg/L)	0.0222	<0.00010			
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020			
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050			
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010			
	Cadmium (Cd)-Dissolved (mg/L)	0.000264	<0.0000050			
	Calcium (Ca)-Dissolved (mg/L)	61.2	<0.050			
	Chromium (Cr)-Dissolved (mg/L)	0.00013	<0.00010			
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010			
	Copper (Cu)-Dissolved (mg/L)	<0.00020	<0.00020			
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010			
	Lead (Pb)-Dissolved (mg/L)	0.000108	<0.000050			
	Lithium (Li)-Dissolved (mg/L)	0.0015	<0.0010			
	Magnesium (Mg)-Dissolved (mg/L)	3.17	<0.10			
	Manganese (Mn)-Dissolved (mg/L)	0.00042	<0.00010			
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Dissolved (mg/L)	0.000720	<0.000050			
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050			
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050			
	Potassium (K)-Dissolved (mg/L)	0.40	<0.10			
	Selenium (Se)-Dissolved (mg/L)	0.00101	<0.000050			
	Silicon (Si)-Dissolved (mg/L)	3.14	<0.050			
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Dissolved (mg/L)	0.824	<0.050			
	Strontium (Sr)-Dissolved (mg/L)	0.204	<0.00020			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2165391-1	L2165391-2	L2165391-3	L2165391-4	L2165391-5
Description	H2O	H2O	H2O	H2O	H2O
Sampled Date	14-SEP-18	14-SEP-18	13-SEP-18	13-SEP-18	14-SEP-18
Sampled Time	09:15	12:40	18:00	15:50	13:50
Client ID	MH-04	MH-11	MH-12	MH-13	MH-29
Grouping / Analyte					
WATER					
Dissolved Metals Sulfur (S)-Dissolved (mg/L)	6.57	5.67	3.75	3.15	1.81
Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium (U)-Dissolved (mg/L)	0.000873	0.00108	0.000929	0.00139	0.000693
Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved (mg/L)	0.0051	0.0029	0.0017	<0.0010	<0.0010
Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2165391-6	L2165391-7			
	Description	H2O	H2O			
	Sampled Date					
	Sampled Time					
	Client ID	DUP	FIELD BLANK: FB			
Grouping	**Analyte**					
WATER						
Dissolved Metals	Sulfur (S)-Dissolved (mg/L)	6.54	<0.50			
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010			
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030			
	Uranium (U)-Dissolved (mg/L)	0.000858	<0.000010			
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Dissolved (mg/L)	0.0054	<0.0010			
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030			

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Silver (Ag)-Total	B	L2165391-2
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2165391-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2165391-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2165391-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2165391-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Barium (Ba)-Total	MS-B	L2165391-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Calcium (Ca)-Total	MS-B	L2165391-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2165391-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Strontium (Sr)-Total	MS-B	L2165391-1, -2, -3, -4, -5, -6, -7

Qualifiers for Individual Parameters Listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
DTMF	Dissolved concentration exceeds total for field-filtered metals sample. Metallic contaminants may have been introduced to dissolved sample during field filtration.
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**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". 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.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

C-TIC-PCT-SK	Soil	Total Inorganic Carbon in Soil	CSSS (2008) P216-217

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.

C-TOC-CALC-SK	Soil	Total Organic Carbon Calculation	CSSS (2008) 21.2

Total Organic Carbon (TOC) is calculated by the difference between total carbon (TC) and total inorganic carbon. (TIC)

C-TOT-LECO-SK	Soil	Total Carbon by combustion method	CSSS (2008) 21.2

The sample is ignited in a combustion analyzer where carbon in the reduced CO2 gas is determined using a thermal conductivity detector.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-200.2-CVAF-VA	Soil	Mercury in Soil by CVAAS	EPA 200.2/1631E (mod)

Soil samples are digested with hot nitric and hydrochloric acids, followed by CVAAS analysis. This method is fully compliant with the BC SALM strong acid leachable metals digestion method.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

Reference Information

IC-CACO3-CALC-SK	Soil	Inorganic Carbon as CaCO3 Equivalent	Calculation
MET-200.2-CCMS-VA	Soil	Metals in Soil by CRC ICPMS	EPA 200.2/6020A (mod)

Soil/sediment is dried, disaggregated, and sieved (2 mm). Strong Acid Leachable Metals in the <2mm fraction are solubilized by heated digestion with nitric and hydrochloric acids. Instrumental analysis is by Collision / Reaction Cell ICPMS.

Limitations: This method is intended to liberate environmentally available metals. Silicate minerals are not solubilized. Some metals may be only partially recovered (matrix dependent), including Al, Ba, Be, Cr, S, Sr, Ti, Tl, V, W, and Zr. Elemental Sulfur may be poorly recovered by this method. Volatile forms of sulfur (e.g. sulfide, H2S) may be excluded if lost during sampling, storage, or digestion.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water 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-WR	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-WR	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.

PH-1:2-VA	Soil	pH in Soil (1:2 Soil:Water Extraction)	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL

This analysis is carried out in accordance with procedures described in the pH, Electrometric in Soil and Sediment method - Section B Physical/Inorganic and Misc. Constituents, BC Environmental Laboratory Manual 2007. 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. The pH of the solution is then measured using a standard pH probe.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PSA-PIPET+GRAVEL-SK	Soil	Particle size - Sieve and Pipette	SSIR-51 METHOD 3.2.1

Particle size distribution is determined by a combination of techniques. Dry sieving is performed for coarse particles, wet sieving for sand particles and the pipette sedimentation method for clay particles.

Reference:

Burt, R. (2009). Soil Survey Field and Laboratory Methods Manual. Soil Survey Investigations Report No. 5. Method 3.2.1.2.2. United States Department of Agriculture Natural Resources Conservation Service.

SO4-IC-WR	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
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.

Reference Information

** 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
WR	ALS ENVIRONMENTAL - WHITEHORSE, YUKON, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

17-653852

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 Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2165391-COFC

COC Number: 17 - 653852

Page 1 of 1

Report To	Contact and company name below will appear on the final report
Company:	TECK RESOURCES
Contact:	MICHELLE UNGER
Phone:	250-432-5264
	Company address below will appear on the final report
Street:	
City/Province:	
Postal Code:	

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	bonnieburns@northwestel.net
Email 2	michelle.unger@teck.com
Email 3	

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)	
Regular [R]	☑ Standard TAT if received by 3 pm - business days - no surcharges apply
PRIORITY (Business Days) 4 day [P4-20%]	☐
PRIORITY (Business Days) 3 day [P3-25%]	☐
PRIORITY (Business Days) 2 day [P2-50%]	☐
EMERGENCY 1 Business day [E-100%]	☐
EMERGENCY Same Day, Weekend or Statutory holiday [E2-200%] (Laboratory opening fees may apply)]	☐
Date and Time Required for all E&P TATs:	dd-mmm-yy hh:mm
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:		
Contact:		

Invoice Distribution	
Select Invoice Distribution:	☐ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	
Email 2	

Project Information	
ALS Account # / Quote #:	Sa Dena Hes
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: Bonnie Burns

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, alkalinity	Specific conductance	TSS, TDS,	Total metals	Dissolved metals	total ammonia	nitrate, nitrite,	dissolved SO4	hardness		TOC	Particle Size	Metals on portion that <2mm	SAMPLES ON HOLD	Sample is hazardous (please provide further details	NUMBER OF CONTAINERS
	MH-04	14/9/18	09:15	H2O																7
	MH-11	14/9/18	12:40	"																7
	MH-12	13/9/18	18:00	"																7
	MH-13	13/9/18	15:50	"																7
	MH-29	14/9/18	13:50	"																7
	DUP	-	-	"																7
	Field Blank: FB	-	-	"																7
	MH-04	14/9/18		Sediment																2
	MH-11	14/9/18		"																2
	MH-12	13/9/18		"																2
	MH-13	13/9/18		"																2
	MH-29	14/9/18		"																2

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	WQ - analyze metals to low MDLs. to compare to CCME Sr protection of Freshwater Aquatic Life
Are samples for human consumption/ 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
2°C	9

SHIPMENT RELEASE (client use)		
Released by:	Date:	Time:

INITIAL SHIPMENT RECEPTION (lab use only)		
Received by:	Date: Sept 17/18	Time: 11:15

FINAL SHIPMENT RECEPTION (lab use only)		
Received by: HA	Date: 9/18	Time: 2:37

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

JULY 2017 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**.

TECK METALS LTD.
ATTN: Michelle Unger
601 Knightton Road
KIMBERLEY BC V1A 3E1

Date Received: 22-OCT-18
Report Date: 31-OCT-18 18:34 (MT)
Version: FINAL

Client Phone: 250-427-8404

Certificate of Analysis

Lab Work Order #: L2184929

Project P.O. #: NOT SUBMITTED
Job Reference: TECK-18-01
C of C Numbers: 1 of 1
Legal Site Desc:

Can Dang
Senior Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2184929-1	L2184929-2	L2184929-3	L2184929-4	L2184929-5
	Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
	Sampled Date	20-OCT-18	18-OCT-18	19-OCT-18	20-OCT-18	19-OCT-18
	Sampled Time	16:20	17:30	10:53	13:05	14:40
	Client ID	MW13-01	MW13-04	MW13-06	MW13-07	MW13-08
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	305	326	657	478	544
	Hardness (as CaCO3) (mg/L)	167	183	351	244	330
	pH (pH)	8.15	8.27	7.95	8.23	8.00
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	158	182	209	232	306
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0183	0.0126	0.160	0.0118
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	0.57	<0.50
	Fluoride (F) (mg/L)	0.362	0.055	0.627	0.389	0.046
	Nitrate (as N) (mg/L)	0.360	0.981	<0.0050	<0.0050	0.289
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sulfate (SO4) (mg/L)	10.4	3.89	160	43.2	15.7
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0019	0.0037	0.0017	0.0023	0.0026
	Antimony (Sb)-Dissolved (mg/L)	0.00012	0.00026	0.00014	<0.00010	0.00018
	Arsenic (As)-Dissolved (mg/L)	0.00034	0.00079	0.0531	0.00320	0.00020
	Barium (Ba)-Dissolved (mg/L)	0.0215	0.0448	0.0244	0.0264	0.215
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	0.012	0.023	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	0.000669	0.000509	0.0000621	<0.0000050	0.0000645
	Calcium (Ca)-Dissolved (mg/L)	60.1	66.1	127	70.0	113
	Chromium (Cr)-Dissolved (mg/L)	0.00018	0.00029	0.00280	0.00014	0.00038
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	0.00291	0.00059	<0.00010
	Copper (Cu)-Dissolved (mg/L)	<0.00020	0.00092	0.00042	<0.00020	0.00033
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	0.674	2.32	<0.010
	Lead (Pb)-Dissolved (mg/L)	0.000942	0.000340	<0.000050	<0.000050	0.000119
	Lithium (Li)-Dissolved (mg/L)	0.0014	0.0016	0.0084	0.0080	0.0020
	Magnesium (Mg)-Dissolved (mg/L)	4.00	4.43	8.39	16.8	11.5
	Manganese (Mn)-Dissolved (mg/L)	0.00036	0.00061	0.351	1.03	<0.00030 DLB
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000557	0.000509	0.0411	0.00376	0.000576
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	0.0309	0.00223	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	0.171	0.095	<0.050
	Potassium (K)-Dissolved (mg/L)	0.65	0.56	2.01	3.31	0.70
	Selenium (Se)-Dissolved (mg/L)	0.00116	0.000792	<0.000050	0.000090	0.00200
	Silicon (Si)-Dissolved (mg/L)	3.35	3.56	15.6	7.19	3.92

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2184929-6	L2184929-7	L2184929-8	L2184929-9	L2184929-10
Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Sampled Date	19-OCT-18	20-OCT-18	20-OCT-18	20-OCT-18	20-OCT-18
Sampled Time	13:53	09:47	15:21	14:50	16:25
Client ID	MW13-10	MW13-13	MW14-01	MW14-04	MW-GW
Grouping / **Analyte**					
WATER					
Physical Tests					
Conductivity (uS/cm)	433	257	395	303	306
Hardness (as CaCO3) (mg/L)	251	131	226	173	169
pH (pH)	8.24	8.15	8.22	8.17	8.11
Anions and Nutrients					
Alkalinity, Total (as CaCO3) (mg/L)	212	105	233	226	159
Ammonia, Total (as N) (mg/L)	0.0057	0.0073	0.0251	0.0308	<0.0050
Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	0.54	<0.50
Fluoride (F) (mg/L)	0.058	0.164	0.141	0.073	0.355
Nitrate (as N) (mg/L)	0.539	0.951	0.225	0.0486	0.361
Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Sulfate (SO4) (mg/L)	34.9	33.3	3.98	4.58	10.4
Dissolved Metals					
Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved (mg/L)	0.0040	0.0180	0.0143	0.0053	0.0062
Antimony (Sb)-Dissolved (mg/L)	0.00012	0.00015	0.00016	0.00022	0.00013
Arsenic (As)-Dissolved (mg/L)	0.00112	0.00046	0.00032	0.00053	0.00040
Barium (Ba)-Dissolved (mg/L)	0.00786	0.0118	0.127	0.108	0.0214
Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved (mg/L)	0.0000156	0.000599	0.0000392	0.0000409	0.000616
Calcium (Ca)-Dissolved (mg/L)	86.2	49.2	72.5	57.9	60.9
Chromium (Cr)-Dissolved (mg/L)	0.00045	0.00024	0.00061	0.00034	0.00022
Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved (mg/L)	<0.00020	0.00049	0.00074	0.00099	<0.00020
Iron (Fe)-Dissolved (mg/L)	<0.010	0.022	0.028	<0.010	<0.010
Lead (Pb)-Dissolved (mg/L)	0.000209	0.000775	0.000160	0.000083	0.000984
Lithium (Li)-Dissolved (mg/L)	0.0016	<0.0010	<0.0010	0.0017	0.0016
Magnesium (Mg)-Dissolved (mg/L)	8.62	2.08	10.9	6.84	4.13
Manganese (Mn)-Dissolved (mg/L)	0.00038	0.00049	0.00108	0.00150	0.00079
Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)	0.00186	0.000450	0.00214	0.00406	0.000597
Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved (mg/L)	1.09	0.72	0.70	1.25	0.66
Selenium (Se)-Dissolved (mg/L)	0.00168	0.000714	0.00108	0.000203	0.00120
Silicon (Si)-Dissolved (mg/L)	3.83	2.48	4.49	3.36	3.34

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2184929-1	L2184929-2	L2184929-3	L2184929-4	L2184929-5
Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Sampled Date	20-OCT-18	18-OCT-18	19-OCT-18	20-OCT-18	19-OCT-18
Sampled Time	16:20	17:30	10:53	13:05	14:40
Client ID	MW13-01	MW13-04	MW13-06	MW13-07	MW13-08
Grouping / **Analyte**					
WATER					
Dissolved Metals					
Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved (mg/L)	0.820	1.02	10.8	12.7	1.09
Strontium (Sr)-Dissolved (mg/L)	0.167	0.156	0.385	0.481	0.341
Sulfur (S)-Dissolved (mg/L)	3.68	1.35	55.7	15.3	5.42
Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	0.000016	<0.000010	<0.000010
Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium (U)-Dissolved (mg/L)	0.000854	0.000752	0.0151	0.00712	0.00164
Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved (mg/L)	0.0241	0.0127	0.106	0.0026	<0.0010
Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Volatile Organic Compounds					
Benzene (mg/L)		<0.00050		<0.00050	
Ethylbenzene (mg/L)		<0.00050		<0.00050	
Methyl t-butyl ether (MTBE) (mg/L)		<0.00050		<0.00050	
Styrene (mg/L)		<0.00050		<0.00050	
Toluene (mg/L)		<0.00045		<0.00045	
ortho-Xylene (mg/L)		<0.00050		<0.00050	
meta- & para-Xylene (mg/L)		<0.00050		<0.00050	
Xylenes (mg/L)		<0.00075		<0.00075	
Surrogate: 4-Bromofluorobenzene (SS) (%)		88.1		85.0	
Surrogate: 1,4-Difluorobenzene (SS) (%)		101.8		102.4	
Hydrocarbons					
EPH10-19 (mg/L)		<0.25		<0.25	
EPH19-32 (mg/L)		<0.25		<0.25	
LEPH (mg/L)		<0.25		<0.25	
HEPH (mg/L)		<0.25		<0.25	
Volatile Hydrocarbons (VH6-10) (mg/L)		<0.10		<0.10	
VPH (C6-C10) (mg/L)		<0.10		<0.10	
Surrogate: 2-Bromobenzotrifluoride (%)		85.0		90.2	
Surrogate: 3,4-Dichlorotoluene (SS) (%)		101.2		68.7 SURR-ND	
Polycyclic Aromatic Hydrocarbons					
Acenaphthene (mg/L)		<0.000010		<0.000010	
Acenaphthylene (mg/L)		<0.000010		<0.000010	
Acridine (mg/L)		<0.000010		<0.000010	
Anthracene (mg/L)		<0.000010		<0.000010	
Benz(a)anthracene (mg/L)		<0.000010		<0.000010	
Benzo(a)pyrene (mg/L)		<0.0000050		<0.0000050	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2184929-6 Groundwater 19-OCT-18 13:53 MW13-10	L2184929-7 Groundwater 20-OCT-18 09:47 MW13-13	L2184929-8 Groundwater 20-OCT-18 15:21 MW14-01	L2184929-9 Groundwater 20-OCT-18 14:50 MW14-04	L2184929-10 Groundwater 20-OCT-18 16:25 MW-GW
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.89	0.637	1.42	1.59	0.813
	Strontium (Sr)-Dissolved (mg/L)	0.352	0.0850	0.234	0.205	0.180
	Sulfur (S)-Dissolved (mg/L)	12.0	10.9	1.47	1.64	3.53
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.0045 DLM	0.00053	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.00300	0.000642	0.000613	0.000542	0.000899
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0016	0.0124	<0.0010	0.0014	0.0223
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Volatile Organic Compounds	Benzene (mg/L)	<0.00050		<0.00050	<0.00050	
	Ethylbenzene (mg/L)	<0.00050		<0.00050	<0.00050	
	Methyl t-butyl ether (MTBE) (mg/L)	<0.00050		<0.00050	<0.00050	
	Styrene (mg/L)	<0.00050		<0.00050	<0.00050	
	Toluene (mg/L)	<0.00045		<0.00045	<0.00045	
	ortho-Xylene (mg/L)	<0.00050		<0.00050	<0.00050	
	meta- & para-Xylene (mg/L)	<0.00050		<0.00050	<0.00050	
	Xylenes (mg/L)	<0.00075		<0.00075	<0.00075	
	Surrogate: 4-Bromofluorobenzene (SS) (%)	92.8		94.2	92.9	
	Surrogate: 1,4-Difluorobenzene (SS) (%)	95.9		98.6	91.4	
Hydrocarbons	EPH10-19 (mg/L)	<0.25		<0.25	<0.25	
	EPH19-32 (mg/L)	<0.25		<0.25	<0.25	
	LEPH (mg/L)	<0.25		<0.25	<0.25	
	HEPH (mg/L)	<0.25		<0.25	<0.25	
	Volatile Hydrocarbons (VH6-10) (mg/L)	<0.10		<0.10	<0.10	
	VPH (C6-C10) (mg/L)	<0.10		<0.10	<0.10	
	Surrogate: 2-Bromobenzotrifluoride (%)	100.1		92.8	99.8	
	Surrogate: 3,4-Dichlorotoluene (SS) (%)	99.5		104.2	91.2	
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)	<0.000010		<0.000010	<0.000020 DLQ	
	Acenaphthylene (mg/L)	<0.000010		<0.000010	<0.000010	
	Acridine (mg/L)	<0.000010		<0.000010	<0.000010	
	Anthracene (mg/L)	<0.000010		<0.000010	<0.000010	
	Benz(a)anthracene (mg/L)	<0.000010		<0.000010	<0.000010	
	Benzo(a)pyrene (mg/L)	<0.0000050		<0.0000050	<0.0000050	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2184929-1	L2184929-2	L2184929-3	L2184929-4	L2184929-5
Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Sampled Date	20-OCT-18	18-OCT-18	19-OCT-18	20-OCT-18	19-OCT-18
Sampled Time	16:20	17:30	10:53	13:05	14:40
Client ID	MW13-01	MW13-04	MW13-06	MW13-07	MW13-08
Grouping / **Analyte**					
WATER					
Polycyclic Aromatic Hydrocarbons					
Benzo(b&j)fluoranthene (mg/L)		<0.000010		<0.000010	
Benzo(b+j+k)fluoranthene (mg/L)		<0.000015		<0.000015	
Benzo(g,h,i)perylene (mg/L)		<0.000010		<0.000010	
Benzo(k)fluoranthene (mg/L)		<0.000010		<0.000010	
Chrysene (mg/L)		<0.000010		<0.000010	
Dibenz(a,h)anthracene (mg/L)		<0.0000050		<0.0000050	
Fluoranthene (mg/L)		<0.000010		<0.000010	
Fluorene (mg/L)		<0.000010		<0.000010	
Indeno(1,2,3-c,d)pyrene (mg/L)		<0.000010		<0.000010	
1-Methylnaphthalene (mg/L)		<0.000050		<0.000050	
2-Methylnaphthalene (mg/L)		<0.000050		<0.000050	
Naphthalene (mg/L)		<0.000050		<0.000050	
Phenanthrene (mg/L)		<0.000020		<0.000020	
Pyrene (mg/L)		<0.000010		<0.000010	
Quinoline (mg/L)		<0.000050		<0.000050	
Surrogate: Acridine d9 (%)		77.9		90.1	
Surrogate: Chrysene d12 (%)		69.0		99.8	
Surrogate: Naphthalene d8 (%)		103.5		110.0	
Surrogate: Phenanthrene d10 (%)		76.2		95.1	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2184929-6 Groundwater 19-OCT-18 13:53 MW13-10	L2184929-7 Groundwater 20-OCT-18 09:47 MW13-13	L2184929-8 Groundwater 20-OCT-18 15:21 MW14-01	L2184929-9 Groundwater 20-OCT-18 14:50 MW14-04	L2184929-10 Groundwater 20-OCT-18 16:25 MW-GW
WATER						
Polycyclic Aromatic Hydrocarbons	Benzo(b&j)fluoranthene (mg/L)	<0.000010		<0.000010	<0.000010	
	Benzo(b+j+k)fluoranthene (mg/L)	<0.000015		<0.000015	<0.000015	
	Benzo(g,h,i)perylene (mg/L)	<0.000010		<0.000010	<0.000010	
	Benzo(k)fluoranthene (mg/L)	<0.000010		<0.000010	<0.000010	
	Chrysene (mg/L)	<0.000010		<0.000010	<0.000010	
	Dibenz(a,h)anthracene (mg/L)	<0.0000050		<0.0000050	<0.0000050	
	Fluoranthene (mg/L)	<0.000010		<0.000010	<0.000010	
	Fluorene (mg/L)	<0.000010		<0.000010	<0.000010	
	Indeno(1,2,3-c,d)pyrene (mg/L)	<0.000010		<0.000010	<0.000010	
	1-Methylnaphthalene (mg/L)	<0.000050		<0.000050	<0.000050	
	2-Methylnaphthalene (mg/L)	<0.000050		<0.000050	<0.000050	
	Naphthalene (mg/L)	<0.000050		<0.000050	<0.000050	
	Phenanthrene (mg/L)	<0.000020		<0.000020	<0.000020	
	Pyrene (mg/L)	<0.000010		<0.000010	<0.000010	
	Quinoline (mg/L)	<0.000050		<0.000050	<0.000050	
	Surrogate: Acridine d9 (%)	82.8		76.2	87.9	
	Surrogate: Chrysene d12 (%)	93.2		78.8	93.0	
	Surrogate: Naphthalene d8 (%)	109.2		101.1	118.6	
	Surrogate: Phenanthrene d10 (%)	92.2		86.9	99.9	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2184929-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2184929-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2184929-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2184929-1, -10, -2, -3, -4, -5, -6, -7, -8, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLB	Detection Limit Raised. Analyte detected at comparable level in Method Blank.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DLQ	Detection Limit raised due to co-eluting interference. GCMS qualifier ion ratio did not meet acceptance criteria.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
SURR-ND	Surrogate recovery marginally exceeded ALS DQO. Reported non-detect results for associated samples were deemed to be unaffected.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". 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.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

EPH-ME-FID-VA	Water	EPH in Water	BC Lab Manual

EPH is extracted from water using a hexane micro-extraction technique, with analysis by GC-FID, as per the BC Lab Manual. EPH results include PAHs and are therefore not equivalent to LEPH or HEPH.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

LEPH/HEPH-CALC-VA	Water	LEPHs and HEPHs	BC MOE LEPH/HEPH

LEPHw and HEPHw are measures of Light and Heavy Extractable Petroleum Hydrocarbons in water. Results are calculated by subtraction of applicable PAH concentrations from EPH10-19 and EPH19-32, as per the BC Lab Manual LEPH/HEPH calculation procedure.

LEPHw = EPH10-19 minus Acenaphthene, Acridine, Anthracene, Fluorene, Naphthalene and Phenanthrene.

HEPHw = EPH19-32 minus Benz(a)anthracene, Benzo(a)pyrene, Fluoranthene, and Pyrene.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Reference Information

NH3-F-VA	Water	Ammonia in Water 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-VA	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-VA	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.

PAH-ME-MS-VA	Water	PAHs in Water	EPA 3511/8270D (mod)

PAHs are extracted from water using a hexane micro-extraction technique, with analysis by GC/MS. Because the two isomers cannot be readily separated chromatographically, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

VH-HSFID-VA	Water	VH in Water by Headspace GCFID	BC Env. Lab Manual (VH in Water)

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Compounds eluting between n-hexane and n-decane are measured and summed together using flame-ionization detection.

VH-SURR-FID-VA	Water	VH Surrogates for Waters	BC Env. Lab Manual (VH in Solids)
VOC7-HSMS-VA	Water	BTEX/MTBE/Styrene by Headspace GCMS	EPA 5021A/8260C

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

VOC7/VOC-SURR-MS-VA	Water	VOC7 and/or VOC Surrogates for Waters	EPA 5035A/5021A/8260C
VPH-CALC-VA	Water	VPH is VH minus select aromatics	BC MOE VPH

VPHw measures Volatile Petroleum Hydrocarbons in water. Results are calculated by subtraction of specific Monocyclic Aromatic Hydrocarbons from VH6-10, as per the BC Lab Manual VPH calculation procedure.
VPHw = VH6-10 minus Benzene, Toluene, Ethylbenzene, Xylenes, and Styrene

XYLENES-CALC-VA	Water	Sum of Xylene Isomer Concentrations	CALCULATION

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** 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
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

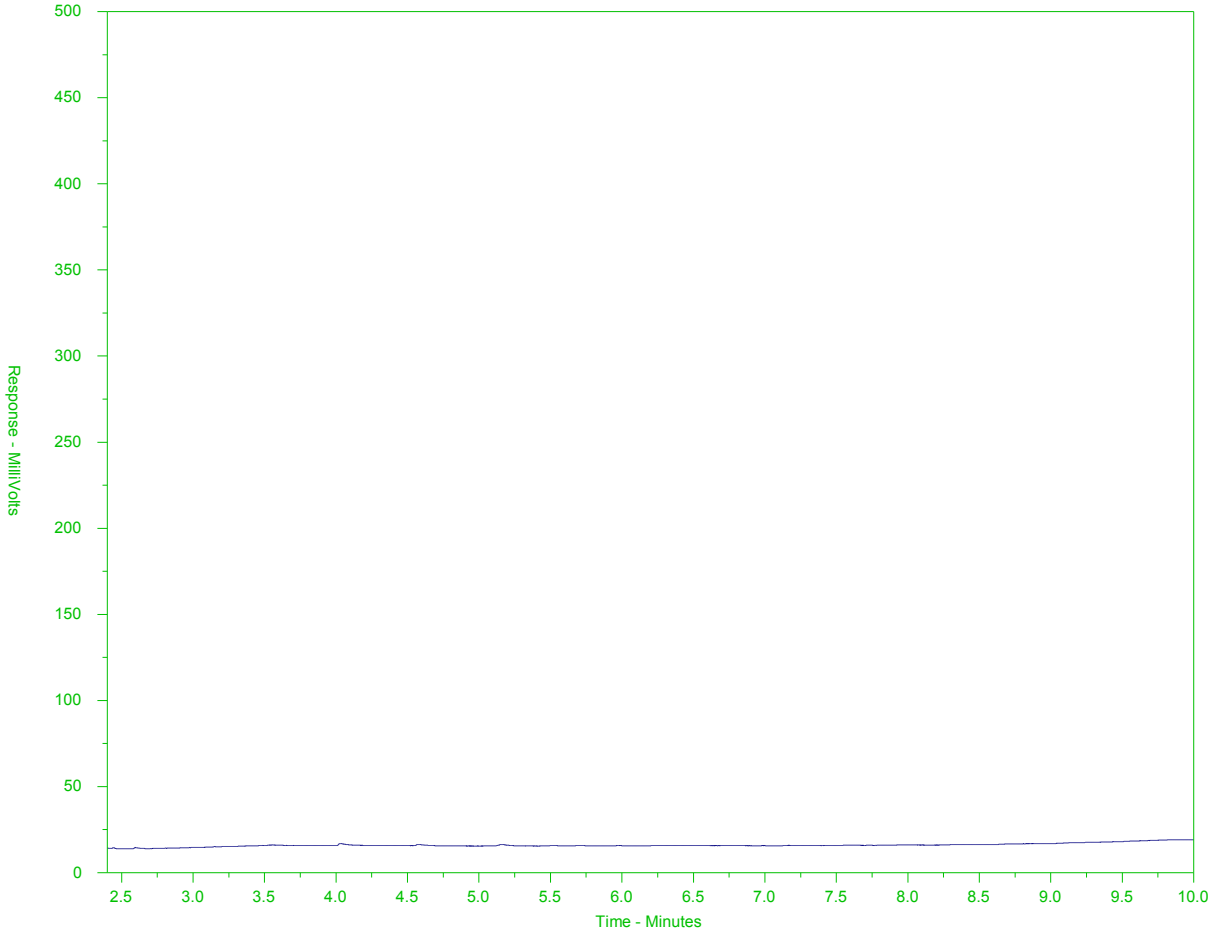
GLOSSARY OF REPORT TERMS

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.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2184929-2
Client Sample ID: MW13-04



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

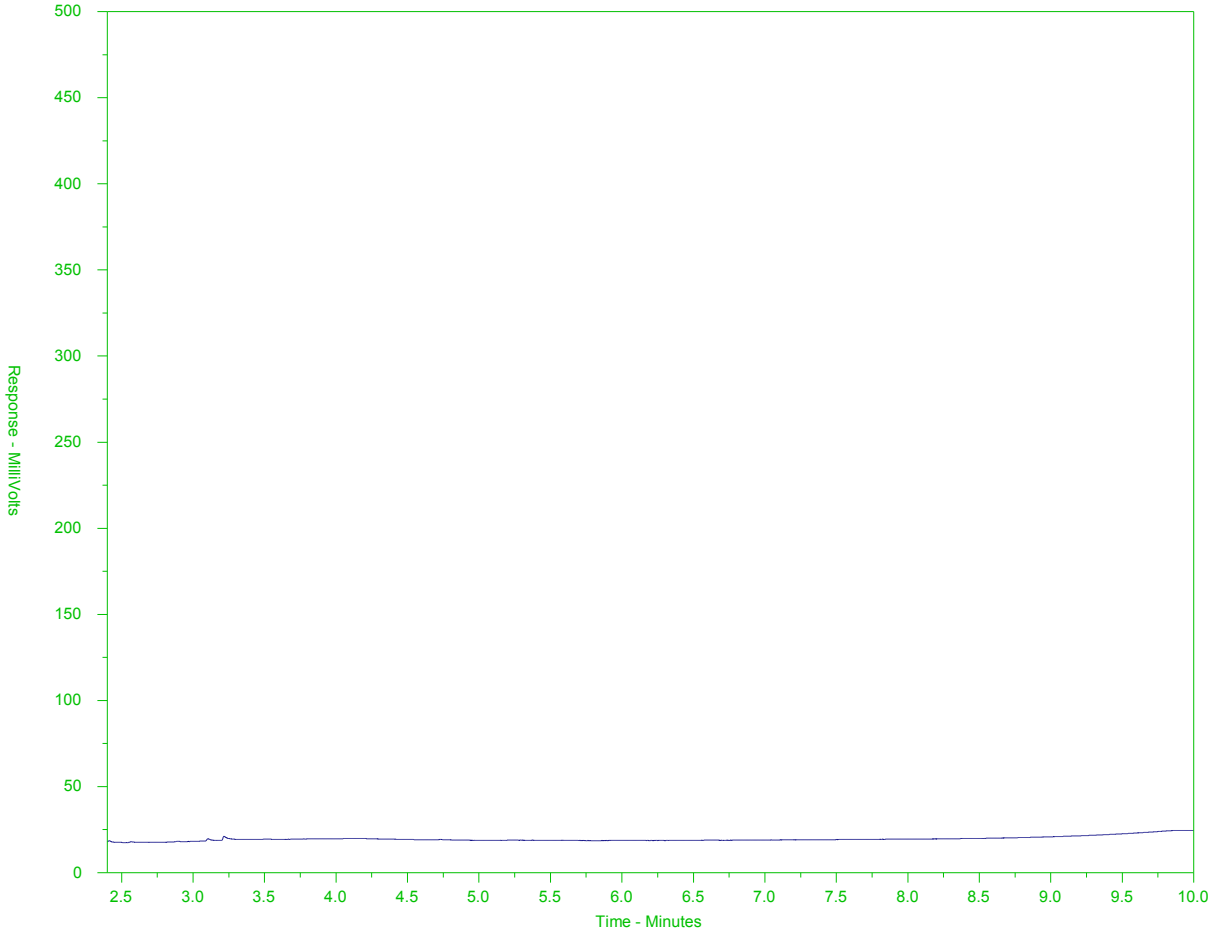
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2184929-4
Client Sample ID: MW13-07



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

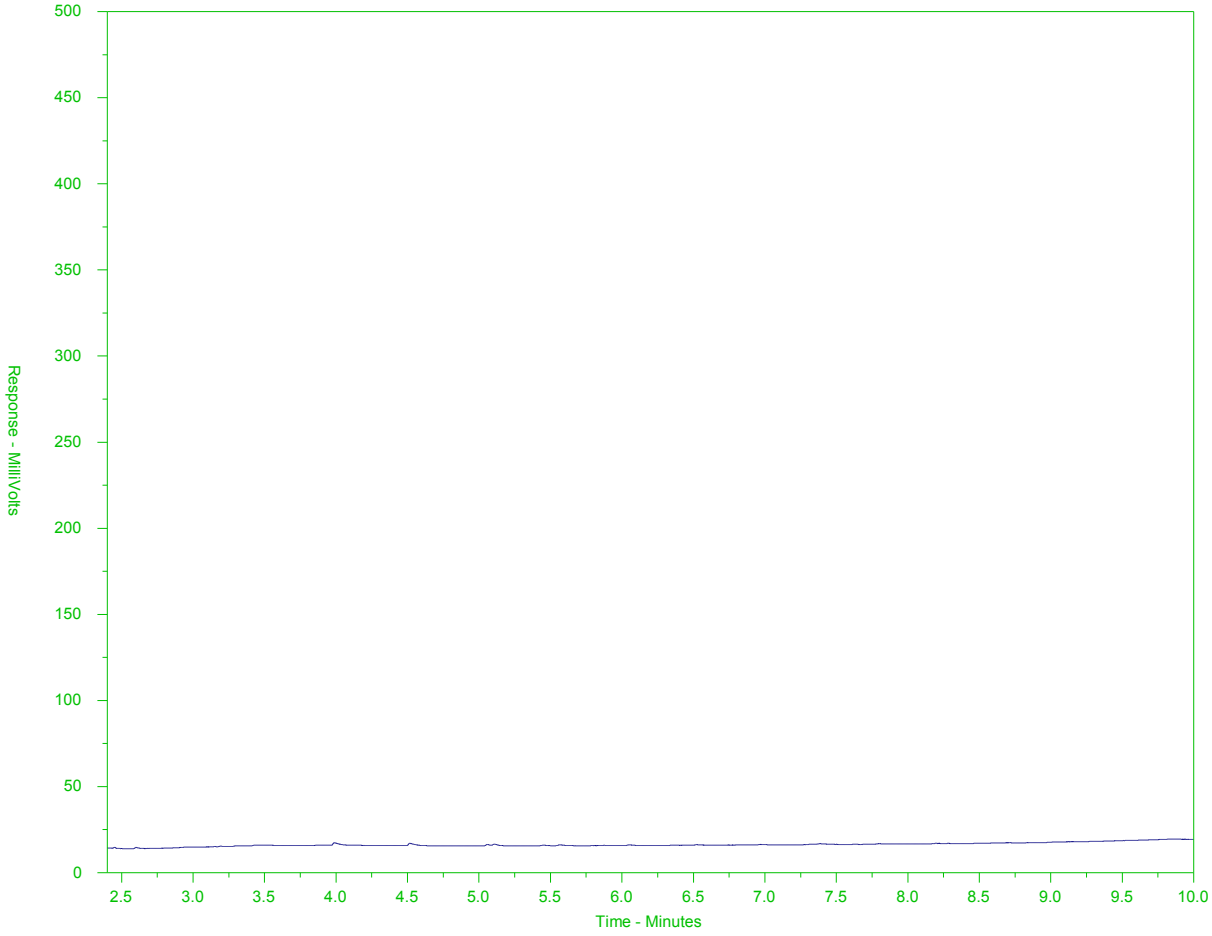
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2184929-6
Client Sample ID: MW13-10



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

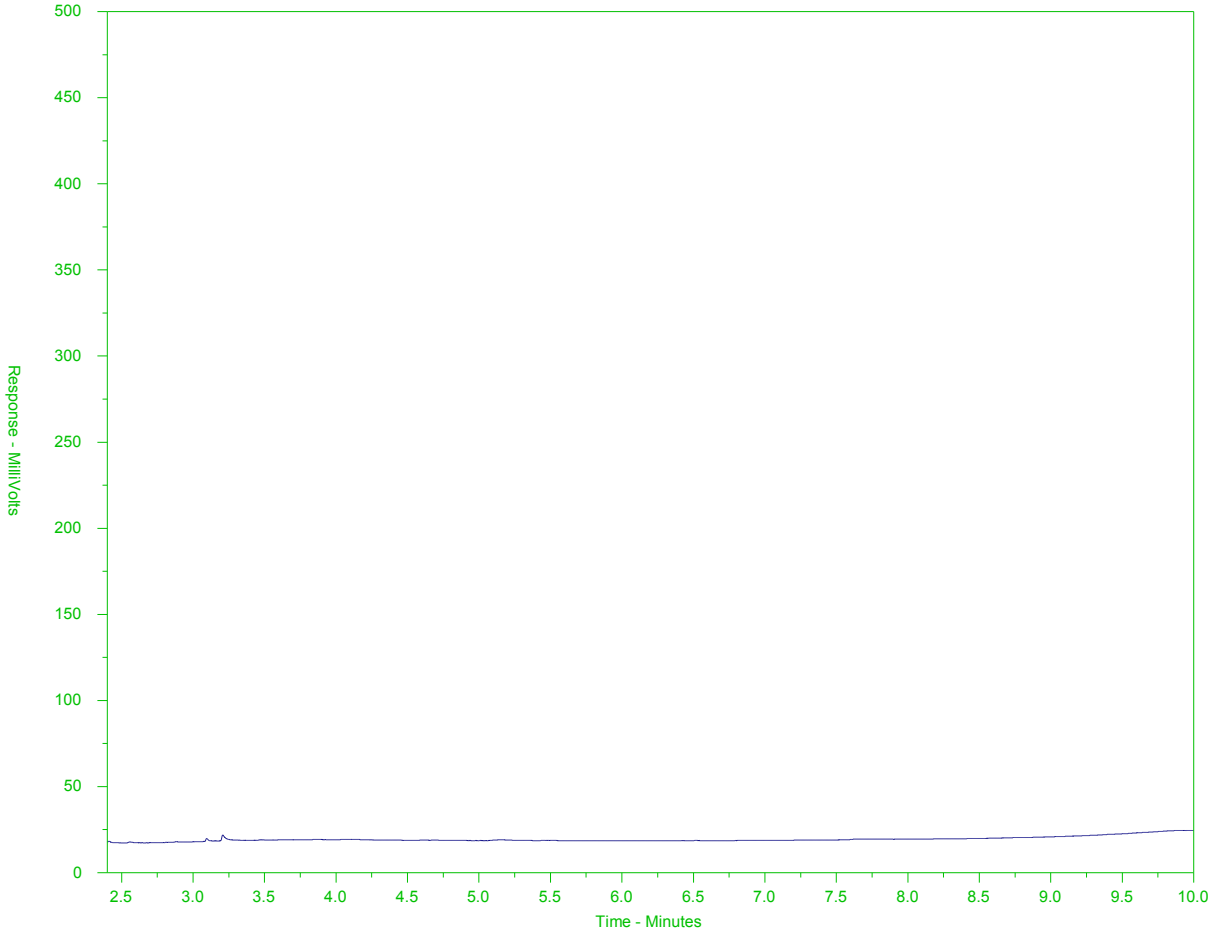
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2184929-8
Client Sample ID: MW14-01



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

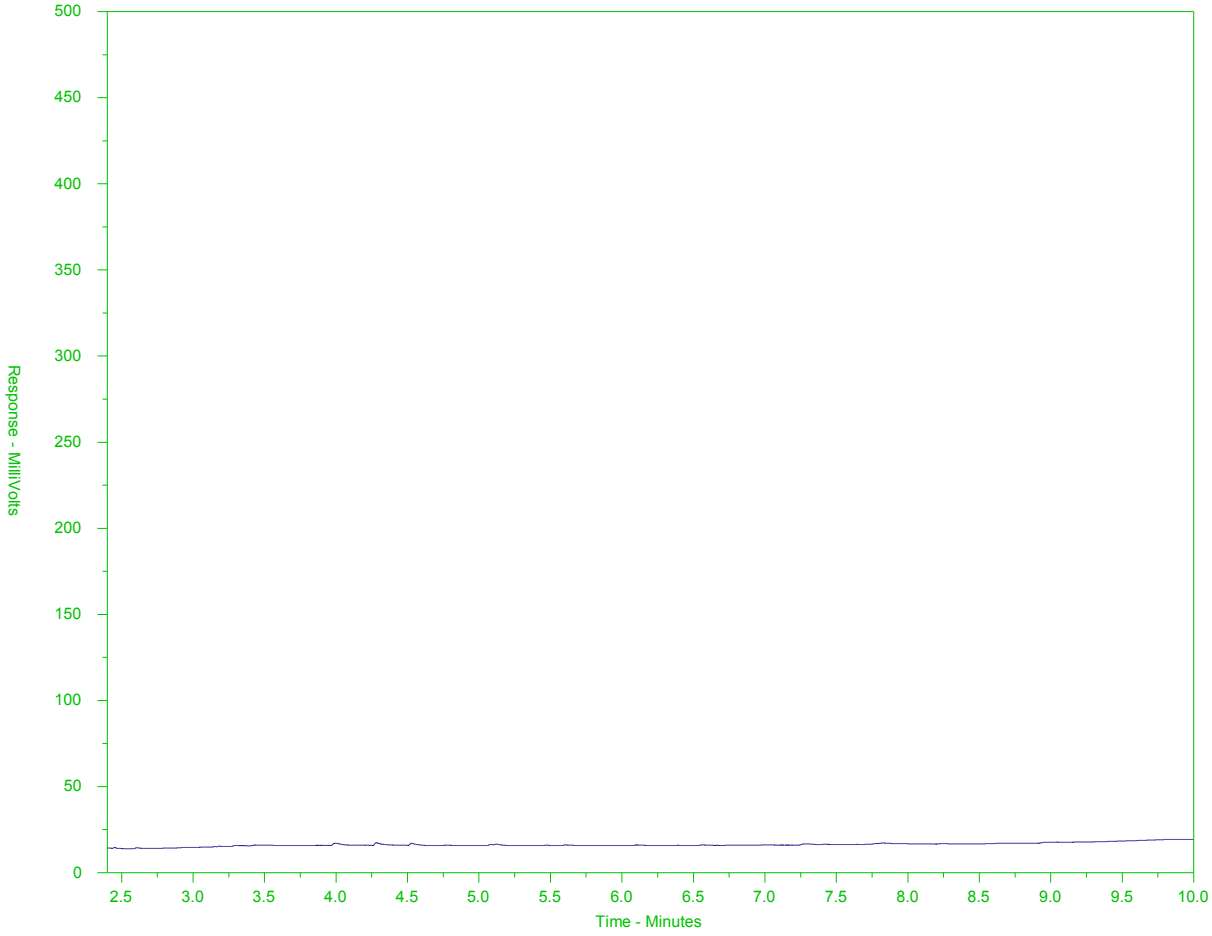
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2184929-9
Client Sample ID: MW14-04



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

ALS Environmental

Chain of Custody / Analy
Canada Toll Free: 1
www.alsglob

L2184929-COFC

COC #

Page 1 of 1

Report To		Report Format / Distribution	Service Requested (Rush for routine analysis subject to availability)
Company:	TECK Metals Ltd	☑ Standard ☐ Other	◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Michelle Unger	☑ PDF ☑ Excel ☑ Digital ☐ Fax	○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	601 Knightton Road	Email 1: amacphail@accessconsulting.ca, marieducharme	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Kimberly, BC	Email 2: michelle.unger@teck.com	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	250-427-8422 Fax:	Email 3:	
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information	
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #: TECK-18-01	
Company:		PO / AFE:	
Contact:		LSD:	
Address:			
Phone:		Quote #: Q62635	

Lab Work Order # (lab use only):

ALS Contact: Can Dang Sampler: A. MacPhail

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	pH, SPC, alkalinity, hardness	dissolved metals low level +Hg	Anions (nitrate, nitrite, sulphate, Cl, F, Br)	Ammonia	BTEX, LEPH, HEPH	VPH, PAH									Number of Containers
					F/P	F/P		P	P	P									
	MW13-01 (LP)	20-Oct-18	16:20	Groundwater	X	X	X	X											
	MW13-04 (LP)	18-Oct-18	17:30	Groundwater	X	X	X	X	X	X									
	MW13-05 (LP)			Groundwater	X	X	X	X	X	X									
	MW13-06 (LP)	19-Oct-18	10:53	Groundwater	X	X	X	X											
	MW13-07 (LP)	20-Oct-18	13:05	Groundwater	X	X	X	X	X	X									
	MW13-08 (LP)	19-Oct-18	14:40	Groundwater	X	X	X	X											
	MW13-10 (LP)	19-Oct-18	13:53	Groundwater	X	X	X	X	X	X									
	MW13-13 (LP)	19-Oct-18	9:47	Groundwater	X	X	X	X											
	MW14-01 (LP)	18-Oct-18	15:21	Groundwater	X	X	X	X	X	X									
	MW14-02 (LP)			Groundwater	X	X	X	X	X	X									
	MW14-03 (LP)			Groundwater	X	X	X	X	X	X									
	MW14-04 (LP)	19-Oct-18	14:50	Groundwater	X	X	X	X	X	X									
	MW-GW (LQR)	20-Oct-18	16:25	Groundwater	X	X	X	X	X	X									

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Yukon EQWin and ACC200 digital formats. **General A:** pH, EC, TSS (low) **General B:** pH, EC, TSS (low), anions-all
General C: pH, EC, TSS (low), anions-all, ion balance, alkalinity **General D:** pH, EC, TSS (low), SO4, ion balance, alkalinity **General E:** pH, EC, TSS (low), SO4, ion balance

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: Andrew MacPhail	Date (dd-mmm-yy): 22-Oct-18	Time (hh-mm): 13:00	Received by:	Date: OCT 22/18	Time: 13:02	Temperature: 2°/3 °C	Verified by:	Date:	Time:	Obse Observations: Yes / Yes / No ? If Ye If Yes add SIF

GENF 20.00 Front

TECK METALS LTD.
ATTN: Michelle Unger
601 Knightton Road
KIMBERLEY BC V1A 3E1

Date Received: 22-OCT-18
Report Date: 31-OCT-18 18:46 (MT)
Version: FINAL

Client Phone: 250-427-8404

Certificate of Analysis

Lab Work Order #: L2184945

Project P.O. #: TECK-18-1
Job Reference: TECK-18-1
C of C Numbers: 1 of 2, 2 of 2
Legal Site Desc:

Comments: The samples, "SDH-S2" and "TRIBEWF02", were not received.

Can Dang
Senior Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2184945-1 Water 18-OCT-18 14:00 MH-12	L2184945-2 Water 19-OCT-18 15:10 MH-04	L2184945-3 Water 20-OCT-18 10:45 MH-11	L2184945-4 Water 20-OCT-18 11:05 MH-29	L2184945-5 Water 18-OCT-18 16:25 MH-02
WATER						
Physical Tests	Conductivity (uS/cm)	303	301	363	319	794
	Hardness (as CaCO3) (mg/L)	168	161	202	177	433
	pH (pH)	8.36	8.33	8.36	8.35	8.21
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	192	185	233	207	581
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	162	151	188	181	238
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.25 DLDS
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<2.5 DLDS
	Fluoride (F) (mg/L)	0.120	0.154	0.085	0.049	<0.10 DLDS
	Nitrate (as N) (mg/L)	0.0343	0.215	0.0739	0.0380	<0.025 DLDS
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050
	Sulfate (SO4) (mg/L)	10.6	16.6	18.8	4.30	217
Total Metals	Aluminum (Al)-Total (mg/L)	0.0039	0.0489	0.0063	0.0043	<0.0030
	Antimony (Sb)-Total (mg/L)	0.00020	0.00015	0.00015	0.00016	<0.00010
	Arsenic (As)-Total (mg/L)	0.00076	0.00046	0.00052	0.00062	0.00032
	Barium (Ba)-Total (mg/L)	0.0765	0.0232	0.0636	0.0451	0.0340
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.0000345	0.000309	0.0000437	0.0000407	0.0000058
	Calcium (Ca)-Total (mg/L)	57.1	59.2	68.2	61.9	152
	Chromium (Cr)-Total (mg/L)	0.00014	0.00022	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00044
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	<0.010	0.080	0.048	<0.010	0.011
	Lead (Pb)-Total (mg/L)	0.000140	0.00155	0.000163	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	0.0014	0.0016	0.0015	0.0012	<0.0010
	Magnesium (Mg)-Total (mg/L)	6.08	3.51	8.53	6.05	15.1
	Manganese (Mn)-Total (mg/L)	0.00064	0.00312	0.00710	0.00174	0.0174
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.00127	0.000744	0.000913	0.000646	0.000255
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.43	0.41	0.47	0.25	2.29
	Selenium (Se)-Total (mg/L)	0.000650	0.000845	0.000770	0.000491	0.000085
	Silicon (Si)-Total (mg/L)	4.16	3.39	3.70	3.72	4.33

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2184945-6 Water 21-OCT-18 12:22 MH-13	L2184945-7 Water 21-OCT-18 11:40 MH-30	L2184945-8 Water 21-OCT-18 09:05 MH-15	L2184945-9 Water 18-OCT-18 16:40 MH-SW	L2184945-10 Water 20-OCT-18 14:35 MH-FB
WATER						
Physical Tests	Conductivity (uS/cm)	337	263	336	799	<2.0
	Hardness (as CaCO3) (mg/L)	191	150	192	440	<0.50
	pH (pH)	8.36	8.18	8.36	8.25	5.45
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	1.4	<1.0
	Total Dissolved Solids (mg/L)	206	154	209	580	<10
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	188	145	191	237	<1.0
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0086	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.25 DLDS	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<2.5 DLDS	<0.50
	Fluoride (F) (mg/L)	0.062	0.051	0.093	<0.10 DLDS	<0.020
	Nitrate (as N) (mg/L)	0.0312	0.0100	<0.0050	<0.025 DLDS	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0050 DLDS	<0.0010
	Sulfate (SO4) (mg/L)	10.4	5.13	4.62	227	<0.30
Total Metals	Aluminum (Al)-Total (mg/L)	0.0059	0.0047	0.0053	<0.0030	<0.0030
	Antimony (Sb)-Total (mg/L)	0.00011	<0.00010	0.00011	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00041	0.00027	0.00033	0.00033	<0.00010
	Barium (Ba)-Total (mg/L)	0.139	0.183	0.163	0.0337	<0.00010
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.0000118	0.0000310	0.0000075	0.0000052	<0.0000050
	Calcium (Ca)-Total (mg/L)	54.2	37.5	53.7	152	<0.050
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	0.00044	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.188	0.359	0.082	<0.010	<0.010
	Lead (Pb)-Total (mg/L)	<0.000050	0.000051	0.000234	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	0.0011	<0.0010	0.0011	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	13.5	13.5	13.2	15.0	<0.10
	Manganese (Mn)-Total (mg/L)	0.00758	0.0206	0.00758	0.0171	<0.00010
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000989	0.00121	0.00176	0.000251	<0.000050
	Nickel (Ni)-Total (mg/L)	<0.00050	0.00061	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.38	0.38	0.42	2.30	<0.10
	Selenium (Se)-Total (mg/L)	0.000540	0.000385	0.000436	0.000093	<0.000050
	Silicon (Si)-Total (mg/L)	3.26	2.92	3.79	4.21	<0.10

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2184945-11	L2184945-13	L2184945-14	L2184945-16	L2184945-17
Description	Water	Water	Water	Water	Water
Sampled Date		19-OCT-18	21-OCT-18	21-OCT-18	19-OCT-18
Sampled Time		11:25	11:00	10:05	16:10
Client ID	TRIP BLANK	MH-22	TRIBEWF01	TRIBEWF03	PH-01
Grouping / **Analyte**					
WATER					
Physical Tests					
Conductivity (uS/cm)	<2.0	295	319	339	311
Hardness (as CaCO3) (mg/L)	<0.50 HTC	150	179	189	163
pH (pH)	5.44	8.21	8.19	8.34	8.19
Total Suspended Solids (mg/L)	<1.0	<1.0	1.3	<1.0	<1.0
Total Dissolved Solids (mg/L)	<10	194	217	202	202
Anions and Nutrients					
Alkalinity, Total (as CaCO3) (mg/L)	<1.0	114	176	192	137
Ammonia, Total (as N) (mg/L)	<0.060 RRV	<0.0050	0.0064	0.0083	<0.0050
Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
Fluoride (F) (mg/L)	<0.020	1.30	0.087	0.094	0.240
Nitrate (as N) (mg/L)	<0.0050	0.134	<0.0050	0.0264	0.447
Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Sulfate (SO4) (mg/L)	<0.30	41.5	3.97	4.27	32.5
Total Metals					
Aluminum (Al)-Total (mg/L)	<0.0030	<0.0030	0.0040	0.0075	<0.0030
Antimony (Sb)-Total (mg/L)	<0.00010	0.00263	0.00013	0.00013	0.00015
Arsenic (As)-Total (mg/L)	<0.00010	0.00375	0.00101	0.00044	0.00063
Barium (Ba)-Total (mg/L)	<0.00010	0.0169	0.181	0.195	0.0189
Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Total (mg/L)	<0.0000050	0.00417	0.0000089	0.0000133	0.000736
Calcium (Ca)-Total (mg/L)	<0.050	50.0	53.3	55.1	59.1
Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00014
Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron (Fe)-Total (mg/L)	<0.010	<0.010	0.491	0.184	<0.010
Lead (Pb)-Total (mg/L)	<0.000050	0.000322	0.000068	<0.000050	0.00122
Lithium (Li)-Total (mg/L)	<0.0010	0.0058	0.0011	0.0011	0.0020
Magnesium (Mg)-Total (mg/L)	<0.10	6.81	10.6	12.7	4.08
Manganese (Mn)-Total (mg/L)	<0.00010	0.00012	0.0488	0.0152	0.00028
Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Total (mg/L)	<0.000050	0.00876	0.00180	0.00211	0.00108
Nickel (Ni)-Total (mg/L)	<0.00050	0.00352	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Total (mg/L)	<0.10	0.57	0.36	0.42	0.54
Selenium (Se)-Total (mg/L)	<0.000050	0.0145	0.000485	0.000609	0.00173
Silicon (Si)-Total (mg/L)	<0.10	4.53	4.59	3.88	3.47

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2184945-18 Water 19-OCT-18 15:30 CC-01	L2184945-19 Water 20-OCT-18 11:38 MH-27	L2184945-20 Water 20-OCT-18 12:16 MH-28	L2184945-21 Water 18-OCT-18 15:55 MH-23	L2184945-22 Water 18-OCT-18 14:25 NC-01
WATER						
Physical Tests	Conductivity (uS/cm)	250	379	383	269	302
	Hardness (as CaCO3) (mg/L)	132	210	209	146	166
	pH (pH)	8.28	8.37	8.35	8.34	8.37
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	2.2	<1.0
	Total Dissolved Solids (mg/L)	163	244	236	169	190
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	131	192	194	148	164
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	0.0055	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.059	0.095	0.111	0.137	0.121
	Nitrate (as N) (mg/L)	0.114	0.0976	0.134	0.0367	0.0508
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	0.0010	<0.0010	<0.0010
	Sulfate (SO4) (mg/L)	9.44	24.7	26.1	5.71	10.6
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0030	0.0050	0.0079	0.0181	0.0098
	Antimony (Sb)-Total (mg/L)	0.00014	0.00015	0.00016	0.00022	0.00021
	Arsenic (As)-Total (mg/L)	0.00042	0.00052	0.00050	0.00108	0.00080
	Barium (Ba)-Total (mg/L)	0.0116	0.0614	0.0551	0.0652	0.0763
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.0000928	0.0000479	0.000107	0.0000444	0.0000395
	Calcium (Ca)-Total (mg/L)	49.6	69.5	71.4	50.6	56.1
	Chromium (Cr)-Total (mg/L)	0.00021	<0.00010	<0.00010	0.00019	0.00017
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	0.00076	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	<0.010	0.069	0.161	0.054	0.015
	Lead (Pb)-Total (mg/L)	0.000264	0.000162	0.000576	0.00134	0.000285
	Lithium (Li)-Total (mg/L)	0.0012	0.0015	0.0016	0.0015	0.0014
	Magnesium (Mg)-Total (mg/L)	2.24	8.61	7.60	5.46	6.16
	Manganese (Mn)-Total (mg/L)	0.00012	0.0100	0.0264	0.0136	0.00178
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000670	0.00101	0.00102	0.00131	0.00131
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.32	0.56	0.64	0.34	0.42
	Selenium (Se)-Total (mg/L)	0.000328	0.000895	0.000973	0.000535	0.000675
	Silicon (Si)-Total (mg/L)	2.75	3.56	3.59	4.26	3.99

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2184945-23	L2184945-24			
	Description	Water	Water			
	Sampled Date	18-OCT-18	19-OCT-18			
	Sampled Time	12:40	12:30			
	Client ID	NC-02	MH-08			
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	291	254			
	Hardness (as CaCO3) (mg/L)	156	142			
	pH (pH)	8.19	8.33			
	Total Suspended Solids (mg/L)	4.0	10.0			
	Total Dissolved Solids (mg/L)	175	173			
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	157	138			
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050			
	Bromide (Br) (mg/L)	<0.050	<0.050			
	Chloride (Cl) (mg/L)	<0.50	<0.50			
	Fluoride (F) (mg/L)	0.113	0.308			
	Nitrate (as N) (mg/L)	<0.0050	0.0429			
	Nitrite (as N) (mg/L)	<0.0010	<0.0010			
	Sulfate (SO4) (mg/L)	8.78	5.54			
Total Metals	Aluminum (Al)-Total (mg/L)	0.0283	0.0559			
	Antimony (Sb)-Total (mg/L)	0.00015	0.00042			
	Arsenic (As)-Total (mg/L)	0.00053	0.00207			
	Barium (Ba)-Total (mg/L)	0.0592	0.0410			
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020			
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050			
	Boron (B)-Total (mg/L)	<0.010	<0.010			
	Cadmium (Cd)-Total (mg/L)	0.000183	0.0000828			
	Calcium (Ca)-Total (mg/L)	52.6	45.7			
	Chromium (Cr)-Total (mg/L)	<0.00010	0.00192			
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010			
	Copper (Cu)-Total (mg/L)	0.00100	<0.00050			
	Iron (Fe)-Total (mg/L)	0.188	0.102			
	Lead (Pb)-Total (mg/L)	0.000737	0.000254			
	Lithium (Li)-Total (mg/L)	0.0011	0.0026			
	Magnesium (Mg)-Total (mg/L)	5.76	5.18			
	Manganese (Mn)-Total (mg/L)	0.0157	0.00700			
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Total (mg/L)	0.000871	0.000710			
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050			
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050			
	Potassium (K)-Total (mg/L)	0.63	0.54			
	Selenium (Se)-Total (mg/L)	0.000325	0.00184			
	Silicon (Si)-Total (mg/L)	3.76	6.16			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2184945-1	L2184945-2	L2184945-3	L2184945-4	L2184945-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	18-OCT-18	19-OCT-18	20-OCT-18	20-OCT-18	18-OCT-18
	Sampled Time	14:00	15:10	10:45	11:05	16:25
	Client ID	MH-12	MH-04	MH-11	MH-29	MH-02
Grouping	**Analyte**					
WATER						
Total Metals	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	1.07	0.889	1.16	0.938	8.02
	Strontium (Sr)-Total (mg/L)	0.207	0.214	0.269	0.227	0.522
	Sulfur (S)-Total (mg/L)	3.69	5.93	6.76	1.63	83.7
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	0.00126	<0.00030	<0.00030	<0.00030
	Uranium (U)-Total (mg/L)	0.000883	0.000856	0.00111	0.000648	0.00166
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	0.0082	0.0034	<0.0030	0.0031
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0013	0.0019	0.0018	0.0023	<0.0010
	Antimony (Sb)-Dissolved (mg/L)	0.00020	0.00013	0.00013	0.00015	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00072	0.00039	0.00046	0.00059	0.00027
	Barium (Ba)-Dissolved (mg/L)	0.0764	0.0225	0.0632	0.0447	0.0330
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	0.0000310	0.000260	0.0000388	0.0000377	0.0000069
	Calcium (Ca)-Dissolved (mg/L)	57.0	58.9	66.5	60.8	149
	Chromium (Cr)-Dissolved (mg/L)	0.00015	0.00016	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00040
	Copper (Cu)-Dissolved (mg/L)	<0.00020	<0.00020	0.00027	0.00032	<0.00020
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	0.023	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	0.000107	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0014	0.0014	0.0014	0.0012	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	6.33	3.51	8.81	6.05	14.7
	Manganese (Mn)-Dissolved (mg/L)	0.00023	0.00040	0.00528	0.00136	0.0166
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.00127	0.000739	0.000884	0.000569	0.000264
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.45	0.41	0.47	0.25	2.30
	Selenium (Se)-Dissolved (mg/L)	0.000705	0.000815	0.000872	0.000461	0.000078
	Silicon (Si)-Dissolved (mg/L)	4.10	3.34	3.61	3.74	4.21

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2184945-6 Water 21-OCT-18 12:22 MH-13	L2184945-7 Water 21-OCT-18 11:40 MH-30	L2184945-8 Water 21-OCT-18 09:05 MH-15	L2184945-9 Water 18-OCT-18 16:40 MH-SW	L2184945-10 Water 20-OCT-18 14:35 MH-FB
WATER						
Total Metals	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.968	0.754	1.04	7.98	<0.050
	Strontium (Sr)-Total (mg/L)	0.197	0.107	0.174	0.536	<0.00020
	Sulfur (S)-Total (mg/L)	3.78	2.02	1.81	82.2	<0.50
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Total (mg/L)	0.00129	0.00107	0.000768	0.00161	<0.000010
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	0.0035	<0.0030	0.0031	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0014	0.0024	0.0014	<0.0010	<0.0010
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	0.00011	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00029	0.00018	0.00027	0.00026	<0.00010
	Barium (Ba)-Dissolved (mg/L)	0.138	0.181	0.165	0.0342	<0.00010
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	0.0000089	0.0000152	<0.0000050	0.0000072	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	54.9	37.6	54.5	151	<0.050
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	0.00040	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00022	0.00021	<0.00020	<0.00020	<0.00020
	Iron (Fe)-Dissolved (mg/L)	0.037	0.239	0.065	0.013	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	0.000068	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0010	<0.0010	0.0011	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	13.2	13.6	13.5	15.1	<0.10
	Manganese (Mn)-Dissolved (mg/L)	0.00496	0.0197	0.00631	0.0170	<0.00010
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000985	0.00123	0.00172	0.000269	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.39	0.35	0.43	2.39	<0.10
	Selenium (Se)-Dissolved (mg/L)	0.000524	0.000457	0.000471	0.000080	<0.000050
	Silicon (Si)-Dissolved (mg/L)	3.23	2.94	3.91	4.26	<0.050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2184945-11	L2184945-13	L2184945-14	L2184945-16	L2184945-17
Description	Water	Water	Water	Water	Water
Sampled Date		19-OCT-18	21-OCT-18	21-OCT-18	19-OCT-18
Sampled Time		11:25	11:00	10:05	16:10
Client ID	TRIP BLANK	MH-22	TRIBEWF01	TRIBEWF03	PH-01
Grouping / **Analyte**					
WATER					
Total Metals Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total (mg/L)	<0.050	0.864	0.960	1.02	0.789
Strontium (Sr)-Total (mg/L)	<0.00020	0.244	0.167	0.172	0.156
Sulfur (S)-Total (mg/L)	<0.50	14.6	1.50	1.56	11.5
Thallium (Tl)-Total (mg/L)	<0.000010	0.000018	<0.000010	<0.000010	<0.000010
Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium (U)-Total (mg/L)	<0.000010	0.00366	0.000606	0.000842	0.000977
Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total (mg/L)	<0.0030	0.759	<0.0030	0.0061	0.0135
Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals Dissolved Mercury Filtration Location		FIELD	FIELD	FIELD	FIELD
Dissolved Metals Filtration Location		FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved (mg/L)		0.0011	<0.0010	0.0013	<0.0010
Antimony (Sb)-Dissolved (mg/L)		0.00253	0.00012	0.00012	0.00013
Arsenic (As)-Dissolved (mg/L)		0.00366	0.00075	0.00033	0.00059
Barium (Ba)-Dissolved (mg/L)		0.0166	0.172	0.196	0.0185
Beryllium (Be)-Dissolved (mg/L)		<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Dissolved (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved (mg/L)		<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved (mg/L)		0.00407	0.0000064	0.0000085	0.000717
Calcium (Ca)-Dissolved (mg/L)		48.9	53.6	54.6	58.7
Chromium (Cr)-Dissolved (mg/L)		0.00013	<0.00010	<0.00010	0.00016
Cobalt (Co)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved (mg/L)		0.00030	<0.00020	<0.00020	<0.00020
Iron (Fe)-Dissolved (mg/L)		<0.010	0.168	0.085	<0.010
Lead (Pb)-Dissolved (mg/L)		0.000336	<0.000050	<0.000050	0.00102
Lithium (Li)-Dissolved (mg/L)		0.0057	0.0010	0.0011	0.0019
Magnesium (Mg)-Dissolved (mg/L)		6.86	11.0	12.7	4.02
Manganese (Mn)-Dissolved (mg/L)		0.00028	0.0487	0.0149	<0.00010
Mercury (Hg)-Dissolved (mg/L)		<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)		0.00847	0.00175	0.00209	0.00106
Nickel (Ni)-Dissolved (mg/L)		0.00352	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Dissolved (mg/L)		<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved (mg/L)		0.59	0.38	0.42	0.54
Selenium (Se)-Dissolved (mg/L)		0.0149	0.000398	0.000618	0.00177
Silicon (Si)-Dissolved (mg/L)		4.62	4.64	3.92	3.48

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2184945-18	L2184945-19	L2184945-20	L2184945-21	L2184945-22
	Description	Water	Water	Water	Water	Water
	Sampled Date	19-OCT-18	20-OCT-18	20-OCT-18	18-OCT-18	18-OCT-18
	Sampled Time	15:30	11:38	12:16	15:55	14:25
	Client ID	CC-01	MH-27	MH-28	MH-23	NC-01
Grouping	**Analyte**					
WATER						
Total Metals	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.786	1.18	1.14	0.891	1.03
	Strontium (Sr)-Total (mg/L)	0.207	0.278	0.290	0.183	0.217
	Sulfur (S)-Total (mg/L)	3.36	8.80	9.48	2.12	3.72
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	0.00061	<0.00030
	Uranium (U)-Total (mg/L)	0.000756	0.00124	0.00132	0.000683	0.000909
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	0.0036	0.0048	0.0122	0.0040	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	<0.0010	0.0018	0.0019	0.0014	0.0015
	Antimony (Sb)-Dissolved (mg/L)	0.00013	0.00014	0.00014	0.00020	0.00019
	Arsenic (As)-Dissolved (mg/L)	0.00039	0.00045	0.00038	0.00097	0.00076
	Barium (Ba)-Dissolved (mg/L)	0.0112	0.0624	0.0540	0.0677	0.0761
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	0.0000883	0.0000390	0.0000982	0.0000332	0.0000330
	Calcium (Ca)-Dissolved (mg/L)	48.9	70.2	71.1	49.5	56.2
	Chromium (Cr)-Dissolved (mg/L)	0.00019	<0.00010	<0.00010	0.00015	0.00017
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	<0.00020	0.00024	0.00026	<0.00020	<0.00020
	Iron (Fe)-Dissolved (mg/L)	<0.010	0.036	0.072	0.015	<0.010
	Lead (Pb)-Dissolved (mg/L)	0.000230	0.000054	0.000159	0.000123	0.000055
	Lithium (Li)-Dissolved (mg/L)	0.0011	0.0015	0.0015	0.0015	0.0014
	Magnesium (Mg)-Dissolved (mg/L)	2.31	8.34	7.56	5.50	6.12
	Manganese (Mn)-Dissolved (mg/L)	<0.00010	0.00868	0.0244	0.00988	0.00046
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000623	0.00101	0.000955	0.00126	0.00128
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.32	0.57	0.65	0.35	0.43
	Selenium (Se)-Dissolved (mg/L)	0.000275	0.000927	0.000879	0.000665	0.000793
	Silicon (Si)-Dissolved (mg/L)	2.82	3.64	3.56	4.16	4.07

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2184945-23	L2184945-24			
	Description	Water	Water			
	Sampled Date	18-OCT-18	19-OCT-18			
	Sampled Time	12:40	12:30			
	Client ID	NC-02	MH-08			
Grouping	**Analyte**					
WATER						
Total Metals	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Total (mg/L)	1.09	0.812			
	Strontium (Sr)-Total (mg/L)	0.193	0.158			
	Sulfur (S)-Total (mg/L)	3.05	1.96			
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010			
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Total (mg/L)	<0.00075 DLM	0.00149			
	Uranium (U)-Total (mg/L)	0.000542	0.000673			
	Vanadium (V)-Total (mg/L)	<0.00050	0.00069			
	Zinc (Zn)-Total (mg/L)	0.0047	0.0038			
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030			
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD			
	Dissolved Metals Filtration Location	FIELD	FIELD			
	Aluminum (Al)-Dissolved (mg/L)	0.0016	<0.0010			
	Antimony (Sb)-Dissolved (mg/L)	0.00013	0.00042			
	Arsenic (As)-Dissolved (mg/L)	0.00032	0.00200			
	Barium (Ba)-Dissolved (mg/L)	0.0668	0.0384			
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020			
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050			
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010			
	Cadmium (Cd)-Dissolved (mg/L)	0.000495 DTMF	0.0000634			
	Calcium (Ca)-Dissolved (mg/L)	52.8	48.2			
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	0.00048			
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010			
	Copper (Cu)-Dissolved (mg/L)	0.00133	<0.00020			
	Iron (Fe)-Dissolved (mg/L)	0.050	<0.010			
	Lead (Pb)-Dissolved (mg/L)	0.000259	<0.000050			
	Lithium (Li)-Dissolved (mg/L)	0.0011	0.0026			
	Magnesium (Mg)-Dissolved (mg/L)	5.94	5.27			
	Manganese (Mn)-Dissolved (mg/L)	0.0129	0.00204			
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Dissolved (mg/L)	0.000876	0.000733			
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050			
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050			
	Potassium (K)-Dissolved (mg/L)	0.88 DTMF	0.58			
	Selenium (Se)-Dissolved (mg/L)	0.000287	0.00189			
	Silicon (Si)-Dissolved (mg/L)	3.72	5.63			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2184945-1	L2184945-2	L2184945-3	L2184945-4	L2184945-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	18-OCT-18	19-OCT-18	20-OCT-18	20-OCT-18	18-OCT-18
	Sampled Time	14:00	15:10	10:45	11:05	16:25
	Client ID	MH-12	MH-04	MH-11	MH-29	MH-02
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.04	0.867	1.16	0.931	7.94
	Strontium (Sr)-Dissolved (mg/L)	0.214	0.208	0.255	0.218	0.516
	Sulfur (S)-Dissolved (mg/L)	3.52	5.63	6.55	1.46	77.5
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.000868	0.000818	0.00111	0.000647	0.00158
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0013	0.0053	0.0033	<0.0010	0.0032
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals	Chromium (III)-Total (mg/L)	0.00014	0.00022	<0.00010	<0.00010	<0.00010
	Hexavalent Chromium (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2184945-6	L2184945-7	L2184945-8	L2184945-9	L2184945-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	21-OCT-18	21-OCT-18	21-OCT-18	18-OCT-18	20-OCT-18
	Sampled Time	12:22	11:40	09:05	16:40	14:35
	Client ID	MH-13	MH-30	MH-15	MH-SW	MH-FB
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.973	0.711	1.07	8.28	<0.050
	Strontium (Sr)-Dissolved (mg/L)	0.198	0.108	0.169	0.539	<0.00020
	Sulfur (S)-Dissolved (mg/L)	3.47	1.73	1.67	77.2	<0.50
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.00126	0.00105	0.000728	0.00157	<0.000010
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	0.0011	0.0012	0.0033	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals	Chromium (III)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Hexavalent Chromium (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2184945-11	L2184945-13	L2184945-14	L2184945-16	L2184945-17
Description	Water	Water	Water	Water	Water
Sampled Date		19-OCT-18	21-OCT-18	21-OCT-18	19-OCT-18
Sampled Time		11:25	11:00	10:05	16:10
Client ID	TRIP BLANK	MH-22	TRIBEWF01	TRIBEWF03	PH-01
Grouping / **Analyte**					
WATER					
Dissolved Metals Silver (Ag)-Dissolved (mg/L)		<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved (mg/L)		0.895	0.996	1.09	0.768
Strontium (Sr)-Dissolved (mg/L)		0.240	0.164	0.170	0.155
Sulfur (S)-Dissolved (mg/L)		14.1	1.35	1.49	11.2
Thallium (Tl)-Dissolved (mg/L)		0.000016	<0.000010	<0.000010	<0.000010
Tin (Sn)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved (mg/L)		<0.00030	<0.00030	<0.00030	<0.00030
Uranium (U)-Dissolved (mg/L)		0.00355	0.000574	0.000820	0.000958
Vanadium (V)-Dissolved (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved (mg/L)		0.847	<0.0010	<0.0010	0.0144
Zirconium (Zr)-Dissolved (mg/L)		<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals Chromium (III)-Total (mg/L)		<0.00010	<0.00010	<0.00010	0.00014
Hexavalent Chromium (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2184945-18	L2184945-19	L2184945-20	L2184945-21	L2184945-22
	Description	Water	Water	Water	Water	Water
	Sampled Date	19-OCT-18	20-OCT-18	20-OCT-18	18-OCT-18	18-OCT-18
	Sampled Time	15:30	11:38	12:16	15:55	14:25
	Client ID	CC-01	MH-27	MH-28	MH-23	NC-01
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.806	1.21	1.17	0.883	1.04
	Strontium (Sr)-Dissolved (mg/L)	0.202	0.281	0.285	0.180	0.213
	Sulfur (S)-Dissolved (mg/L)	3.44	8.68	9.12	1.93	4.00
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.000726	0.00122	0.00130	0.000648	0.000889
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0041	0.0050	0.0122	0.0029	0.0017
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals	Chromium (III)-Total (mg/L)	0.00021	<0.00010	<0.00010	0.00019	0.00017
	Hexavalent Chromium (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2184945-23	L2184945-24			
	Description	Water	Water			
	Sampled Date	18-OCT-18	19-OCT-18			
	Sampled Time	12:40	12:30			
	Client ID	NC-02	MH-08			
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Dissolved (mg/L)	1.31	0.839			
	Strontium (Sr)-Dissolved (mg/L)	0.193	0.157			
	Sulfur (S)-Dissolved (mg/L)	3.07	1.67			
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010			
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030			
	Uranium (U)-Dissolved (mg/L)	0.000548	0.000671			
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Dissolved (mg/L)	0.0088	0.0016			
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030			
Speciated Metals	Chromium (III)-Total (mg/L)	<0.00010	0.00192			
	Hexavalent Chromium (mg/L)	<0.00050	<0.00050			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2184945-1, -10, -13, -14, -16, -17, -18, -19, -2, -20, -21, -22, -23, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2184945-24
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2184945-1, -10, -13, -14, -16, -17, -18, -19, -2, -20, -21, -22, -23, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2184945-24
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2184945-1, -10, -13, -14, -16, -17, -18, -19, -2, -20, -21, -22, -23, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2184945-24
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2184945-1, -10, -13, -14, -16, -17, -18, -19, -2, -20, -21, -22, -23, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2184945-24
Matrix Spike	Barium (Ba)-Total	MS-B	L2184945-1, -10, -11, -13, -14, -16, -17, -18, -19, -2, -20, -21, -22, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Boron (B)-Total	MS-B	L2184945-23, -24
Matrix Spike	Calcium (Ca)-Total	MS-B	L2184945-1, -10, -11, -13, -14, -16, -17, -18, -19, -2, -20, -21, -22, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2184945-1, -10, -11, -13, -14, -16, -17, -18, -19, -2, -20, -21, -22, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2184945-23, -24
Matrix Spike	Potassium (K)-Total	MS-B	L2184945-23, -24
Matrix Spike	Sodium (Na)-Total	MS-B	L2184945-23, -24
Matrix Spike	Strontium (Sr)-Total	MS-B	L2184945-1, -10, -11, -13, -14, -16, -17, -18, -19, -2, -20, -21, -22, -3, -4, -5, -6, -7, -8, -9

Qualifiers for Individual Parameters Listed:

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).
DTMF	Dissolved concentration exceeds total for field-filtered metals sample. Metallic contaminants may have been introduced to dissolved sample during field filtration.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". 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.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CR-CR3-TOT-CALC-ED	Water	Total Trivalent Chromium in Water	CALCULATION

Chromium (III)-Total is calculated as the difference between the total chromium and the total hexavalent chromium (Cr(VI)) results.The Limit of Reporting for Chromium (III) varies as a function of the test results.

CR-CR6-ED	Water	Chromium, Hexavalent (Cr +6)	APHA 3500-Cr C (Ion Chromatography)

Reference Information

This analysis is carried out using procedures adapted from method 3500-Cr C in "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1636 published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution.
Results are based on an un-filtered, field-preserved sample.

EC-PCT-VA Water Conductivity (Automated) APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA Water Conductivity Screen (Internal Use Only) APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water 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-VA 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-VA 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.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TSS-LOW-VA Water Total Suspended Solids by Grav. (1 mg/L) APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
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.

Reference Information

** 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
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

1 of 2 2 of 2

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.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

L2184945-COFC

COC Number: 15 -

Report To	Contact and company name below will appear on the final report
Company:	TECK Metals Ltd
Contact:	Michelle Unger
Phone:	250-4278422
	Company address below will appear on the final report
Street:	601 Knightton Road
City/Province:	Kimberly, BC
Postal Code:	V1A 3E1
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	
Contact:	

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: amacphail@accessconsulting.ca,mducharme@acc

Email 2: Michelle.unger@teck.com

Email 3:

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: Michelle.unger@teck.com

Email 2: roxanne.menear@teck.com

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

ALS Account # / Quote #:	Q62635
Job #:	TECK-18-1
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: Can Dang **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 (low level) + Hg	Dissolved Metals (low level) +Hg	pH, SPC, alkalinity, hardness	Anions(Nitrate, Nitrite, Sulphate, Cl, F, Br)	Ammonia	TDS, TSS(low)	Chromium Speciation	Number of Containers
					P	F/P		P	P		P	
	MH-12 (LP)	18-Oct-18	14:00	Water	R	R	R	R	R	R	R	8
	MH-04 (LP)	19-Oct-18	15:10	Water	R	R	R	R	R	R	R	8
	MH-11 (LP)	20-Oct-18	10:45	Water	R	R	R	R	R	R	R	8
	MH-29 (LP)	20-Oct-18	11:05	Water	R	R	R	R	R	R	R	8
	MH-02 (LP)	18-Oct-18	16:25	Water	R	R	R	R	R	R	R	8
	MH-13 (LP)	21-Oct-18	12:22	Water	R	R	R	R	R	R	R	8
	MH-30 (LP)	21-Oct-18	11:40	Water	R	R	R	R	R	R	R	8
	MH-15 (LP)	21-Oct-18	9:05	Water	R	R	R	R	R	R	R	8
	MH-SW (LQR)	18-Oct-18	16:40	Water	R	R	R	R	R	R	R	8
	MH-FB (LQFB)	20-Oct-18	14:35	Water	R	R	R	R	R	R		7
	Trip Blank (LQTB)	n/a	n/a	Water	R	R	R	R	R	R		7
	SDH-S2 (LP)			Water	R	R	R	R	R	R	R	8

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	13	2/2	2		6

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Andrew MacPhail	Date: 22-Oct-18	Time: 13:00	Received by:	Date: OCT 22, 2018	Time: 13:02	Received by: HD	Date: 10/23	Time: 12:48P

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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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

L2184945-COFC

COC Number: 15 -

Report To	Contact and company name below will appear on the final report
Company:	TECK Metals Ltd
Contact:	Michelle Unger
Phone:	250-4278422
	Company address below will appear on the final report
Street:	601 Knightton Road
City/Province:	Kimberly, BC
Postal Code:	V1A 3E1
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	
Contact:	

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	scott@accessconsulting.ca, chenry@accessconsu
Email 2	amacphail@accessconsulting.ca,mducharme@acc
Email 3	Michelle.unger@teck.com

Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	Michelle.unger@teck.com
Email 2	roxanne.menear@teck.com

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 #:	Q62635	AFE/Cost Center:	PO#
Job #:	TECK-18-1	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	

ALS Lab Work Order # (lab use only)		ALS Contact: Can Dang	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 (low level) + Hg	Dissolved Metals (low level) +Hg	pH, SPC, alkalinity, hardness	Anions(Nitrate, Nitrite, Sulphate, Cl, F, Br)	Ammonia	TDS, TSS(low)	Chromium Speciation						Number of Containers
					P	F/P		P	P		P						
	MH-22 (LP)	19-Oct-18	11:25	Water	R	R	R	R	R	R	R						8
	TRIBEWF01 (LM)	21-Oct-18	11:00	Water	R	R	R	R	R	R	R						8
	TRIBEWF02 (LM)			Water	R	R	R	R	R	R	R						8
	TRIBEWF03 (LM)	21-Oct-18	10:05	Water	R	R	R	R	R	R	R						8
	PH-01 (LM)	19-Oct-18	16:10	Water	R	R	R	R	R	R	R						8
	CC-01 (LM)	19-Oct-18	15:30	Water	R	R	R	R	R	R	R						8
	MH-27 (LM)	20-Oct-18	11:38	Water	R	R	R	R	R	R	R						8
	MH-28 (LM)	20-Oct-18	12:16	Water	R	R	R	R	R	R	R						8
	MH-23 (LM)	18-Oct-18	15:55	Water	R	R	R	R	R	R	R						8
	NC-01 (LM)	18-Oct-18	14:25	Water	R	R	R	R	R	R	R						8
	NC-02 (LM)	18-Oct-18	12:40	Water	R	R	R	R	R	R	R						8
	MH-08 (LM)	19-Oct-18	12:30	Water	R	R	R	R	R	R	R						8

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

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Andrew MacPhail	Date: 22-Oct-18	Time: 13:00	Received by:	Date:	Time:	Received by: HA	Date: 10/23	Time: 12148

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**.

TECK METALS LTD.
ATTN: Michelle Unger
601 Knightton Road
KIMBERLEY BC V1A 3E1

Date Received: 06-DEC-18
Report Date: 18-DEC-18 18:17 (MT)
Version: FINAL

Client Phone: 250-427-8404

Certificate of Analysis

Lab Work Order #: L2206836

Project P.O. #: NOT SUBMITTED
Job Reference: TECK-18-1
C of C Numbers: 1 of 3, 2 of 3, 3 of 3
Legal Site Desc:

Can Dang
Senior Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2206836-1 Water 01-DEC-18 16:55 MH-12 (LP)	L2206836-2 Water 02-DEC-18 15:03 MH-04 (LP)	L2206836-3 Water 03-DEC-18 12:33 MH-11 (LP)	L2206836-4 Water 03-DEC-18 13:05 MH-29 (LP)	L2206836-5 Water 03-DEC-18 15:52 MH-02 (LP)
WATER						
Physical Tests	Conductivity (uS/cm)	322	302	382	340	1050
	Hardness (as CaCO3) (mg/L)	153	163	207	186	572
	pH (pH)	8.30	8.29	8.30	8.31	8.02
	Total Suspended Solids (mg/L)	1.3	1.5	<1.0	<1.0	18.1
	Total Dissolved Solids (mg/L)	209	197	234	216	784
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	165	152	201	191	300
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	0.0059
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.25 DLDS
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<2.5 DLDS
	Fluoride (F) (mg/L)	0.112	0.149	0.088	0.051	<0.10 DLDS
	Nitrate (as N) (mg/L)	0.103	0.243	0.125	0.103	<0.025 DLDS
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	0.0052
	Sulfate (SO4) (mg/L)	10.9	15.7	14.4	4.61	317
Total Metals	Aluminum (Al)-Total (mg/L)	0.0042	0.0047	0.0046	0.0061	0.166
	Antimony (Sb)-Total (mg/L)	0.00020	0.00015	0.00013	0.00016	0.00011
	Arsenic (As)-Total (mg/L)	0.00065	0.00037	0.00044	0.00047	0.00323
	Barium (Ba)-Total (mg/L)	0.0704	0.0221	0.0640	0.0459	0.0644
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.0000363	0.000260	0.0000435	0.0000424	0.000104
	Calcium (Ca)-Total (mg/L)	60.5	61.2	71.9	67.6	219
	Chromium (Cr)-Total (mg/L)	<0.00030 DLB	<0.00040 DLB	<0.00020 DLB	<0.00010	0.00033
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00120
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	0.00059
	Iron (Fe)-Total (mg/L)	<0.010	<0.010	<0.040 DLB	0.018	1.11
	Lead (Pb)-Total (mg/L)	0.000086	0.000190	0.000104	<0.000050	0.00938
	Lithium (Li)-Total (mg/L)	0.0013	0.0015	0.0016	0.0013	0.0016
	Magnesium (Mg)-Total (mg/L)	6.32	3.39	8.20	5.96	20.5
	Manganese (Mn)-Total (mg/L)	<0.00040 DLB	<0.00070 DLB	0.00806	0.00362	0.858
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.000025 DLM
	Molybdenum (Mo)-Total (mg/L)	0.00131	0.000727	0.000832	0.000591	0.000217
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	0.00079
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.40	0.39	0.38	0.23	1.46
	Selenium (Se)-Total (mg/L)	0.000716	0.00105	0.000734	0.000667	0.000098
	Silicon (Si)-Total (mg/L)	3.78	3.26	3.64	3.69	5.21

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2206836-6 Water 04-DEC-18 13:33 MH-13 (LP)	L2206836-7 Water 04-DEC-18 13:00 MH-30 (LP)	L2206836-8 Water 04-DEC-18 09:52 MH-15 (LP)	L2206836-9 Water 03-DEC-18 12:40 MH-SW (LQR)	L2206836-10 Water 05-DEC-18 10:50 MH-FB (LQTB)
WATER						
Physical Tests	Conductivity (uS/cm)	359	297	372	383	<2.0
	Hardness (as CaCO3) (mg/L)	197	161	211	208	<0.50
	pH (pH)	8.28	8.15	8.25	8.31	5.44
	Total Suspended Solids (mg/L)	<1.0	1.3	3.9	<1.0	<1.0
	Total Dissolved Solids (mg/L)	235	176	228	234	<10
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	201	161	207	197	<1.0
	Ammonia, Total (as N) (mg/L)	0.0070	0.0162	0.0088	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.058	0.050	0.091	0.087	<0.020
	Nitrate (as N) (mg/L)	0.0886	0.0437	0.0585	0.125	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sulfate (SO4) (mg/L)	8.57	5.08	3.88	14.5	<0.30
Total Metals	Aluminum (Al)-Total (mg/L)	0.0062	0.0069	0.0046	0.0038	<0.0030
	Antimony (Sb)-Total (mg/L)	0.00011	<0.00010	0.00012	0.00013	<0.00010
	Arsenic (As)-Total (mg/L)	0.00034	0.00024	0.00030	0.00044	<0.00010
	Barium (Ba)-Total (mg/L)	0.153	0.208	0.193	0.0620	<0.00010
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.0000166	0.0000273	0.0000059	0.0000366	<0.0000050
	Calcium (Ca)-Total (mg/L)	58.6	42.4	62.8	71.4	<0.050
	Chromium (Cr)-Total (mg/L)	<0.00030 DLB	<0.00020 DLB	<0.00020 DLB	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.172	0.458	0.184	<0.040 DLB	<0.010
	Lead (Pb)-Total (mg/L)	0.000161	0.000142	<0.000050	0.000099	<0.000050
	Lithium (Li)-Total (mg/L)	0.0011	<0.0010	0.0012	0.0016	<0.0010
	Magnesium (Mg)-Total (mg/L)	15.5	15.4	14.4	8.19	<0.10
	Manganese (Mn)-Total (mg/L)	0.00952	0.0251	0.0161	0.00797	<0.00010
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.00103	0.00139	0.00196	0.000818	<0.000050
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.40	0.33	0.38	0.39	<0.10
	Selenium (Se)-Total (mg/L)	0.000681	0.000488	0.000668	0.000706	<0.000050
	Silicon (Si)-Total (mg/L)	3.27	3.23	4.13	3.62	<0.10

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2206836-11	L2206836-12	L2206836-13	L2206836-14	L2206836-15
Description	Water	Water	Water	Water	Water
Sampled Date		02-DEC-18	04-DEC-18	04-DEC-18	02-DEC-18
Sampled Time		13:55	12:25	11:15	16:16
Client ID	TRIP BLANK (LQTB)	MH-22 (LP)	TRIBEWF01 (LM)	TRIBEWF03 (LM)	PH-01 (LM)
Grouping / **Analyte**					
WATER					
Physical Tests					
Conductivity (uS/cm)	<2.0	299	389	355	312
Hardness (as CaCO3) (mg/L)	<0.50 HTC	149	208	200	173
pH (pH)	5.49	8.18	8.14	8.32	8.25
Total Suspended Solids (mg/L)	<1.0	<1.0	4.5	6.7	<1.0
Total Dissolved Solids (mg/L)	<10	183	251	218	203
Anions and Nutrients					
Alkalinity, Total (as CaCO3) (mg/L)	<1.0	115	221	206	138
Ammonia, Total (as N) (mg/L)	<0.010 RRV	<0.0050	0.0531	0.0131	0.0065
Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
Fluoride (F) (mg/L)	<0.020	1.31	0.081	0.090	0.233
Nitrate (as N) (mg/L)	<0.0050	0.133	0.0076	0.0659	0.439
Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Sulfate (SO4) (mg/L)	<0.30	42.4	2.39	3.60	30.2
Total Metals					
Aluminum (Al)-Total (mg/L)	<0.0030	<0.0030	0.0084	0.0101	<0.0030
Antimony (Sb)-Total (mg/L)	<0.00010	0.00267	<0.00010	0.00014	0.00014
Arsenic (As)-Total (mg/L)	<0.00010	0.00363	0.00275	0.00050	0.00062
Barium (Ba)-Total (mg/L)	<0.00010	0.0159	0.199	0.207	0.0176
Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Total (mg/L)	<0.0000050	0.00442	0.0000072	0.0000196	0.000737
Calcium (Ca)-Total (mg/L)	<0.050	49.8	65.5	60.4	58.9
Chromium (Cr)-Total (mg/L)	0.00020 RRV	<0.00020 DLB	<0.00010	<0.00020 DLB	0.00018
Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	0.00021	<0.00010	<0.00010
Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron (Fe)-Total (mg/L)	<0.010	<0.010	1.71	0.413	<0.010
Lead (Pb)-Total (mg/L)	<0.000050	0.000380	0.000053	<0.000050	0.00113
Lithium (Li)-Total (mg/L)	<0.0010	0.0058	0.0012	0.0012	0.0020
Magnesium (Mg)-Total (mg/L)	<0.10	6.74	13.3	13.3	4.09
Manganese (Mn)-Total (mg/L)	<0.00010	<0.00020 DLB	0.130	0.0251	<0.00010
Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Total (mg/L)	<0.000050	0.00920	0.00113	0.00214	0.00104
Nickel (Ni)-Total (mg/L)	<0.00050	0.00340	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Total (mg/L)	<0.10	0.59	0.36	0.40	0.57
Selenium (Se)-Total (mg/L)	<0.000050	0.0156	0.000300	0.000720	0.00193
Silicon (Si)-Total (mg/L)	<0.10	4.38	5.59	4.14	3.31

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2206836-16	L2206836-17	L2206836-18	L2206836-19	L2206836-20
Description	Water	Water	Water	Water	Water
Sampled Date	02-DEC-18	03-DEC-18	03-DEC-18	02-DEC-18	02-DEC-18
Sampled Time	15:54	14:07	14:43	12:03	11:23
Client ID	CC-01 (LM)	MH-27 (LM)	MH-28 (LM)	MH-23 (LM)	NC-01 (LM)
Grouping / **Analyte**					
WATER					
Physical Tests					
Conductivity (uS/cm)	255	390	379	279	321
Hardness (as CaCO3) (mg/L)	143	218	213	156	183
pH (pH)	8.30	8.32	8.35	8.30	8.36
Total Suspended Solids (mg/L)	2.5	1.3	<1.0	<1.0	1.0
Total Dissolved Solids (mg/L)	174	238	239	172	200
Anions and Nutrients					
Alkalinity, Total (as CaCO3) (mg/L)	133	201	195	150	169
Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	0.0061	<0.0050	<0.0050
Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
Fluoride (F) (mg/L)	0.060	0.099	0.116	0.129	0.111
Nitrate (as N) (mg/L)	0.129	0.144	0.174	0.0863	0.109
Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Sulfate (SO4) (mg/L)	9.19	18.1	17.8	5.13	10.9
Total Metals					
Aluminum (Al)-Total (mg/L)	0.0139	0.0048	0.0141	0.0144	0.0100
Antimony (Sb)-Total (mg/L)	0.00014	0.00014	0.00013	0.00021	0.00020
Arsenic (As)-Total (mg/L)	0.00048	0.00041	0.00040	0.00091	0.00076
Barium (Ba)-Total (mg/L)	0.0106	0.0649	0.0562	0.0629	0.0731
Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Total (mg/L)	0.000101	0.0000469	0.0000804	0.0000442	0.0000374
Calcium (Ca)-Total (mg/L)	50.9	74.6	73.1	50.3	60.9
Chromium (Cr)-Total (mg/L)	<0.00030 DLB	<0.00010	<0.00010	<0.00020 DLB	0.00018
Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron (Fe)-Total (mg/L)	<0.020 DLB	<0.070 DLB	0.139	<0.040 DLB	0.012
Lead (Pb)-Total (mg/L)	0.000904	0.000170	0.000674	0.000849	0.000270
Lithium (Li)-Total (mg/L)	0.0012	0.0016	0.0015	0.0014	0.0014
Magnesium (Mg)-Total (mg/L)	2.21	8.34	6.38	5.77	6.70
Manganese (Mn)-Total (mg/L)	<0.00090 DLB	0.0160	0.0270	0.0106	0.00115
Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Total (mg/L)	0.000699	0.000861	0.000827	0.00126	0.00131
Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Total (mg/L)	0.33	0.48	0.52	0.33	0.42
Selenium (Se)-Total (mg/L)	0.000335	0.000755	0.000817	0.000730	0.000814
Silicon (Si)-Total (mg/L)	2.62	3.75	3.63	4.07	3.93

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2206836-21	L2206836-22	L2206836-23	L2206836-24	L2206836-25
Description	Water	Water	Water	Water	Water
Sampled Date	01-DEC-18	02-DEC-18	05-DEC-18	05-DEC-18	03-DEC-18
Sampled Time	16:15	14:30	09:56	10:39	16:48
Client ID	NC-02 (LM)	MH-08 (LM)	MW13-01 (LP)	MW13-04 (LP)	MW13-13 (LP)
Grouping / **Analyte**					
WATER					
Physical Tests					
Conductivity (uS/cm)	330	253	302	310	246
Hardness (as CaCO3) (mg/L)	199	147	172	196	140
pH (pH)	8.03	8.21	7.76	8.05	7.96
Total Suspended Solids (mg/L)	<1.0	<1.0			
Total Dissolved Solids (mg/L)	212	158			
Anions and Nutrients					
Alkalinity, Total (as CaCO3) (mg/L)	159	133	149	167	107
Ammonia, Total (as N) (mg/L)	0.0080	<0.0050	<0.0050	0.0167	0.0325
Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
Fluoride (F) (mg/L)	0.105	0.307	0.348	0.052	0.159
Nitrate (as N) (mg/L)	<0.0050	0.105	0.385	0.924	0.764
Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Sulfate (SO4) (mg/L)	10.5	5.27	10.7	4.41	20.9
Total Metals					
Aluminum (Al)-Total (mg/L)	0.0065	0.0058			
Antimony (Sb)-Total (mg/L)	0.00014	0.00041			
Arsenic (As)-Total (mg/L)	0.00065	0.00234			
Barium (Ba)-Total (mg/L)	0.0748	0.0383			
Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020			
Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050			
Boron (B)-Total (mg/L)	<0.010	<0.010			
Cadmium (Cd)-Total (mg/L)	0.0000226	0.0000757			
Calcium (Ca)-Total (mg/L)	66.0	48.0			
Chromium (Cr)-Total (mg/L)	<0.00010	0.00075			
Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010			
Copper (Cu)-Total (mg/L)	<0.00050	<0.00050			
Iron (Fe)-Total (mg/L)	0.277	<0.010			
Lead (Pb)-Total (mg/L)	0.000505	<0.000050			
Lithium (Li)-Total (mg/L)	0.0012	0.0028			
Magnesium (Mg)-Total (mg/L)	6.82	5.32			
Manganese (Mn)-Total (mg/L)	0.154	0.00038			
Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050			
Molybdenum (Mo)-Total (mg/L)	0.000800	0.000719			
Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050			
Phosphorus (P)-Total (mg/L)	<0.050	<0.050			
Potassium (K)-Total (mg/L)	0.61	0.47			
Selenium (Se)-Total (mg/L)	0.000266	0.00196			
Silicon (Si)-Total (mg/L)	4.18	5.65			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2206836-26				
	Description	Water				
	Sampled Date	05-DEC-18				
	Sampled Time	10:00				
	Client ID	MWGW (LQR)				
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	303				
	Hardness (as CaCO3) (mg/L)	176				
	pH (pH)	7.79				
	Total Suspended Solids (mg/L)					
	Total Dissolved Solids (mg/L)					
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	152				
	Ammonia, Total (as N) (mg/L)	<0.0050				
	Bromide (Br) (mg/L)	<0.050				
	Chloride (Cl) (mg/L)	<0.50				
	Fluoride (F) (mg/L)	0.340				
	Nitrate (as N) (mg/L)	0.394				
	Nitrite (as N) (mg/L)	<0.0010				
	Sulfate (SO4) (mg/L)	10.7				
Total Metals	Aluminum (Al)-Total (mg/L)					
	Antimony (Sb)-Total (mg/L)					
	Arsenic (As)-Total (mg/L)					
	Barium (Ba)-Total (mg/L)					
	Beryllium (Be)-Total (mg/L)					
	Bismuth (Bi)-Total (mg/L)					
	Boron (B)-Total (mg/L)					
	Cadmium (Cd)-Total (mg/L)					
	Calcium (Ca)-Total (mg/L)					
	Chromium (Cr)-Total (mg/L)					
	Cobalt (Co)-Total (mg/L)					
	Copper (Cu)-Total (mg/L)					
	Iron (Fe)-Total (mg/L)					
	Lead (Pb)-Total (mg/L)					
	Lithium (Li)-Total (mg/L)					
	Magnesium (Mg)-Total (mg/L)					
	Manganese (Mn)-Total (mg/L)					
	Mercury (Hg)-Total (mg/L)					
	Molybdenum (Mo)-Total (mg/L)					
	Nickel (Ni)-Total (mg/L)					
	Phosphorus (P)-Total (mg/L)					
	Potassium (K)-Total (mg/L)					
	Selenium (Se)-Total (mg/L)					
	Silicon (Si)-Total (mg/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2206836-1	L2206836-2	L2206836-3	L2206836-4	L2206836-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	01-DEC-18	02-DEC-18	03-DEC-18	03-DEC-18	03-DEC-18
	Sampled Time	16:55	15:03	12:33	13:05	15:52
	Client ID	MH-12 (LP)	MH-04 (LP)	MH-11 (LP)	MH-29 (LP)	MH-02 (LP)
Grouping	**Analyte**					
WATER						
Total Metals	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	0.000017
	Sodium (Na)-Total (mg/L)	0.981	0.831	1.15	0.885	10.8
	Strontium (Sr)-Total (mg/L)	0.217	0.210	0.278	0.229	0.705
	Sulfur (S)-Total (mg/L)	4.04	5.96	5.44	1.87	120
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	0.00313
	Uranium (U)-Total (mg/L)	0.00104	0.000909	0.00115	0.000733	0.00214
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0060 DLB	<0.012 DLB	<0.0090 DLB	<0.0030	0.0360
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0013	0.0013	0.0016	0.0017	<0.0010
	Antimony (Sb)-Dissolved (mg/L)	0.00015	<0.00010	0.00010	0.00012	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00053	0.00034	0.00036	0.00046	0.00054
	Barium (Ba)-Dissolved (mg/L)	0.0713	0.0248	0.0705	0.0515	0.0550
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	0.0000343	0.000249	0.0000360	0.0000380	0.0000137
	Calcium (Ca)-Dissolved (mg/L)	52.1	59.6	69.6	65.2	200
	Chromium (Cr)-Dissolved (mg/L)	0.00012	0.00011	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00057
	Copper (Cu)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	0.00023	<0.00020
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	0.015	0.019	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0013	0.0015	0.0016	0.0013	0.0012
	Magnesium (Mg)-Dissolved (mg/L)	5.57	3.32	7.96	5.69	17.8
	Manganese (Mn)-Dissolved (mg/L)	<0.00010	0.00023	0.00714	0.00231	0.109
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.00110	0.000687	0.000811	0.000559	0.000150
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.38	0.39	0.40	0.23	1.33
	Selenium (Se)-Dissolved (mg/L)	0.000854	0.000802	0.000701	0.000593	<0.000050
	Silicon (Si)-Dissolved (mg/L)	3.36	3.20	3.78	3.68	4.80

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2206836-6	L2206836-7	L2206836-8	L2206836-9	L2206836-10
Description	Water	Water	Water	Water	Water
Sampled Date	04-DEC-18	04-DEC-18	04-DEC-18	03-DEC-18	05-DEC-18
Sampled Time	13:33	13:00	09:52	12:40	10:50
Client ID	MH-13 (LP)	MH-30 (LP)	MH-15 (LP)	MH-SW (LQR)	MH-FB (LQTB)
Grouping / **Analyte**					
WATER					
Total Metals Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total (mg/L)	1.00	0.720	1.06	1.13	<0.050
Strontium (Sr)-Total (mg/L)	0.201	0.115	0.191	0.272	<0.00020
Sulfur (S)-Total (mg/L)	3.58	2.14	1.71	5.40	<0.50
Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium (U)-Total (mg/L)	0.00141	0.00130	0.000888	0.00120	<0.000010
Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total (mg/L)	<0.0060 DLB	<0.0060 DLB	<0.0030	<0.0060 DLB	<0.0030
Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved (mg/L)	0.0011	0.0017	0.0010	0.0013	<0.0010
Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	0.00033 DTMF	0.00011	<0.00010
Arsenic (As)-Dissolved (mg/L)	0.00019	0.00017	0.00018	0.00035	<0.00010
Barium (Ba)-Dissolved (mg/L)	0.151	0.208	0.201	0.0703	0.00025 RRV
Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved (mg/L)	0.0000117	0.0000202	0.0000054	0.0000368	<0.0000050
Calcium (Ca)-Dissolved (mg/L)	56.2	41.0	62.3	70.5	<0.050
Chromium (Cr)-Dissolved (mg/L)	0.00016	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved (mg/L)	0.00021	0.00026	<0.00020	<0.00020	<0.00020
Iron (Fe)-Dissolved (mg/L)	0.018	0.154	0.032	0.016	<0.010
Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Dissolved (mg/L)	0.0012	<0.0010	0.0013	0.0016	<0.0010
Magnesium (Mg)-Dissolved (mg/L)	13.7	14.2	13.5	7.84	<0.10
Manganese (Mn)-Dissolved (mg/L)	0.00645	0.0236	0.0126	0.00712	<0.00010
Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)	0.000947	0.00123	0.00191	0.000799	<0.000050
Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved (mg/L)	0.38	0.35	0.40	0.38	<0.10
Selenium (Se)-Dissolved (mg/L)	0.000616	0.000424	0.000642	0.000637	<0.000050
Silicon (Si)-Dissolved (mg/L)	3.35	3.23	4.27	3.70	<0.050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2206836-11	L2206836-12	L2206836-13	L2206836-14	L2206836-15
Description	Water	Water	Water	Water	Water
Sampled Date		02-DEC-18	04-DEC-18	04-DEC-18	02-DEC-18
Sampled Time		13:55	12:25	11:15	16:16
Client ID	TRIP BLANK (LQTB)	MH-22 (LP)	TRIBEWF01 (LM)	TRIBEWF03 (LM)	PH-01 (LM)
Grouping / **Analyte**					
WATER					
Total Metals Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total (mg/L)	<0.050	0.809	1.10	1.04	0.748
Strontium (Sr)-Total (mg/L)	<0.00020	0.257	0.204	0.185	0.154
Sulfur (S)-Total (mg/L)	<0.50	14.7	1.11	1.55	10.7
Thallium (Tl)-Total (mg/L)	<0.000010	0.000016	<0.000010	<0.000010	<0.000010
Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium (U)-Total (mg/L)	<0.000010	0.00380	0.000573	0.000963	0.00105
Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total (mg/L)	<0.0030	0.783	<0.0030	<0.0030	0.0128
Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals Dissolved Mercury Filtration Location		FIELD	FIELD	FIELD	FIELD
Dissolved Metals Filtration Location		FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved (mg/L)		<0.0010	<0.0010	0.0012	0.0010
Antimony (Sb)-Dissolved (mg/L)		0.00249	<0.00010	0.00012	0.00014
Arsenic (As)-Dissolved (mg/L)		0.00331	0.00128	0.00026	0.00055
Barium (Ba)-Dissolved (mg/L)		0.0176	0.182	0.199	0.0195
Beryllium (Be)-Dissolved (mg/L)		<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Dissolved (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved (mg/L)		<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved (mg/L)		0.00430	0.0000090	0.0000103	0.000741
Calcium (Ca)-Dissolved (mg/L)		49.4	63.5	59.8	62.6
Chromium (Cr)-Dissolved (mg/L)		<0.00010	<0.00010	0.00012	0.00019
Cobalt (Co)-Dissolved (mg/L)		<0.00010	0.00019	<0.00010	<0.00010
Copper (Cu)-Dissolved (mg/L)		<0.00020	<0.00020	<0.00020	<0.00020
Iron (Fe)-Dissolved (mg/L)		<0.010	0.252	0.045	<0.010
Lead (Pb)-Dissolved (mg/L)		0.000339	<0.000050	<0.000050	0.00109
Lithium (Li)-Dissolved (mg/L)		0.0059	0.0012	0.0012	0.0021
Magnesium (Mg)-Dissolved (mg/L)		6.27	12.1	12.3	3.96
Manganese (Mn)-Dissolved (mg/L)		<0.00010	0.123	0.0183	<0.00010
Mercury (Hg)-Dissolved (mg/L)		<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)		0.00853	0.00108	0.00222	0.00111
Nickel (Ni)-Dissolved (mg/L)		0.00337	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Dissolved (mg/L)		<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved (mg/L)		0.57	0.43	0.37	0.56
Selenium (Se)-Dissolved (mg/L)		0.0135	0.000218	0.000674	0.00161
Silicon (Si)-Dissolved (mg/L)		4.24	5.16	4.07	3.30

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2206836-16 Water 02-DEC-18 15:54 CC-01 (LM)	L2206836-17 Water 03-DEC-18 14:07 MH-27 (LM)	L2206836-18 Water 03-DEC-18 14:43 MH-28 (LM)	L2206836-19 Water 02-DEC-18 12:03 MH-23 (LM)	L2206836-20 Water 02-DEC-18 11:23 NC-01 (LM)
WATER						
Total Metals	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.768	1.23	1.11	0.854	1.03
	Strontium (Sr)-Total (mg/L)	0.212	0.282	0.269	0.189	0.221
	Sulfur (S)-Total (mg/L)	3.54	6.79	6.89	2.05	4.33
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	0.00032	<0.00030	0.00042	0.00046	0.00070
	Uranium (U)-Total (mg/L)	0.000801	0.00129	0.00127	0.000680	0.00100
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0060 DLB	<0.0090 DLB	0.0136	<0.0090 DLB	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	<0.0010	0.0011	0.0011	0.0012	0.0011
	Antimony (Sb)-Dissolved (mg/L)	0.00015	0.00012	0.00013	0.00019	0.00019
	Arsenic (As)-Dissolved (mg/L)	0.00038	0.00031	0.00026	0.00075	0.00063
	Barium (Ba)-Dissolved (mg/L)	0.0121	0.0688	0.0562	0.0667	0.0762
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	0.000100	0.0000432	0.0000771	0.0000382	0.0000402
	Calcium (Ca)-Dissolved (mg/L)	53.5	75.1	75.5	53.5	63.2
	Chromium (Cr)-Dissolved (mg/L)	0.00023	<0.00010	<0.00010	0.00016	0.00022
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	0.00029
	Iron (Fe)-Dissolved (mg/L)	<0.010	0.024	0.028	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	0.000273	<0.000050	0.000053	0.000128	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0012	0.0016	0.0015	0.0014	0.0013
	Magnesium (Mg)-Dissolved (mg/L)	2.28	7.53	6.04	5.50	6.11
	Manganese (Mn)-Dissolved (mg/L)	<0.00010	0.0123	0.0247	0.00901	0.00013
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000741	0.000848	0.000819	0.00120	0.00128
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.33	0.46	0.50	0.30	0.40
	Selenium (Se)-Dissolved (mg/L)	0.000248	0.000599	0.000736	0.000580	0.000701
	Silicon (Si)-Dissolved (mg/L)	2.63	3.55	3.58	3.90	3.76

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2206836-21	L2206836-22	L2206836-23	L2206836-24	L2206836-25
Description	Water	Water	Water	Water	Water
Sampled Date	01-DEC-18	02-DEC-18	05-DEC-18	05-DEC-18	03-DEC-18
Sampled Time	16:15	14:30	09:56	10:39	16:48
Client ID	NC-02 (LM)	MH-08 (LM)	MW13-01 (LP)	MW13-04 (LP)	MW13-13 (LP)
Grouping / **Analyte**					
WATER					
Total Metals Silver (Ag)-Total (mg/L)	<0.000010	<0.000010			
Sodium (Na)-Total (mg/L)	1.24	0.795			
Strontium (Sr)-Total (mg/L)	0.231	0.158			
Sulfur (S)-Total (mg/L)	3.79	1.80			
Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010			
Tin (Sn)-Total (mg/L)	<0.00010	<0.00010			
Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030			
Uranium (U)-Total (mg/L)	0.000496	0.000688			
Vanadium (V)-Total (mg/L)	<0.00050	<0.00050			
Zinc (Zn)-Total (mg/L)	0.0899	<0.0030			
Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030			
Dissolved Metals Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved (mg/L)	0.0010	<0.0010	0.0011	0.0040	0.0073
Antimony (Sb)-Dissolved (mg/L)	0.00011	0.00040	0.00012	0.00024	0.00015
Arsenic (As)-Dissolved (mg/L)	0.00065	0.00214	0.00032	0.00090	0.00047
Barium (Ba)-Dissolved (mg/L)	0.0795	0.0402	0.0233	0.0485	0.0134
Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved (mg/L)	0.0000255	0.0000648	0.000770	0.000364	0.000515
Calcium (Ca)-Dissolved (mg/L)	68.6	50.5	62.4	71.1	52.9
Chromium (Cr)-Dissolved (mg/L)	<0.00010	0.00070	0.00032	0.00054	0.00022
Cobalt (Co)-Dissolved (mg/L)	0.00012	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved (mg/L)	0.00029	<0.00020	0.00030	0.00088	0.00055
Iron (Fe)-Dissolved (mg/L)	0.048	<0.010	<0.010	<0.010	<0.010
Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	0.000871	0.000296	0.000241
Lithium (Li)-Dissolved (mg/L)	0.0012	0.0028	0.0015	0.0015	<0.0010
Magnesium (Mg)-Dissolved (mg/L)	6.68	5.06	3.88	4.54	2.03
Manganese (Mn)-Dissolved (mg/L)	0.225 DTMF	<0.00010	0.00131	0.00024	0.00027
Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)	0.000857	0.000700	0.000563	0.000687	0.000427
Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved (mg/L)	0.76	0.46	0.69	0.54	0.74
Selenium (Se)-Dissolved (mg/L)	0.000265	0.00177	0.00124	0.000707	0.000476
Silicon (Si)-Dissolved (mg/L)	4.19	5.65	3.28	3.52	2.63

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2206836-26				
	Description	Water				
	Sampled Date	05-DEC-18				
	Sampled Time	10:00				
	Client ID	MWGW (LQR)				
Grouping	**Analyte**					
WATER						
Total Metals	Silver (Ag)-Total (mg/L)					
	Sodium (Na)-Total (mg/L)					
	Strontium (Sr)-Total (mg/L)					
	Sulfur (S)-Total (mg/L)					
	Thallium (Tl)-Total (mg/L)					
	Tin (Sn)-Total (mg/L)					
	Titanium (Ti)-Total (mg/L)					
	Uranium (U)-Total (mg/L)					
	Vanadium (V)-Total (mg/L)					
	Zinc (Zn)-Total (mg/L)					
	Zirconium (Zr)-Total (mg/L)					
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD				
	Dissolved Metals Filtration Location	FIELD				
	Aluminum (Al)-Dissolved (mg/L)	0.0017				
	Antimony (Sb)-Dissolved (mg/L)	0.00013				
	Arsenic (As)-Dissolved (mg/L)	0.00032				
	Barium (Ba)-Dissolved (mg/L)	0.0245				
	Beryllium (Be)-Dissolved (mg/L)	<0.000020				
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050				
	Boron (B)-Dissolved (mg/L)	<0.010				
	Cadmium (Cd)-Dissolved (mg/L)	0.000794				
	Calcium (Ca)-Dissolved (mg/L)	64.0				
	Chromium (Cr)-Dissolved (mg/L)	0.00036				
	Cobalt (Co)-Dissolved (mg/L)	<0.00010				
	Copper (Cu)-Dissolved (mg/L)	0.00029				
	Iron (Fe)-Dissolved (mg/L)	<0.010				
	Lead (Pb)-Dissolved (mg/L)	0.000934				
	Lithium (Li)-Dissolved (mg/L)	0.0015				
	Magnesium (Mg)-Dissolved (mg/L)	3.95				
	Manganese (Mn)-Dissolved (mg/L)	0.00134				
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050				
	Molybdenum (Mo)-Dissolved (mg/L)	0.000527				
	Nickel (Ni)-Dissolved (mg/L)	<0.00050				
	Phosphorus (P)-Dissolved (mg/L)	<0.050				
	Potassium (K)-Dissolved (mg/L)	0.70				
	Selenium (Se)-Dissolved (mg/L)	0.00113				
	Silicon (Si)-Dissolved (mg/L)	3.36				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2206836-1	L2206836-2	L2206836-3	L2206836-4	L2206836-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	01-DEC-18	02-DEC-18	03-DEC-18	03-DEC-18	03-DEC-18
	Sampled Time	16:55	15:03	12:33	13:05	15:52
	Client ID	MH-12 (LP)	MH-04 (LP)	MH-11 (LP)	MH-29 (LP)	MH-02 (LP)
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.993	0.914	1.30	0.979	10.3
	Strontium (Sr)-Dissolved (mg/L)	0.191	0.199	0.262	0.223	0.666
	Sulfur (S)-Dissolved (mg/L)	3.12	5.26	4.86	1.60	105
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.000904	0.000936	0.00121	0.000688	0.00197
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0013	0.0044	0.0039	0.0017	0.0110
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals	Chromium (III)-Total (mg/L)	<0.00030	<0.00040	<0.00020	<0.00010	0.00033
	Hexavalent Chromium (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Volatile Organic Compounds	Benzene (mg/L)					
	Ethylbenzene (mg/L)					
	Methyl t-butyl ether (MTBE) (mg/L)					
	Styrene (mg/L)					
	Toluene (mg/L)					
	ortho-Xylene (mg/L)					
	meta- & para-Xylene (mg/L)					
	Xylenes (mg/L)					
	Surrogate: 4-Bromofluorobenzene (SS) (%)					
	Surrogate: 1,4-Difluorobenzene (SS) (%)					
Hydrocarbons	EPH10-19 (mg/L)					
	EPH19-32 (mg/L)					
	LEPH (mg/L)					
	HEPH (mg/L)					
	Volatile Hydrocarbons (VH6-10) (mg/L)					
	VPH (C6-C10) (mg/L)					
	Surrogate: 2-Bromobenzotrifluoride (%)					
	Surrogate: 3,4-Dichlorotoluene (SS) (%)					
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)					
	Acenaphthylene (mg/L)					
	Acridine (mg/L)					
	Anthracene (mg/L)					
	Benz(a)anthracene (mg/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2206836-6	L2206836-7	L2206836-8	L2206836-9	L2206836-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	04-DEC-18	04-DEC-18	04-DEC-18	03-DEC-18	05-DEC-18
	Sampled Time	13:33	13:00	09:52	12:40	10:50
	Client ID	MH-13 (LP)	MH-30 (LP)	MH-15 (LP)	MH-SW (LQR)	MH-FB (LQTB)
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.07	0.843	1.22	1.27	<0.050
	Strontium (Sr)-Dissolved (mg/L)	0.195	0.110	0.189	0.268	<0.00020
	Sulfur (S)-Dissolved (mg/L)	2.96	1.63	1.35	4.67	<0.50
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.00143	0.00131	0.000957	0.00125	<0.000010
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0012	0.0028	<0.0010	0.0035	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals	Chromium (III)-Total (mg/L)	<0.00030	<0.00020	<0.00020	<0.00010	
	Hexavalent Chromium (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
Volatile Organic Compounds	Benzene (mg/L)					
	Ethylbenzene (mg/L)					
	Methyl t-butyl ether (MTBE) (mg/L)					
	Styrene (mg/L)					
	Toluene (mg/L)					
	ortho-Xylene (mg/L)					
	meta- & para-Xylene (mg/L)					
	Xylenes (mg/L)					
	Surrogate: 4-Bromofluorobenzene (SS) (%)					
	Surrogate: 1,4-Difluorobenzene (SS) (%)					
Hydrocarbons	EPH10-19 (mg/L)					
	EPH19-32 (mg/L)					
	LEPH (mg/L)					
	HEPH (mg/L)					
	Volatile Hydrocarbons (VH6-10) (mg/L)					
	VPH (C6-C10) (mg/L)					
	Surrogate: 2-Bromobenzotrifluoride (%)					
	Surrogate: 3,4-Dichlorotoluene (SS) (%)					
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)					
	Acenaphthylene (mg/L)					
	Acridine (mg/L)					
	Anthracene (mg/L)					
	Benz(a)anthracene (mg/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2206836-11	L2206836-12	L2206836-13	L2206836-14	L2206836-15
Description	Water	Water	Water	Water	Water
Sampled Date		02-DEC-18	04-DEC-18	04-DEC-18	02-DEC-18
Sampled Time		13:55	12:25	11:15	16:16
Client ID	TRIP BLANK (LQTB)	MH-22 (LP)	TRIBEWF01 (LM)	TRIBEWF03 (LM)	PH-01 (LM)
Grouping / **Analyte**					
WATER					
Dissolved Metals Silver (Ag)-Dissolved (mg/L)		<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved (mg/L)		0.891	1.24	1.07	0.817
Strontium (Sr)-Dissolved (mg/L)		0.236	0.192	0.196	0.172
Sulfur (S)-Dissolved (mg/L)		12.6	0.70	1.33	9.49
Thallium (Tl)-Dissolved (mg/L)		0.000015	<0.000010	<0.000010	<0.000010
Tin (Sn)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved (mg/L)		<0.00030	<0.00030	<0.00030	<0.00030
Uranium (U)-Dissolved (mg/L)		0.00382	0.000566	0.00102	0.00118
Vanadium (V)-Dissolved (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved (mg/L)		0.791	0.0012	<0.0010	0.0159
Zirconium (Zr)-Dissolved (mg/L)		<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals Chromium (III)-Total (mg/L)		<0.00020	<0.00010	<0.00020	0.00018
Hexavalent Chromium (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050
Volatile Organic Compounds Benzene (mg/L)					
Ethylbenzene (mg/L)					
Methyl t-butyl ether (MTBE) (mg/L)					
Styrene (mg/L)					
Toluene (mg/L)					
ortho-Xylene (mg/L)					
meta- & para-Xylene (mg/L)					
Xylenes (mg/L)					
Surrogate: 4-Bromofluorobenzene (SS) (%)					
Surrogate: 1,4-Difluorobenzene (SS) (%)					
Hydrocarbons EPH10-19 (mg/L)					
EPH19-32 (mg/L)					
LEPH (mg/L)					
HEPH (mg/L)					
Volatile Hydrocarbons (VH6-10) (mg/L)					
VPH (C6-C10) (mg/L)					
Surrogate: 2-Bromobenzotrifluoride (%)					
Surrogate: 3,4-Dichlorotoluene (SS) (%)					
Polycyclic Aromatic Hydrocarbons Acenaphthene (mg/L)					
Acenaphthylene (mg/L)					
Acridine (mg/L)					
Anthracene (mg/L)					
Benz(a)anthracene (mg/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2206836-16	L2206836-17	L2206836-18	L2206836-19	L2206836-20
	Description	Water	Water	Water	Water	Water
	Sampled Date	02-DEC-18	03-DEC-18	03-DEC-18	02-DEC-18	02-DEC-18
	Sampled Time	15:54	14:07	14:43	12:03	11:23
	Client ID	CC-01 (LM)	MH-27 (LM)	MH-28 (LM)	MH-23 (LM)	NC-01 (LM)
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.850	1.29	1.18	0.890	1.08
	Strontium (Sr)-Dissolved (mg/L)	0.232	0.294	0.286	0.188	0.226
	Sulfur (S)-Dissolved (mg/L)	2.97	5.38	5.70	1.64	3.45
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.000899	0.00140	0.00138	0.000766	0.00109
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0041	0.0058	0.0113	0.0047	0.0031
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals	Chromium (III)-Total (mg/L)	<0.00030	<0.00010	<0.00010	<0.00020	0.00018
	Hexavalent Chromium (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Volatile Organic Compounds	Benzene (mg/L)					
	Ethylbenzene (mg/L)					
	Methyl t-butyl ether (MTBE) (mg/L)					
	Styrene (mg/L)					
	Toluene (mg/L)					
	ortho-Xylene (mg/L)					
	meta- & para-Xylene (mg/L)					
	Xylenes (mg/L)					
	Surrogate: 4-Bromofluorobenzene (SS) (%)					
	Surrogate: 1,4-Difluorobenzene (SS) (%)					
Hydrocarbons	EPH10-19 (mg/L)					
	EPH19-32 (mg/L)					
	LEPH (mg/L)					
	HEPH (mg/L)					
	Volatile Hydrocarbons (VH6-10) (mg/L)					
	VPH (C6-C10) (mg/L)					
	Surrogate: 2-Bromobenzotrifluoride (%)					
	Surrogate: 3,4-Dichlorotoluene (SS) (%)					
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)					
	Acenaphthylene (mg/L)					
	Acridine (mg/L)					
	Anthracene (mg/L)					
	Benz(a)anthracene (mg/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2206836-21	L2206836-22	L2206836-23	L2206836-24	L2206836-25
Description	Water	Water	Water	Water	Water
Sampled Date	01-DEC-18	02-DEC-18	05-DEC-18	05-DEC-18	03-DEC-18
Sampled Time	16:15	14:30	09:56	10:39	16:48
Client ID	NC-02 (LM)	MH-08 (LM)	MW13-01 (LP)	MW13-04 (LP)	MW13-13 (LP)
Grouping / **Analyte**					
WATER					
Dissolved Metals Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved (mg/L)	1.35	0.838	0.871	2.57	0.739
Strontium (Sr)-Dissolved (mg/L)	0.241	0.164	0.183	0.173	0.0899
Sulfur (S)-Dissolved (mg/L)	2.79	1.40	3.38	1.37	6.20
Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium (U)-Dissolved (mg/L)	0.000589	0.000745	0.000886	0.000982	0.000596
Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved (mg/L)	0.0616	0.0019	0.0325	0.0074	0.0093
Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals Chromium (III)-Total (mg/L)	<0.00010	0.00075			
Hexavalent Chromium (mg/L)	<0.00050	<0.00050			
Volatile Organic Compounds Benzene (mg/L)				<0.00050	
Ethylbenzene (mg/L)				<0.00050	
Methyl t-butyl ether (MTBE) (mg/L)				<0.00050	
Styrene (mg/L)				<0.00050	
Toluene (mg/L)				<0.00045	
ortho-Xylene (mg/L)				<0.00050	
meta- & para-Xylene (mg/L)				<0.00050	
Xylenes (mg/L)				<0.00075	
Surrogate: 4-Bromofluorobenzene (SS) (%)				111.8	
Surrogate: 1,4-Difluorobenzene (SS) (%)				110.8	
Hydrocarbons EPH10-19 (mg/L)				<0.25	
EPH19-32 (mg/L)				<0.25	
LEPH (mg/L)				<0.25	
HEPH (mg/L)				<0.25	
Volatile Hydrocarbons (VH6-10) (mg/L)				<0.10	
VPH (C6-C10) (mg/L)				<0.10	
Surrogate: 2-Bromobenzotrifluoride (%)				99.2	
Surrogate: 3,4-Dichlorotoluene (SS) (%)				92.3	
Polycyclic Aromatic Hydrocarbons Acenaphthene (mg/L)				<0.000010	
Acenaphthylene (mg/L)				<0.000010	
Acridine (mg/L)				<0.000010	
Anthracene (mg/L)				<0.000010	
Benz(a)anthracene (mg/L)				<0.000010	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2206836-26				
	Description	Water				
	Sampled Date	05-DEC-18				
	Sampled Time	10:00				
	Client ID	MWGW (LQR)				
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010				
	Sodium (Na)-Dissolved (mg/L)	0.896				
	Strontium (Sr)-Dissolved (mg/L)	0.184				
	Sulfur (S)-Dissolved (mg/L)	3.35				
	Thallium (Tl)-Dissolved (mg/L)	<0.000010				
	Tin (Sn)-Dissolved (mg/L)	<0.00010				
	Titanium (Ti)-Dissolved (mg/L)	<0.00030				
	Uranium (U)-Dissolved (mg/L)	0.000881				
	Vanadium (V)-Dissolved (mg/L)	<0.00050				
	Zinc (Zn)-Dissolved (mg/L)	0.0327				
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030				
Speciated Metals	Chromium (III)-Total (mg/L)					
	Hexavalent Chromium (mg/L)					
Volatile Organic Compounds	Benzene (mg/L)					
	Ethylbenzene (mg/L)					
	Methyl t-butyl ether (MTBE) (mg/L)					
	Styrene (mg/L)					
	Toluene (mg/L)					
	ortho-Xylene (mg/L)					
	meta- & para-Xylene (mg/L)					
	Xylenes (mg/L)					
	Surrogate: 4-Bromofluorobenzene (SS) (%)					
	Surrogate: 1,4-Difluorobenzene (SS) (%)					
Hydrocarbons	EPH10-19 (mg/L)					
	EPH19-32 (mg/L)					
	LEPH (mg/L)					
	HEPH (mg/L)					
	Volatile Hydrocarbons (VH6-10) (mg/L)					
	VPH (C6-C10) (mg/L)					
	Surrogate: 2-Bromobenzotrifluoride (%)					
	Surrogate: 3,4-Dichlorotoluene (SS) (%)					
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)					
	Acenaphthylene (mg/L)					
	Acridine (mg/L)					
	Anthracene (mg/L)					
	Benz(a)anthracene (mg/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2206836-1	L2206836-2	L2206836-3	L2206836-4	L2206836-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	01-DEC-18	02-DEC-18	03-DEC-18	03-DEC-18	03-DEC-18
	Sampled Time	16:55	15:03	12:33	13:05	15:52
	Client ID	MH-12 (LP)	MH-04 (LP)	MH-11 (LP)	MH-29 (LP)	MH-02 (LP)
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Benzo(a)pyrene (mg/L)					
	Benzo(b&j)fluoranthene (mg/L)					
	Benzo(b+j+k)fluoranthene (mg/L)					
	Benzo(g,h,i)perylene (mg/L)					
	Benzo(k)fluoranthene (mg/L)					
	Chrysene (mg/L)					
	Dibenz(a,h)anthracene (mg/L)					
	Fluoranthene (mg/L)					
	Fluorene (mg/L)					
	Indeno(1,2,3-c,d)pyrene (mg/L)					
	1-Methylnaphthalene (mg/L)					
	2-Methylnaphthalene (mg/L)					
	Naphthalene (mg/L)					
	Phenanthrene (mg/L)					
	Pyrene (mg/L)					
	Quinoline (mg/L)					
	Surrogate: Acridine d9 (%)					
	Surrogate: Chrysene d12 (%)					
	Surrogate: Naphthalene d8 (%)					
	Surrogate: Phenanthrene d10 (%)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2206836-6	L2206836-7	L2206836-8	L2206836-9	L2206836-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	04-DEC-18	04-DEC-18	04-DEC-18	03-DEC-18	05-DEC-18
	Sampled Time	13:33	13:00	09:52	12:40	10:50
	Client ID	MH-13 (LP)	MH-30 (LP)	MH-15 (LP)	MH-SW (LQR)	MH-FB (LQTB)
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Benzo(a)pyrene (mg/L)					
	Benzo(b&j)fluoranthene (mg/L)					
	Benzo(b+j+k)fluoranthene (mg/L)					
	Benzo(g,h,i)perylene (mg/L)					
	Benzo(k)fluoranthene (mg/L)					
	Chrysene (mg/L)					
	Dibenz(a,h)anthracene (mg/L)					
	Fluoranthene (mg/L)					
	Fluorene (mg/L)					
	Indeno(1,2,3-c,d)pyrene (mg/L)					
	1-Methylnaphthalene (mg/L)					
	2-Methylnaphthalene (mg/L)					
	Naphthalene (mg/L)					
	Phenanthrene (mg/L)					
	Pyrene (mg/L)					
	Quinoline (mg/L)					
	Surrogate: Acridine d9 (%)					
	Surrogate: Chrysene d12 (%)					
	Surrogate: Naphthalene d8 (%)					
	Surrogate: Phenanthrene d10 (%)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2206836-11	L2206836-12	L2206836-13	L2206836-14	L2206836-15
	Description	Water	Water	Water	Water	Water
	Sampled Date		02-DEC-18	04-DEC-18	04-DEC-18	02-DEC-18
	Sampled Time		13:55	12:25	11:15	16:16
	Client ID	TRIP BLANK (LQTB)	MH-22 (LP)	TRIBEWF01 (LM)	TRIBEWF03 (LM)	PH-01 (LM)
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Benzo(a)pyrene (mg/L)					
	Benzo(b&j)fluoranthene (mg/L)					
	Benzo(b+j+k)fluoranthene (mg/L)					
	Benzo(g,h,i)perylene (mg/L)					
	Benzo(k)fluoranthene (mg/L)					
	Chrysene (mg/L)					
	Dibenz(a,h)anthracene (mg/L)					
	Fluoranthene (mg/L)					
	Fluorene (mg/L)					
	Indeno(1,2,3-c,d)pyrene (mg/L)					
	1-Methylnaphthalene (mg/L)					
	2-Methylnaphthalene (mg/L)					
	Naphthalene (mg/L)					
	Phenanthrene (mg/L)					
	Pyrene (mg/L)					
	Quinoline (mg/L)					
	Surrogate: Acridine d9 (%)					
	Surrogate: Chrysene d12 (%)					
	Surrogate: Naphthalene d8 (%)					
	Surrogate: Phenanthrene d10 (%)					

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2206836-16	L2206836-17	L2206836-18	L2206836-19	L2206836-20
	Description	Water	Water	Water	Water	Water
	Sampled Date	02-DEC-18	03-DEC-18	03-DEC-18	02-DEC-18	02-DEC-18
	Sampled Time	15:54	14:07	14:43	12:03	11:23
	Client ID	CC-01 (LM)	MH-27 (LM)	MH-28 (LM)	MH-23 (LM)	NC-01 (LM)
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Benzo(a)pyrene (mg/L)					
	Benzo(b&j)fluoranthene (mg/L)					
	Benzo(b+j+k)fluoranthene (mg/L)					
	Benzo(g,h,i)perylene (mg/L)					
	Benzo(k)fluoranthene (mg/L)					
	Chrysene (mg/L)					
	Dibenz(a,h)anthracene (mg/L)					
	Fluoranthene (mg/L)					
	Fluorene (mg/L)					
	Indeno(1,2,3-c,d)pyrene (mg/L)					
	1-Methylnaphthalene (mg/L)					
	2-Methylnaphthalene (mg/L)					
	Naphthalene (mg/L)					
	Phenanthrene (mg/L)					
	Pyrene (mg/L)					
	Quinoline (mg/L)					
	Surrogate: Acridine d9 (%)					
	Surrogate: Chrysene d12 (%)					
	Surrogate: Naphthalene d8 (%)					
	Surrogate: Phenanthrene d10 (%)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2206836-21	L2206836-22	L2206836-23	L2206836-24	L2206836-25
	Description	Water	Water	Water	Water	Water
	Sampled Date	01-DEC-18	02-DEC-18	05-DEC-18	05-DEC-18	03-DEC-18
	Sampled Time	16:15	14:30	09:56	10:39	16:48
	Client ID	NC-02 (LM)	MH-08 (LM)	MW13-01 (LP)	MW13-04 (LP)	MW13-13 (LP)
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Benzo(a)pyrene (mg/L)				<0.0000050	
	Benzo(b&j)fluoranthene (mg/L)				<0.000010	
	Benzo(b+j+k)fluoranthene (mg/L)				<0.000015	
	Benzo(g,h,i)perylene (mg/L)				<0.000010	
	Benzo(k)fluoranthene (mg/L)				<0.000010	
	Chrysene (mg/L)				<0.000010	
	Dibenz(a,h)anthracene (mg/L)				<0.0000050	
	Fluoranthene (mg/L)				<0.000010	
	Fluorene (mg/L)				<0.000010	
	Indeno(1,2,3-c,d)pyrene (mg/L)				<0.000010	
	1-Methylnaphthalene (mg/L)				<0.000050	
	2-Methylnaphthalene (mg/L)				<0.000050	
	Naphthalene (mg/L)				<0.000050	
	Phenanthrene (mg/L)				<0.000020	
	Pyrene (mg/L)				<0.000010	
	Quinoline (mg/L)				<0.000050	
	Surrogate: Acridine d9 (%)				96.8	
	Surrogate: Chrysene d12 (%)				99.4	
	Surrogate: Naphthalene d8 (%)				91.7	
	Surrogate: Phenanthrene d10 (%)				98.2	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2206836-26				
	Description	Water				
	Sampled Date	05-DEC-18				
	Sampled Time	10:00				
	Client ID	MWGW (LQR)				
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Benzo(a)pyrene (mg/L)					
	Benzo(b&j)fluoranthene (mg/L)					
	Benzo(b+j+k)fluoranthene (mg/L)					
	Benzo(g,h,i)perylene (mg/L)					
	Benzo(k)fluoranthene (mg/L)					
	Chrysene (mg/L)					
	Dibenz(a,h)anthracene (mg/L)					
	Fluoranthene (mg/L)					
	Fluorene (mg/L)					
	Indeno(1,2,3-c,d)pyrene (mg/L)					
	1-Methylnaphthalene (mg/L)					
	2-Methylnaphthalene (mg/L)					
	Naphthalene (mg/L)					
	Phenanthrene (mg/L)					
	Pyrene (mg/L)					
	Quinoline (mg/L)					
	Surrogate: Acridine d9 (%)					
	Surrogate: Chrysene d12 (%)					
	Surrogate: Naphthalene d8 (%)					
	Surrogate: Phenanthrene d10 (%)					

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Arsenic (As)-Total	MB-LOR	L2206836-10, -11, -15, -18, -20, -4, -5
Method Blank	Bismuth (Bi)-Total	MB-LOR	L2206836-10, -11, -15, -18, -20, -4, -5
Method Blank	Cadmium (Cd)-Total	MB-LOR	L2206836-10, -11, -15, -18, -20, -4, -5
Method Blank	Chromium (Cr)-Total	MB-LOR	L2206836-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -3, -5, -6, -7, -8, -9
Method Blank	Iron (Fe)-Total	MB-LOR	L2206836-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -3, -5, -6, -7, -8, -9
Method Blank	Magnesium (Mg)-Total	MB-LOR	L2206836-10, -11, -15, -18, -20, -4, -5
Method Blank	Manganese (Mn)-Total	MB-LOR	L2206836-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -3, -5, -6, -7, -8, -9
Method Blank	Selenium (Se)-Total	MB-LOR	L2206836-10, -11, -15, -18, -20, -4, -5
Method Blank	Thallium (Tl)-Total	MB-LOR	L2206836-10, -11, -15, -18, -20, -4, -5
Method Blank	Zinc (Zn)-Total	MB-LOR	L2206836-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -3, -5, -6, -7, -8, -9
Laboratory Control Sample	Zinc (Zn)-Dissolved	MES	L2206836-10
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2206836-1, -10, -12, -13, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2206836-10
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2206836-1, -10, -12, -13, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2206836-14, -15, -16, -17, -18, -19, -20, -21, -22, -23, -24, -25, -26
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2206836-10
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2206836-1, -10, -12, -13, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2206836-14, -15, -16, -17, -18, -19, -20, -21, -22, -23, -24, -25, -26
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2206836-10
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2206836-10
Matrix Spike	Potassium (K)-Dissolved	MS-B	L2206836-10
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2206836-1, -10, -12, -13, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2206836-10
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2206836-1, -10, -12, -13, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2206836-14, -15, -16, -17, -18, -19, -20, -21, -22, -23, -24, -25, -26
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2206836-10
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2206836-1, -10, -12, -13, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2206836-10
Matrix Spike	Barium (Ba)-Total	MS-B	L2206836-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Total	MS-B	L2206836-21, -22
Matrix Spike	Barium (Ba)-Total	MS-B	L2206836-10, -11, -15, -18, -20, -4, -5
Matrix Spike	Calcium (Ca)-Total	MS-B	L2206836-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L2206836-21, -22
Matrix Spike	Calcium (Ca)-Total	MS-B	L2206836-10, -11, -15, -18, -20, -4, -5
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2206836-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2206836-21, -22
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2206836-10, -11, -15, -18, -20, -4, -5
Matrix Spike	Manganese (Mn)-Total	MS-B	L2206836-21, -22
Matrix Spike	Strontium (Sr)-Total	MS-B	L2206836-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Total	MS-B	L2206836-21, -22
Matrix Spike	Strontium (Sr)-Total	MS-B	L2206836-10, -11, -15, -18, -20, -4, -5

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLB	Detection Limit Raised. Analyte detected at comparable level in Method Blank.

Reference Information

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.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
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).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". 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.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
CR-CR3-TOT-CALC-ED	Water	Total Trivalent Chromium in Water	CALCULATION
Chromium (III)-Total is calculated as the difference between the total chromium and the total hexavalent chromium (Cr(VI)) results.The Limit of Reporting for Chromium (III) varies as a function of the test results.			
CR-CR6-ED	Water	Chromium, Hexavalent (Cr +6)	APHA 3500-Cr C (Ion Chromatography)
This analysis is carried out using procedures adapted from method 3500-Cr C in "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1636 published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution. Results are based on an un-filtered, field-preserved sample.			
EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.			
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.			
EPH-ME-FID-VA	Water	EPH in Water	BC Lab Manual
EPH is extracted from water using a hexane micro-extraction technique, with analysis by GC-FID, as per the BC Lab Manual. EPH results include PAHs and are therefore not equivalent to LEPH or HEPH.			
F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			

Reference Information

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

LEPH/HEPH-CALC-VA Water LEPHs and HEPHs BC MOE LEPH/HEPH

LEPHw and HEPHw are measures of Light and Heavy Extractable Petroleum Hydrocarbons in water. Results are calculated by subtraction of applicable PAH concentrations from EPH10-19 and EPH19-32, as per the BC Lab Manual LEPH/HEPH calculation procedure.

LEPHw = EPH10-19 minus Acenaphthene, Acridine, Anthracene, Fluorene, Naphthalene and Phenanthrene.

HEPHw = EPH19-32 minus Benz(a)anthracene, Benzo(a)pyrene, Fluoranthene, and Pyrene.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water 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-VA 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-VA 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.

PAH-ME-MS-VA Water PAHs in Water EPA 3511/8270D (mod)

PAHs are extracted from water using a hexane micro-extraction technique, with analysis by GC/MS. Because the two isomers cannot be readily separated chromatographically, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TSS-LOW-VA Water Total Suspended Solids by Grav. (1 mg/L) APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
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.

VH-HSFID-VA Water VH in Water by Headspace GCFID BC Env. Lab Manual (VH in Water)

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Compounds eluting between n-hexane and n-decane are measured and summed together using flame-ionization detection.

VH-SURR-FID-VA Water VH Surrogates for Waters BC Env. Lab Manual (VH in Solids)

VOC7-HSMS-VA Water BTEX/MTBE/Styrene by Headspace GCMS EPA 5021A/8260C

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

VOC7/VOC-SURR-MS-VA Water VOC7 and/or VOC Surrogates for Waters EPA 5035A/5021A/8260C

VPH-CALC-VA Water VPH is VH minus select aromatics BC MOE VPH

Reference Information

VPHw measures Volatile Petroleum Hydrocarbons in water. Results are calculated by subtraction of specific Monocyclic Aromatic Hydrocarbons from VH6-10, as per the BC Lab Manual VPH calculation procedure.
VPHw = VH6-10 minus Benzene, Toluene, Ethylbenzene, Xylenes, and Styrene

XYLENES-CALC-VA	Water	Sum of Xylene Isomer Concentrations	CALCULATION

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** 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
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

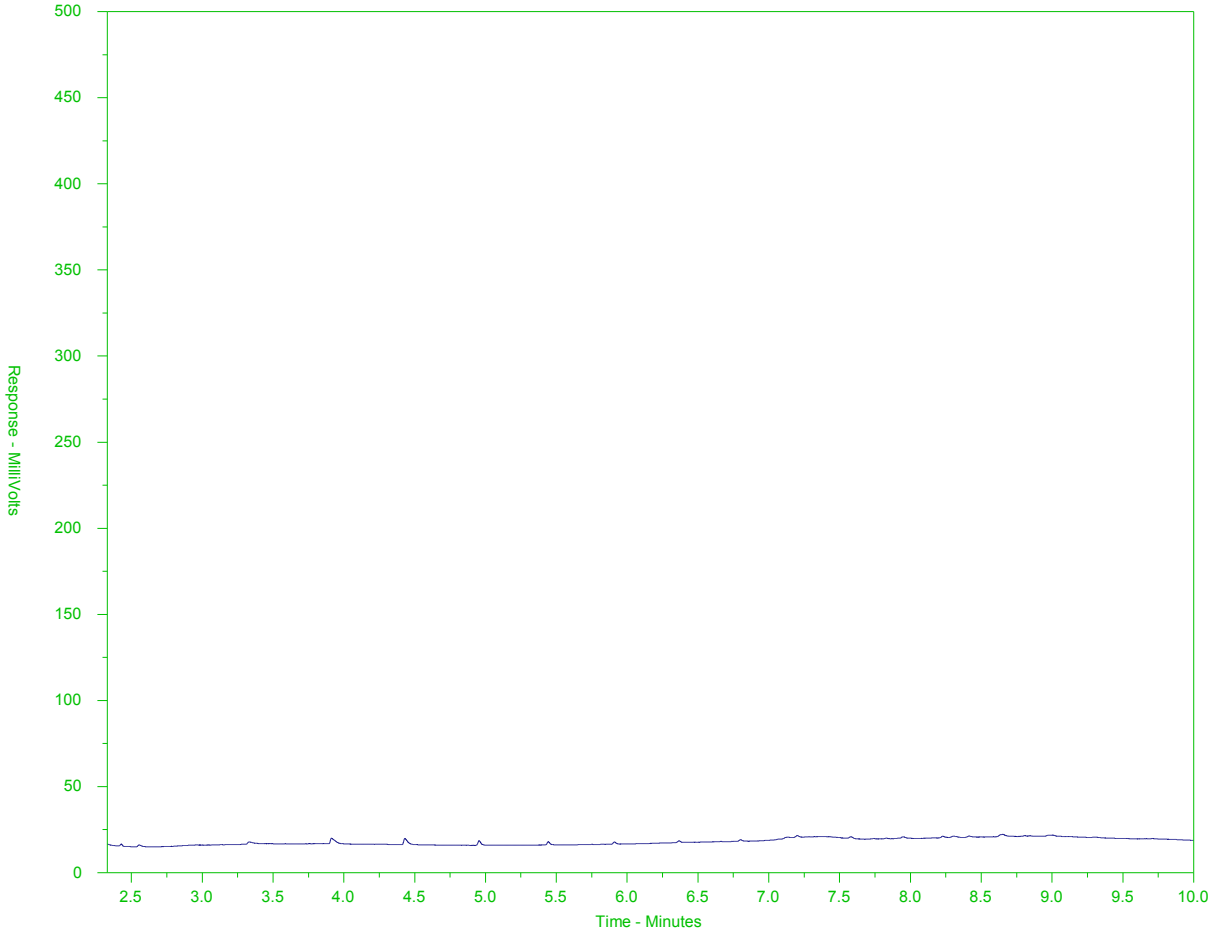
1 of 3 2 of 3 3 of 3

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.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2206836-24
Client Sample ID: MW13-04 (LP)



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2206836-COFC

COC Number: 15 -

Page 1 of 2 3

Report To	Contact and company name below will appear on the final report
Company:	TECK Metals Ltd
Contact:	Michelle Unger
Phone:	250-4278422
	Company address below will appear on the final report
Street:	601 Knightton Road
City/Province:	Kimberly, BC
Postal Code:	V1A 3E1
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	
Contact:	

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	amacphail@accessconsulting.ca,mducharme@acc
Email 2	Michelle.unger@teck.com
Email 3	

Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	Michelle.unger@teck.com
Email 2	roxanne.menear@teck.com

Project Information	
ALS Account # / Quote #:	Q62635
Job #:	TECK-18-1
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: Can Dang	Sampler: KN

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: dd-mmm-yy hh:mm

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	Total Metals (low level) + Hg	Dissolved Metals (low level) +Hg	pH, SPC, alkalinity, hardness	Anions(Nitrate, Nitrite, Sulphate, Cl, F, Br)	Ammonia	TDS, TSS(low)	Chromium Speciation							Number of Containers
					P	F/P		P	P		P							
	MH-12 (LP)	1-Dec-18	16:55	Water	R	R	R	R	R	R	R							8
	MH-04 (LP)	2-Dec-18	15:03	Water	R	R	R	R	R	R	R							8
	MH-11 (LP)	3-Dec-18	12:33	Water	R	R	R	R	R	R	R							8
	MH-29 (LP)	3-Dec-18	13:05	Water	R	R	R	R	R	R	R							8
	MH-02 (LP)	3-Dec-18	15:52	Water	R	R	R	R	R	R	R							8
	MH-13 (LP)	4-Dec-18	13:33	Water	R	R	R	R	R	R	R							8
	MH-30 (LP)	4-Dec-18	13:00	Water	R	R	R	R	R	R	R							8
	MH-15 (LP)	4-Dec-18	9:52	Water	R	R	R	R	R	R	R							8
	MH-SW (LQR)	3-Dec-18	12:40	Water	R	R	R	R	R	R	R							8
	MH-FB (LQFB)	5-Dec-18	10:50	Water	R	R	R	R	R	R								7
	Trip Blank (LQTB)	n/a	n/a	Water	R	R	R	R	R	R								7
	SDH-S2 (LP)			Water	R	R	R	R	R	R	R							8

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		
3°	4°	6°			

SHIPMENT RELEASE (client use)		
Released by: Kyle Nault	Date: 6-12-18	Time:

INITIAL SHIPMENT RECEPTION (lab use only)		
Received by:	Date: DEC 6, 2018	Time: 09:24

FINAL SHIPMENT RECEPTION (lab use only)		
Received by: HA	Date: 12/7	Time: 12:45p

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

L2206836-COFC

COC Number: 15 -

Report To	Contact and company name below will appear on the final report
Company:	TECK Metals Ltd
Contact:	Michelle Unger
Phone:	250-4278422
	Company address below will appear on the final report
Street:	601 Knightton Road
City/Province:	Kimberly, BC
Postal Code:	V1A 3E1
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	
Contact:	

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	amacphail@accessconsulting.ca,mducharme@acc
Email 2	Michelle.unger@teck.com
Email 3	

Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	Michelle.unger@teck.com
Email 2	roxanne.menear@teck.com

Project Information	
ALS Account # / Quote #:	Q62635
Job #:	TECK-18-1
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: Can Dang Sampler: KN

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: dd-mmm-yy hh:mm

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	Total Metals (low level) + Hg	Dissolved Metals (low level) +Hg	pH, SPC, alkalinity, hardness	Anions(Nitrate, Nitrite, Sulphate, Cl, F, Br)	Ammonia	TDS, TSS(low)	Chromium Speciation							Number of Containers
					P	F/P		P	P		P							
	MH-22 (LP)	2-Dec-18	13:55	Water	R	R	R	R	R	R	R							8
	TRIBEWF01 (LM)	4-Dec-18	12:25	Water	R	R	R	R	R	R	R							8
	TRIBEWF02 (LM)			Water	R	R	R	R	R	R	R							8
	TRIBEWF03 (LM)	4-Dec-18	11:15	Water	R	R	R	R	R	R	R							8
	PH-01 (LM)	2-Dec-18	16:16	Water	R	R	R	R	R	R	R							8
	CC-01 (LM)	2-Dec-18	15:54	Water	R	R	R	R	R	R	R							8
	MH-27 (LM)	3-Dec-18	14:07	Water	R	R	R	R	R	R	R							8
	MH-28 (LM)	3-Dec-18	14:43	Water	R	R	R	R	R	R	R							8
	MH-23 (LM)	2-Dec-18	12:03	Water	R	R	R	R	R	R	R							8
	NC-01 (LM)	2-Dec-18	11:23	Water	R	R	R	R	R	R	R							8
	NC-02 (LM)	1-Dec-18	16:15	Water	R	R	R	R	R	R	R							8
	MH-08 (LM)	2-Dec-18	14:30	Water	R	R	R	R	R	R	R							8

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		
					9

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Kyle Nault	Date: 6-12-18	Time:	Received by:	Date:	Time:	Received by: NA	Date: 12/7	Time: 1214 5p

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

Chain of Custody / Ana
Canada Toll Free:
www.alsgl

L2206836-COFC

COC #

Page 3 of 4 3

Report To		Report Format / Distribution		Service Requested (Rush for routine analysis subject to availability)
Company:	TECK Metals Ltd	☑ Standard ☐ Other		◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Michelle Unger	☑ PDF ☑ Excel ☑ Digital ☐ Fax		○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	601 Knightton Road	Email 1:	arnacphail@accessconsulting.ca, mducharme@a	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Kimberly, BC	Email 2:	michelle.unger@teck.com	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	250-427-8422 Fax:	Email 3:		
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information		Analysis Request
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	TECK-18-01	Please indicate below Filtered, Preserved or both (F, P, F/P)
Company:		PO / AFE:		
Contact:		LSD:		
Address:				
Phone:		Quote #:	Q62635	
Lab Work Order # (lab use only)		ALS Contact:	Can Dang	Sampler: kn

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	pH, SPC, alkalinity, hardness	F/P dissolved metals low level +Hg	Anions (nitrate, nitrite, sulphate, Cl, F, Br)	P Ammonia	P BTEX, LEPH, HEPH	P VPH, PAH	Number of Containers
	MW13-01 (LP)	05-Dec-18	9:56	Groundwater	X	X	X	X			
	MW13-04 (LP)	05-Dec-18	10:39	Groundwater	X	X	X	X	X	X	
	MW13-05 (LP)			Groundwater	X	X	X	X	X	X	
	MW13-06 (LP)			Groundwater	X	X	X	X			
	MW13-07 (LP)			Groundwater	X	X	X	X	X	X	
	MW13-08 (LP)			Groundwater	X	X	X	X			
	MW13-10 (LP)			Groundwater	X	X	X	X	X	X	
	MW13-13 (LP)	03-Dec-18	16:48	Groundwater	X	X	X	X			
	MW14-01 (LP)			Groundwater	X	X	X	X	X	X	
	MW14-02 (LP)			Groundwater	X	X	X	X	X	X	
	MW14-03 (LP)			Groundwater	X	X	X	X	X	X	
	MW14-04 (LP)			Groundwater	X	X	X	X	X	X	
	MW-GW (LQR)	05-Dec-18	10:00	Groundwater	X	X	X	X	X	X	

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Yukon EQWin and ACC200 digital formats. General A: pH, EC, TSS (low) **General B:** pH, EC, TSS (low), anions-all
General C: pH, EC, TSS (low), anions-all, ion balance, alkalinity **General D:** pH, EC, TSS (low), SO4, ion balance, alkalinity **General E:** pH, EC, TSS (low), SO4, ion balance

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:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Obs Observations: Yes , Yes / No ? If Ye If Yes add SIF
Kyle Nault	6-Dec-18		JA	12/7	1214 5p	9 °C				

GENF 20.00 Front

APPENDIX D

2018 WATER QUALITY RESULTS

		QZ16-051 WUL	MH-02 Tailings North Dam Seepage							MH-12 East fork of Tributary E — of false Canyon approximately 2 km downstream north tailings dam						
			21-Feb-18	5-Apr-18	4-Jun-18	13-Aug-18	18-Oct-18	3-Dec-18		20-Feb-18	3-Apr-18	4-Jun-18	13-Aug-18	13-Sep-18	18-Oct-18	1-Dec-18
Total Hardness	mg/L		659	682							489					
Dissolved Hardness	mg/L		723	673	403	533	433	572			464	155	164	176	168	153
Temperature - Field	C		0	-0.1	9.4	13.4	1.3	-0.4			-0.1	2.9	7.3	2.3	1.2	-0.1
pH - Field	pH		7.34	7.36	7.66	7.67	7.89	7.31			8.07	7.93	8.16	8.8	8.48	7.97
pH - Lab	pH		7.83	8.13	8.38	8.20	8.21	8.02			8.30	8.24	8.42	8.38	8.36	8.30
Conductivity - Field	µS/cm		1056	1098	729.0	883	745.3	951.3			721.6	272.8	284.8	350	280.9	282.8
Conductivity - Lab	µS/cm		1170	1120	724	928	794	1050			716	261	312	322	303	322
Total Dissolved Solids	mg/L		902	878	529	680	581	784		Frozen	504	176	187	209	192	209
Total Suspended Solids	mg/L		49.1	2.6	<1.0	<1.0	<1.0	18.1			7.4	29.7	1.0	1.2	<1.0	1.3
Discharge	L/min		0		50	10	10					6150	1520		648	738
Ammonia Nitrogen	mg/L		0.0068	0.0051	<0.0050	<0.0050	<0.0050	0.0059			0.150	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
NO2-W	mg/L		<0.0050	<0.0050	<0.0010	<0.0050	<0.0050	0.0052			<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
NO3-W	mg/L		<0.025	<0.025	<0.0050	<0.025	<0.025	<0.025			0.420	0.129	0.0146	0.0154	0.0343	0.103
Sulphate	mg/L	*	374	376	189	293	217	317			36.6	9.92	10.7	11.1	10.6	10.9
Fluoride	mg/L		<0.10	<0.10	0.075	<0.10	<0.10	<0.10			0.25	0.100	0.116		0.120	0.112
Chloride	mg/L		<2.5	<2.5	<0.50	<2.5	<2.5	<2.5			<2.5	<0.50	<0.50		<0.50	<0.50
Bromide	mg/L		<0.25	<0.25	<0.050	<0.25	<0.25	<0.25			<0.25	<0.050	<0.050		<0.050	<0.050
Dissolved Oxygen	mg/L		4.87	5.5	8.22	7.18	9.27	7.99			12.27	11.79	10.6	11.8	11.93	12.24
Dissolved Oxygen	%		38.4	42.5	82.4	79	74.6	61.7			94.4	98.3	100.1		94.2	93.5
Redox	mV		103	147.7	167.7	162	90.2	98.5			87.6	124.8	159.2		103.5	88
Alkalinity (CaCO3)	mg/L		339	340	313	257	238	300			416	134	164	168	162	165
Total Silver	mg/L	0.00025	0.000028	<0.000010	<0.000010	<0.000010	<0.000010	0.000017			<0.000010	0.000020	<0.000010	<0.000010	<0.000010	<0.000010
Total Aluminum	mg/L		0.389	0.0423	<0.0030	<0.0030	<0.0030	0.166			0.0228	0.393	0.0184	0.0098	0.0039	0.0042
Total Arsenic	mg/L	0.005	0.00381	0.00094	0.00038	0.00046	0.00032	0.00323			0.00227	0.00175	0.00088	0.00082	0.00076	0.00065
Total Barium	mg/L		0.0921	0.0684	0.0438	0.0501	0.0340	0.0644			0.184	0.0670	0.0741	0.0714	0.0765	0.0704
Total Beryllium	mg/L	0.00013	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020			<0.000020	0.000025	<0.000020	<0.000020	<0.000020	<0.000020
Total Bismuth	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Total Boron	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010			<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Calcium	mg/L		230	239	137	155	152	219			162	50.3	48.2	57.1	57.1	60.5
Total Cadmium	mg/L		0.000208	0.0000572	0.0000082	<0.0000050	0.0000058	0.000104			0.000109	0.000170	0.0000504	0.0000434	0.0000345	0.0000363
Total Cobalt	mg/L	0.004	0.00196	0.00113	0.00032	0.00057	0.00044	0.00120			<0.00010	0.00032	<0.00010	<0.00010	<0.00010	<0.00010
Total Chromium III	mg/L			0.00032	0.00026	<0.00010	<0.00010	0.00033			<0.00072	0.00103	0.00027		0.00014	<0.00030
Total Chromium	mg/L	0.001	0.00066	0.00032	0.00026	<0.00010	<0.00010	0.00033			0.00097	0.00103	0.00027	0.00018	0.00014	<0.00030
Total Chromium VI	mg/L	0.001		<0.0010	<0.00050	<0.00050	<0.00050	<0.00050			0.0010	<0.00050	<0.00050		<0.00050	<0.00050
Total Copper	mg/L	*	0.00135	<0.00050	<0.00050	<0.00050	<0.00050	0.00059			0.00294	0.00140	<0.00050	<0.00050	<0.00050	<0.00050
Total Iron	mg/L	1	1.84	0.363	0.019	0.029	0.011	1.11			0.104	0.679	0.031	0.017	<0.010	<0.010
Total Mercury	mg/L		<0.000025	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.000025			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Total Potassium	mg/L		1.80	1.87	1.66	2.10	2.29	1.46			3.91	0.64	0.42	0.43	0.43	0.40
Total Lithium	mg/L		0.0018	0.0012	0.0011	0.0013	<0.0010	0.0016			0.0039	0.0018	0.0014	0.0014	0.0014	0.0013
Total Magnesium	mg/L		20.7	20.4	10.8	18.3	15.1	20.5			20.9	4.75	5.71	5.72	6.08	6.32
Total Manganese	mg/L		2.40	1.52	0.0316	0.0701	0.0174	0.858			0.00864	0.0412	0.00317	0.00176	0.00064	<0.00040
Total Molybdenum	mg/L	0.073	0.000438	0.000288	0.000528	0.000438	0.000255	0.000217			0.00410	0.00130	0.00129	0.00127	0.00127	0.00131
Total Sodium	mg/L		11.6	11.5	6.79	11.4	8.02	10.8			4.15	0.819	1.03	0.996	1.07	0.981
Total Nickel	mg/L	*	0.00189	0.00317	<0.00050	<0.00050	<0.00050	0.00079			0.00184	0.00123	<0.00050	<0.00050	<0.00050	<0.00050
Total Lead	mg/L	*	0.0134	0.00150	0.000196	0.000053	<0.000050	0.00938			0.000904	0.0146	0.000913	0.000336	0.000140	0.000086
Total Phosphorus	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050			<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Total Antimony	mg/L	0.009	0.00016	<0.00010	0.00014	<0.00010	<0.00010	0.00011			0.00062	0.00032	0.00022	0.00021	0.00020	0.00020
Total Selenium	mg/L	0.002	0.000125	0.000074	0.000214	0.000059	0.000085	0.000098			**0.00260**	0.000865	0.000710	0.000681	0.000650	0.000716
Total Silicon	mg/L		5.79	5.42	4.10	4.60	4.33	5.21			12.5	4.37	4.02	3.77	4.16	3.78
Total Tin	mg/L		0.00024	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010			<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Total Strontium	mg/L		0.761	0.738	0.464	0.605	0.522	0.705			0.599	0.186	0.206	0.216	0.207	0.217
Total Sulphur	mg/L		127	137	72.5	98.2	83.7	120			13.6	3.66	3.37	3.58	3.69	4.04
Total Titanium	mg/L		0.00695	0.00084	<0.00030	<0.00030	<0.00030	0.00313			0.00047	0.0128	0.00040	<0.00030	<0.00030	<0.00030
Total Thallium	mg/L	0.0008	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010			<0.000010	0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Total Uranium	mg/L		0.00207	0.00186	0.00155	0.00139	0.00166	0.00214			0.00297	0.000927	0.000932	0.000897	0.000883	0.00104
Total Vanadium	mg/L		0.00088	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050			0.00071	0.00183	<0.00050	<0.00050	<0.00050	<0.00050
Total Zinc	mg/L	*	0.101	0.0768	0.0032	<0.0030	0.0031	0.0360			0.321	0.0255	<0.0030	<0.0030	<0.0030	<0.0060
Total Zirconium	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030			<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

The license applies only to monitoring stations MH-11, MH-12 and MH-15.
The * indicates the guideline is calculated based on hardness (SO4, Cd, Cu, Pb, Ni, Zn).
Lead and Zinc guidelines also based on TSS levels, and when TSS is greater than 4 mg/L, the guideline applies to the dissolved faction.

		QZ16-051 WUL	MH-02 Tailings North Dam Seepage							MH-12 East fork of Tributary E — of false Canyon approximately 2 km downstream north tailings dam						
			21-Feb-18	5-Apr-18	4-Jun-18	13-Aug-18	18-Oct-18	3-Dec-18		20-Feb-18	3-Apr-18	4-Jun-18	13-Aug-18	13-Sep-18	18-Oct-18	1-Dec-18
Dissolved Silver	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dissolved Arsenic	mg/L		0.00045	0.00057	0.00033	0.00041	0.00027	0.00054			0.00211	0.00102	0.00098	0.00080	0.00072	0.00053
Dissolved Aluminium	mg/L	*	<0.0010	<0.0010	0.0012	<0.0010	<0.0010	<0.0010			0.0023	0.0060	0.0028	0.0015	0.0013	0.0013
Dissolved Barium	mg/L		0.0645	0.0677	0.0466	0.0458	0.0330	0.0550			0.176	0.0670	0.0733	0.0747	0.0764	0.0713
Dissolved Boron	mg/L		<0.010													
Dissolved Beryllium	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020			<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Dissolved Boron -	mg/L			<0.010	<0.010	<0.010	<0.010	<0.010			<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Dissolved Bismuth	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050		Frozen	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Dissolved Calcium	mg/L		255	235	143	186	149	200			152	53.6	56.6	60.8	57.0	52.1
Dissolved Cadmium	mg/L	*	0.0000588	0.0000315	0.0000055	0.0000058	0.0000069	0.0000137			0.0000890	0.0000404	0.0000424	0.0000430	0.0000310	0.0000343
Dissolved Cobalt	mg/L		0.00069	0.00100	0.00029	0.00050	0.00040	0.00057			<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Chromium	mg/L		0.00012	<0.00010	0.00015	<0.00010	<0.00010	<0.00010			0.00044	0.00049	0.00028	0.00014	0.00015	0.00012
Dissolved Copper	mg/L		0.00047	0.00024	0.00033	<0.00020	<0.00020	<0.00020			0.00153	0.00046	0.00026	0.00024	<0.00020	<0.00020
Dissolved Iron	mg/L		0.012	0.165	<0.010	<0.010	<0.010	<0.010			<0.010	0.013	<0.010	<0.010	<0.010	<0.010
Dissolved Mercury	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Dissolved Potassium	mg/L		1.90	1.85	1.66	2.04	2.30	1.33			3.74	0.63	0.43	0.44	0.45	0.38
Dissolved Lithium	mg/L		<0.0010	<0.0010	0.0011	0.0014	<0.0010	0.0012			0.0040	0.0014	0.0015	0.0015	0.0014	0.0013
Dissolved Magnesium	mg/L		20.6	20.7	11.1	17.0	14.7	17.8			20.3	5.10	5.59	5.90	6.33	5.57
Dissolved Manganese	mg/L		1.22	1.46	0.0329	0.0651	0.0166	0.109			0.00569	0.00168	0.00123	0.00053	0.00023	<0.00010
Dissolved Molybdenum	mg/L		0.000284	0.000276	0.000516	0.000451	0.000264	0.000150			0.00387	0.00130	0.00125	0.00124	0.00127	0.00110
Dissolved Sodium	mg/L		11.7	11.3	6.69	10.7	7.94	10.3			3.82	0.856	1.02	1.03	1.04	0.993
Dissolved Nickel	mg/L		0.00087	0.00213	<0.00050	<0.00050	<0.00050	<0.00050			0.00140	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Lead	mg/L	*	0.000082	0.000108	0.000095	<0.000050	<0.000050	<0.000050			0.000141	0.000386	0.000409	<0.000050	<0.000050	<0.000050
Dissolved Phosphorus	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050			<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dissolved Antimony	mg/L		<0.00010	<0.00010	0.00012	0.00010	<0.00010	<0.00010			0.00056	0.00022	0.00023	0.00020	0.00020	0.00015
Dissolved Sulphur	mg/L		125	134	66.3	96.6	77.5	105			13.0	3.11	3.34	3.75	3.52	3.12
Dissolved Selenium	mg/L		0.000055	0.000070	0.000281	0.000081	0.000078	<0.000050			0.00260	0.000788	0.000671	0.000746	0.000705	0.000854
Dissolved Silicon	mg/L		4.88	5.15	3.93	4.27	4.21	4.80			12.1	3.64	3.78	3.98	4.10	3.36
Dissolved Tin	mg/L		0.00023	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010			<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Strontium	mg/L		0.772	0.794	0.457	0.642	0.516	0.666			0.609	0.197	0.210	0.212	0.214	0.191
Dissolved Titanium	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030			<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Thallium	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dissolved Uranium	mg/L		0.00176	0.00195	0.00155	0.00134	0.00158	0.00197			0.00300	0.000956	0.000910	0.000929	0.000868	0.000904
Dissolved Vanadium	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050			0.00056	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Zinc	mg/L	*	0.0608	0.0719	0.0032	0.0025	0.0032	0.0110			0.136	0.0015	0.0015	0.0017	0.0013	0.0013
Dissolved Zirconium	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030			<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

The license applies only to monitoring stations MH-11, MH-12 and MH-15.
The * indicates the guideline is calculated based on hardness (SO4, Cd, Cu, Pb, Ni, Zn).
Lead and Zinc guidelines also based on TSS levels, and when TSS is greater than 4 mg/L, the guideline applies to the dissolved faction.

		QZ16-051 WUL	MH-22							MH-15					
			Burnick 1200 Portal discharge							Trib E, West Fork, u/s of Trib E East Fork					
			20-Feb-18	3-Apr-18	5-Jun-18	15-Aug-18	19-Oct-18	2-Dec-18		22-Feb-18	4-Apr-18	19-Jun-18	16-Aug-18	21-Oct-18	4-Dec-18
Total Hardness	mg/L									194	206				
Dissolved Hardness	mg/L				121	146	150	149		211	205	194	212	192	211
Temperature - Field	C				3.2	3.2	1.9	0.3		-0.2	-0.1	12.5	9.4	0.2	-0.4
pH - Field	pH				7.75	8.66	7.91	7.83		8.01	8.05	7.9	7.93	8.32	7.43
pH - Lab	pH				7.98	8.17	8.21	8.18		8.14	8.46	8.48	8.40	8.36	8.25
Conductivity - Field	µS/cm				248.3	262.8	281	302.6		328.7	325.3	361	340.8	311.3	350.5
Conductivity - Lab	µS/cm				248	280	295	299		366	347	347	361	336	372
Total Dissolved Solids	mg/L		Frozen	Frozen	160	179	194	183		215	211	204	207	209	228
Total Suspended Solids	mg/L				<1.0	<1.0	<1.0	<1.0		2.0	1.6	1.3	<1.0	<1.0	3.9
Discharge	L/min				340	20	20	10		2480	2630		3200	2800	3080
Ammonia Nitrogen	mg/L				<0.0050	<0.0050	<0.0050	<0.0050		0.0149	0.0143	<0.0050	<0.0050	<0.0050	0.0088
NO2-W	mg/L				<0.0010	<0.0010	<0.0010	<0.0010		0.0011	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
NO3-W	mg/L				0.160	0.141	0.134	0.133		0.0947	0.102	0.0124	<0.0050	<0.0050	0.0585
Sulphate	mg/L	*			30.4	37.5	41.5	42.4		4.33	4.29	3.78	2.16	4.62	3.88
Fluoride	mg/L				0.989	1.19	1.30	1.31		0.096	0.100	0.098	0.101	0.093	0.091
Chloride	mg/L				<0.50	<0.50	<0.50	<0.50		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bromide	mg/L				<0.050	<0.050	<0.050	<0.050		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dissolved Oxygen	mg/L				11.05	10.68	9.93	12.02		10.57	12.73		10.31	11.85	14.1
Dissolved Oxygen	%				95.5	92.5	83.7	95.9		79.7	95.3		99.7	90	104.4
Redox	mV				119.6	100.8	82.7	90.3		63.9	175.8		232.1	82	78.2
Alkalinity (CaCO3)	mg/L				89.4	110	114	115		197	205	205	207	191	207
Total Silver	mg/L	0.00025			<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Total Aluminum	mg/L				<0.0030	<0.0030	<0.0030	<0.0030		0.0103	0.0144	0.0101	0.0057	0.0053	0.0046
Total Arsenic	mg/L	0.005			0.00423	0.00396	0.00375	0.00363		0.00038	0.00041	0.00039	0.00057	0.00033	0.00030
Total Barium	mg/L				0.0126	0.0162	0.0169	0.0159		0.189	0.204	0.184	0.190	0.163	0.193
Total Beryllium	mg/L	0.00013			<0.000020	<0.000020	<0.000020	<0.000020		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Total Bismuth	mg/L				<0.000050	<0.000050	<0.000050	<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Total Boron	mg/L				<0.010	<0.010	<0.010	<0.010		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Calcium	mg/L				39.5	38.4	50.0	49.8		58.0	62.0	56.6	50.3	53.7	62.8
Total Cadmium	mg/L				0.00286	0.00360	0.00417	0.00442		0.0000115	0.0000138	0.0000093	0.0000055	0.0000075	0.0000059
Total Cobalt	mg/L	0.004			<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Total Chromium III	mg/L				0.00023	0.00016	<0.00010	<0.00020			0.00013	<0.00010	<0.00010	<0.00010	<0.00020
Total Chromium	mg/L	0.001			0.00023	0.00016	<0.00010	<0.00020		<0.00010	0.00013	<0.00010	<0.00010	<0.00010	<0.00020
Total Chromium VI	mg/L	0.001			<0.00050	<0.00050	<0.00050	<0.00050			<0.0010	<0.00050	<0.00050	<0.00050	<0.00050
Total Copper	mg/L	*			<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Total Iron	mg/L	1			<0.010	<0.010	<0.010	<0.010		0.298	0.271	0.118	0.184	0.082	0.184
Total Mercury	mg/L				<0.0000050	<0.0000050	<0.0000050	<0.0000050		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Total Potassium	mg/L				0.50	0.54	0.57	0.59		0.39	0.45	0.35	0.27	0.42	0.38
Total Lithium	mg/L				0.0050	0.0047	0.0058	0.0058		0.0011	0.0012	0.0014	0.0011	0.0011	0.0012
Total Magnesium	mg/L				5.33	6.28	6.81	6.74		12.0	12.5	12.9	13.7	13.2	14.4
Total Manganese	mg/L				0.00389	0.00030	0.00012	<0.00020		0.0228	0.0166	0.0102	0.0131	0.00758	0.0161
Total Molybdenum	mg/L	0.073			0.0104	0.00846	0.00876	0.00920		0.00205	0.00224	0.00219	0.00186	0.00176	0.00196
Total Sodium	mg/L				0.843	0.836	0.864	0.809		1.05	1.14	0.974	1.06	1.04	1.06
Total Nickel	mg/L	*			0.00423	0.00361	0.00352	0.00340		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Total Lead	mg/L	*			0.000392	0.000299	0.000322	0.000380		<0.000050	0.000063	<0.000050	<0.000050	0.000234	<0.000050
Total Phosphorus	mg/L				<0.050	<0.050	<0.050	<0.050		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Total Antimony	mg/L	0.009			0.00253	0.00235	0.00263	0.00267		0.00014	0.00013	0.00015	<0.00010	0.00011	0.00012
Total Selenium	mg/L	0.002			0.00937	0.0117	0.0145	0.0156		0.000765	0.000780	0.000375	0.000272	0.000436	0.000668
Total Silicon	mg/L				4.64	4.25	4.53	4.38		4.17	4.26	3.28	3.75	3.79	4.13
Total Tin	mg/L				<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Total Strontium	mg/L				0.210	0.214	0.244	0.257		0.181	0.181	0.186	0.184	0.174	0.191
Total Sulphur	mg/L				10.6	11.7	14.6	14.7		1.30	1.54	1.54	0.62	1.81	1.71
Total Titanium	mg/L				<0.00030	<0.00030	<0.00030	<0.00030		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Total Thallium	mg/L	0.0008			0.000016	0.000021	0.000018	0.000016		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Total Uranium	mg/L				0.00277	0.00357	0.00366	0.00380		0.000977	0.00103	0.000878	0.000699	0.000768	0.000888
Total Vanadium	mg/L				<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Total Zinc	mg/L	*			0.375	0.555	0.759	0.783		<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Total Zirconium	mg/L				<0.00030	<0.00030	<0.00030	<0.00030		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

The license applies only to monitoring stations MH-11, MH-12 and MH-15.
The * indicates the guideline is calculated based on hardness (SO4, Cd, Cu, Pb, Ni, Zn).
Lead and Zinc guidelines also based on TSS levels, and when TSS is greater than 4 mg/L, the guideline applies to the dissolved faction.

		QZ16-051 WUL	MH-22						MH-15					
			Burnick 1200 Portal discharge						Trib E, West Fork, u/s of Trib E East Fork					
			20-Feb-18	3-Apr-18	5-Jun-18	15-Aug-18	19-Oct-18	2-Dec-18	22-Feb-18	4-Apr-18	19-Jun-18	16-Aug-18	21-Oct-18	4-Dec-18
Dissolved Silver	mg/L				<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dissolved Arsenic	mg/L				0.00429	0.00395	0.00366	0.00331	0.00021	0.00024	0.00040	0.00044	0.00027	0.00018
Dissolved Aluminium	mg/L	*			0.0055	0.0015	0.0011	<0.0010	0.0010	0.0017	0.0019	0.0015	0.0014	0.0010
Dissolved Barium	mg/L				0.0142	0.0155	0.0166	0.0176	0.186	0.188	0.190	0.187	0.165	0.201
Dissolved Boron	mg/L								<0.010					
Dissolved Beryllium	mg/L				<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Dissolved Boron -	mg/L				<0.010	<0.010	<0.010	<0.010		<0.010	<0.010	<0.010	<0.010	<0.010
Dissolved Bismuth	mg/L		Frozen	Frozen	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Dissolved Calcium	mg/L				39.8	47.7	48.9	49.4	64.0	61.9	57.2	61.4	54.5	62.3
Dissolved Cadmium	mg/L	*			0.00285	0.00359	0.00407	0.0043	<0.0000050	0.0000100	0.0000059	0.0000070	<0.0000050	0.0000054
Dissolved Cobalt	mg/L				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Chromium	mg/L				0.00023	0.00014	0.00013	<0.00010	<0.00010	<0.00010	0.00016	<0.00010	0.00010	<0.00010
Dissolved Copper	mg/L				0.00074	0.00026	0.00030	<0.00020	<0.00020	<0.00020	0.00023	<0.00020	<0.00020	<0.00020
Dissolved Iron	mg/L				0.027	<0.010	<0.010	<0.010	0.035	0.038	0.052	0.085	0.065	0.032
Dissolved Mercury	mg/L				<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Dissolved Potassium	mg/L				0.56	0.57	0.59	0.57	0.43	0.42	0.34	0.31	0.43	0.40
Dissolved Lithium	mg/L				0.0050	0.0056	0.0057	0.0059	0.0010	0.0012	0.0013	0.0012	0.0011	0.0013
Dissolved Magnesium	mg/L				5.39	6.41	6.86	6.27	12.5	12.2	12.3	14.2	13.5	13.5
Dissolved Manganese	mg/L				0.00568	0.00030	0.00028	<0.00010	0.0138	0.00810	0.00391	0.00690	0.00631	0.0126
Dissolved Molybdenum	mg/L				0.0103	0.00836	0.00847	0.00853	0.00182	0.00221	0.00221	0.00176	0.00172	0.00191
Dissolved Sodium	mg/L				0.906	0.865	0.895	0.891	1.06	1.04	0.923	1.09	1.07	1.22
Dissolved Nickel	mg/L				0.00422	0.00376	0.00352	0.00337	<0.00050	<0.00050	0.00063	<0.00050	<0.00050	<0.00050
Dissolved Lead	mg/L	*			0.000849	0.000254	0.000336	0.000339	<0.000050	<0.000050	<0.000050	<0.000050	0.000068	<0.000050
Dissolved Phosphorus	mg/L				<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dissolved Antimony	mg/L				0.00246	0.00253	0.00253	0.00249	0.00012	0.00013	0.00014	<0.00010	0.00011	0.00033
Dissolved Sulphur	mg/L				10.2	12.1	14.1	12.6	0.88	1.43	1.48	0.83	1.67	1.35
Dissolved Selenium	mg/L				0.00947	0.0122	0.0149	0.0135	0.000763	0.000716	0.000424	0.000298	0.000471	0.000642
Dissolved Silicon	mg/L				4.45	4.24	4.62	4.24	3.91	4.03	2.77	3.65	3.91	4.27
Dissolved Tin	mg/L				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Strontium	mg/L				0.207	0.220	0.240	0.236	0.190	0.197	0.188	0.190	0.169	0.189
Dissolved Titanium	mg/L				<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Thallium	mg/L				0.000018	0.000017	0.000016	0.000015	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dissolved Uranium	mg/L				0.00276	0.00346	0.00355	0.00382	0.000891	0.00105	0.000842	0.000687	0.000728	0.000957
Dissolved Vanadium	mg/L				<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Zinc	mg/L	*			0.375	0.584	0.847	0.791	<0.0010	<0.0010	<0.0010	<0.0010	0.0012	<0.0010
Dissolved Zirconium	mg/L				<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

The license applies only to monitoring stations MH-11, MH-12 and MH-15.
The * indicates the guideline is calculated based on hardness (SO4, Cd, Cu, Pb, Ni, Zn).
Lead and Zinc guidelines also based on TSS levels, and when TSS is greater than 4 mg/L, the guideline applies to the dissolved faction.

		QZ16-051 WUL	SDH-S2						MH-11						
			Waste rock below Main Zone						Camp Creek located 2km downstream of the Reclaim Pond (Upper False Creek Canyon).						
			22-Feb-18	4-Apr-18	6-Jun-18	15-Aug-18	19-Oct-18		21-Feb-18	3-Apr-18	5-Jun-18	14-Aug-18	14-Sep-18	20-Oct-18	3-Dec-18
Total Hardness	mg/L								220	222					
Dissolved Hardness	mg/L				204				257	225	188	196	202	202	207
Temperature - Field	C				0.3				-0.4	-0.1	2.2	7.8	2.1	0.6	-0.4
pH - Field	pH				7.39				7.75	7.82	8.04	7.9	8.6	8.34	7.67
pH - Lab	pH				7.27				8.07	8.44	8.34	8.36	8.36	8.36	8.30
Conductivity - Field	µS/cm				413.9				372.2	376.4	332.3	334	420	331.7	362
Conductivity - Lab	µS/cm				432				409	386	332	354	377	363	382
Total Dissolved Solids	mg/L		Dry	Dry	307	Dry	Inaccessible		256	235	215	214	245	233	234
Total Suspended Solids	mg/L				12.1				<1.0	<1.0	2.1	<1.0	<1.0	<1.0	<1.0
Discharge	L/min								702	672	11240	3070		2690	1460
Ammonia Nitrogen	mg/L				<0.0050				<0.0050	0.0060	<0.0050	0.0074	<0.0050	<0.0050	<0.0050
NO2-W	mg/L				<0.0010				<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
NO3-W	mg/L				0.492				0.0861	0.0862	0.199	0.0568	0.0773	0.0739	0.125
Sulphate	mg/L	*			159				14.5	13.5	15.0	13.7	15.5	18.8	14.4
Fluoride	mg/L				0.104				0.093	0.094	0.075	0.089		0.085	0.088
Chloride	mg/L				<0.50				<0.50	<0.50	<0.50	<0.50		<0.50	<0.50
Bromide	mg/L				<0.050				<0.050	<0.050	<0.050	<0.050		<0.050	<0.050
Dissolved Oxygen	mg/L								11.28	11.31	12.37	9.91	12.4	11.42	12.18
Dissolved Oxygen	%								85.9	87.4	102.8	95		90.1	92.7
Redox	mV				187.1				55	102.3	160.7	140.9		96.9	58.8
Alkalinity (CaCO3)	mg/L				54.6				211	217	221	187	194	188	201
Total Silver	mg/L	0.00025			0.000538 ww				<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Total Aluminum	mg/L				0.0888				0.0060	0.0048	0.0226	0.0082	0.0068	0.0063	0.0046
Total Arsenic	mg/L	0.005			0.00045				0.00037	0.00040	0.00041	0.00065	0.00054	0.00052	0.00044
Total Barium	mg/L				0.0168				0.0841	0.0784	0.0208	0.0663	0.0603	0.0636	0.0640
Total Beryllium	mg/L	0.00013			0.000028				<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Total Bismuth	mg/L				0.000388				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Total Boron	mg/L				<0.010				<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Calcium	mg/L				76.9				73.4	73.4	56.0	59.3	66.4	68.2	71.9
Total Cadmium	mg/L				0.106				0.0000411	0.0000442	0.000327	0.0000499	0.0000376	0.0000437	0.0000435
Total Cobalt	mg/L	0.004			0.00056				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Total Chromium III	mg/L				0.00052					<0.00010	0.00225	0.00016		<0.00010	<0.00020
Total Chromium	mg/L	0.001			0.00052				0.00024	<0.00010	0.00225	0.00016	<0.00010	<0.00010	<0.00020
Total Chromium VI	mg/L	0.001			<0.00050					<0.0010	<0.00050	<0.00050		<0.00050	<0.00050
Total Copper	mg/L	*			0.00149				<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Total Iron	mg/L	1			0.391				0.054	0.039	0.040	0.064	0.058	0.048	<0.040
Total Mercury	mg/L				<0.0000050				<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Total Potassium	mg/L				0.75				0.49	0.49	0.45	0.37	0.42	0.47	0.38
Total Lithium	mg/L				0.0015				0.0017	0.0017	0.0014	0.0016	0.0016	0.0015	0.0016
Total Magnesium	mg/L				2.94				8.93	9.46	3.10	7.49	7.48	8.53	8.20
Total Manganese	mg/L				0.0422				0.0131	0.0114	0.00199	0.00828	0.00935	0.00710	0.00806
Total Molybdenum	mg/L	0.073			0.000723				0.000794	0.000778	0.000669	0.000884	0.000836	0.000913	0.000832
Total Sodium	mg/L				0.492				1.42	1.42	0.812	1.14	1.11	1.16	1.15
Total Nickel	mg/L	*			0.00171				<0.00050	<0.00050	0.00067	<0.00050	<0.00050	<0.00050	<0.00050
Total Lead	mg/L	*			0.906 ww				0.000138	0.000127	0.000733	0.000236	0.000167	0.000163	0.000104
Total Phosphorus	mg/L				<0.050				<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Total Antimony	mg/L	0.009			0.00100				0.00015	0.00013	0.00017	0.00016	0.00015	0.00015	0.00013
Total Selenium	mg/L	0.002			0.00447 ww				0.000593	0.000528	0.000739	0.000476	0.000514	0.000770	0.000734
Total Silicon	mg/L				2.73				4.10	4.12	3.15	3.57	3.40	3.70	3.64
Total Tin	mg/L				<0.00010				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Total Strontium	mg/L				0.0913				0.286	0.293	0.199	0.244	0.258	0.269	0.278
Total Sulphur	mg/L				59.4				4.81	5.05	5.57	4.70	5.30	6.76	5.44
Total Titanium	mg/L				0.00276				<0.00030	<0.00030	0.00130	<0.00030	<0.00030	<0.00030	<0.00030
Total Thallium	mg/L	0.0008			0.000029				<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Total Uranium	mg/L				0.000225				0.00144	0.00137	0.000819	0.00111	0.00104	0.00111	0.00115
Total Vanadium	mg/L				0.00061				<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Total Zinc	mg/L	*			10.6 ww				0.0050	0.0045	0.0079	0.0037	0.0035	0.0034	<0.0090
Total Zirconium	mg/L				<0.00030				<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

The license applies only to monitoring stations MH-11, MH-12 and MH-15.
The * indicates the guideline is calculated based on hardness (SO4, Cd, Cu, Pb, Ni, Zn).
Lead and Zinc guidelines also based on TSS levels, and when TSS is greater than 4 mg/L, the guideline applies to the dissolved faction.

		QZ16-051 WUL	SDH-S2						MH-11						
			Waste rock below Main Zone						Camp Creek located 2km downstream of the Reclaim Pond (Upper False Creek Canyon).						
			22-Feb-18	4-Apr-18	6-Jun-18	15-Aug-18	19-Oct-18		21-Feb-18	3-Apr-18	5-Jun-18	14-Aug-18	14-Sep-18	20-Oct-18	3-Dec-18
Dissolved Silver	mg/L				<0.000010				<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dissolved Arsenic	mg/L				<0.00010				0.00038	0.00033	0.00058	0.00063	0.00048	0.00046	0.00036
Dissolved Aluminium	mg/L	*			<0.0010				0.0012	0.0013	0.0046	0.0027	0.0020	0.0018	0.0016
Dissolved Barium	mg/L				0.0160				0.0872	0.0801	0.0558	0.0646	0.0633	0.0632	0.0705
Dissolved Boron	mg/L								<0.010						
Dissolved Beryllium	mg/L				<0.000020				<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Dissolved Boron -	mg/L		Dry	Dry	<0.010					<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Dissolved Bismuth	mg/L				<0.000050				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Dissolved Calcium	mg/L				77.1				86.4	75.4	64.4	66.2	68.6	66.5	69.6
Dissolved Cadmium	mg/L	*			0.101 ww				0.0000427	0.0000398	0.0000491	0.0000393	0.0000334	0.0000388	0.0000360
Dissolved Cobalt	mg/L				0.00031				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Chromium	mg/L				<0.00010				<0.00010	<0.00010	0.00020	0.00011	0.00016	<0.00010	<0.00010
Dissolved Copper	mg/L				0.00052				<0.00020	<0.00020	0.00078	0.00031	0.00025	0.00027	<0.00020
Dissolved Iron	mg/L				<0.010				0.019	0.020	0.021	0.024	0.027	0.023	0.015
Dissolved Mercury	mg/L				<0.0000050				<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Dissolved Potassium	mg/L				0.73				0.56	0.47	0.55	0.37	0.43	0.47	0.40
Dissolved Lithium	mg/L				0.0014				0.0016	0.0017	0.0014	0.0016	0.0016	0.0014	0.0016
Dissolved Magnesium	mg/L				2.82				10.0	8.93	6.65	7.32	7.50	8.81	7.96
Dissolved Manganese	mg/L				0.00504				0.0126	0.0100	0.00286	0.00524	0.00729	0.00528	0.00714
Dissolved Molybdenum	mg/L				0.000684				0.000694	0.000791	0.000895	0.000882	0.000872	0.000884	0.000811
Dissolved Sodium	mg/L				0.474				1.51	1.35	0.956	1.11	1.11	1.16	1.30
Dissolved Nickel	mg/L				0.00091				<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Lead	mg/L	*			0.0870 ww				<0.000050	<0.000050	0.000369	0.000053	<0.000050	<0.000050	<0.000050
Dissolved Phosphorus	mg/L				<0.050				<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dissolved Antimony	mg/L				0.00032				0.00013	0.00012	0.00019	0.00017	0.00014	0.00013	0.00010
Dissolved Sulphur	mg/L				50.7				4.45	4.84	5.19	4.69	5.67	6.55	4.86
Dissolved Selenium	mg/L				0.00394				0.000620	0.000583	0.000790	0.000471	0.000673	0.000872	0.000701
Dissolved Silicon	mg/L				2.21				4.09	4.00	3.48	3.33	3.54	3.61	3.78
Dissolved Tin	mg/L				<0.00010				<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Strontium	mg/L				0.0929				0.318	0.311	0.233	0.248	0.265	0.255	0.262
Dissolved Titanium	mg/L				<0.00030				<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Thallium	mg/L				0.000019				<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dissolved Uranium	mg/L				0.000196				0.00134	0.00143	0.00112	0.000992	0.00108	0.00111	0.00121
Dissolved Vanadium	mg/L				<0.00050				<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Zinc	mg/L	*			9.63 ww				0.0051	0.0039	0.0035	0.0031	0.0029	0.0033	0.0039
Dissolved Zirconium	mg/L				<0.00030				<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

The license applies only to monitoring stations MH-11, MH-12 and MH-15.
The * indicates the guideline is calculated based on hardness (SO4, Cd, Cu, Pb, Ni, Zn).
Lead and Zinc guidelines also based on TSS levels, and when TSS is greater than 4 mg/L, the guideline applies to the dissolved faction.

		QZ16-051 WUL	MH-04 Lower Camp Creek							MH-13 False Creek Canyon, 10 km d/s of Reclaim Pond					
			20-Feb-18	5-Apr-18	6-Jun-18	15-Aug-18	14-Sep-18	19-Oct-18	2-Dec-18	22-Feb-18	4-Apr-18	19-Jun-18	16-Aug-18	14-Sep-18	21-Oct-18
Total Hardness	mg/L		166	174						228	231				
Dissolved Hardness	mg/L		170	167	158	158	164	161	163	243	218	168	195	211	191
Temperature - Field	C		-0.1	-0.1	2.3	3.6	1.5	1.1	-0.4	-0.2	-0.1	8.3	8.4	3.2	0.3
pH - Field	pH		8.23	8.35	8.01	7.91	8.5	8.36	8.01	7.84	7.9	7.8	7.91	8.5	8.41
pH - Lab	pH		8.24	8.36	8.27	8.32	8.29	8.33	8.29	8.13	8.42	8.41	8.38	8.38	8.36
Conductivity - Field	µS/cm		286.1	292.2	290.7	277.2	350	272.9	285.3	376.9	378.2	316	323.4	410	315.8
Conductivity - Lab	µS/cm		309	298	284	289	312	301	302	409	389	304	348	371	337
Total Dissolved Solids	mg/L		188	185	191	178	199	185	197	245	227	182	204	232	206
Total Suspended Solids	mg/L		<1.0	13.2	1.9	1.3	<1.0	<1.0	1.5	<1.0	1.1	1.8	<1.0	<1.0	<1.0
Discharge	L/min		370	390	3300	930		430	350	2790	2670		10280		9318
Ammonia Nitrogen	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0075	0.0099	<0.0050	0.0066	<0.0050	<0.0050
NO2-W	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
NO3-W	mg/L		0.247	0.243	0.280	0.186	0.216	0.215	0.243	0.126	0.126	0.0594	0.0105	<0.0050	0.0312
Sulphate	mg/L	*	14.9	14.6	15.3	16.4	18.7	16.6	15.7	10.6	10.5	7.81	7.77	9.17	10.4
Fluoride	mg/L		0.153	0.155	0.129	0.146		0.154	0.149	0.063	0.065	0.059	0.061		0.062
Chloride	mg/L		<0.50	<0.50	<0.50	<0.50		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50		<0.50
Bromide	mg/L		<0.050	<0.050	<0.050	<0.050		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050		<0.050
Dissolved Oxygen	mg/L		11.04	11.44	11.71	11.7	12.3	10.47	11.98	11	12.86		10.61	12.5	11.17
Dissolved Oxygen	%		86.7	88.8	99.1	101.3		85.5	92.4	83.1	96.8		100.6		85.5
Redox	mV		84.3	151.7	177.0	210.2		134	105.2	76.3	154.3		248.5		74.6
Alkalinity (CaCO3)	mg/L		152	161	137	146	150	151	152	217	224	165	193	201	188
Total Silver	mg/L	0.00025	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000012	<0.000010	<0.000010	<0.000010	<0.000010
Total Aluminum	mg/L		0.0037	0.0312	0.0254	0.0111	0.0068	0.0489	0.0047	0.0046	0.0066	0.0249	0.0083	0.0039	0.0059
Total Arsenic	mg/L	0.005	0.00038	0.00047	0.00041	0.00041	0.00042	0.00046	0.00037	0.00031	0.00040	0.00049	0.00053	0.00051	0.00041
Total Barium	mg/L		0.0232	0.0242	0.0205	0.0215	0.0218	0.0232	0.0221	0.166	0.165	0.117	0.145	0.143	0.139
Total Beryllium	mg/L	0.00013	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Total Bismuth	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Total Boron	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Calcium	mg/L		61.0	63.8	56.3	49.0	58.2	59.2	61.2	65.1	65.0	49.2	47.4	57.3	54.2
Total Cadmium	mg/L		0.000212	0.000244	0.000324	0.000292	0.000283	0.000309	0.000260	0.0000148	0.0000218	0.0000192	0.0000138	0.0000122	0.0000118
Total Cobalt	mg/L	0.004	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Total Chromium III	mg/L			0.00025	0.00222	0.00023		0.00022	<0.00040		0.00053	0.00010	<0.00010		<0.00010
Total Chromium	mg/L	0.001	0.00011	0.00025	0.00222	0.00023	0.00021	0.00022	<0.00040	<0.00010	0.00053	0.00010	<0.00010	0.00020	<0.00010
Total Chromium VI	mg/L	0.001		<0.0010	<0.00050	<0.00050		<0.00050	<0.00050		<0.0010	<0.00050	<0.00050		<0.00050
Total Copper	mg/L	*	<0.00050	0.00053	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00052	<0.00050	<0.00050	<0.00050
Total Iron	mg/L	1	<0.010	0.036	0.024	0.017	0.010	0.080	<0.010	0.134	0.163	0.198	0.198	0.179	0.188
Total Mercury	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Total Potassium	mg/L		0.37	0.40	0.46	0.39	0.39	0.41	0.39	0.41	0.43	0.36	0.34	0.37	0.38
Total Lithium	mg/L		0.0014	0.0015	0.0014	0.0015	0.0016	0.0016	0.0015	0.0013	0.0013	0.0012	0.0011	0.0012	0.0011
Total Magnesium	mg/L		3.39	3.48	3.08	3.24	3.16	3.51	3.39	15.9	16.7	9.90	13.1	13.3	13.5
Total Manganese	mg/L		0.00026	0.00138	0.00177	0.00100	0.00084	0.00312	<0.00070	0.0115	0.0101	0.00945	0.00655	0.0109	0.00758
Total Molybdenum	mg/L	0.073	0.000773	0.000767	0.000619	0.000721	0.000712	0.000744	0.000727	0.00120	0.00123	0.00107	0.00112	0.00105	0.000989
Total Sodium	mg/L		0.893	0.966	0.807	0.845	0.816	0.889	0.831	1.05	1.12	0.784	0.973	0.930	0.968
Total Nickel	mg/L	*	<0.00050	<0.00050	0.00067	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00055	0.00072	<0.00050	<0.00050	<0.00050
Total Lead	mg/L	*	0.000117	0.000761	0.000718	0.000525	0.000348	0.00155	0.000190	<0.000050	0.000180	0.000174	0.000059	<0.000050	<0.000050
Total Phosphorus	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Total Antimony	mg/L	0.009	0.00017	0.00016	0.00016	0.00015	0.00013	0.00015	0.00015	0.00013	0.00011	0.00018	0.00012	0.00011	0.00011
Total Selenium	mg/L	0.002	0.000896	0.00100	0.000729	0.000834	0.000859	0.000845	0.00105	0.000725	0.000751	0.000636	0.000461	0.000478	0.000540
Total Silicon	mg/L		3.33	3.38	3.20	3.19	3.14	3.39	3.26	3.49	3.49	2.73	3.18	2.91	3.26
Total Tin	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Total Strontium	mg/L		0.213	0.213	0.199	0.193	0.203	0.214	0.210	0.222	0.204	0.180	0.197	0.205	0.197
Total Sulphur	mg/L		4.75	5.45	5.75	5.32	6.38	5.93	5.96	3.31	3.94	2.95	2.56	3.12	3.78
Total Titanium	mg/L		<0.00030	0.00049	<0.00090	<0.00030	<0.00030	0.00126	<0.00030	<0.00030	<0.00030	0.00045	<0.00030	<0.00030	<0.00030
Total Thallium	mg/L	0.0008	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Total Uranium	mg/L		0.00105	0.00107	0.000821	0.000852	0.000828	0.000856	0.000909	0.00188	0.00193	0.00121	0.00142	0.00136	0.00129
Total Vanadium	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Total Zinc	mg/L	*	0.0040	0.0099	0.0075	0.0057	0.0061	0.0082	<0.012	<0.0030	0.0037	<0.0030	<0.0030	<0.0030	<0.0030
Total Zirconium	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

The license applies only to monitoring stations MH-11, MH-12 and MH-15.
The * indicates the guideline is calculated based on hardness (SO4, Cd, Cu, Pb, Ni, Zn).
Lead and Zinc guidelines also based on TSS levels, and when TSS is greater than 4 mg/L, the guideline applies to the dissolved faction.

		QZ16-051 WUL	MH-04 Lower Camp Creek								MH-13 False Creek Canyon, 10 km d/s of Reclaim Pond					
			20-Feb-18	5-Apr-18	6-Jun-18	15-Aug-18	14-Sep-18	19-Oct-18	2-Dec-18		22-Feb-18	4-Apr-18	19-Jun-18	16-Aug-18	14-Sep-18	21-Oct-18
Dissolved Silver	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dissolved Arsenic	mg/L		0.00040	0.00039	0.00037	0.00039	0.00036	0.00039	0.00034		0.00024	0.00024	0.00048	0.00042	0.00041	0.00029
Dissolved Aluminium	mg/L	*	0.0013	0.0059	0.0029	0.0017	0.0016	0.0019	0.0013		<0.0010	0.0011	0.0042	0.0022	0.0016	0.0014
Dissolved Barium	mg/L		0.0237	0.0230	0.0227	0.0211	0.0229	0.0225	0.0248		0.160	0.170	0.120	0.142	0.147	0.138
Dissolved Boron	mg/L		<0.010								<0.010					
Dissolved Beryllium	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Dissolved Boron -	mg/L			<0.010	<0.010	<0.010	<0.010	<0.010	<0.010			<0.010	<0.010	<0.010	<0.010	<0.010
Dissolved Bismuth	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Dissolved Calcium	mg/L		62.9	61.1	57.9	58.3	60.5	58.9	59.6		69.4	60.5	50.2	56.9	62.3	54.9
Dissolved Cadmium	mg/L	*	0.000226	0.000191	0.000287	0.000263	0.000264	0.000260	0.000249		0.0000117	0.0000146	0.0000174	0.0000124	0.0000100	0.0000089
Dissolved Cobalt	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Chromium	mg/L		0.00011	0.00014	0.00043	0.00012	0.00014	0.00016	0.00011		<0.00010	<0.00010	0.00015	<0.00010	<0.00010	<0.00010
Dissolved Copper	mg/L		<0.00020	<0.00020	0.00030	<0.00020	<0.00020	<0.00020	<0.00020		<0.00020	0.00023	0.00040	0.00035	0.00027	0.00022
Dissolved Iron	mg/L		<0.010	0.012	<0.010	<0.010	<0.010	<0.010	<0.010		0.012	0.011	0.096	0.060	0.059	0.037
Dissolved Mercury	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Dissolved Potassium	mg/L		0.38	0.38	0.47	0.39	0.41	0.41	0.39		0.42	0.42	0.37	0.34	0.38	0.39
Dissolved Lithium	mg/L		0.0012	0.0014	0.0014	0.0015	0.0015	0.0014	0.0015		<0.0010	0.0010	0.0011	0.0011	0.0012	0.0010
Dissolved Magnesium	mg/L		3.21	3.42	3.28	3.09	3.21	3.51	3.32		17.0	16.2	10.2	12.8	13.5	13.2
Dissolved Manganese	mg/L		0.00014	0.00027	0.00021	0.00032	0.00044	0.00040	0.00023		0.00891	0.00737	0.00540	0.00390	0.0112	0.00496
Dissolved Molybdenum	mg/L		0.000650	0.000756	0.000668	0.000719	0.000747	0.000739	0.000687		0.00104	0.00124	0.00105	0.00109	0.00108	0.000985
Dissolved Sodium	mg/L		0.859	0.933	0.831	0.827	0.836	0.867	0.914		1.06	1.06	0.804	0.946	0.959	0.973
Dissolved Nickel	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Lead	mg/L	*	0.000052	0.000065	0.000208	0.000143	0.000100	0.000107	<0.000050		<0.000050	<0.000050	0.000065	<0.000050	<0.000050	<0.000050
Dissolved Phosphorus	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dissolved Antimony	mg/L		0.00013	0.00012	0.00013	0.00015	0.00012	0.00013	<0.00010		<0.00010	0.00010	0.00018	0.00013	<0.00010	<0.00010
Dissolved Sulphur	mg/L		4.37	4.97	5.05	5.44	6.57	5.63	5.26		3.05	3.44	2.76	2.61	3.15	3.47
Dissolved Selenium	mg/L		0.000901	0.000942	0.000729	0.000788	0.000930	0.000815	0.000802		0.000750	0.000678	0.000705	0.000534	0.000582	0.000524
Dissolved Silicon	mg/L		3.12	3.25	3.02	2.94	3.23	3.34	3.20		3.35	3.33	2.41	2.97	3.07	3.23
Dissolved Tin	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Strontium	mg/L		0.211	0.222	0.203	0.194	0.211	0.208	0.199		0.225	0.215	0.178	0.202	0.217	0.198
Dissolved Titanium	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Thallium	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dissolved Uranium	mg/L		0.000901	0.00106	0.000848	0.000823	0.000873	0.000818	0.000936		0.00168	0.00199	0.00115	0.00130	0.00139	0.00126
Dissolved Vanadium	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Zinc	mg/L	*	0.0040	0.0036	0.0059	0.0051	0.0051	0.0053	0.0044		0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Dissolved Zirconium	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

The license applies only to monitoring stations MH-11, MH-12 and MH-15.
The * indicates the guideline is calculated based on hardness (SO4, Cd, Cu, Pb, Ni, Zn).
Lead and Zinc guidelines also based on TSS levels, and when TSS is greater than 4 mg/L, the guideline applies to the dissolved faction.

		QZ16-051 WUL	MH-29								MH-30					
			Access Cr, u/s of Camp Cr								Unnamed tributary to False Canyon Creek, approximately 3 km d/s of MH-11					
			4-Dec-18	21-Feb-18	3-Apr-18	5-Jun-18	14-Aug-18	14-Sep-18	20-Oct-18	3-Dec-18	22-Feb-18	4-Apr-18	19-Jun-18	16-Aug-18	21-Oct-18	4-Dec-18
Total Hardness	mg/L			214							203	209				
Dissolved Hardness	mg/L		197	234		166	183	188	177	186	232	205	114	154	150	161
Temperature - Field	C		-0.4	-0.2		1.2	6.3	2	0.6	-0.5	-0.3	0	9.7	9.2	0.2	-0.1
pH - Field	pH		7.7	7.74		7.95	8	8.6	8.27	7.69	7.85	7.94	8.2	7.42	7.87	7.36
pH - Lab	pH		8.28	8.01		8.32	8.35	8.36	8.35	8.31	8.06	8.38	8.23	8.24	8.18	8.15
Conductivity - Field	µS/cm		342.8	357.7		297.9	310.8	380	296.5	324.6	337.3	385	219	252.8	243.9	279.2
Conductivity - Lab	µS/cm		359	392		300	330	344	319	340	401	353	217	270	263	297
Total Dissolved Solids	mg/L		235	233	Frozen	188	208	215	207	216	232	207	124	157	154	176
Total Suspended Solids	mg/L		<1.0	<1.0		2.2	<1.0	2.5	<1.0	<1.0	1.3	1.8	<1.0	1.0	<1.0	1.3
Discharge	L/min			72		3070	708		430	310	3160					
Ammonia Nitrogen	mg/L		0.0070	<0.0050		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0143	0.0302	<0.0050	<0.0050	0.0086	0.0162
NO2-W	mg/L		<0.0010	<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
NO3-W	mg/L		0.0886	0.0168		0.153	0.0202	0.0330	0.0380	0.103	0.113	0.0903	0.0091	<0.0050	0.0100	0.0437
Sulphate	mg/L	*	8.57	5.47		3.97	3.75	4.50	4.30	4.61	10.3	6.48	4.49	4.32	5.13	5.08
Fluoride	mg/L		0.058	0.044		0.045	0.054		0.049	0.051	0.062	0.057	0.048	0.052	0.051	0.050
Chloride	mg/L		<0.50	<0.50		<0.50	<0.50		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bromide	mg/L		<0.050	<0.050		<0.050	<0.050		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dissolved Oxygen	mg/L		12.1	9.29		12.68	10.56	11.6	10.91	11.26	9.23	10.78		8.85	8.81	8.76
Dissolved Oxygen	%		90.1	71.6		101.9	97.5		86.6	85.7	69.9	81.8		86.1	67.7	66.3
Redox	mV		74.2	97.1		176.6	113.3		102.3	62	102.6	155.1		239	33.9	5.1
Alkalinity (CaCO3)	mg/L		201	217		205	185	189	181	191	218	210	117	147	145	161
Total Silver	mg/L	0.00025	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Total Aluminum	mg/L		0.0062	0.0032		0.0268	0.0076	0.106	0.0043	0.0061	0.0078	0.0118	0.0062	0.0073	0.0047	0.0069
Total Arsenic	mg/L	0.005	0.00034	0.00038		0.00083	0.00082	0.00092	0.00062	0.00047	0.00039	0.00037	0.00019	0.00033	0.00027	0.00024
Total Barium	mg/L		0.153	0.0553		0.0402	0.0513	0.0486	0.0451	0.0459	0.160	0.246	0.137	0.199	0.183	0.208
Total Beryllium	mg/L	0.00013	<0.000020	<0.000020		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Total Bismuth	mg/L		<0.000050	<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Total Boron	mg/L		<0.010	<0.010		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Calcium	mg/L		58.6	72.4		55.9	56.0	64.9	61.9	67.6	58.6	53.2	29.5	33.9	37.5	42.4
Total Cadmium	mg/L		0.0000166	0.0000498		0.0000788	0.0000529	0.000152	0.0000407	0.0000424	0.0000452	0.0000504	0.0000167	0.0000245	0.0000310	0.0000273
Total Cobalt	mg/L	0.004	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00014	<0.00010	<0.00010	<0.00010	<0.00010
Total Chromium III	mg/L		<0.00030			0.00019	0.00013		<0.00010	<0.00010		0.00021	<0.00010	<0.00010	<0.00010	<0.00020
Total Chromium	mg/L	0.001	<0.00030	<0.00010		0.00019	0.00013	0.00027	<0.00010	<0.00010	<0.00010	0.00021	<0.00010	<0.00010	<0.00010	<0.00020
Total Chromium VI	mg/L	0.001	<0.00050			<0.00050	<0.00050		<0.00050	<0.00050		<0.0010	<0.00050	<0.00050	<0.00050	<0.00050
Total Copper	mg/L	*	<0.00050	<0.00050		0.00054	<0.00050	0.00070	<0.00050	<0.00050	<0.00050	0.00075	<0.00050	<0.00050	<0.00050	<0.00050
Total Iron	mg/L	1	0.172	0.018		0.045	0.013	0.196	<0.010	0.018	0.336	0.713	0.135	0.300	0.359	0.458
Total Mercury	mg/L		<0.0000050	<0.0000050		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Total Potassium	mg/L		0.40	0.32		0.41	0.25	0.30	0.25	0.23	0.37	0.44	0.29	0.26	0.38	0.33
Total Lithium	mg/L		0.0011	0.0014		0.0013	0.0014	0.0016	0.0012	0.0013	0.0013	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Magnesium	mg/L		15.5	8.06		4.65	5.32	5.49	6.05	5.96	13.9	18.3	9.59	13.1	13.5	15.4
Total Manganese	mg/L		0.00952	0.00473		0.00556	0.00251	0.0326	0.00174	0.00362	0.0306	0.0409	0.00584	0.0106	0.0206	0.0251
Total Molybdenum	mg/L	0.073	0.00103	0.000339		0.000680	0.000700	0.000414	0.000646	0.000591	0.00125	0.00181	0.00112	0.00134	0.00121	0.00139
Total Sodium	mg/L		1.00	1.14		0.757	0.947	0.915	0.938	0.885	0.963	0.877	0.600	0.702	0.754	0.720
Total Nickel	mg/L	*	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00134	0.00063	0.00068	0.00061	<0.00050
Total Lead	mg/L	*	0.000161	<0.000050		0.000215	<0.000050	0.000870	<0.000050	<0.000050	0.000111	0.000354	<0.000050	<0.000050	0.000051	0.000142
Total Phosphorus	mg/L		<0.050	<0.050		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Total Antimony	mg/L	0.009	0.00011	0.00018		0.00022	0.00020	0.00016	0.00016	0.00016	0.00013	0.00012	0.00012	<0.00010	<0.00010	<0.00010
Total Selenium	mg/L	0.002	0.000681	0.000331		0.000763	0.000470	0.000419	0.000491	0.000667	0.000696	0.000617	0.000513	0.000380	0.000385	0.000488
Total Silicon	mg/L		3.27	4.17		3.80	3.83	3.77	3.72	3.69	3.27	3.49	2.26	2.50	2.92	3.23
Total Tin	mg/L		<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Total Strontium	mg/L		0.201	0.262		0.192	0.214	0.227	0.227	0.229	0.212	0.133	0.0874	0.109	0.107	0.115
Total Sulphur	mg/L		3.58	1.59		1.48	0.91	1.53	1.63	1.87	3.07	2.48	1.75	1.39	2.02	2.14
Total Titanium	mg/L		<0.00030	<0.00030		<0.00090	<0.00030	0.00245	<0.00030	<0.00030	<0.00030	0.00033	<0.00030	<0.00030	<0.00030	<0.00030
Total Thallium	mg/L	0.0008	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Total Uranium	mg/L		0.00141	0.000773		0.000726	0.000701	0.000655	0.000648	0.000733	0.00189	0.00223	0.000860	0.00118	0.00107	0.00130
Total Vanadium	mg/L		<0.00050	<0.00050		<0.00050	<0.00050	0.00061	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Total Zinc	mg/L	*	<0.0060	<0.0030		<0.0030	<0.0030	0.0061	<0.0030	<0.0030	<0.0030	0.0256	<0.0030	<0.0030	0.0035	<0.0060
Total Zirconium	mg/L		<0.00030	<0.00030		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

The license applies only to monitoring stations MH-11, MH-12 and MH-15.
The * indicates the guideline is calculated based on hardness (SO4, Cd, Cu, Pb, Ni, Zn).
Lead and Zinc guidelines also based on TSS levels, and when TSS is greater than 4 mg/L, the guideline applies to the dissolved faction.

		QZ16-051 WUL	MH-29								MH-30					
			Access Cr, u/s of Camp Cr								Unnamed tributary to False Canyon Creek, approximately 3 km d/s of MH-11					
			4-Dec-18	21-Feb-18	3-Apr-18	5-Jun-18	14-Aug-18	14-Sep-18	20-Oct-18	3-Dec-18	22-Feb-18	4-Apr-18	19-Jun-18	16-Aug-18	21-Oct-18	4-Dec-18
Dissolved Silver	mg/L		<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dissolved Arsenic	mg/L		0.00019	0.00038		0.00076	0.00078	0.00068	0.00059	0.00046	0.00027	0.00025	0.00025	0.00027	0.00018	0.00017
Dissolved Aluminium	mg/L	*	0.0011	0.0017		0.0042	0.0033	0.0022	0.0023	0.0017	<0.0010	0.0014	0.0094	0.0033	0.0024	0.0017
Dissolved Barium	mg/L		0.151	0.0576		0.0436	0.0486	0.0467	0.0447	0.0515	0.170	0.241	0.142	0.190	0.181	0.208
Dissolved Boron	mg/L			<0.010							<0.010					
Dissolved Beryllium	mg/L		<0.000020	<0.000020		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Dissolved Boron -	mg/L		<0.010			<0.010	<0.010	<0.010	<0.010	<0.010		<0.010	<0.010	<0.010	<0.010	<0.010
Dissolved Bismuth	mg/L		<0.000050	<0.000050	Frozen	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Dissolved Calcium	mg/L		56.2	80.2		58.5	64.6	66.4	60.8	65.2	66.5	51.8	30.1	39.8	37.6	41.0
Dissolved Cadmium	mg/L	*	0.0000117	0.0000573		0.0000480	0.0000506	0.0000409	0.0000377	0.0000380	0.0000398	0.0000227	0.0000167	0.0000151	0.0000152	0.0000202
Dissolved Cobalt	mg/L		<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00014	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Chromium	mg/L		0.00016	<0.00010		0.00031	0.00011	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Copper	mg/L		0.00021	0.00033		0.00054	0.00041	0.00032	0.00032	0.00023	<0.00020	0.00034	0.00042	0.00031	0.00021	0.00026
Dissolved Iron	mg/L		0.018	0.015		<0.010	<0.010	<0.010	<0.010	0.019	0.040	0.180	0.181	0.202	0.239	0.154
Dissolved Mercury	mg/L		<0.0000050	<0.0000050		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Dissolved Potassium	mg/L		0.38	0.35		0.43	0.27	0.27	0.25	0.23	0.42	0.43	0.29	0.28	0.35	0.35
Dissolved Lithium	mg/L		0.0012	<0.0010		0.0013	0.0015	0.0013	0.0012	0.0013	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Dissolved Magnesium	mg/L		13.7	8.27		4.92	5.26	5.35	6.05	5.69	16.1	18.5	9.46	13.2	13.6	14.2
Dissolved Manganese	mg/L		0.00645	0.00480		0.00114	0.00153	0.00247	0.00136	0.00231	0.0327	0.0403	0.00610	0.00951	0.0197	0.0236
Dissolved Molybdenum	mg/L		0.000947	0.000292		0.000623	0.000677	0.000643	0.000569	0.000559	0.00112	0.00176	0.00112	0.00127	0.00123	0.00123
Dissolved Sodium	mg/L		1.07	1.12		0.772	0.923	0.915	0.931	0.979	1.04	0.825	0.577	0.705	0.711	0.843
Dissolved Nickel	mg/L		<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00088	0.00063	0.00068	<0.00050	<0.00050
Dissolved Lead	mg/L	*	<0.000050	<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Dissolved Phosphorus	mg/L		<0.050	<0.050		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dissolved Antimony	mg/L		<0.00010	0.00012		0.00020	0.00020	0.00017	0.00015	0.00012	0.00010	<0.00010	0.00011	<0.00010	<0.00010	<0.00010
Dissolved Sulphur	mg/L		2.96	1.40		1.40	1.38	1.81	1.46	1.60	2.77	2.04	1.64	1.59	1.73	1.63
Dissolved Selenium	mg/L		0.000616	0.000312		0.000611	0.000469	0.000488	0.000461	0.000593	0.000780	0.000658	0.000532	0.000336	0.000457	0.000424
Dissolved Silicon	mg/L		3.35	4.05		3.55	3.71	3.69	3.74	3.68	3.27	3.25	1.99	2.27	2.94	3.23
Dissolved Tin	mg/L		<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Strontium	mg/L		0.195	0.274		0.196	0.216	0.231	0.218	0.223	0.225	0.139	0.0879	0.113	0.108	0.110
Dissolved Titanium	mg/L		<0.00030	<0.00030		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Thallium	mg/L		<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dissolved Uranium	mg/L		0.00143	0.000681		0.000733	0.000662	0.000693	0.000647	0.000688	0.00181	0.00222	0.000825	0.00113	0.00105	0.00131
Dissolved Vanadium	mg/L		<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Zinc	mg/L	*	0.0012	0.0013		<0.0010	<0.0010	<0.0010	<0.0010	0.0017	0.0023	0.0142	<0.0010	<0.0010	0.0011	0.0028
Dissolved Zirconium	mg/L		<0.00030	<0.00030		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

The license applies only to monitoring stations MH-11, MH-12 and MH-15.
The * indicates the guideline is calculated based on hardness (SO4, Cd, Cu, Pb, Ni, Zn).
Lead and Zinc guidelines also based on TSS levels, and when TSS is greater than 4 mg/L, the guideline applies to the dissolved faction.

		Yukon Contaminated Site Regulations	MW13-06					MW13-13					MW13-01				
			Burwick 1200 Portal					Downgradient of 1380 Portal					1360 Gully, downgradient of 1380 Portal				
			29-Mar-18	5-Jun-18	17-Aug-18	19-Oct-18	2-Dec-18	29-Mar-18	6-Jun-18	15-Aug-18	18-Oct-18	3-Dec-18	27-Mar-18	4-Jun-18	14-Aug-18	20-Oct-18	5-Dec-18
Ground Water Elevation	masl		1178.435	1183.969	1181.434	1180.044	1180.18		1249.142	1247.379	1245.833	1245.665	1180.184	1181.634	1180.904	1180.578	1180.465
Temperature - Field	C		2.1	5.0		4.9			0.5	3.2	0.8	0.8	1.5	4.0	5.9	2.6	0.8
pH - Field	pH		6.86	6.86		7.06			7.82	7.66	7.81	7.91	7.09	7.16	7.3	7.42	7.09
pH - Lab	pH		8.50			7.95				8.08	8.15	7.96	8.33		7.97	8.15	7.76
Hardness (Dissolved)	mg/L		358	338		351			110	121	131	140	179	151	146	167	172
Conductivity - Field	µS/cm		696.6	641.4		619.4			232.2	247.1	2775	243	316.8	296.4	280	277	426
Conductivity - Lab	µS/cm		660			657				277	257	246	320		301	305	302
Ammonia Nitrogen	mg/L		0.0125	0.0147	Not Sampled; equipment failure	0.0126	Not Sampled; equipment failure	Site Inaccessible	<0.0050	0.0070	0.0073	0.0325	0.0110	<0.0050	<0.0050	<0.0050	<0.0050
NO2-W	mg/L		<0.0010	<0.0010		<0.0010			<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
NO3-W	mg/L		<0.0050	<0.0050		<0.0050			0.370	0.604	0.951	0.764	0.385	0.360	0.357	0.360	0.385
Sulphate	mg/L		167	142		160			32.4	49.8	33.3	20.9	11.1	11.6	10.2	10.4	10.7
Fluoride	mg/L		0.633	0.620		0.627			0.117	0.146	0.164	0.159	0.349	0.319	0.352	0.362	0.348
Chloride	mg/L		0.81	<0.50		<0.50			<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bromide	mg/L		<0.050	<0.050		<0.050			<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dissolved Oxygen	mg/L		1.21	0.92		2.25			11.91	10.81	10.22	9.84	8.46	7.08	6.88	6.26	11.64
Dissolved Oxygen	%		10.1	8.4		20.4			97.0	93.7	84.1	80.3	67.6	62.7	64.2	53.1	94
Redox	mV		-16.8	11.9		18.9			195.8	245.6	80.7	83.7	211.8	184.8		84.6	62.3
Alkalinity (CaCO3)	mg/L		215			209				87.1	105	107	168		152	158	149
Dissolved Arsenic	mg/L		0.0587	0.0476		0.0531			0.00051	0.00037	0.00046	0.00047	0.00046	0.00050	0.00036	0.00034	0.00032
Dissolved Silver	mg/L		<0.000010	<0.000010		<0.000010			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dissolved Aluminium	mg/L		0.0019	0.0015		0.0017			0.0117	0.0129	0.0180	0.0073	0.0021	0.0028	0.0029	0.0019	0.0011
Dissolved Barium	mg/L		0.0275	0.0237		0.0244			0.0126	0.0130	0.0118	0.0134	0.0229	0.0198	0.0212	0.0215	0.0233
Dissolved Beryllium	mg/L		<0.000020	<0.000020		<0.000020			<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Dissolved Boron	mg/L		0.013	0.012		0.012			<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Dissolved Bismuth	mg/L		<0.000050	<0.000050		<0.000050			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Dissolved Calcium	mg/L		129	122		127			41.5	44.8	49.2	52.9	64.6	54.7	52.7	60.1	62.4
Dissolved Cadmium	mg/L	*	<0.000040	<0.000060		0.0000621			0.00182	0.000725	0.000599	0.000515	0.000588	0.000642	0.000658	0.000669	0.000770
Dissolved Cobalt	mg/L		0.00322	0.00288		0.00291			<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Chromium	mg/L		0.00020	0.00080		0.00280			0.00010	0.00017	0.00024	0.00022	0.00027	0.00019	0.00020	0.00018	0.00032
Dissolved Copper	mg/L		0.00033	0.00031		0.00042			0.00079	0.00070	0.00049	0.00055	0.00035	0.00028	<0.00020	<0.00020	0.00030
Dissolved Iron	mg/L		0.752	0.572		0.674			0.018	0.016	0.022	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Dissolved Mercury	mg/L		<0.0000050	<0.0000050		<0.0000050			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Dissolved Potassium	mg/L		2.12	1.92		2.01			0.46	0.71	0.72	0.74	0.70	0.60	0.63	0.65	0.69
Dissolved Lithium	mg/L		0.0088	0.0087		0.0084			<0.0010	<0.0010	<0.0010	<0.0010	0.0018	0.0017	0.0013	0.0014	0.0015
Dissolved Magnesium	mg/L		8.45	7.96		8.39			1.53	2.08	2.08	2.03	4.34	3.57	3.61	4.00	3.88
Dissolved Manganese	mg/L		0.435	0.343		0.351			0.00045	0.00045	0.00049	0.00027	0.00154	0.00266	0.00116	0.00036	0.00131
Dissolved Molybdenum	mg/L		0.0433	0.0433		0.0411			0.000193	0.000337	0.000450	0.000427	0.000681	0.000750	0.000624	0.000557	0.000563
Dissolved Sodium	mg/L		14.0	8.73		10.8			0.469	0.691	0.637	0.739	0.897	0.697	0.781	0.820	0.871
Dissolved Nickel	mg/L		0.0270	0.0271		0.0309			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Lead	mg/L	*	<0.000050	<0.000050		<0.000050			0.00152	0.000882	0.000775	0.000241	0.000978	0.000701	0.00152	0.000942	0.000871
Dissolved Phosphorus	mg/L		0.192	0.134		0.171			<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dissolved Antimony	mg/L		0.00011	0.00018		0.00014			0.00011	0.00014	0.00015	0.00015	0.00015	0.00015	0.00012	0.00012	0.00012
Dissolved Sulphur	mg/L		57.2	43.8		55.7			9.49	15.0	10.9	6.20	3.95	3.29	3.00	3.68	3.38
Dissolved Selenium	mg/L		<0.000050	<0.000050		<0.000050			0.000860	0.00108	0.000714	0.000476	0.00148	0.00101	0.000939	0.00116	0.00124
Dissolved Silicon	mg/L		16.3	15.7		15.6			1.78	2.26	2.48	2.63	3.55	3.18	3.21	3.35	3.28
Dissolved Tin	mg/L		<0.00010	<0.00010		<0.00010			<0.00010	0.00014	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Strontium	mg/L		0.443	0.395		0.385			0.0679	0.0843	0.0850	0.0899	0.206	0.179	0.163	0.167	0.183
Dissolved Titanium	mg/L		<0.00030	<0.00030		<0.00030			0.00040	0.00035	<0.0045	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Thallium	mg/L		0.000016	0.000014		0.000016			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dissolved Uranium	mg/L		0.0187	0.0156		0.0151			0.000268	0.000711	0.000642	0.000596	0.00107	0.000909	0.000957	0.000854	0.000886
Dissolved Vanadium	mg/L		<0.00050	<0.00050		<0.00050			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Zinc	mg/L	*	0.0698	0.0884		0.106			0.0463	0.0178	0.0124	0.0093	0.0206	0.0230	0.0247	0.0241	0.0325
Dissolved Zirconium	mg/L		<0.00030	<0.00030		<0.00030			<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

Yukon Contaminated Sites Regulation (YCSR) Water Quality Guideline for the protection of Freshwater Aquatic Life (Schedule 3) applies only to MW14-01, MW14-02, MW14-03, and MW14-04.
The * indicates the guideline is calculated based on hardness (SO4, Cd, Zn and Pb).

		Yukon Contaminated Site Regulations	MW13-06					MW13-13					MW13-01				
			Burwick 1200 Portal					Downgradient of 1380 Portal					1360 Gully, downgradient of 1380 Portal				
			29-Mar-18	5-Jun-18	17-Aug-18	19-Oct-18	2-Dec-18	29-Mar-18	6-Jun-18	15-Aug-18	18-Oct-18	3-Dec-18	27-Mar-18	4-Jun-18	14-Aug-18	20-Oct-18	5-Dec-18
Acenaphthene	mg/L	0.06															
Acenaphthylene	mg/L																
Acridine	mg/L	0.0005															
Anthracene	mg/L	0.001															
Benz(a)anthracene	mg/L	0.001			Not Sampled; equipment failure		Not Sampled; equipment failure	Site Inaccessible									
Benzene	mg/L	4															
Benzo(a)pyrene	mg/L	0.0001															
2-Methylnaphthalene	mg/L																
Benzo(b,j)fluoranthene	mg/L																
Benzo(g,h,i)perylene	mg/L																
VPH (C6-C10)	mg/L	1.5															
Benzo(k)fluoranthene	mg/L																
Methyl t-butyl ether	mg/L																
Xylenes, total	mg/L																
1-Methylnaphthalene	mg/L																
Dibenz(a,h) anthracene	mg/L																
HEPH_Name	mg/L																
Fluorene	mg/L	0.12															
Fluoranthene	mg/L	0.002															
Ethylbenzene	mg/L	2															
EPH19-32	mg/L																
Chrysene	mg/L																
EPH10-19	mg/L	5															
Pyrene	mg/L	0.00020															
Volatile Hydroc (VH6-10)	mg/L																
Toluene	mg/L	0.39															
Quinoline	mg/L	0.034															
LEPH	mg/L	0.5															
Phenanthrene	mg/L	0.003															
ortho-Xylene	mg/L																
Naphthalene	mg/L	0.01															
Methyl t-butyl ether	mg/L																
meta- & para-Xylene	mg/L																
Styrene	mg/L																
Indeno(1,2,3-c,d)pyrene	mg/L																

Yukon Contaminated Sites Regulation (YCSR) Water Quality Guideline for the protection of Freshwater Aquatic Life (Schedule 3) applies only to MW14-01, MW14-02, MW14-03, and MW14-04.
The * indicates the guideline is calculated based on hardness (SO4, Cd, Zn and Pb).

		Yukon Contaminated Site Regulations	MW13-08				MW14-01				MW14-02				MW14-03			
			Downgradient of 1380 Portal				In proximity of the landfill				In proximity of the landfill				In proximity of the landfill			
			28-Mar-18	6-Jun-18	15-Aug-18	19-Oct-18	28-Mar-18	4-Jun-18	14-Aug-18	18-Oct-18	28-Mar-18	4-Jun-18	13-Aug-18	18-Oct-18	28-Mar-18	4-Jun-18	13-Aug-18	18-Oct-18
Ground Water Elevation	masl		1130.509	1133.995	1132.026	1131.365			1015.476	1014.711								
Temperature - Field	C		0.3	5.0	3.7	2.1			4.8	2.9								
pH - Field	pH		7.25	7.32	7.19	7.36			7.38	7.62								
pH - Lab	pH		7.99		7.94	8.00			8.15	8.22								
Hardness (Dissolved)	mg/L		361	259	264	330			212	226								
Conductivity - Field	µS/cm		599.7	451.5	468.3	515.9			412.2	358.8								
Conductivity - Lab	µS/cm		437		506	544			423	395								
Ammonia Nitrogen	mg/L		0.0554	0.0254	0.0251	0.0118			0.0277	0.0251								
NO2-W	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	Dry	Dry	<0.0010	<0.0010	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
NO3-W	mg/L		0.0513	0.292	0.303	0.289			0.329	0.225								
Sulphate	mg/L		17.6	9.97	10.1	15.7			6.71	3.98								
Fluoride	mg/L		0.054	0.056	0.050	0.046			0.093	0.141								
Chloride	mg/L		<0.50	<0.50	<0.50	<0.50			<0.50	<0.50								
Bromide	mg/L		<0.050	<0.050	<0.050	<0.050			<0.050	<0.050								
Dissolved Oxygen	mg/L		4.1	6.46	7.85	5			7.77	8.05								
Dissolved Oxygen	%		31.6	58.6	68.3	42.1			69.4	67.3								
Redox	mV		51.2	184.0	207.7	143.5			210.9	140.6								
Alkalinity (CaCO3)	mg/L		249		276	306			226	233								
Dissolved Arsenic	mg/L		0.00074	0.00025	0.00028	0.00020			0.00029	0.00032								
Dissolved Silver	mg/L		<0.000010	<0.000010	<0.000010	<0.000010			<0.000010	<0.000010								
Dissolved Aluminium	mg/L		0.150	0.0034	0.0039	0.0026			0.0177	0.0143								
Dissolved Barium	mg/L		0.282	0.136	0.166	0.215			0.123	0.127								
Dissolved Beryllium	mg/L		<0.000020	<0.000020	<0.000020	<0.000020			<0.000020	<0.000020								
Dissolved Boron	mg/L		<0.010	<0.010	<0.010	<0.010			<0.010	<0.010								
Dissolved Bismuth	mg/L		<0.000050	<0.000050	<0.000050	<0.000050			<0.000050	<0.000050								
Dissolved Calcium	mg/L		123	88.8	89.9	113			66.8	72.5								
Dissolved Cadmium	mg/L	*	0.0000651	0.0000647	0.0000756	0.0000645			0.0000346	0.0000392								
Dissolved Cobalt	mg/L		0.00066	<0.00010	0.00031	<0.00010			<0.00010	<0.00010								
Dissolved Chromium	mg/L		0.00030	0.00039	0.00023	0.00038			0.00057	0.00061								
Dissolved Copper	mg/L		0.00062	<0.00020	0.00049	0.00033			0.00052	0.00074								
Dissolved Iron	mg/L		0.278	<0.010	0.014	<0.010			0.028	0.028								
Dissolved Mercury	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050			<0.0000050	<0.0000050								
Dissolved Potassium	mg/L		0.82	0.64	0.65	0.70			0.80	0.70								
Dissolved Lithium	mg/L		0.0022	0.0014	0.0016	0.0020			<0.0010	<0.0010								
Dissolved Magnesium	mg/L		13.3	8.93	9.58	11.5			11.0	10.9								
Dissolved Manganese	mg/L		0.0253	0.00042	0.0100	<0.00030			0.00164	0.00108								
Dissolved Molybdenum	mg/L		0.000803	0.000855	0.000628	0.000576			0.00213	0.00214								
Dissolved Sodium	mg/L		1.40	1.19	1.05	1.09			2.63	1.42								
Dissolved Nickel	mg/L		0.00100	<0.00050	0.00058	<0.00050			<0.00050	<0.00050								
Dissolved Lead	mg/L	*	0.000539	<0.000050	0.000174	0.000119			0.000233	0.000160								
Dissolved Phosphorus	mg/L		<0.050	<0.050	<0.050	<0.050			<0.050	<0.050								
Dissolved Antimony	mg/L		0.00021	0.00014	0.00016	0.00018			0.00015	0.00016								
Dissolved Sulphur	mg/L		6.18	2.89	2.93	5.42			1.94	1.47								
Dissolved Selenium	mg/L		0.00103	0.000889	0.00113	0.00200			0.000873	0.00108								
Dissolved Silicon	mg/L		4.64	3.82	3.81	3.92			4.57	4.49								
Dissolved Tin	mg/L		<0.00010	<0.00010	<0.00010	<0.00010			<0.00010	<0.00010								
Dissolved Strontium	mg/L		0.415	0.286	0.303	0.341			0.236	0.234								
Dissolved Titanium	mg/L		0.00545	<0.00030	<0.00030	<0.00030			0.00048	0.00053								
Dissolved Thallium	mg/L		<0.000010	<0.000010	<0.000010	<0.000010			<0.000010	<0.000010								
Dissolved Uranium	mg/L		0.00222	0.00143	0.00154	0.00164			0.000862	0.000613								
Dissolved Vanadium	mg/L		<0.00050	<0.00050	<0.00050	<0.00050			<0.00050	<0.00050								
Dissolved Zinc	mg/L	*	0.0028	<0.0010	0.0011	<0.0010			0.0013	<0.0010								
Dissolved Zirconium	mg/L		<0.00030	<0.00030	<0.00030	<0.00030			<0.00030	<0.00030								

Yukon Contaminated Sites Regulation (YCSR) Water Quality Guideline for the protection of Freshwater Aquatic Life (Schedule 3) applies only to MW14-01, MW14-02, MW14-03, and MW14-04.
The * indicates the guideline is calculated based on hardness (SO4, Cd, Zn and Pb).

		Yukon Contaminated Site Regulations	MW13-08				MW14-01				MW14-02				MW14-03			
			Downgradient of 1380 Portal				In proximity of the landfill				In proximity of the landfill				In proximity of the landfill			
			28-Mar-18	6-Jun-18	15-Aug-18	19-Oct-18	28-Mar-18	4-Jun-18	14-Aug-18	18-Oct-18	28-Mar-18	4-Jun-18	13-Aug-18	18-Oct-18	28-Mar-18	4-Jun-18	13-Aug-18	18-Oct-18
Acenaphthene	mg/L	0.06							<0.000010	<0.000010								
Acenaphthylene	mg/L								<0.000010	<0.000010								
Acridine	mg/L	0.0005							<0.000010	<0.000010								
Anthracene	mg/L	0.001							<0.000010	<0.000010								
Benz(a)anthracene	mg/L	0.001							<0.000010	<0.000010								
Benzene	mg/L	4							<0.00050	<0.00050								
Benzo(a)pyrene	mg/L	0.0001					Dry	Dry	<0.0000050	<0.0000050	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
2-Methylnaphthalene	mg/L								<0.000050	<0.000050								
Benzo(b,j)fluoranthene	mg/L								<0.000010	<0.000010								
Benzo(g,h,i)perylene	mg/L								<0.000010	<0.000010								
VPH (C6-C10)	mg/L	1.5							<0.10	<0.10								
Benzo(k)fluoranthene	mg/L								<0.000010	<0.000010								
Methyl t-butyl ether	mg/L								<0.00050	<0.00050								
Xylenes, total	mg/L								<0.00075	<0.00075								
1-Methylnaphthalene	mg/L								<0.000050	<0.000050								
Dibenz(a,h) anthracene	mg/L								<0.0000050	<0.0000050								
HEPH_Name	mg/L								<0.25	<0.25								
Fluorene	mg/L	0.12							<0.000010	<0.000010								
Fluoranthene	mg/L	0.002							<0.000010	<0.000010								
Ethylbenzene	mg/L	2							<0.00050	<0.00050								
EPH19-32	mg/L								<0.25	<0.25								
Chrysene	mg/L								<0.000010	<0.000010								
EPH10-19	mg/L	5							<0.25	<0.25								
Pyrene	mg/L	0.00020							<0.000010	<0.000010								
Volatile Hydroc (VH6-10)	mg/L								<0.10	<0.10								
Toluene	mg/L	0.39							<0.00045	<0.00045								
Quinoline	mg/L	0.034							<0.000050	<0.000050								
LEPH	mg/L	0.5							<0.25	<0.25								
Phenanthrene	mg/L	0.003							<0.000020	<0.000020								
ortho-Xylene	mg/L								<0.00050	<0.00050								
Naphthalene	mg/L	0.01							<0.000050	<0.000050								
Methyl t-butyl ether	mg/L																	
meta- & para-Xylene	mg/L								<0.00050	<0.00050								
Styrene	mg/L								<0.00050	<0.00050								
Indeno(1,2,3-c,d)pyrene	mg/L								<0.000010	<0.000010								

Yukon Contaminated Sites Regulation (YCSR) Water Quality Guideline for the protection of Freshwater Aquatic Life (Schedule 3) applies only to MW14-01, MW14-02, MW14-03, and MW14-04.
The * indicates the guideline is calculated based on hardness (SO4, Cd, Zn and Pb).

		Yukon Contaminated Site Regulations	MW14-04				MW13-04					MW13-05				
			In proximity of the landfill				Main Access Road					South of the Mill Site on the Main Access Road				
			28-Mar-18	6-Jun-18	13-Aug-18	18-Oct-18	29-Mar-18	6-Jun-18	17-Aug-18	18-Oct-18	5-Dec-18	29-Mar-18	6-Jun-18	15-Aug-18	18-Oct-18	3-Dec-18
Ground Water Elevation	masl		1018.055	1017.885	1017.815	1017.854		1192.788	1181.974	1180.265	1179.96		1193.715	1190.703		
Temperature - Field	C		1.7	8.4		2.1		5.2	3.9	1.5	0.9		3.5	4.7		
pH - Field	pH		8.15	7.82		8.2		7.66	7.16	7.92	7.73		7.68	7.57		
pH - Lab	pH		8.42			8.17			8.12	8.27	8.05			7.96		
Hardness (Dissolved)	mg/L		182	173		173		131	132	183	196		171	167		
Conductivity - Field	µS/cm		414.8	380.6		296.4		249.8	248.2	304.8	298		342.0	301.2		
Conductivity - Lab	µS/cm		328			303			263	326	310			337		
Ammonia Nitrogen	mg/L		0.0071	0.0327		0.0308		<0.0050	0.0211	0.0183	0.0167		<0.0050	0.0337		
NO2-W	mg/L		<0.0010	<0.0010	Dry	<0.0010	Dry	<0.0010	<0.0010	<0.0010	<0.0010	Dry	<0.0010	<0.0010	Dry	Dry
NO3-W	mg/L		0.0714	0.0420		0.0486		0.343	0.400	0.981	0.924		1.53	1.51		
Sulphate	mg/L		15.2	7.07		4.58		5.58	5.45	3.89	4.41		48.2	48.1		
Fluoride	mg/L		0.046	0.062		0.073		0.060	0.055	0.055	0.052		0.062	0.071		
Chloride	mg/L		2.74	2.50		0.54		<0.50	<0.50	<0.50	<0.50		<0.50	<0.50		
Bromide	mg/L		<0.050	<0.050		<0.050		<0.050	<0.050	<0.050	<0.050		<0.050	<0.050		
Dissolved Oxygen	mg/L		10.29	6.62		8.32			9.77	9.22	11.01		10.54	10.06		
Dissolved Oxygen	%		83.5	65.0		68.6		99.7	85.8	75.9	89		92.7	90.2		
Redox	mV		102.5	130.8		29.9		204.5	150.9	131	133.5		199.4	243.2		
Alkalinity (CaCO3)	mg/L		180			226			133	182	167			117		
Dissolved Arsenic	mg/L		0.00041	0.00050		0.00053		0.00071	0.00057	0.00079	0.00090		0.00060	0.00074		
Dissolved Silver	mg/L		<0.000010	<0.000010		<0.000010		<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010		
Dissolved Aluminium	mg/L		0.0046	0.0049		0.0053		0.0046	0.0123	0.0037	0.0040		0.0036	0.0084		
Dissolved Barium	mg/L		0.131	0.112		0.108		0.0338	0.0583	0.0448	0.0485		0.0556	0.0552		
Dissolved Beryllium	mg/L		<0.000020	<0.000020		<0.000020		<0.000020	<0.000020	<0.000020	<0.000020		<0.000020	<0.000020		
Dissolved Boron	mg/L		<0.010	<0.010		<0.010		<0.010	<0.010	<0.010	<0.010		<0.010	<0.010		
Dissolved Bismuth	mg/L		<0.000050	<0.000050		<0.000050		<0.000050	<0.000050	<0.000050	<0.000050		<0.000050	<0.000050		
Dissolved Calcium	mg/L		62.3	59.2		57.9		47.8	46.8	66.1	71.1		62.7	61.3		
Dissolved Cadmium	mg/L	*	0.0000177	0.0000766		0.0000409		0.000447	0.000159	0.000509	0.000364		0.0000771	0.0000454		
Dissolved Cobalt	mg/L		<0.00010	<0.00010		<0.00010		<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010		
Dissolved Chromium	mg/L		0.00103	0.00035		0.00034		0.00028	0.00029	0.00029	0.00054		0.00039	0.00019		
Dissolved Copper	mg/L		0.00626	0.00276		0.00099		0.00062	0.00093	0.00092	0.00088		0.00151	0.00051		
Dissolved Iron	mg/L		<0.010	<0.010		<0.010		<0.010	0.014	<0.010	<0.010		<0.010	0.015		
Dissolved Mercury	mg/L		<0.0000050	<0.0000050		<0.0000050		<0.0000050	<0.0000050	<0.0000050	<0.0000050		<0.0000050	<0.0000050		
Dissolved Potassium	mg/L		0.75	1.25		1.25		0.45	0.55	0.56	0.54		0.64	0.48		
Dissolved Lithium	mg/L		0.0012	0.0014		0.0017		0.0015	0.0014	0.0016	0.0015		0.0016	0.0015		
Dissolved Magnesium	mg/L		6.46	6.18		6.84		2.83	3.68	4.43	4.54		3.58	3.48		
Dissolved Manganese	mg/L		0.00057	0.00108		0.00150		0.00034	0.00055	0.00061	0.00024		0.00085	0.00023		
Dissolved Molybdenum	mg/L		0.000954	0.00337		0.00406		0.000618	0.000684	0.000509	0.000687		0.000784	0.000733		
Dissolved Sodium	mg/L		1.12	1.52		1.59		0.621	1.02	1.02	2.57		1.01	0.828		
Dissolved Nickel	mg/L		<0.00050	0.00054		<0.00050		<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050		
Dissolved Lead	mg/L	*	0.000130	0.000768		0.000083		0.000674	0.000253	0.000340	0.000296		0.000768	0.000135		
Dissolved Phosphorus	mg/L		<0.050	<0.050		<0.050		<0.050	<0.050	<0.050	<0.050		<0.050	<0.050		
Dissolved Antimony	mg/L		0.00017	0.00027		0.00022		0.00028	0.00026	0.00026	0.00024		0.00031	0.00032		
Dissolved Sulphur	mg/L		4.71	1.98		1.64		1.63	1.47	1.35	1.37		14.9	14.3		
Dissolved Selenium	mg/L		0.000127	0.000174		0.000203		0.000992	0.00101	0.000792	0.000707		0.00236	0.00236		
Dissolved Silicon	mg/L		3.49	3.26		3.36		3.61	3.78	3.56	3.52		4.40	3.98		
Dissolved Tin	mg/L		<0.00010	<0.00010		<0.00010		<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	0.00039		
Dissolved Strontium	mg/L		0.216	0.200		0.205		0.112	0.117	0.156	0.173		0.179	0.168		
Dissolved Titanium	mg/L		<0.00030	<0.00030		<0.00030		<0.00030	0.00053	<0.00030	<0.00030		<0.00030	0.00038		
Dissolved Thallium	mg/L		<0.000010	<0.000010		<0.000010		<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010		
Dissolved Uranium	mg/L		0.000556	0.000587		0.000542		0.000590	0.000643	0.000752	0.000982		0.000789	0.000720		
Dissolved Vanadium	mg/L		<0.00050	<0.00050		<0.00050		<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050		
Dissolved Zinc	mg/L	*	0.0051	0.0048		0.0014		0.0138	0.0053	0.0127	0.0074		0.0066	<0.0010		
Dissolved Zirconium	mg/L		<0.00030	<0.00030		<0.00030		<0.00030	<0.00030	<0.00030	<0.00030		<0.00030	<0.00030		

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The * indicates the guideline is calculated based on hardness (SO4, Cd, Zn and Pb).

		Yukon Contaminated Site Regulations	MW14-04				MW13-04					MW13-05				
			In proximity of the landfill				Main Access Road					South of the Mill Site on the Main Access Road				
			28-Mar-18	6-Jun-18	13-Aug-18	18-Oct-18	29-Mar-18	6-Jun-18	17-Aug-18	18-Oct-18	5-Dec-18	29-Mar-18	6-Jun-18	15-Aug-18	18-Oct-18	3-Dec-18
Acenaphthene	mg/L	0.06	<0.000010	<0.000010		<0.000020		<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010		
Acenaphthylene	mg/L		<0.000010	<0.000010		<0.000010		<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010		
Acridine	mg/L	0.0005	<0.000010	<0.000010		<0.000010		<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010		
Anthracene	mg/L	0.001	<0.000010	<0.000010		<0.000010		<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010		
Benz(a)anthracene	mg/L	0.001	<0.000010	<0.000010		<0.000010		<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010		
Benzene	mg/L	4	<0.00050	<0.00050		<0.00050		<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050		
Benzo(a)pyrene	mg/L	0.0001	<0.0000050	<0.0000050	Dry	<0.0000050	Dry	<0.0000050	<0.0000050	<0.0000050	<0.0000050	Dry	<0.0000050	<0.0000050	Dry	Dry
2-Methylnaphthalene	mg/L		<0.000050	<0.000050		<0.000050		<0.000050	<0.000050	<0.000050	<0.000050		<0.000050	<0.000050		
Benzo(b,j)fluoranthene	mg/L		<0.000010	<0.000010		<0.000010		<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010		
Benzo(g,h,i)perylene	mg/L		<0.000010	<0.000010		<0.000010		<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010		
VPH (C6-C10)	mg/L	1.5	<0.10	<0.10		<0.10		<0.10	<0.10	<0.10	<0.10		<0.10	<0.10		
Benzo(k)fluoranthene	mg/L		<0.000010	<0.000010		<0.000010		<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010		
Methyl t-butyl ether	mg/L			<0.00050		<0.00050		<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050		
Xylenes, total	mg/L		<0.00075	<0.00075		<0.00075		<0.00075	<0.00075	<0.00075	<0.00075		<0.00075	<0.00075		
1-Methylnaphthalene	mg/L		<0.000050	<0.000050		<0.000050		<0.000050	<0.000050	<0.000050	<0.000050		<0.000050	<0.000050		
Dibenz(a,h) anthracene	mg/L		<0.0000050	<0.0000050		<0.0000050		<0.0000050	<0.0000050	<0.0000050	<0.0000050		<0.0000050	<0.0000050		
HEPH_Name	mg/L		<0.25	<0.25		<0.25		<0.25	<0.25	<0.25	<0.25		<0.25	<0.25		
Fluorene	mg/L	0.12	<0.000010	<0.000010		<0.000010		<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010		
Fluoranthene	mg/L	0.002	<0.000010	<0.000010		<0.000010		<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010		
Ethylbenzene	mg/L	2	<0.00050	<0.00050		<0.00050		<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050		
EPH19-32	mg/L		<0.25	<0.25		<0.25		<0.25	<0.25	<0.25	<0.25		<0.25	<0.25		
Chrysene	mg/L		<0.000010	<0.000010		<0.000010		<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010		
EPH10-19	mg/L	5	<0.25	<0.25		<0.25		<0.25	<0.25	<0.25	<0.25		<0.25	<0.25		
Pyrene	mg/L	0.00020	<0.000010	<0.000010		<0.000010		<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010		
Volatile Hydroc (VH6-10)	mg/L		<0.10	<0.10		<0.10		<0.10	<0.10	<0.10	<0.10		<0.10	<0.10		
Toluene	mg/L	0.39	<0.00045	<0.00045		<0.00045		<0.00045	<0.00045	<0.00045	<0.00045		<0.00045	<0.00045		
Quinoline	mg/L	0.034	<0.000050	<0.000050		<0.000050		<0.000050	<0.000050	<0.000050	<0.000050		<0.000050	<0.000050		
LEPH	mg/L	0.5	<0.25	<0.25		<0.25		<0.25	<0.25	<0.25	<0.25		<0.25	<0.25		
Phenanthrene	mg/L	0.003	<0.000020	<0.000020		<0.000020		<0.000020	<0.000020	<0.000020	<0.000020		<0.000020	<0.000020		
ortho-Xylene	mg/L		<0.00050	<0.00050		<0.00050		<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050		
Naphthalene	mg/L	0.01	<0.000050	<0.000050		<0.000050		<0.000050	<0.000050	<0.000050	<0.000050		<0.000050	<0.000050		
Methyl t-butyl ether	mg/L		<0.00050													
meta- & para-Xylene	mg/L		<0.00050	<0.00050		<0.00050		<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050		
Styrene	mg/L		<0.00050	<0.00050		<0.00050		<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050		
Indeno(1,2,3-c,d)pyrene	mg/L		<0.000010	<0.000010		<0.000010		<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010		

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The * indicates the guideline is calculated based on hardness (SO4, Cd, Zn and Pb).

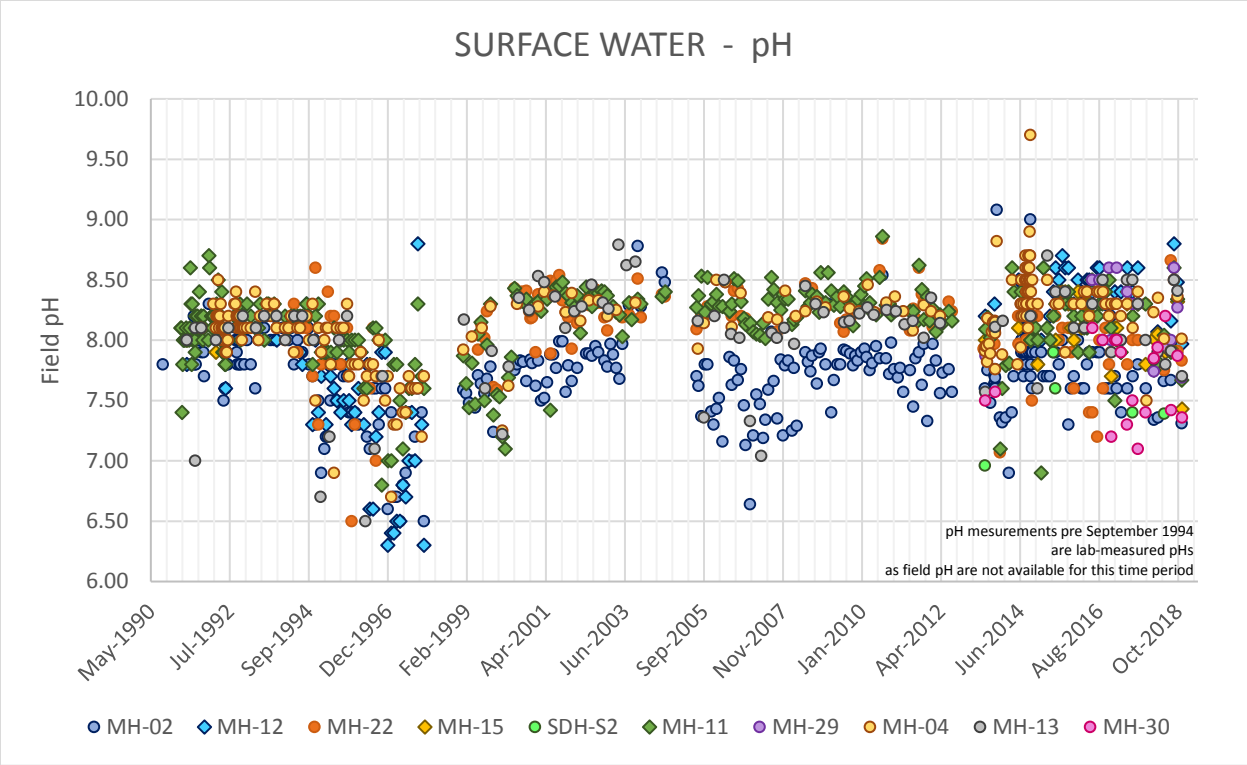
		Yukon Contaminated Site Regulations	MW13-07				MW13-10			
			Norht of the North Dam and Tailings Pond Area				Northeast and downstream of the Mill Site			
			28-Mar-18	5-Jun-18	14-Aug-18	20-Oct-18	4-Apr-18	6-Jun-18	14-Aug-18	19-Oct-18
Ground Water Elevation	masl		1092.749	1094.943	1093.961	1093.607	1115.068	1117.845	1115.693	1115.574
Temperature - Field	C		4.3	4.8	6.4	4	0.8	4.8	5.4	1.6
pH - Field	pH		7.36	7.31	7.19	7.64	7.55	7.43	7.45	7.7
pH - Lab	pH		8.54		8.01	8.23	8.20		8.09	8.24
Hardness (Dissolved)	mg/L		244	248	226	244	245	238	225	251
Conductivity - Field	µS/cm		475.2	521.6	469.5	430	655.1	444.4	408.3	407
Conductivity - Lab	µS/cm		474		509	478	393		450	433
Ammonia Nitrogen	mg/L		0.199	0.171	0.177	0.160	0.0216	0.0188	0.0176	0.0057
NO2-W	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
NO3-W	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	0.517	0.617	0.527	0.539
Sulphate	mg/L		45.7	50.7	47.2	43.2	35.0	30.8	34.4	34.9
Fluoride	mg/L		0.384	0.412	0.394	0.389	0.063	0.053	0.059	0.058
Chloride	mg/L		0.59	0.72	0.61	0.57	<0.50	0.56	<0.50	<0.50
Bromide	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dissolved Oxygen	mg/L		0.2	0.66	0.47	6.36	10.98	10.05	6.88	6.66
Dissolved Oxygen	%		9.8	12.3	4.4	55.1	88	89.9	62.6	55
Redox	mV		-124.5	-124.6	-101.9	-92.2	145.4	172.9	168.5	130.3
Alkalinity (CaCO3)	mg/L		230		233	232	190		207	212
Dissolved Arsenic	mg/L		0.00315	0.00357	0.00339	0.00320	0.00111	0.00110	0.00108	0.00112
Dissolved Silver	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dissolved Aluminium	mg/L		0.0039	0.0029	0.0026	0.0023	0.0060	0.0034	0.0081	0.0040
Dissolved Barium	mg/L		0.0270	0.0268	0.0270	0.0264	0.00852	0.0114	0.00776	0.00786
Dissolved Beryllium	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Dissolved Boron	mg/L		0.022	0.024	0.023	0.023	<0.010	<0.010	<0.010	<0.010
Dissolved Bismuth	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Dissolved Calcium	mg/L		70.0	71.2	63.1	70.0	84.3	81.7	76.2	86.2
Dissolved Cadmium	mg/L	*	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000184	0.0000212	0.0000195	0.0000156
Dissolved Cobalt	mg/L		0.00075	0.00061	0.00057	0.00059	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Chromium	mg/L		0.00022	<0.00010	<0.00010	0.00014	0.00022	0.00098	0.00037	0.00045
Dissolved Copper	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	0.00026	0.00121	0.00052	<0.00020
Dissolved Iron	mg/L		2.15	2.95	2.68	2.32	0.025	0.014	0.013	<0.010
Dissolved Mercury	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Dissolved Potassium	mg/L		3.34	3.24	3.39	3.31	1.20	1.09	1.21	1.09
Dissolved Lithium	mg/L		0.0083	0.0081	0.0076	0.0080	0.0011	0.0015	0.0016	0.0016
Dissolved Magnesium	mg/L		16.9	17.0	16.6	16.8	8.32	8.36	8.34	8.62
Dissolved Manganese	mg/L		1.12	1.23	1.15	1.03	0.00042	0.00052	0.00104	0.00038
Dissolved Molybdenum	mg/L		0.00400	0.00368	0.00342	0.00376	0.00197	0.00170	0.00190	0.00186
Dissolved Sodium	mg/L		15.3	17.6	15.7	12.7	1.92	1.97	1.95	1.89
Dissolved Nickel	mg/L		0.00416	0.00186	0.00178	0.00223	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Lead	mg/L	*	0.000244	<0.000050	0.000070	<0.000050	0.000177	0.000292	0.000247	0.000209
Dissolved Phosphorus	mg/L		0.119	0.121	0.132	0.095	<0.050	<0.050	<0.050	<0.050
Dissolved Antimony	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	0.00014	0.00012	0.00012	0.00012
Dissolved Sulphur	mg/L		15.5	15.0	14.9	15.3	11.8	9.55	11.4	12.0
Dissolved Selenium	mg/L		<0.000050	<0.000050	<0.000050	0.000090	0.00169	0.00147	0.00144	0.00168
Dissolved Silicon	mg/L		7.38	7.25	7.15	7.19	3.90	3.81	3.89	3.83
Dissolved Tin	mg/L		0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Strontium	mg/L		0.492	0.488	0.471	0.481	0.392	0.355	0.369	0.352
Dissolved Titanium	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	0.00032	<0.00030	0.00039	<0.00030
Dissolved Thallium	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dissolved Uranium	mg/L		0.00721	0.00733	0.00762	0.00712	0.00294	0.00254	0.00302	0.00300
Dissolved Vanadium	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Zinc	mg/L	*	0.0014	<0.0010	0.0010	0.0026	0.0015	0.0020	0.0015	0.0016
Dissolved Zirconium	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

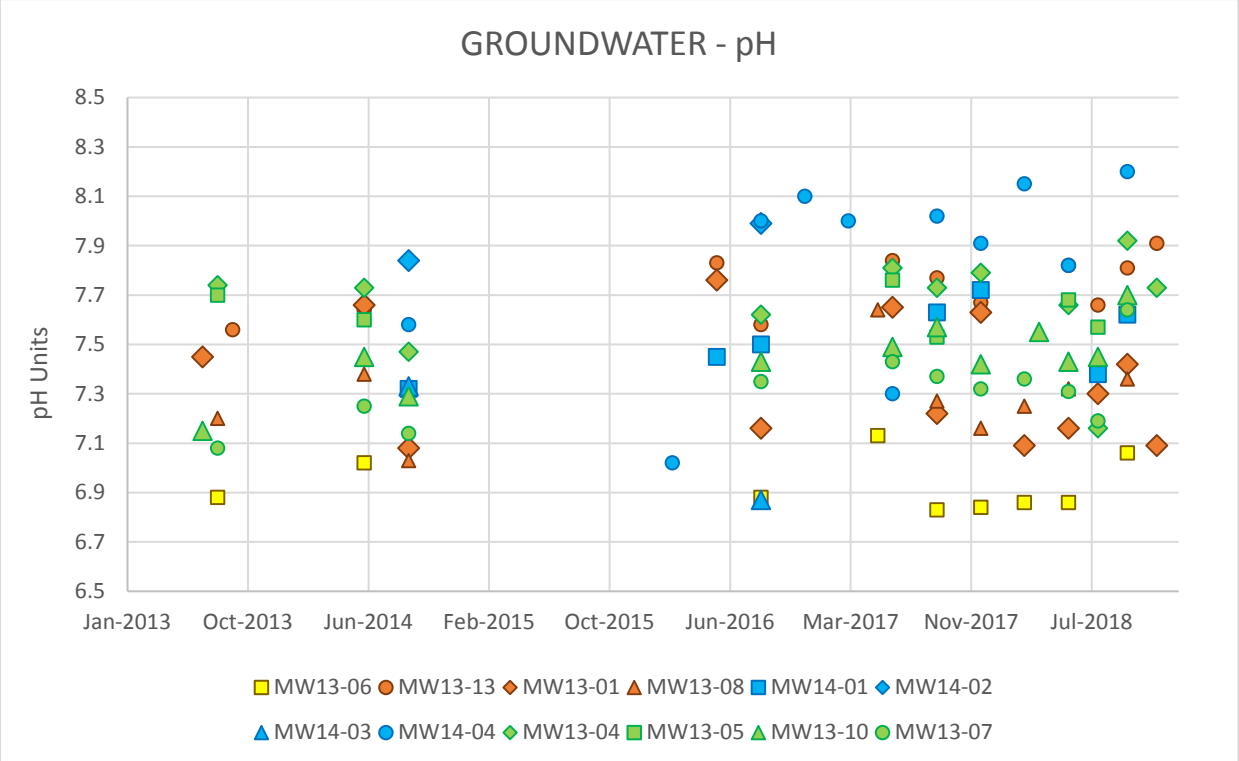
Yukon Contaminated Sites Regulation (YCSR) Water Quality Guideline for the protection of Freshwater Aquatic Life (Schedule 3) applies only to MW14-01, MW14-02, MW14-03, and MW14-04.
The * indicates the guideline is calculated based on hardness (SO4, Cd, Zn and Pb).

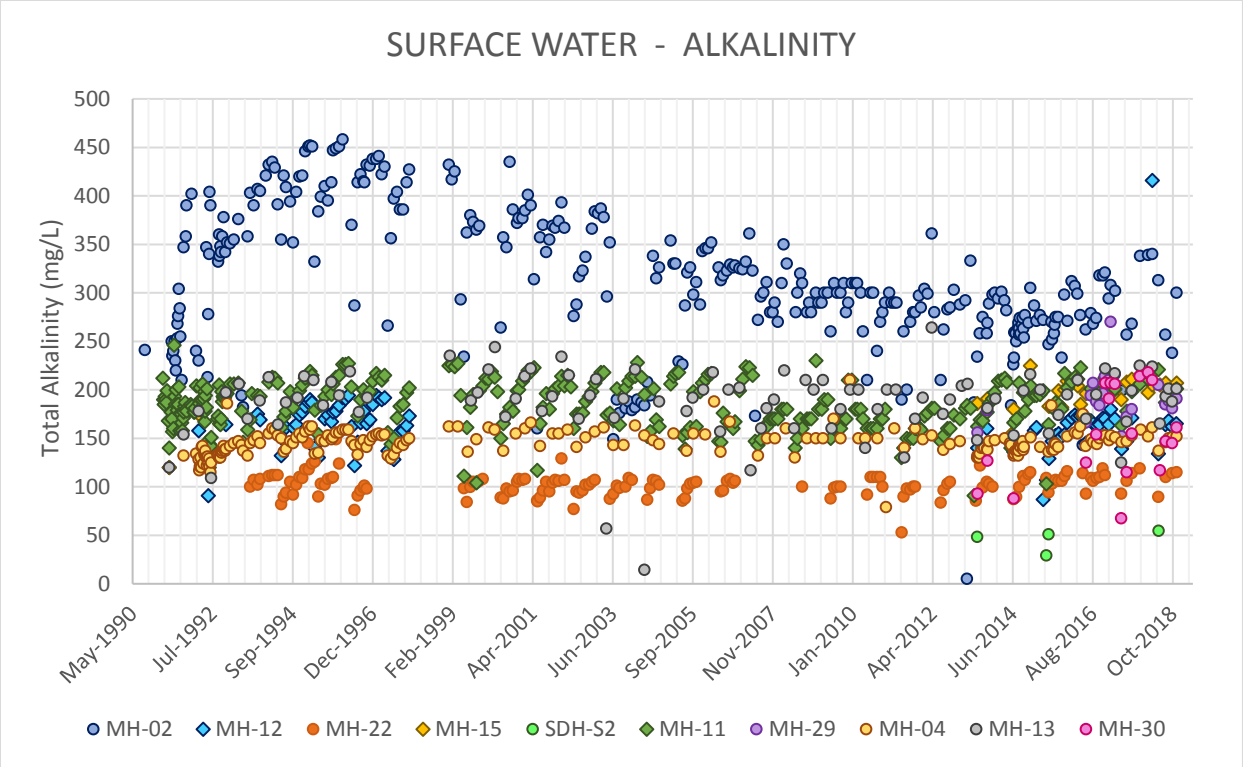
		Yukon Contaminated Site Regulations	MW13-07				MW13-10			
			Norht of the North Dam and Tailings Pond Area				Northeast and downstream of the Mill Site			
			28-Mar-18	5-Jun-18	14-Aug-18	20-Oct-18	4-Apr-18	6-Jun-18	14-Aug-18	19-Oct-18
Acenaphthene	mg/L	0.06	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Acenaphthylene	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Acridine	mg/L	0.0005	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Anthracene	mg/L	0.001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benz(a)anthracene	mg/L	0.001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benzene	mg/L	4	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Benzo(a)pyrene	mg/L	0.0001	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
2-Methylnaphthalene	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Benzo(b,j)fluoranthene	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benzo(g,h,i)perylene	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
VPH (C6-C10)	mg/L	1.5	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Benzo(k)fluoranthene	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Methyl t-butyl ether	mg/L			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Xylenes, total	mg/L		<0.00075	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075
1-Methylnaphthalene	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Dibenz(a,h) anthracene	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
HEPH_Name	mg/L		<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Fluorene	mg/L	0.12	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Fluoranthene	mg/L	0.002	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Ethylbenzene	mg/L	2	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
EPH19-32	mg/L		<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Chrysene	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
EPH10-19	mg/L	5	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Pyrene	mg/L	0.00020	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Volatile Hydroc (VH6-10)	mg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Toluene	mg/L	0.39	<0.00045	0.00636	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045
Quinoline	mg/L	0.034	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
LEPH	mg/L	0.5	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Phenanthrene	mg/L	0.003	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
ortho-Xylene	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Naphthalene	mg/L	0.01	<0.000050	<0.000050	<0.000050	<0.000050	0.000061	<0.000050	<0.000050	<0.000050
Methyl t-butyl ether	mg/L		<0.00050							
meta- & para-Xylene	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Styrene	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Indeno(1,2,3-c,d)pyrene	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

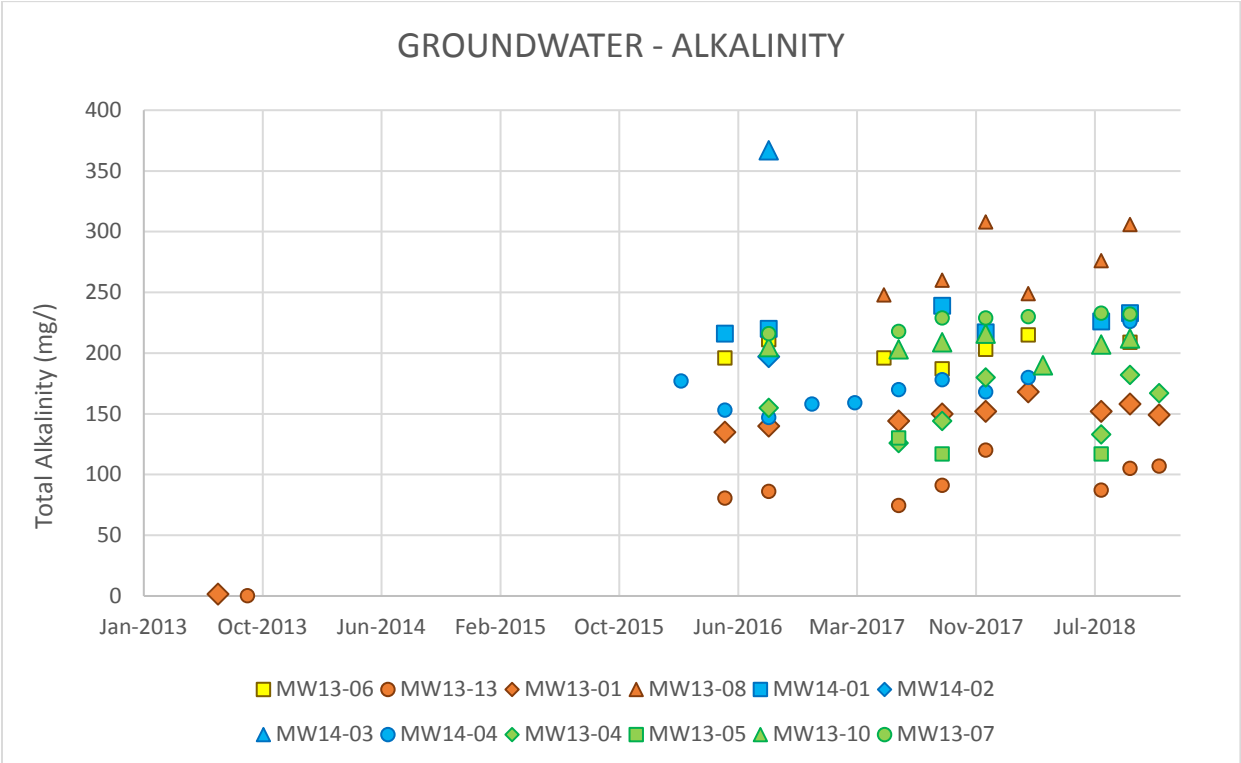
APPENDIX E

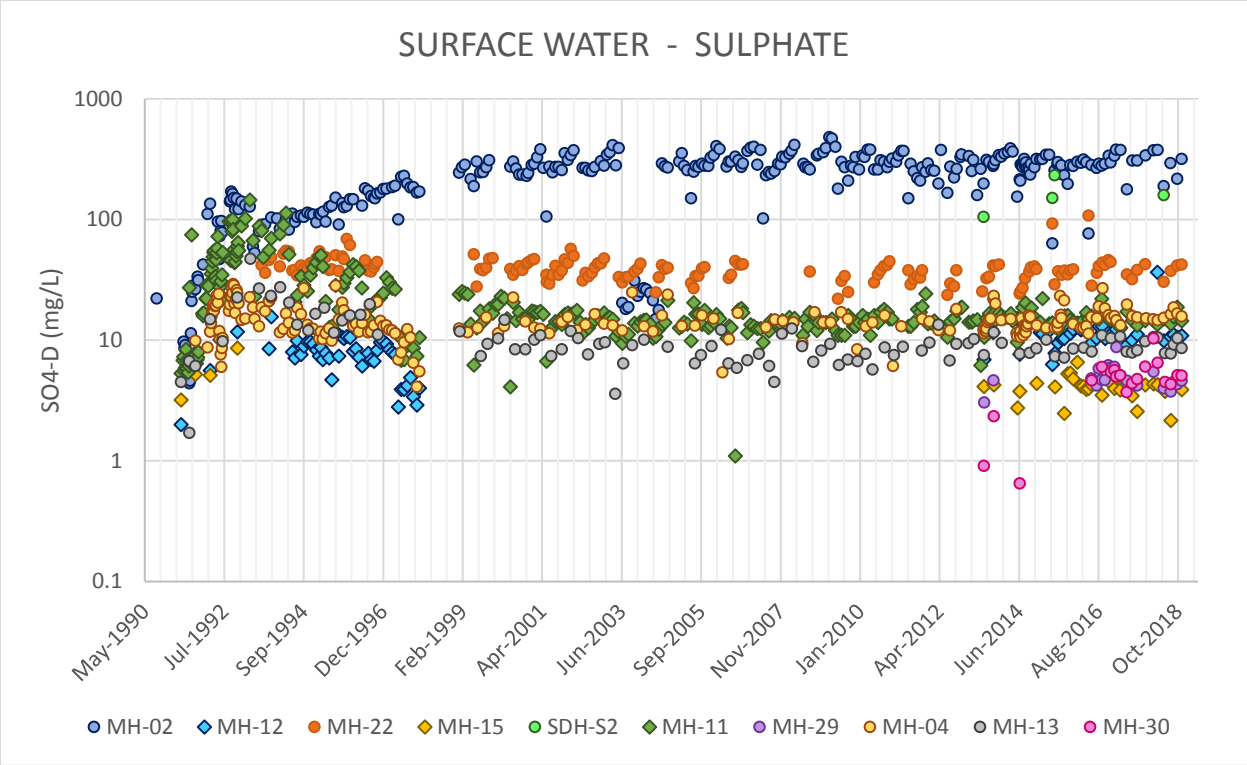
WATER QUALITY PLOTS

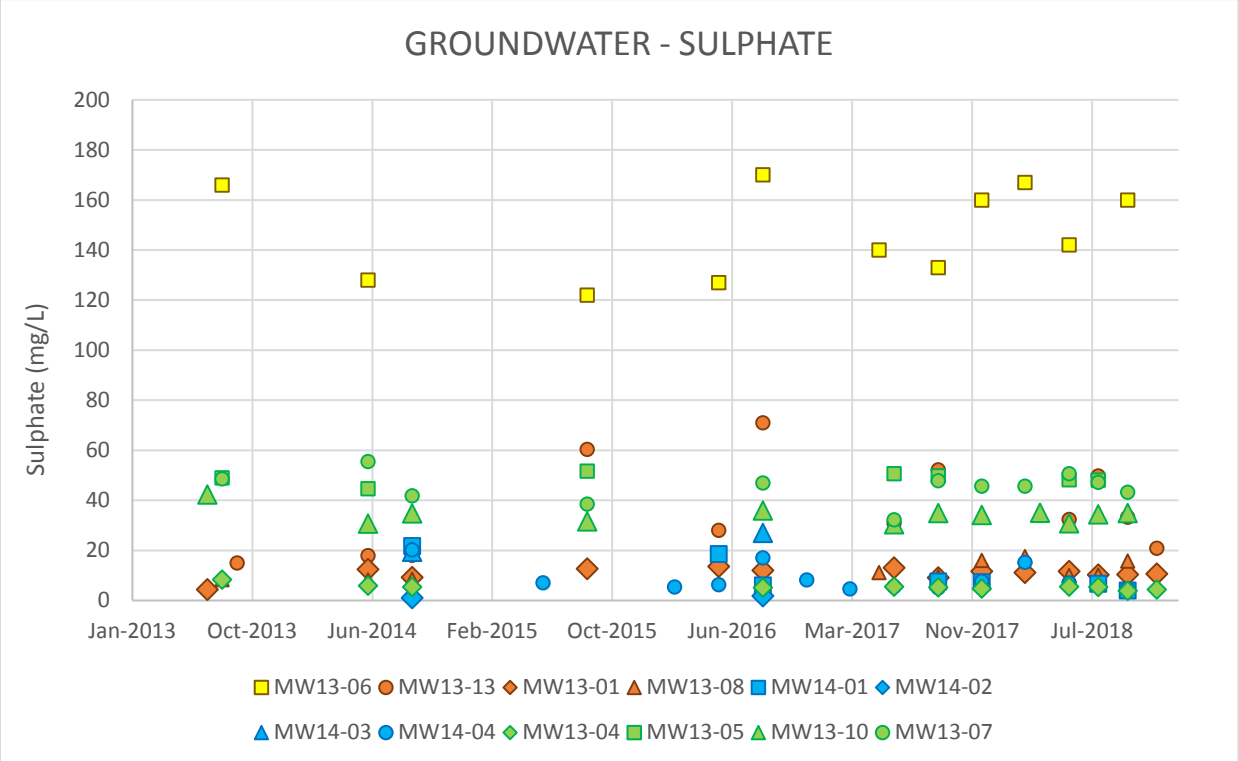

SURFACE WATER - pH
Field pH
10.00
9.50
9.00
8.50
8.00
7.50
7.00
6.50
6.00
May-1990
Jul-1992
Sep-1994
Dec-1996
Feb-1999
Apr-2001
Jun-2003
Sep-2005
Nov-2007
Jan-2010
Apr-2012
Jun-2014
Aug-2016
Oct-2018
pH mesurements pre September 1994
are lab-measured pHs
as field pH are not available for this time period
MH-02
MH-12
MH-22
MH-15
SDH-S2
MH-11
MH-29
MH-04
MH-13
MH-30

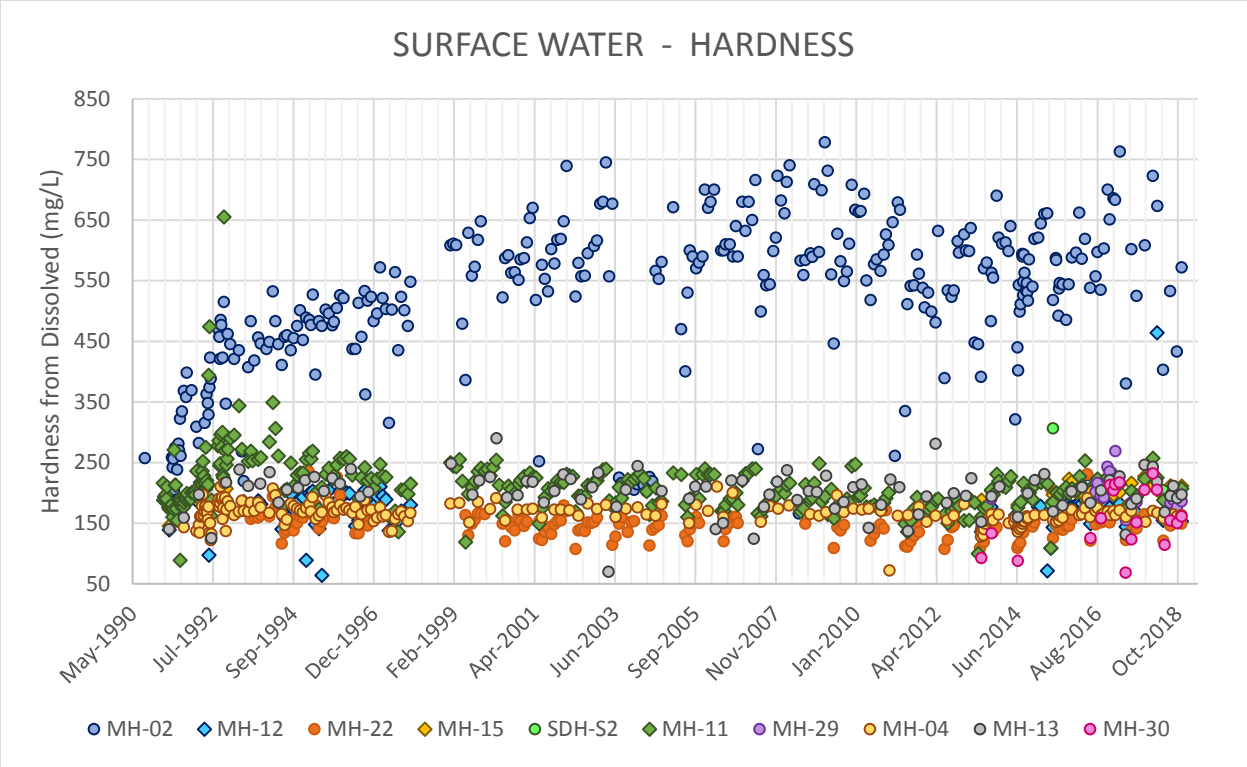

GROUNDWATER - pH
pH Units
8.5
8.3
8.1
7.9
7.7
7.5
7.3
7.1
6.9
6.7
6.5
Jan-2013
Oct-2013
Jun-2014
Feb-2015
Oct-2015
Jun-2016
Mar-2017
Nov-2017
Jul-2018
MW13-06
MW13-13
MW13-01
MW13-08
MW14-01
MW14-02
MW14-03
MW14-04
MW13-04
MW13-05
MW13-10
MW13-07

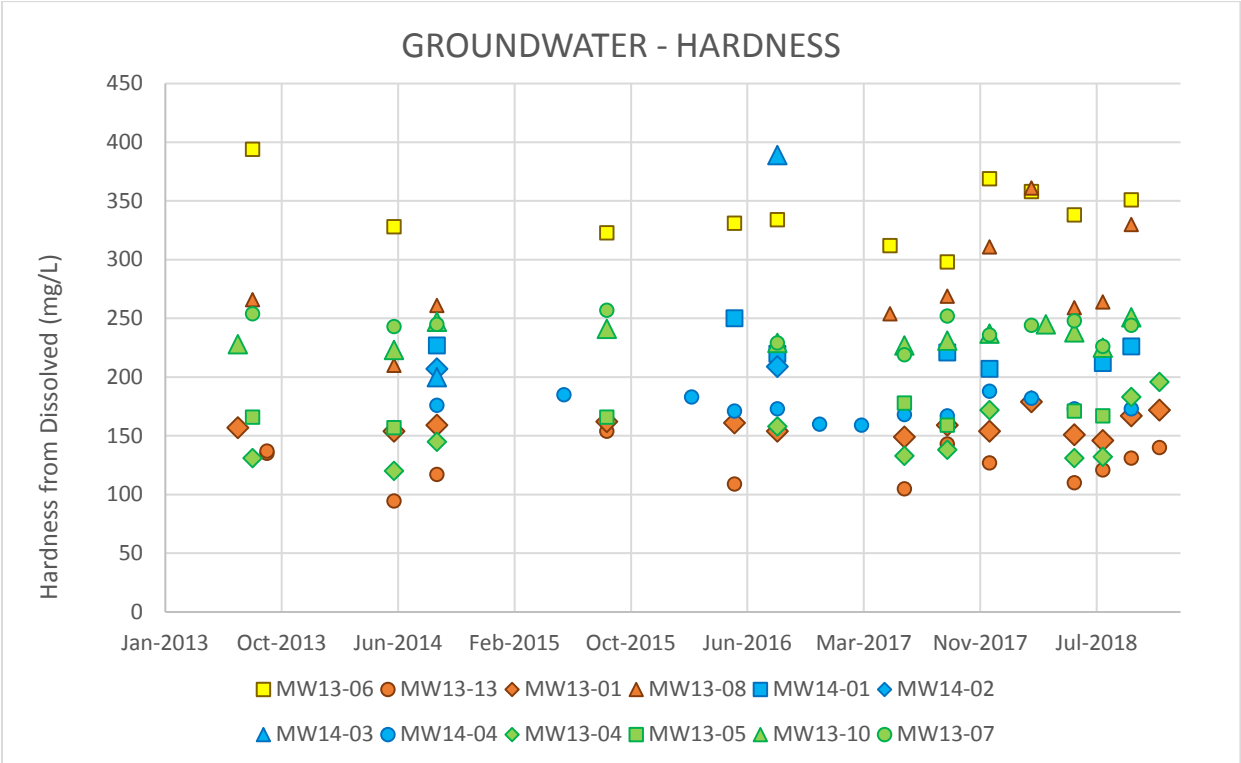

SURFACE WATER - ALKALINITY
Total Alkalinity (mg/L)
500
450
400
350
300
250
200
150
100
50
0
May-1990
Jul-1992
Sep-1994
Dec-1996
Feb-1999
Apr-2001
Jun-2003
Sep-2005
Nov-2007
Jan-2010
Apr-2012
Jun-2014
Aug-2016
Oct-2018
MH-02
MH-12
MH-22
MH-15
SDH-S2
MH-11
MH-29
MH-04
MH-13
MH-30

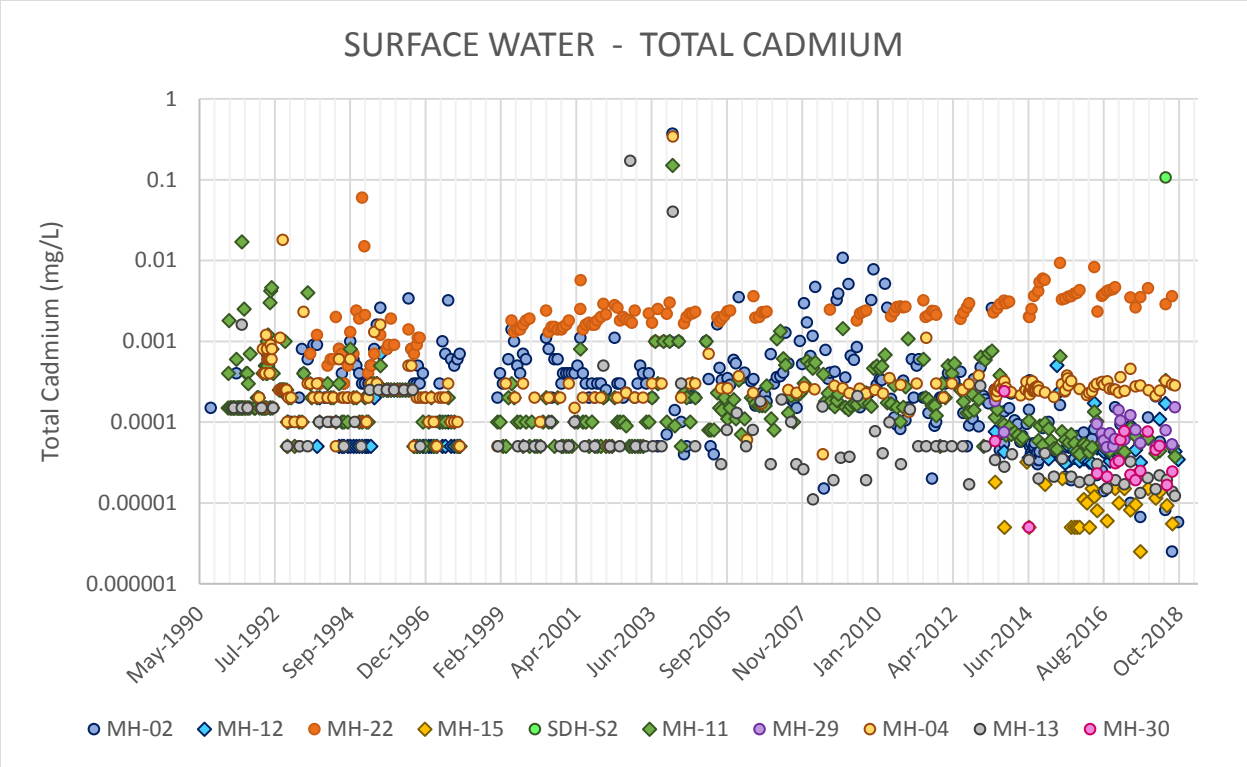

GROUNDWATER - ALKALINITY
Total Alkalinity (mg/)
400
350
300
250
200
150
100
50
0
Jan-2013
Oct-2013
Jun-2014
Feb-2015
Oct-2015
Jun-2016
Mar-2017
Nov-2017
Jul-2018
MW13-06
MW13-13
MW13-01
MW13-08
MW14-01
MW14-02
MW14-03
MW14-04
MW13-04
MW13-05
MW13-10
MW13-07

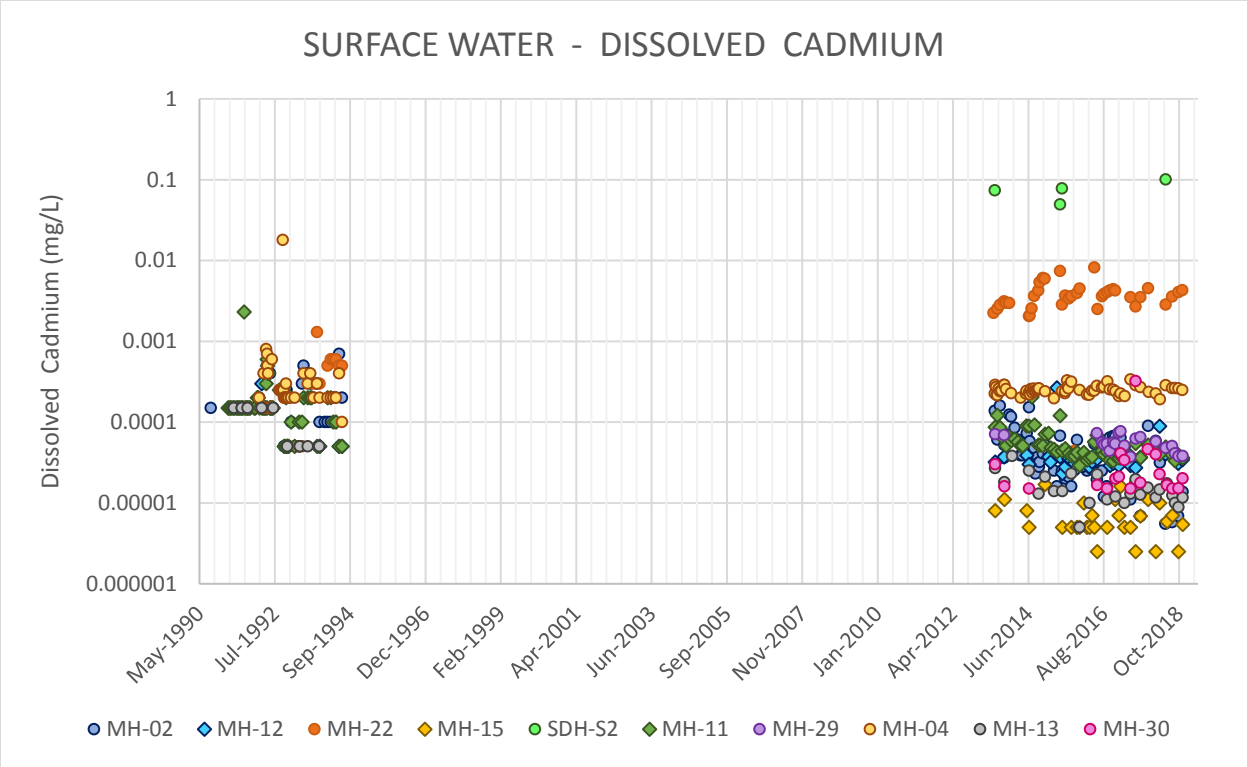

SURFACE WATER - SULPHATE
SO4-D (mg/L)
1000
100
10
1
0.1
May-1990
Jul-1992
Sep-1994
Dec-1996
Feb-1999
Apr-2001
Jun-2003
Sep-2005
Nov-2007
Jan-2010
Apr-2012
Jun-2014
Aug-2016
Oct-2018
MH-02
MH-12
MH-22
MH-15
SDH-S2
MH-11
MH-29
MH-04
MH-13
MH-30

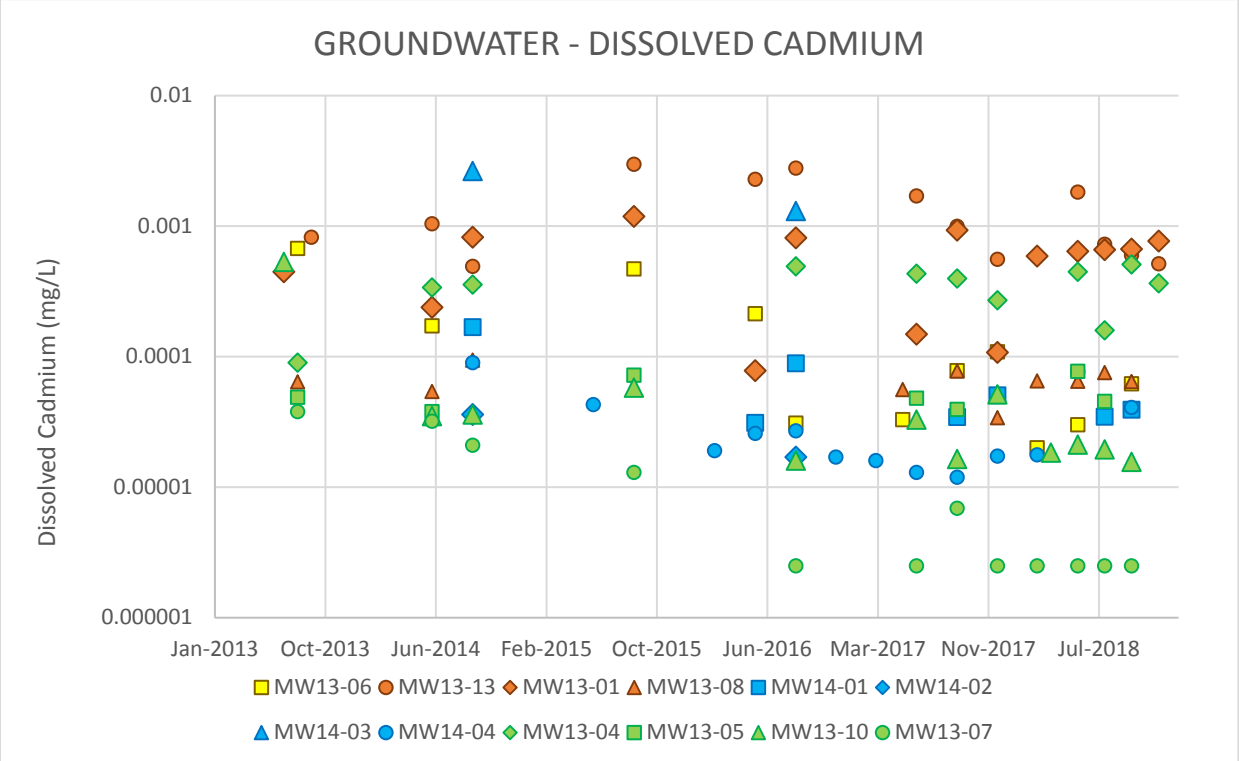

GROUNDWATER - SULPHATE
Sulphate (mg/L)
200
180
160
140
120
100
80
60
40
20
0
Jan-2013
Oct-2013
Jun-2014
Feb-2015
Oct-2015
Jun-2016
Mar-2017
Nov-2017
Jul-2018
MW13-06
MW13-13
MW13-01
MW13-08
MW14-01
MW14-02
MW14-03
MW14-04
MW13-04
MW13-05
MW13-10
MW13-07

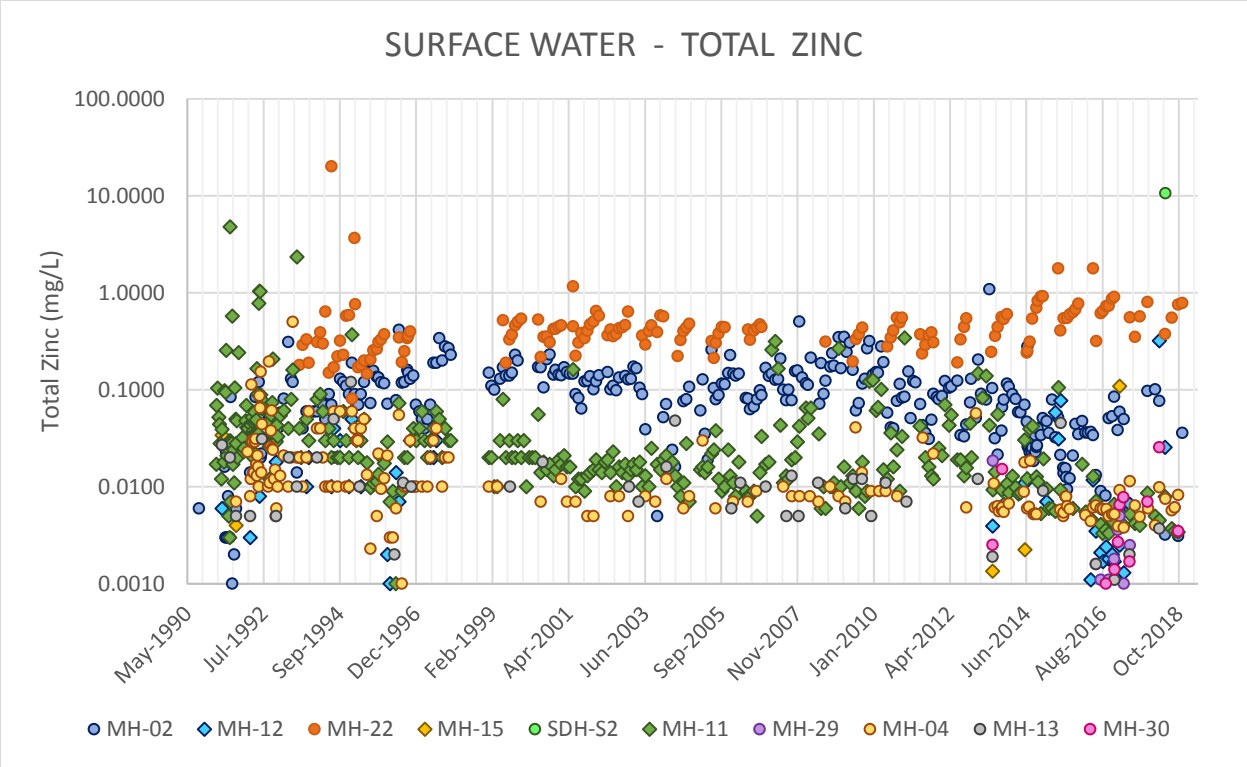

SURFACE WATER - HARDNESS
Hardness from Dissolved (mg/L)
850
750
650
550
450
350
250
150
50
May-1990
Jul-1992
Sep-1994
Dec-1996
Feb-1999
Apr-2001
Jun-2003
Sep-2005
Nov-2007
Jan-2010
Apr-2012
Jun-2014
Aug-2016
Oct-2018
MH-02
MH-12
MH-22
MH-15
SDH-S2
MH-11
MH-29
MH-04
MH-13
MH-30

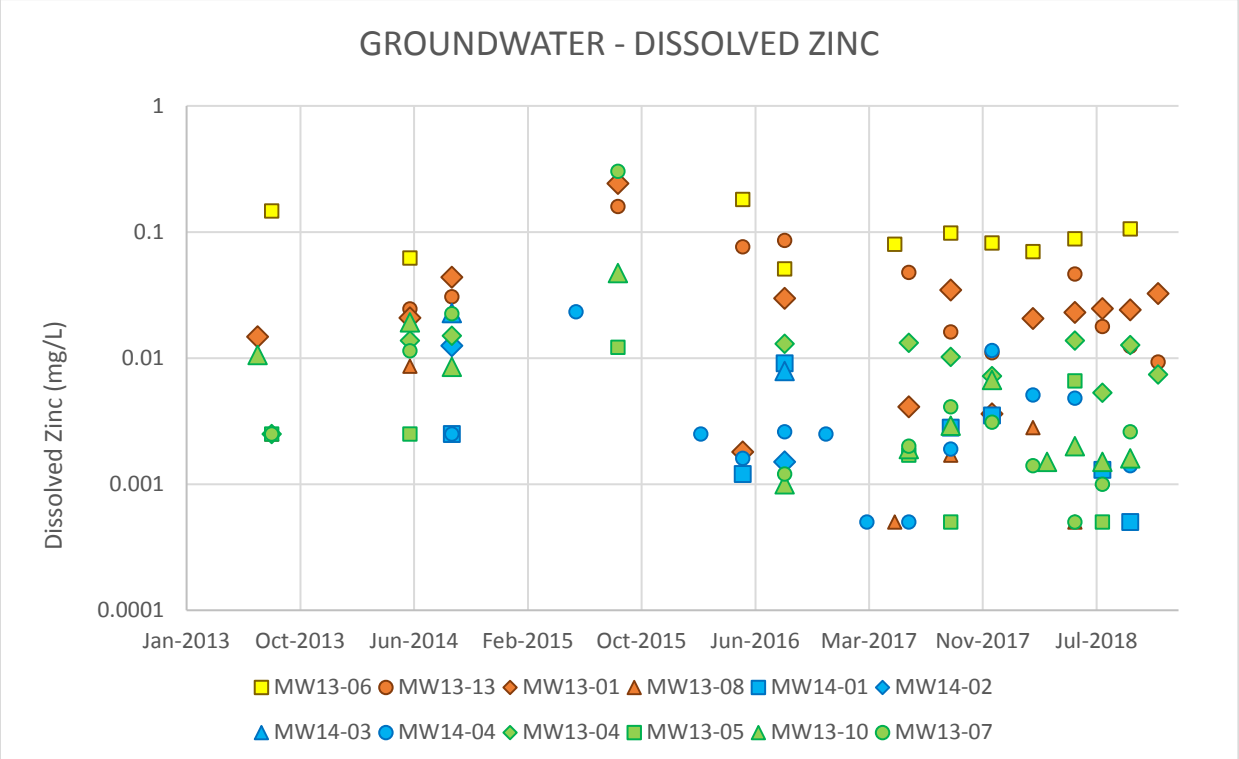

GROUNDWATER - HARDNESS
Hardness from Dissolved (mg/L)
450
400
350
300
250
200
150
100
50
0
Jan-2013
Oct-2013
Jun-2014
Feb-2015
Oct-2015
Jun-2016
Mar-2017
Nov-2017
Jul-2018
MW13-06
MW13-13
MW13-01
MW13-08
MW14-01
MW14-02
MW14-03
MW14-04
MW13-04
MW13-05
MW13-10
MW13-07

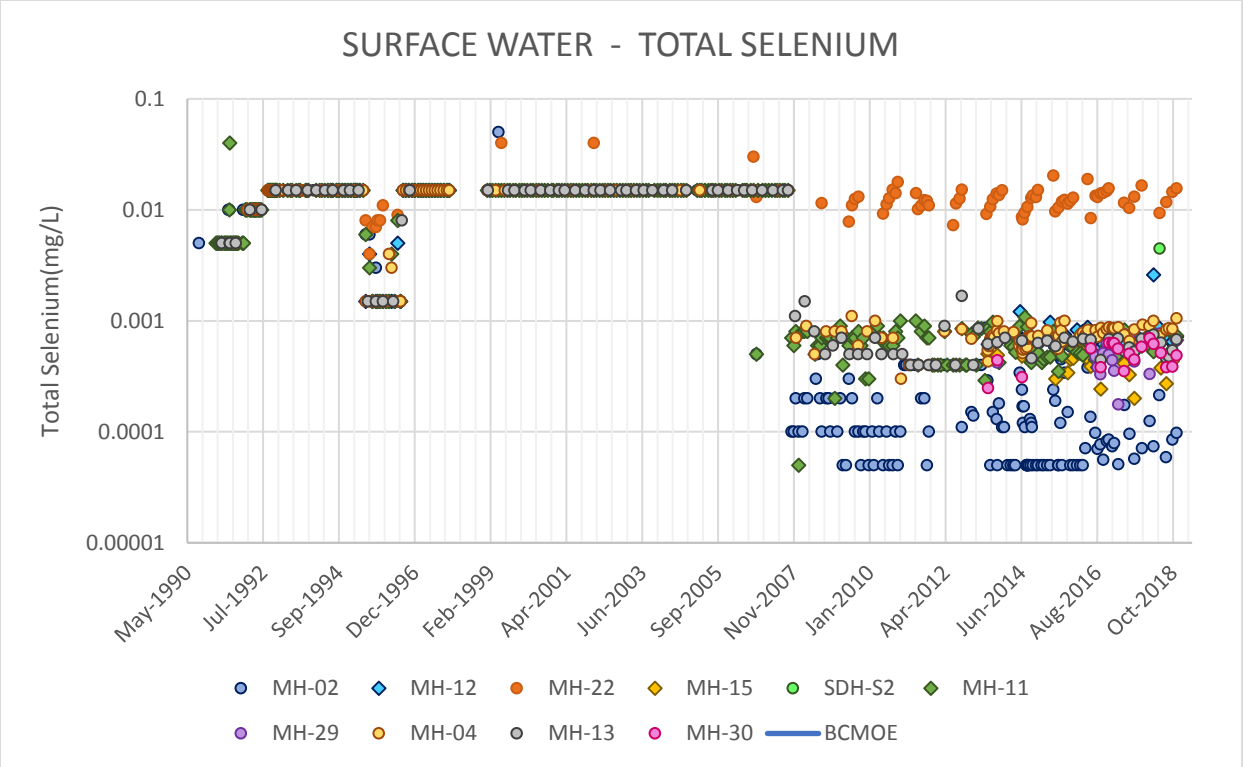

SURFACE WATER - TOTAL CADMIUM
Total Cadmium (mg/L)
1
0.1
0.01
0.001
0.0001
0.00001
0.000001
May-1990
Jul-1992
Sep-1994
Dec-1996
Feb-1999
Apr-2001
Jun-2003
Sep-2005
Nov-2007
Jan-2010
Apr-2012
Jun-2014
Aug-2016
Oct-2018
MH-02
MH-12
MH-22
MH-15
SDH-S2
MH-11
MH-29
MH-04
MH-13
MH-30

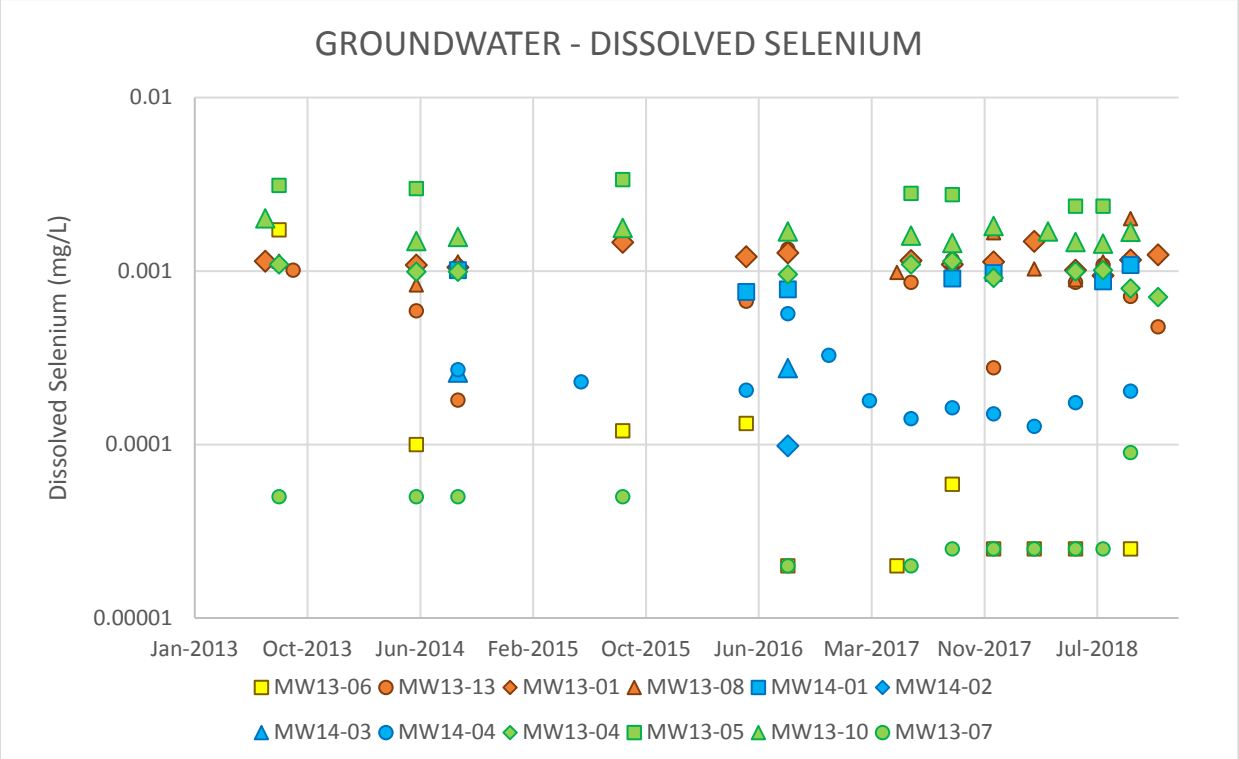

SURFACE WATER - DISSOLVED CADMIUM
Dissolved Cadmium (mg/L)
1
0.1
0.01
0.001
0.0001
0.00001
0.000001
May-1990
Jul-1992
Sep-1994
Dec-1996
Feb-1999
Apr-2001
Jun-2003
Sep-2005
Nov-2007
Jan-2010
Apr-2012
Jun-2014
Aug-2016
Oct-2018
MH-02
MH-12
MH-22
MH-15
SDH-S2
MH-11
MH-29
MH-04
MH-13
MH-30

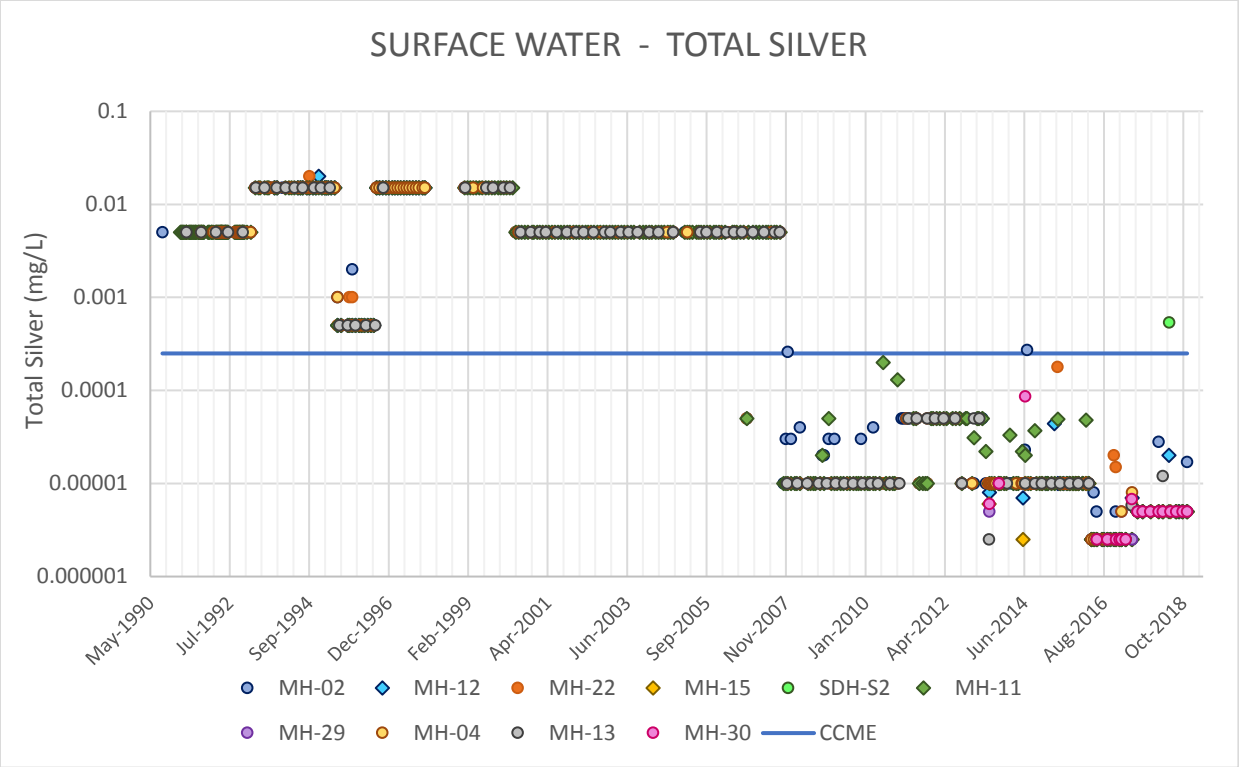

GROUNDWATER - DISSOLVED CADMIUM
Dissolved Cadmium (mg/L)
0.01
0.001
0.0001
0.00001
0.000001
Jan-2013
Oct-2013
Jun-2014
Feb-2015
Oct-2015
Jun-2016
Mar-2017
Nov-2017
Jul-2018
MW13-06
MW13-13
MW13-01
MW13-08
MW14-01
MW14-02
MW14-03
MW14-04
MW13-04
MW13-05
MW13-10
MW13-07

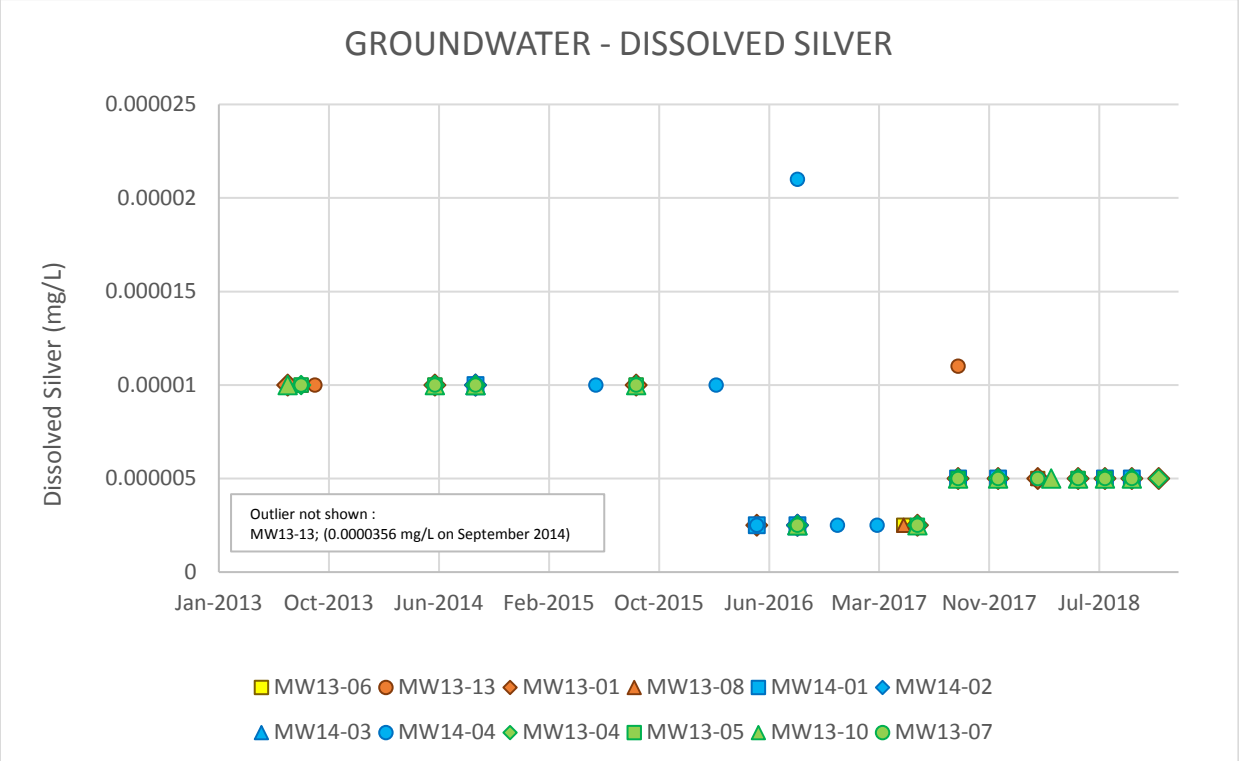

SURFACE WATER - TOTAL ZINC
Total Zinc (mg/L)
100.0000
10.0000
1.0000
0.1000
0.0100
0.0010
May-1990
Jul-1992
Sep-1994
Dec-1996
Feb-1999
Apr-2001
Jun-2003
Sep-2005
Nov-2007
Jan-2010
Apr-2012
Jun-2014
Aug-2016
Oct-2018
MH-02
MH-12
MH-22
MH-15
SDH-S2
MH-11
MH-29
MH-04
MH-13
MH-30


GROUNDWATER - DISSOLVED ZINC
Dissolved Zinc (mg/L)
1
0.1
0.01
0.001
0.0001
Jan-2013
Oct-2013
Jun-2014
Feb-2015
Oct-2015
Jun-2016
Mar-2017
Nov-2017
Jul-2018
MW13-06
MW13-13
MW13-01
MW13-08
MW14-01
MW14-02
MW14-03
MW14-04
MW13-04
MW13-05
MW13-10
MW13-07


SURFACE WATER - TOTAL SELENIUM
Total Selenium(mg/L)
0.1
0.01
0.001
0.0001
0.00001
May-1990
Jul-1992
Sep-1994
Dec-1996
Feb-1999
Apr-2001
Jun-2003
Sep-2005
Nov-2007
Jan-2010
Apr-2012
Jun-2014
Aug-2016
Oct-2018
MH-02
MH-12
MH-22
MH-15
SDH-S2
MH-11
MH-29
MH-04
MH-13
MH-30
BCMOE


GROUNDWATER - DISSOLVED SELENIUM
Dissolved Selenium (mg/L)
0.01
0.001
0.0001
0.00001
Jan-2013
Oct-2013
Jun-2014
Feb-2015
Oct-2015
Jun-2016
Mar-2017
Nov-2017
Jul-2018
MW13-06
MW13-13
MW13-01
MW13-08
MW14-01
MW14-02
MW14-03
MW14-04
MW13-04
MW13-05
MW13-10
MW13-07


SURFACE WATER - TOTAL SILVER
Total Silver (mg/L)
0.1
0.01
0.001
0.0001
0.00001
0.000001
May-1990
Jul-1992
Sep-1994
Dec-1996
Feb-1999
Apr-2001
Jun-2003
Sep-2005
Nov-2007
Jan-2010
Apr-2012
Jun-2014
Aug-2016
Oct-2018
MH-02
MH-12
MH-22
MH-15
SDH-S2
MH-11
MH-29
MH-04
MH-13
MH-30
CCME


GROUNDWATER - DISSOLVED SILVER
Dissolved Silver (mg/L)
0.000025
0.00002
0.000015
0.00001
0.000005
0
Outlier not shown :
MW13-13; (0.0000356 mg/L on September 2014)
Jan-2013
Oct-2013
Jun-2014
Feb-2015
Oct-2015
Jun-2016
Mar-2017
Nov-2017
Jul-2018
MW13-06
MW13-13
MW13-01
MW13-08
MW14-01
MW14-02
MW14-03
MW14-04
MW13-04
MW13-05
MW13-10
MW13-07

APPENDIX F

SURFACE WATER AND GROUNDWATER INTERACTION STUDY

ALEXCO ENVIRONMENTAL GROUP

Sä Dena Hes Mine

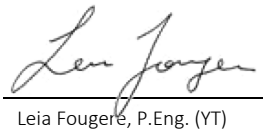
Surface Water - Groundwater Interaction Study

March 20, 2019

Prepared for:

SA DENA HES OPERATING CORPORATION C/O TECK RESOURCES LIMITED

ALEXCO ENVIRONMENTAL GROUP INC. SIGNATURES

Report prepared by:  3/20/2019

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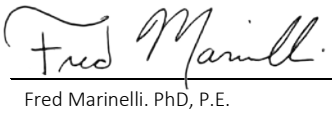
Report reviewed by:  3/20/2019

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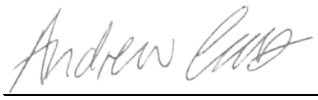
Report reviewed by:  3/20/2019

Andrew Gault, PhD.
Sr. Environmental Chemist

EXECUTIVE SUMMARY

The Sä Dena Hes (SDH) mine is a decommissioned lead/zinc mine located 45 km north of Watson Lake in southeastern Yukon. After 14 years of Temporary Closure, the mine was closed and reclaimed by Teck Resources Limited (Teck), on behalf of Sä Dena Hes Mining Corporation, from 2013 to 2015. Effective 1 April 2017, Teck was granted a new Type B water license (QZ16-051) from the Yukon Water Board (the Board).

Under the Reasons for Decision for the QZ16-051 water license, the Board determined that "it is understood the Licensee has incorporated the entire source load into their modelling" and that the SRK water quality loading model for the SDH site showed that constituent loading from the sources has not been observed in the receiving waters (SRK, 2016). However, while the Water Board agreed that source metal loads have not been observed in the receiving waters and that the loading model was conservative, they determined that a groundwater – surface water interaction study should be conducted to evaluate if the compliance stations are located appropriately and will ultimately capture the source inputs (Clauses 37 and 38).

A Groundwater-Surface Water Interactions Investigation Plan was written by SRK Consulting Ltd (SRK), on behalf of Teck, to meet Clause 37. The plan described additional site characterization work and updating the site conceptual groundwater-surface water model to meet Clause 38. In 2018, Teck requested that AEG conduct the additional field characterization described in the plan and update the site conceptual model based on the new data.

Additional data were collected in August, October, and December 2018, which represents the period of largest decline in groundwater levels across the site. Groundwater levels, surface flows, and water quality analyses, including stable isotopic data, were collected to refine the conceptual groundwater-surface water flow models for three catchments. Following refinement using the 2018 data, the conceptual models for the 1380 Portal, Burnick, and North Tailings catchments indicated that the expected groundwater and surface water flow paths were similar to those described in previous reports.

The surface water-groundwater interactions in each catchment are summarized as follows:

- 1380 Portal Catchment
  - Mine water at the 1380 Portal infiltrates and migrates northward as subsurface flow towards the upper portion of the 1380 gully, and then migrates as groundwater below the channel until it surfaces at station PH-01 (where the drainage becomes perennial). Along this pathway, the mine water is diluted by groundwater inputs and surface water runoff from other portions of the watershed.
  - Along Camp Creek, from stations PH-01 to MH-04, it is expected that most or all of the original portal water has discharged to surface water, and this flow within the Camp Creek channel is further diluted by surface water runoff and groundwater discharges to the Creek.
  - From stations MH-04 to MH-28, the Creek flow has the potential to receive residual subsurface mine-related water associated with the now decommissioned South Tailings facility.
  - Along the lower reach of Camp Creek, from stations MH-28 to MH-11, the flow is mainly fed by surface water runoff, so that any upstream mine-related chemicals are greatly diluted by the surface water contribution.
- Burnick Catchment
  - Mine water at the 1200 Burnick Portal infiltrates and migrates as subsurface groundwater flow to the east-northeast where it would ultimately discharge to surface water in the West Fork of Tributary E between sampling points TRIBEWF01 and TRIBEW02. Along this groundwater flow path, it is expected that the

mine water is diluted by natural infiltration of rainfall/snowmelt, and the chemicals of concern are attenuated by geochemical processes.

- If and when the original mine water was to discharge (as groundwater) into the West Fork of Tributary E, it would be further diluted by surface water runoff and groundwater contributions to the Tributary occurring between TRIBEWF02 to station MH-15. The Tributary is affected by beaver dams that collect and store surface water, and data suggest that there are significant groundwater discharges to the Tributary from other portions of the watershed.

- North Tailings Catchment
  - The visible North Tailings seepage (MH-02) is a mixture of residual tailings porewater, natural groundwater, and hillside surface runoff. This water infiltrates and migrates as groundwater in the north-northeast direction, where it discharges to North Creek upstream and in the vicinity of station NC-01. Along the groundwater flow path, the tailings-related water is subject to dilution by meteoric infiltration and attenuation by geochemical processes.
  - The tailings water has elevated sulphate, and along North Creek from station MH-23 to station NC-01, sulphate concentration in the Creek water nearly doubles (from about 5.2 mg/L to 10.8 mg/L in the downstream direction). This observation provides evidence that tailings-related water has migrated to North Creek and at least a portion of it discharges into the channel upstream of NC-01. There is little change in surface water flow between MH-23 and NC-01, suggesting that the groundwater contribution to stream flow is relatively minor.
  - Gauging data suggest that the lower portion of North Creek, from NC-01 to MH-12, is slightly losing, which would indicate some discharge of surface water into groundwater. However, this conclusion is tentative because the flow differences are relatively small and the measured flow rates could be affected by measurement errors.

Given the groundwater – surface water interactions described above, AEG concludes that the current surface water monitoring network is adequate to sample all water that could be potentially affected by the mine during long-term closure. It is very unlikely that impacted surface water (if any) would not be detected by the distribution of monitoring stations.

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APPENDIX B. 2018 ALS CERTIFICATE OF ANALYSES

1. INTRODUCTION

The Sä Dena Hes (SDH) mine was a lead/zinc mine located 45 km north of Watson Lake in southeastern Yukon within the Traditional Territory of the Kaska First Nation, specifically Liard First Nation (LFN). The SDH mine was operated between August 1991 and December 1992 by Curragh Resources Inc. Approximately 700,000 tonnes of ore were mined and processed onsite during the 16-month operation of the mine. The mine has not been in operation since that time.

In 2006, after 14 years in Temporary Closure, Teck Resources Limited (Teck), on behalf of Sä Dena Hes Mining Corporation, informed YG of its intention to initiate the process of Permanent Closure. The decommissioning, closure and reclamation activities were conducted from 2013 to 2015 in accordance with the licensed and approved Detailed Decommissioning and Reclamation Plan (DDRP). In 2016, Teck applied for a new Type B water license (QZ16-051) from the Yukon Water Board (the Board) for closure, which came into effect on 1 April 2017.

During the public comment and intervention phase of the licensing process for the QZ16-051 water license, the Yukon Government Water Resources Branch (Water Resources) recommended the submission of a groundwater model to determine potential long-term impacts and to evaluate where groundwater discharges to surface water. Water Resources stated that a groundwater model would help verify the site conceptual model, evaluate the effectiveness of closure, and verify that the monitoring facilities were appropriately located. Teck disagreed with the recommendation because the surface water quality predictions supporting the project are considered conservative as they are based on the assumption that the entire load from the 1380 Portal ultimately reaches Camp Creek. Additionally, the surface water and groundwater interactions would be monitored under the Adaptive Management Plan (AMP).

Under the Reasons for Decision for the QZ16-051 water license the Board determined that Water Resources did not provide sufficient rationale to warrant a groundwater model, but that Teck did not provide enough clarification as to why a model was unnecessary. As such, the Board determined that a groundwater-surface water interaction study was warranted to assess whether the receiving water stations are appropriately located to capture loadings from the potential chemical source inputs. Clause 37 and 38 of QZ16-051 reflect this determination:

Clause 37. Within 90 days of the effective date of this licence, the Licensee shall submit to the Board a plan for the assessment of groundwater-surface water interactions at the site including, but not limited to:

- *a) a review of all monitoring results from all wells on site;*
- *b) predictions of groundwater-surface water interactions; and*
- *c) verification of existing site information including rationale supporting location of receiving water monitoring stations.*

Clause 38. The Licensee shall carryout the assessment according the plan and submit report documenting the results of the program and any recommendations stemming from the study on or before March 31, 2019.

SRK Consulting Ltd (SRK), on behalf of Teck, prepared a Groundwater-Surface Water Interactions Investigation Plan (SRK, 2017) to meet Clause 37, which was submitted to the Water Board on 17 July 2017. Additional site characterization work identified in the SRK plan was conducted by AEG in 2018, and this report provides the associated assessment to meet Clause 38.

1.1 SCOPE

There are three loading sources at SDH, with each reporting to a distinct drainage having a downstream surface water compliance monitoring station:

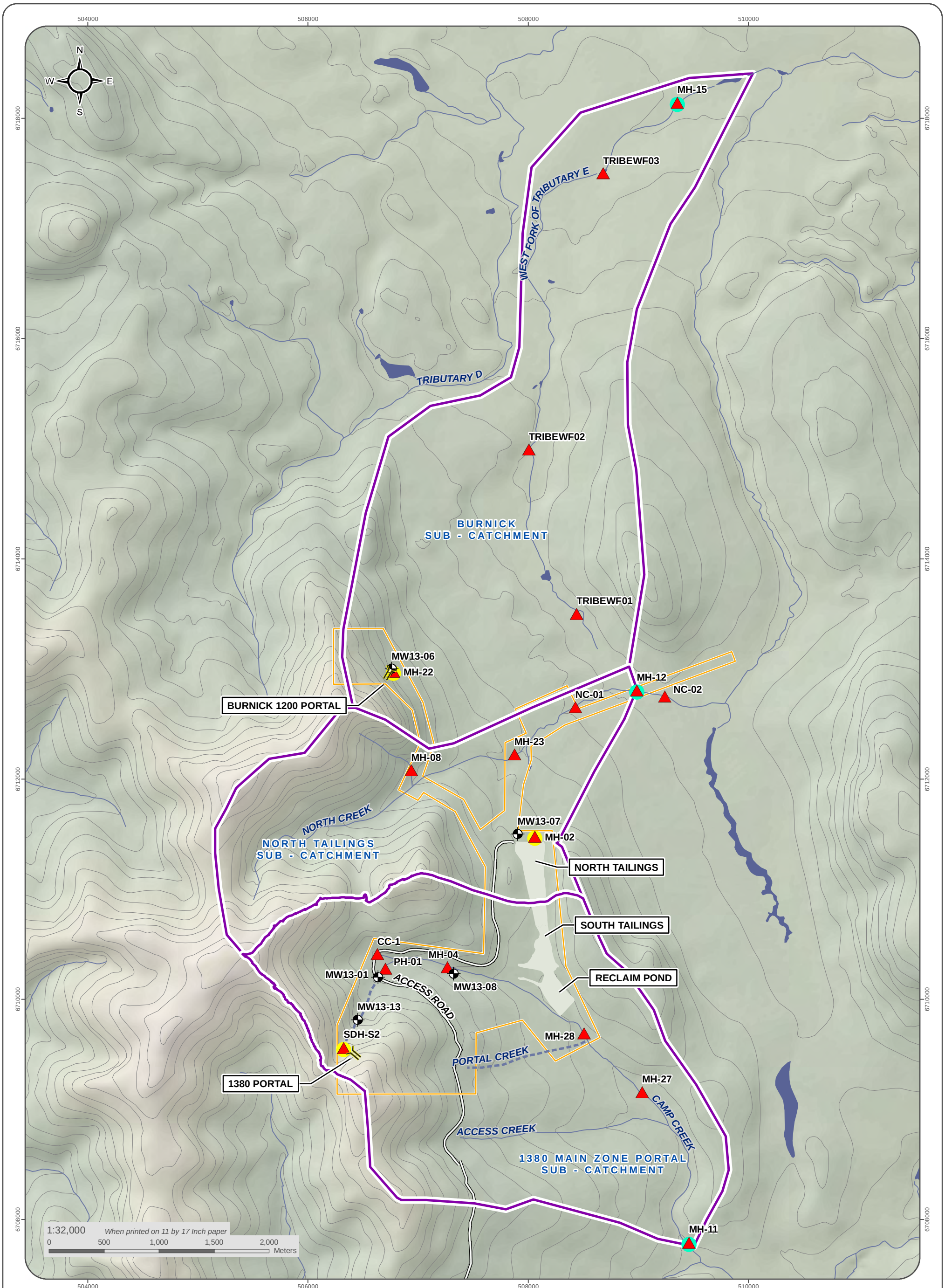
- 1380 Main Zone Portal discharge (SDH-02), monitored by compliance station MH-11;
- 1200 Burnick Portal discharge (MH-22), monitored by compliance station MH-15; and
- North Dam Seepage from the tailings impoundment (MH-02), monitored by compliance station MH-12.

Figure 1-1 shows (1) the locations of the three potential chemical sources, (2) the compliance monitoring stations, and (3) the boundaries of the watershed catchment that each source is located in.

In the Reasons for Decision QZ16-051, the Water Board understood that the "the Licensee has incorporated the entire source load into their modelling", and that the SRK water quality loading model showed that constituent loading from the three sources has not been observed in any of the receiving waters (SRK, 2016). However, while the Water Board agreed that source metal loads have not been observed in the receiving waters and the loading model was conservative, they determined that further information was required to support that the compliance stations were located appropriately and would capture the source inputs. As such, the objective of this groundwater – surface water interaction study is to (1) characterize groundwater flow paths, and (2) evaluate gains and losses along stretches of the receiving catchments to determine if the source discharge is adequately captured by the compliance monitoring locations within the catchment. This was evaluated using data collected in 2018 along each stream reach using the following approaches:

- Measure groundwater levels in monitoring wells, develop a groundwater level contour map, and estimate groundwater flow paths from the potential chemical sources to the receiving streams;
- Perform surface water flow gauging;
- Analyze groundwater and surface water chemistry including environmental isotopes;
- Measure groundwater and surface water temperatures; and
- Compute mass balances for conservative chemical constituents.

Collectively these lines of evidence were used to refine the conceptual flow model for each catchment. It is noted that dilution from surface water and groundwater not affected by the mine could mask the potential chemical loads that reach the surface water compliance stations. Additionally, errors in flow measurements and site conditions that inhibit or prevent flow measurements can affect the usefulness of this additional characterization.



Surface Water Quality Source Monitoring Station

Water License Compliance Surface Water Quality Monitoring Station

Surface Water Quality Station

Groundwater Monitoring Well

Portal

Sub-Catchment Boundaries

Reclaimed Ponds

Sä Dena Hes Land Lease

Waterbody

Watercourse

Seasonal Surface Flow

Access Road

Contours (100ft)

SÄ DENA HES MINE
SURFACE WATER AND GROUNDWATER INTERACTION STUDY REPORT

FIGURE 1-1

SOURCES AND MONITORING LOCATIONS

MARCH 2019

National topographic Data Base (NTDB) compiled by Natural Resources Canada at a scale of 1:50,000. Reproduced under license from Her Majesty the Queen, as represented by the Minister of Natural Resources Canada. All rights reserved.

Datum: NAD 83; Projection: UTM Zone 9N

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AEG

Teck

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(Last edited by: amatlashevska;15/03/2019/11:05 AM)

1.2 SITE MONITORING

Monitoring of the SDH site is conducted under the Environmental Monitoring, Surveillance, and Reporting Plan (EMSRP) (Teck, 2017) and the Adaptive Management Plan (AMP) (AEG, 2017). To perform the groundwater-surface water interactions study, additional monitoring at select surface water and groundwater sites was conducted in 2018 to evaluate the contribution of groundwater discharge to surface water. Monitoring was conducted in August, October, and December, as these months capture the most rapid decline of groundwater elevations, which typically peak in June/July, and are lowest in March/April (SRK, 2017). Generally, the proportion of groundwater discharges to surface water is greatest during the low flow cold-weather months (November through April). From freshet through the open water season, runoff from snowmelt and rainfall is the dominant contributor to flow in the streams. Chemical loading calculations indicated that loadings from the three potential chemical sources would have the greatest effect on surface water chemistry during the November-to-April low-flow period (SRK, 2014).

The three sampling events in August, October, and December 2018 aligned with the bi-monthly surface water sampling scheduled outlined in the EMSRP. The August and October 2018 groundwater sampling events also aligned with the groundwater monitoring schedule in the EMSRP. For this study an additional groundwater monitoring event was added in December 2018.

Under the ESMRP the surface water and groundwater monitoring locations are all sampled for the following parameters:

- Flow (surface water) or water level (groundwater);
- Field parameters (pH, specific conductance, and water temperature); and
- Laboratory analysis (pH, specific conductance, total alkalinity, TSS, TDS, total and dissolved metals, total ammonia-N, nitrate-N, nitrite-N, dissolved sulphate, and hardness).

Isotope analysis was added to the August, October, and December 2018 sampling events for the purposes of this study.

The monitoring sites for groundwater and surface water are described in the following tables:

- Table 1-1: Camp Creek sub-catchment, which includes the 1380 Portal;
- Table 1-2: Burnick Portal drainage and the West Fork of Tributary E; and
- Table 1-3: North Creek catchment, which includes drainage from the North Tailings dam.

These tables also indicate which samples are regularly monitored under the EMSRP, and the sites that were temporarily added to the schedule in 2018 for the purposes of this study. The associated monitoring locations are shown on Figure 1-1.

Table 1-1 1380 Portal/Camp Creek Catchment Monitoring Locations

Site ID	Purpose of Site	Sample Type	EMSRP Schedule Sampling Schedule	Additional GW-SW Sampling Schedule
SDH-S2	1380 Portal Discharge after flowing through a waste rock storage area downgradient of the portal Sampling point is a seasonal seep (flows ~ 3 weeks a year)	Surface water	Bi-monthly	-
MW13-13	Upper 1380 gully sampling point Piezometer screened across overburden/bedrock interface (2.8 to 8.9 mbgs) ~400 m downgradient of portal	Groundwater	Quarterly	December 2018
MW13-01	1380 gully sampling point Piezometer screened across overburden/bedrock interface (20.4 to 26.5 mbgs) ~800 m downgradient of portal	Groundwater	Quarterly	December 2018
PH-01	Headwaters of Camp Creek Water surfaces to sustained flow by the old pumphouse, ~ 900 m downgradient of the portal	Surface water	-	August, October, and December 2018
CC-01	Reference sampling point in a sub-drainage north of Camp Creek Flows into Camp Creek ~ 100 m downgradient of PH-01	Surface water	-	August, October, and December 2018
MW13-08	Piezometer beside Camp Creek ~10m away from MH-04	Groundwater	Quarterly	December 2018
MH-04	Camp Creek sampling point ~ 200m downgradient of where CC-1 flows into Camp Creek ~ 10 m away from MW13-08	Surface water	Bi-monthly	-
MH-28	Camp Creek sampling point Upstream of the confluence with ephemeral Portal Creek Downstream of reclaimed facilities: South Tailings Pond and Reclaim Pond	Surface water	-	August, October, and December 2018
MH-27	Camp Creek sampling point Upstream of the confluence with Access Creek	Surface water	-	August, October, and December 2018
MH-11	Water License Compliance sampling point on Camp Creek	Surface water	Bi-monthly	-

Table 1-2 Burnick Portal Catchment Monitoring Locations

Site ID	Purpose of Site	Sample Type	EMSRP Schedule Sampling Schedule	Additional GW-SW Sampling Schedule
MH-22	1200 Burnick Portal discharge Discharge flows from a pipe which freezes in the winter	Surface water	Bi-monthly	-
MW13-06	Bedrock piezometer, through Burnick waste rock dump (45.1 to 48.2 mbgs) Adjacent to the portal, ~ 10 m away	Groundwater	Quarterly	December 2018
TRIBEWF01	Sampling point at the headwaters of the West Fork of Tributary E	Surface water	-	August, October, and December 2018
TRIBEWF02	Sampling point on West Fork of Tributary E downgradient of TRIBEWF01	Surface water	-	August, October, and December 2018
TRIBEWF03	Sampling point on West Fork of Tributary E downgradient of TRIBEWF02, ~ 1 km upgradient of MH-15	Surface water	-	August, October, and December 2018
MH-15	Water License Compliance sampling point on the West Fork of Tributary E	Surface water	Bi-monthly	-

Table 1-3 North Tailings Drainage Monitoring Locations

Site ID	Purpose of Site	Sample Type	EMSRP Schedule Sampling Schedule	Additional GW-SW Sampling Schedule
MH-02	North Tailings Dam Seepage Water collects below the Dam and is directed into a pipe where the samples and flow measurements are collected.	Surface water	Bi-monthly	-
MW13-07	Bedrock piezometer (30.5 to 33.5 mbgs) downgradient of the North Tailings Impoundment ~ 100m west of MH-02	Groundwater	Quarterly	December 2018
MH-08	Sampling point on Burnick Creek ~ 25 upstream of the confluence of Burnick and North Creek.	Surface water	-	August, October, and December 2018
MH-23	Sampling point of North Creek 500 m downstream of where Burnick Creek joins North Creek.	Surface water	-	August, October, and December 2018
NC-01	Sampling point on North Creek ~ 150m upstream of MH-12	Surface water	-	August, October, and December 2018
MH-12	Water License Compliance sampling point on the West Fork of Tributary E	Surface water	Bi-monthly	-
NC-02	Sampling point on North Creek ~ 200 m downstream of MH-12	Surface water	-	August, October, and December 2018

2. METHODOLOGY

2.1 STREAM GAUGING

The hydrology monitoring program consisted of discrete discharge observations in August, September, and October 2018 at all available surface water stations (Section 1.2). Some stations did not have safe access, and others did not have conditions suitable for collecting flow measurements (for example, the flows were too small, or the channel was braided). The work was carried out according to AEG's *Standard Operating Protocol, Surface Water Hydrology, Data Collection and Management* (AEG, 2016). Flow measurements were collected either using the velocity-area method with an electromagnetic flow meter, or using the salt dilution method. Calibrations for the salt concentration–electrical conductivity relationship were conducted on site for each measurement, weather permitting.

2.2 WATER QUALITY AND ISOTOPE SAMPLING AND LABORATORY TESTING

Surface water and groundwater monitoring wells were sampled for water quality analysis in August, October and early December 2018. Temperature, pH, conductivity, dissolved oxygen, and redox potential were measured in the field along with stream flows and groundwater depths. Samples were collected and processed as per standard protocols and AEG field procedures. The samples were sent to ALS Environmental in Burnaby, British Columbia for analysis of general water chemistry, major anions, and total and dissolved metals. The laboratory QA/QC program included analysis of duplicate samples and laboratory standards as per AEG protocols.

For stable (δD and δ18O) isotopes analysis, surface water and groundwater samples (and duplicates) were collected in tightly sealed glass bottles and sent to the G.G Hatch Stable Isotope Laboratory at the University of Ottawa for analysis. Simultaneous direct measurement of the $^{2}H/^{1}H$, and $^{18}O/^{16}O$ stable isotope ratios in samples was performed using a Cavity Ring Down System (CRDS). Precisions were ±0.5 and ±0.1‰ for δD and $\delta^{18}O$, respectively. The stable isotope analysis QA/QC program included analysis of duplicate samples and laboratory standards. The laboratory analysis retuned acceptable results and none of samples was flagged for contamination or otherwise. The results of stable isotope analysis were expressed in permil relative to V-SMOW according to the relation:

$$\delta\ (‰) = \left[\left(\frac{R\ sample}{R\ \text{std}}\right) - 1\right] X\ 1000$$

where:
std = standard
R = ratio of heavy to light isotope (for example: $^{18}O/^{16}O$)

No precipitation (rainfall or snow) samples were collected in 2018. Instead, the local meteoric water line (LMWL) was derived using publicly available isotope data in the Yukon. It is expected that the latitude, altitude, local precipitation, and local climatic conditions at the site could result in a LMWL slightly different from the LMWL derived the publicly available isotope data; however, the LMWL generated from the Yukon data is considered adequate for the purposes of this study.

2.3 GROUNDWATER LEVELS

Depth-to-water in a well was measured with an electric water-level probe relative to an established measuring point (typically the top of casing). Using a surveyed elevation for the measuring point, the depth-to-water was converted to water-level elevation expressed in meters above mean sea level (m amsl). The groundwater elevations were plotted on a base map showing the site topography. The data indicated that groundwater levels were generally close to ground surface at all locations. Using the measured water-level elevations and topography as a guide, a groundwater level

contour map was developed for the site. Using standard procedures, groundwater flow directions were interpreted from the water-level contours.

3. RESULTS AND DISCUSSION

3.1 GROUNDWATER

Monitoring wells were installed on site by Golder and SRK between 2013 and 2014. A summary of the installed wells is provided in Table 3-1. Material across the site was noted as glacially deposited materials over fractured to competent bedrock (Golder, 2014). Boreholes logs indicate that the wells were screened in overburden (silty sands), bedrock, or across the overburden/bedrock interface (Golder, 2014). In 2014 Golder conducted hydraulic testing on four wells: MW13-04, MW13-08, MW13-09, and MW13-10, and calculated the hydraulic conductivity values to range between 1.5×10^{-5} to 2.2×10^{-6} m/s (Golder, 2014).

Water level measurements have continued in the monitoring wells since installation and the results indicate that groundwater levels generally follow a seasonal pattern. Typically, the groundwater levels are lowest in late winter and early spring (February to April), then rise until around July, after which the levels decline until spring the following year. When snowmelt begins, the groundwater levels rise rapidly due to increased recharge. Measured groundwater levels for the wells at the site are provided on Figure 3-1.

Overall the hydrogeological system at the SDH mine site is locally is driven by topography, such that the water table is generally a muted image of the surface topography. As the groundwater flows from high to low elevations, subsurface flow from the hillsides reports to the creeks at lower elevations. This approximation of water levels and flows is consistent with the hydrologic setting, but could be locally modified due to heterogeneity in geologic units, hydraulic conductivity variations (glacially derived overburden versus fractured rock), and the possible presence of permeable geologic structures such as faults.

Water levels and topography were used to develop a groundwater contour map of the site and to approximate expected groundwater flow paths. To extend the contours out beyond the current groundwater well network, it was assumed that the perennial creeks are hydraulically connected to groundwater and operate as a prescribed head boundaries, which define where the local water table intersects ground surface. Along the main creeks, the groundwater elevation was assumed equal to the stream channel elevation. There may be minor differences in the groundwater contours and flow paths throughout the year due to seasonally fluctuating water levels; however, with the steeper topography of the site the flow path directions are expected to be fairly constant. The water level contour map and estimated flow path directions are shown on Figure 3-2. Consistent with standard procedures, the groundwater flow paths were drawn to be approximately perpendicular to the water-level contours. The flow paths on Figure 3-2 are similar to those developed by SRK in the 2016 SDH Baseline Groundwater Summary (SRK, 2016b). Given site hydraulic gradients, estimated hydraulic conductivities, and generic effective porosities, Golder estimated groundwater migration velocities to be on the order of 80 m/year below the hillsides. However, these calculations have significant uncertainties and local migration velocities could vary from one order-of-magnitude below to one order-of-magnitude above this value (that is, 8 to 800 m/year).

3.1.1 1380 PORTAL CATCHMENT

Groundwater flow paths in the vicinity of the 1380 Portal are expected to flow down into the gully and feed Camp Creek. The groundwater levels recorded in 2017 and 2018 in MW13-13 (upper 1380 Gully) show seasonality with water levels

peaking with the melting of the snow in June, becoming significantly lower in August, and slightly lower in December. Water levels in this well fluctuated by more than 4 meters.

This seasonal trend is also evident in MW13-01, a monitoring well just upgradient of the where groundwater surfaces and becomes Camp Creek (PH-01). However, the trend is muted compared with MW13-13, with an overall water level change between June and December of 2 meters.

3.1.2 BURNICK CATCHMENT

Based on surface contours and groundwater levels, the groundwater around the Burnick mine and 1200 Burnick Portal discharge are expected to migrate downhill towards the West Fork of Tributary E. This is a relatively long groundwater flow path and springs have not been observed in the steeper hillside to indicate groundwater discharge. SRK conducted seep surveys of the slope below the 1200 Burnick portal in 2005 and 2013 to evaluate if the portal discharge surfaces on the hillside; however, they found no evidence of seepage (SRK, 2014).

The MW13-06 monitoring well adjacent (but not downgradient) to the 1200 portal is a 48 m deep and screened in bedrock. Recorded groundwater levels indicated seasonality with groundwater levels rising in the spring, peaking in July, decreasing through the late summer/early fall, and exhibiting lowest levels from October and through December. The data on record indicates that the groundwater level in this well fluctuated by more than 6 m.

3.1.3 NORTH TAILINGS CATCHMENT

Groundwater contours and estimated flow paths indicate that seepage from the North Tailings is a combination of tailings porewater, natural groundwater, and surface runoff from hillsides. The groundwater migration pathway is from the tailings area towards North Creek. The expected discharge of groundwater to the creek is likely upstream of and/or in the vicinity of surface water station NC-01.

MW13-07 is a bedrock monitoring well northwest of the North Tailings seepage that exhibits highest groundwater levels in June/July followed by declining levels through fall, winter, and spring. The lowest recorded level in this well was in March. The measured groundwater levels are shallow; within three to five meters of ground surface and fluctuating by approximately 2 meters throughout the year.

Table 3-1 SDH Monitoring Well Summary

Well ID	Depth of well (mbgs)	Location of Screen	Screen material	Max Recorded Change in WL (m)	Hydraulic Conductivity (m/s)
MW13-01	26.5	20.4 to 26.5	Overburden (Silty sand)/ Bedrock	2.0	1.1×10^{-5} to 7.1×10^{-6}
MW13-04	20.4	17.4 to 20.4 m	Bedrock	15.2	1.53×10^{-5}
MW13-05	5.2	2.1 to 5.2 m	Overburden (silty sand)	3.7	-
MW13-06	48.2	45.1 to 48.2 m	Bedrock	6.4	-
MW13-07	33.5	30.5 to 33.5 m	Bedrock	2.3	-
MW13-08	12.2 m	9.1 to 12.2	Overburden (Silty sand)	4.2	1.56×10^{-5}
MW13-09	10.6 m	7.6 to 10.6 m	Overburden (Silty sand)	0.8	2.19×10^{-6}
MW13-10	13.1	10 to 13.1 m	Overburden (Silty sand)	4.0	7.83×10^{-5}
MW13-13	8.9	2.9 to 8.9 m	Overburden (Clayey Sand)/Bedrock, fractured	4.3	-
MW14-01	11.6	11.5 to 11.6 m	Overburden (Sand and gravel)	12.4	-
MW14-04	12.5	9.4 to 12.5	Overburden (Silty sand)	3.1	-

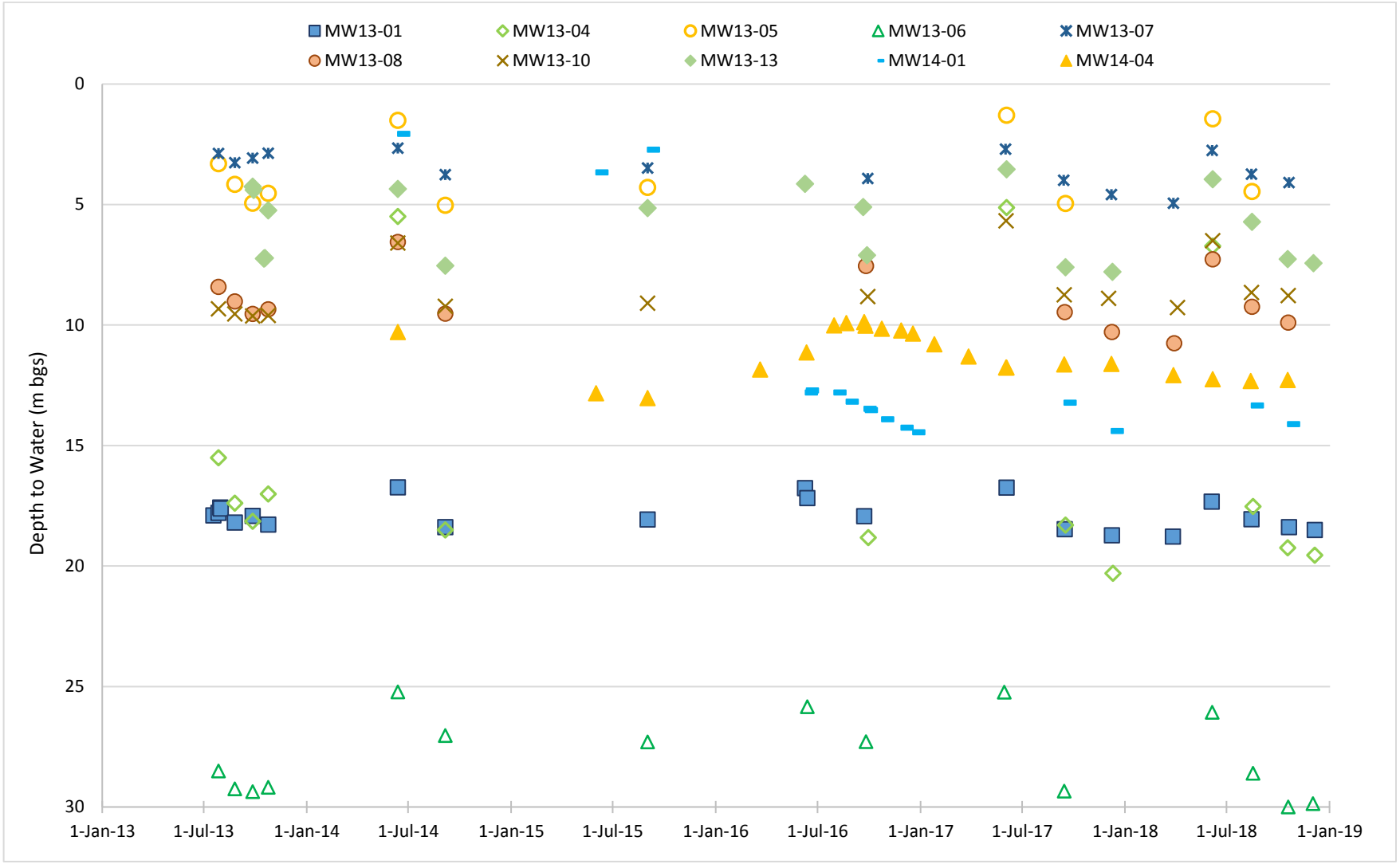
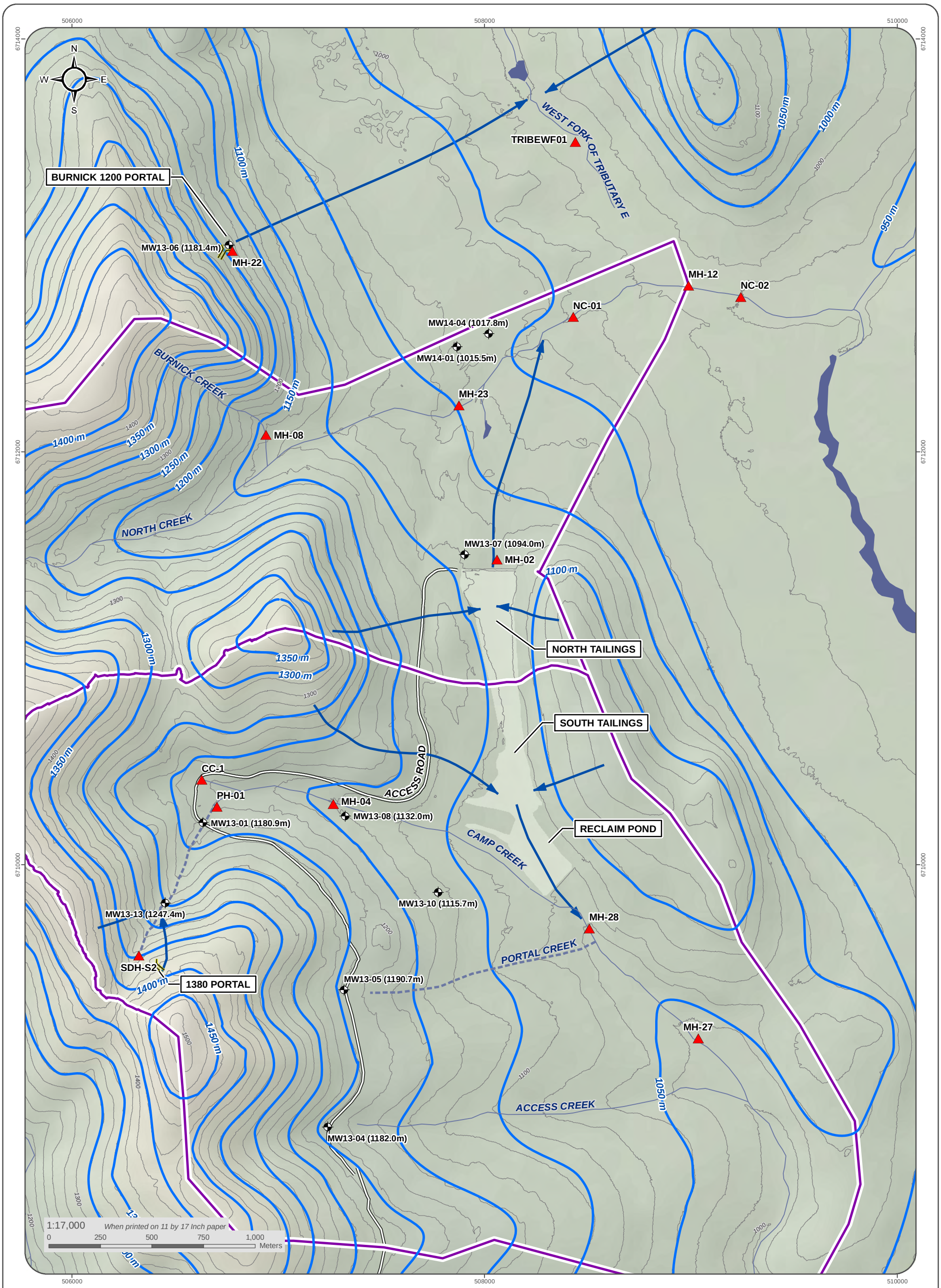


Figure 3-1 Measured Groundwater Levels (2013 to 2018)



GROUNDWATER ELEVATION CONTOURS ARE BASED ON DATA COLLECTED AUGUST 2018 AND SURFACE TOPOGRAPHY

- Portal
- Surface Water Quality Station
- Well (water levels measured August, 2018)
- Groundwater Level Contour (50m interval)
- Flow Direction
- Sub-Catchment Boundaries
- Reclaimed Pond
- Waterbody
- Watercourse
- Seasonal Surface Flow
- Access Road
- Topographic Contour (20m interval)

National topographic Data Base (NTDB) compiled by Natural Resources Canada at a scale of 1:50,000. Reproduced under license from Her Majesty the Queen, as represented by the Minister of Natural Resources Canada. All rights reserved.

Datum: NAD 83; Projection: UTM Zone 9N

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SURFACE WATER-GROUNDWATER INTERACTION STUDY

FIGURE 3-2

AUGUST 2018 ESTIMATED GROUNDWATER LEVEL CONTOURS AND FLOW PATHS

MARCH 2019

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3.2 SURFACE WATER

Flow gauging was conducted along each receiving creek, including tributaries, during August, October, and December 2018 to evaluate lower flow conditions. The intent of the measurements was to evaluate if changes in the flow along a receiving stream could be used to evaluate gaining or losing reaches that could be associated with groundwater discharge or recharge, respectively. Discharge measurements were conducted in 2018 during summer (August), fall (October), and winter (December) at sites located in the 1380 Portal, Burnick, and North Tailings catchments as shown on Figure 3-3. The flow measurements had significant uncertainties and would not include subsurface flow occurring in the stream alluviums. While losing reaches might be indicated at some locations (either actual or associated measurement errors), the hydrogeology provides good evidence that receiving streams are generally gaining with a portion of their flow derived from groundwater discharge.

3.2.1 1380 PORTAL CATCHMENT

Discharge measured at PH-01 in August (380 L/min) was approximately double the flows measured in October and December (110 and 160 L/min, respectively). This temporal decrease seems related to the higher groundwater levels near PH-01 in late summer, which decreased during the fall.

In progressing from PH-01 to MH-04, the discharge generally doubled reflecting groundwater discharge into the stream and accumulation of surface runoff. In August, the MH-04 flow rate was approximately double the MH-04 flows measured in October and December.

From MH-04 downstream to MH-11, the flow nearly triples indicating groundwater discharge and accumulation of surface runoff along the entire reach. The lower reaches of Camp Creek appear to be mostly influenced by surface water inputs as the creek channel width is approximately double in August compared to December at each observation point between MH-04 and MH-11.

3.2.2 BURNICK CATCHMENT

Accurate characterization of this drainage was diminished due to poor site conditions, either preventing sampling (TRIBEWF02), or preventing full characterization sampling (TRIBEWF01 and TRIBEWF03). TRIBEWF03 has been heavily impacted by beaver activity resulting in significant ponding throughout the site. This in combination with no established channel resulted in no flow measurements being conducted at the site. The available Burnick drainage discharge data indicates that the West Fork of Tributary E gains water along the entire reach from a combination of surface water and groundwater. At MH-15, discharge in August was not significantly higher than October and December, which may result from storage in upstream Beaver ponds that provide a dampening effect on surface water flow.

3.2.3 NORTH TAILINGS CATCHMENT

Seepage discharge from the North Tailings was measured as approximately 10 L/min in August and October and was too small to measure in December. Similarly, Burnick Creek, an upgradient tributary to North Creek, ranged from 18 to 2 L/min in August and October respectively, but was too small to measure in December. These flows are small compared to those measure in North Creek. In August, the North Creek flows at MH-23, NC-02 and MH-12 were 1733, 1656, and 1518 L/min, respectively, indicating a large surface water contribution. The flows at these sites drop significantly in October and December. The 2018 data seem to suggest a small overall flow loss in the downstream direction of North Creek along this stretch from NC-01 to MH-12. However, the small changes could be affected by

measurement errors or a situation where some of the overall flow is conveyed in alluvium below and adjacent to the stream channel.

NC-02 is characterized by multiple channels heavily inundated with stands of willow and birch. The surface water at this site flowed in multiple directions and there was no accurate way to gauge the flow rates. As such, no flow measurements were conducted at NC-02.

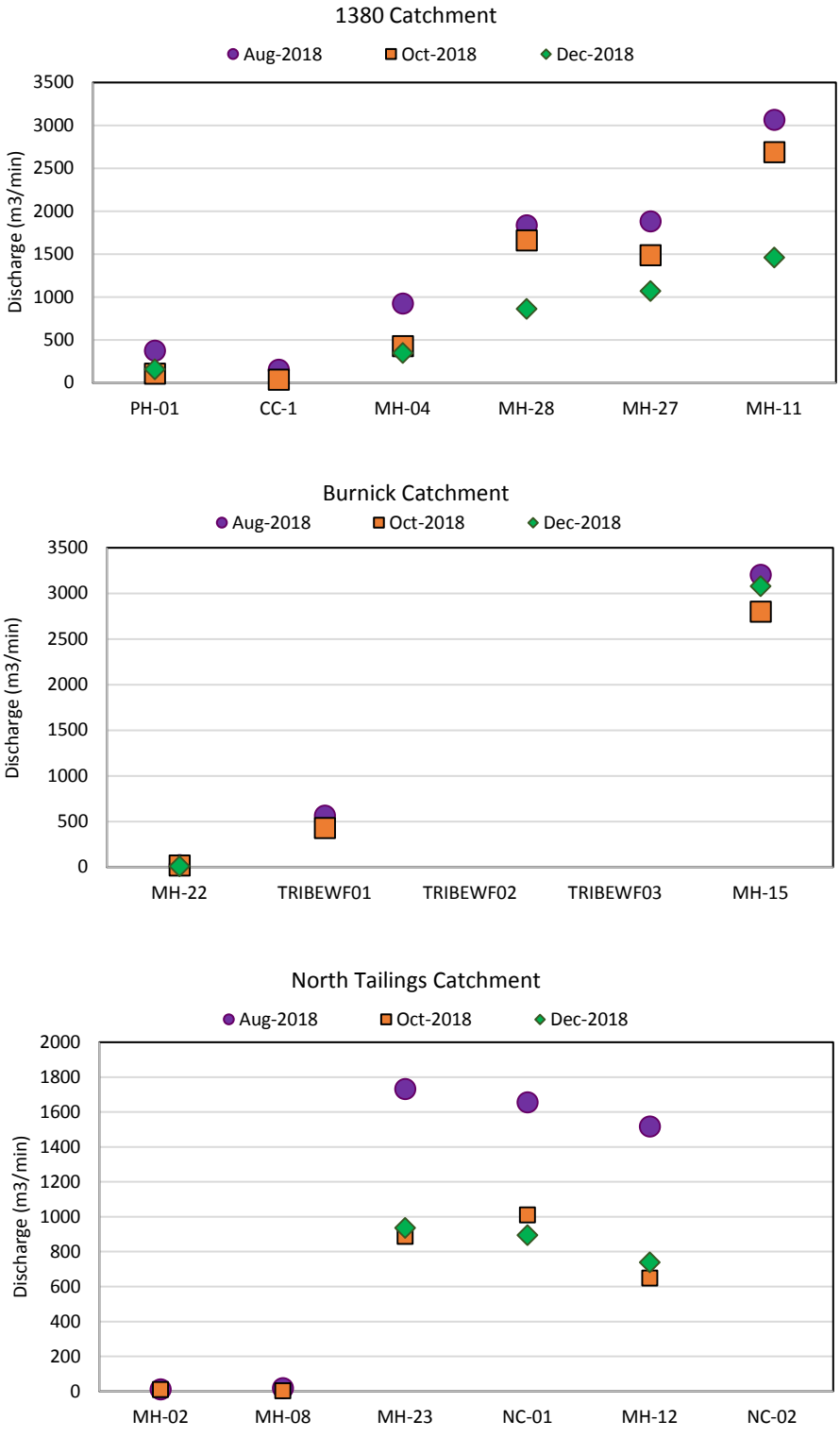


Figure 3-3 Surface Water Discharge in the 1380 Portal, Burnick, and North Tailings Catchments During 2018

3.3 ENVIRONMENTAL STABLE ISOTOPES

Because of their conservative behaviour, the stable isotopes of groundwater and surface water play an important role in identifying the source(s) of water and its constituents, determine the major physical or chemical processes affecting its composition along flow path, investigate groundwater and surface water interactions and assess the impact of groundwater quality discharge on surface runoff and/or vice-versa.

The laboratory results of 2018 environmental isotope of oxygen and hydrogen analysis are provided as Appendix A. The 2018 results, along with the historical data from previous studies, are plotted in Figure 3-4 through Figure 3-7 and summarized below.

- The δD and $\delta^{18}O$ of surface water samples varied from -175.30 to -162.40‰ and -22.80 to -20.31‰, respectively.
- The δD and $\delta^{18}O$ of groundwater water varied from -169.2 to -161.93‰ and -22.23 to -21.20‰, respectively.
- Generally, the groundwater isotope data shows narrower range of variation than surface water indicating less immediate susceptibly to freshet snowmelt recharge than surface water.
- The $\delta^{18}O$ isotope of surface and groundwater are more depleted in heavy isotope (lighter) in August than October and December except in the lower reach of the Burnick portal catchment (TRIBEWF01, TRIBEWF03 and MH-15). The depletion pattern is less evident in the case of δD. This depletion of isotope in summer compared to fall/winter indicates a greater input and recharge of heavy isotope depleted and high-altitude precipitation water during late spring snowmelt.
- Historical isotope data for the 1380 portal catchment, PH-01, CC-1 and MH4 are more depleted compared to their 2018 data. The single September 2012 isotope data for the 1380 portal discharge is the most enriched in heavy isotope water (δD = -161.7‰ and $\delta^{18}O$ = -20.30‰) on site. The portal isotopic signature is likely affected by the interaction of recharge meteoritic water with mineralized rock of hydrothermal origin resulting a slight increase in 18-oxygen and deuterium isotopes compared to groundwater and surface water.
- Two of the three TRIBEWF01 samples had the second most enriched $\delta^{18}O$ isotopes after the 1380 portal discharge and are likely affected by evaporation or summer rainfall inputs. Low precipitation during summer seasons and increased evaporation caused the isotopic ratio of this tributary.

The stable isotopes data and characteristics listed above indicate that groundwater and surface water are all of meteoric origin with the surface water being more influenced by spring snowmelt than groundwater.

In the absence of site-specific precipitation isotope data (rainfall or snow), isotope data of precipitation were obtained in Microsoft Excel format from the Whitehorse Global Network of Isotopes in Precipitation (GNIP) station through the Water Isotope System for Data Analysis, Visualization, and Electronic Retrieval (WISER) portal. The data span from January 1960 to December 1990, and include 192 records of rain and snow samples and associated statistical data. The dataset also included monthly and annual isotope means, estimated long-term isotope mean and regression line reflecting local meteoric water line (GNIP 2019). The dataset shows the following:

- Predicted long-term mean of -21.89 ± 1.53 for $\delta^{18}O$ and -169.1 ± 9.7 for δD
- A monthly $\delta^{18}O$ mean for August, October and December of -18.88 ± 2.37, -23.60 ± 2.55, -26.31 ± 2.95, respectively.
- A monthly δD mean for August, October and December of -147.7 ± 18.3, -175.6 ± 19.8, and -198.8 ± 18, respectively.
- A LMWL: δD = 6.35 ± 0.18 $\delta^{18}O$ - 30.58 ± 4 (N= 914, R^2 =0.93).

Figure 3-4 shows a plot of δD versus $\delta^{18}O$ data along with the global meteoric water line (δD = 8.13 δ18O + 10.8, Rozanski et al. (1993)), a local meteoric water line generated from GNIP data and a local water line drawn using the 2018 surface water data. The GNIP predicted long-term precipitation isotope mean is also shown for reference. The LMRL plots below the GMWL and has a slope smaller than the GMWL reflecting the averaged global data used to create the GMWL. This plot shows that the δD and $\delta^{18}O$ isotope of TRIBEWF03, MH-15 and one TRIBEWF01 sample lied along the LMWL and cluster around the predicted long-term mean. This means that surface water from these locations closely reflect the isotopic signature of meteoric water at the site. This is supported by the low salinity Ca-HCO_3 found at these locations. The composition of groundwater and other surface waters deviated from the LMWL plotting along the GMWL generally toward more heavy isotopes enriched composition. Most of 2018 groundwater and surface water samples plotted close together directly above or slightly up and to the right of the (presumed) meteoric water signature indicating similar sources and a slight enrichment in heavy isotopes in few cases.

The location of the 1380 portal discharge relative to the LMWL confirm its isotopic shift toward more enriched water through water-rock isotopic exchange with mineralized rock.

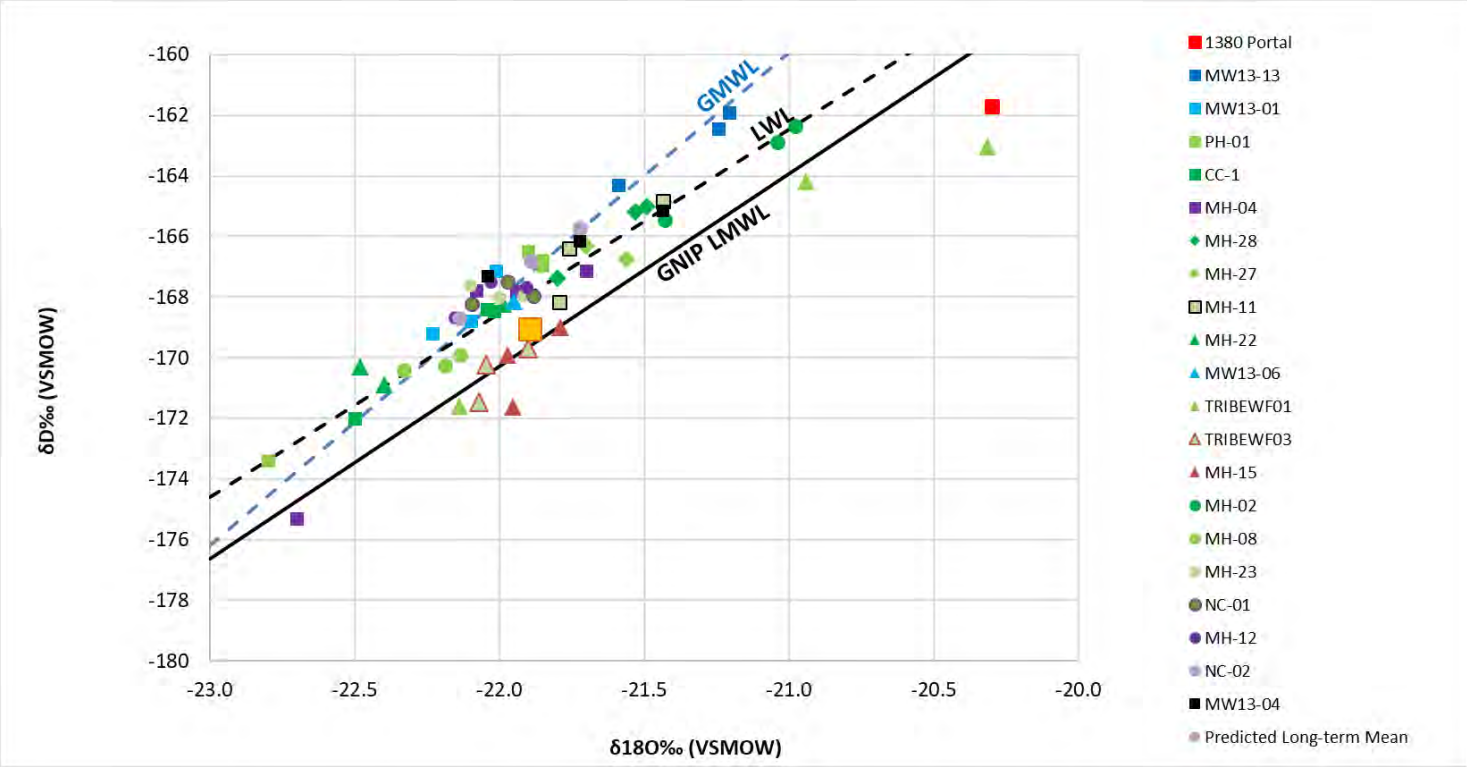


Figure 3-4 δD versus $\delta^{18}O$ of Groundwater, Surface Water and Portals

GMWL: global meteoric water line; GNIP LMWL: local meteoric water line; LWL: local water line

3.3.1 ISOTOPIC COMPOSITION OF GROUNDWATER

The isotopic compositions of groundwater monitoring wells are graphically shown on Figure 3-4 through Figure 3-7. The groundwater samples fell above the isotopic signature of meteoric water along the GMWL. The stable isotopic composition of groundwater was more depleted in August than October and December. The August isotopic composition of MW13-01, MW13-06 and background well MW13-04 plotted above the isotopic signature of meteoric water while the isotopic composition of October and December were slightly shifted up and the right of it indicating a

more enriched water probably due to contribution summer precipitation or an evaporation effect. The October and December MW13-13 groundwater samples had δD composition more enriched in heavy isotopes than other groundwater samples and were comparable with the 1380 portal discharge reflecting an impact of the portal on the groundwater well especially during low flow seasons. In August, the groundwater well receives greater recharge from freshet snowmelt depleted in heavy isotopes. This impact is also reflected in their similar sodium concentration and a sulphate content of MW13-13 5-4 times than the background groundwater concentration. There seems to be lesser impact of the 1380 portal on MW13-01 considering its deeper water table, depleted isotopic composition and lower sulphate concentration.

3.3.2 ISOTOPIC COMPOSITION OF SURFACE WATER

3.3.2.1 1380 Portal Catchment

The stable isotope composition of surface water in the 1380 portal catchment are plotted on Figure 3-5 along with groundwater wells and 1380 portal discharge. This figure shows that the 2018 PH-01 isotope composition is a mixture of groundwater from MW13-01 and MW13-13 as all the three 2018 PH-01 samples plot above the meteoric isotopic signature and between MW13-01 and MW13-13. Groundwater discharge at this location explains the elevated sulphate (median = 32 mg/L). The portal discharge mixes with groundwater from MW13-13 then MW13-01 before emerging at PH-01. Between PH-01 station and MH-04, surface water became slightly enriched in light isotopes and with lower sulphate content as a result of greater contribution from CC-1, a background spring. Between MH-04 and MH-11, surface water became enriched in heavy stable isotopes compared to MH-04 coupled with minor increase of sulphate content (median sulphate 18.1 compared to median sulphate of 16.5 mg/L at MH-4 and 8.7 mg/L at CC-1). This could be due to a discharge of groundwater similar in quality to the background well (with comparable δD, $\delta^{18}O$ and zinc content) and/or the effect of evaporation.

The patterns of δD and $\delta^{18}O$ along the flow path are generally similar in August, October and December despite the difference in absolute values. However, slight variations of pattern are noticeable in the lower reach of the watershed (MH-28, MH-27 and MH-11) indicating a strong variation of surface water isotopic composition in this area compared the upper catchment area.

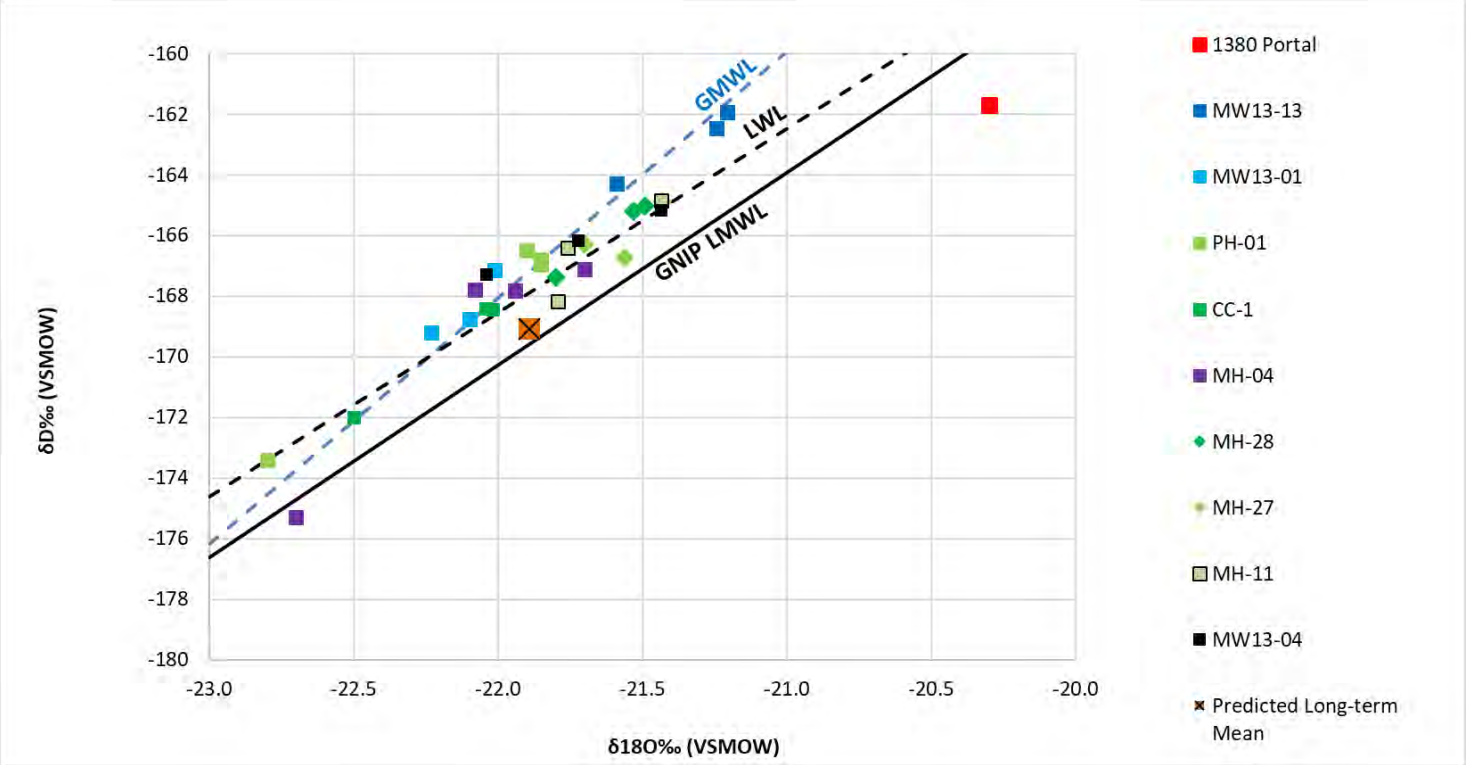


Figure 3-5 δD versus $\delta^{18}O$ of Groundwater, Surface Water and Portal in 1380 Portal Catchment.

Background groundwater monitoring well (MW13-04) and predicted long-term precipitation mean shown for reference

3.3.2.2 Burnick Catchment

The stable isotope composition of surface water in the Burnick portal catchment are plotted on Figure 3-6. As indicated above, the δD and $\delta^{18}O$ isotope of TRIBEWF03, MH-15 and the December TRIBEWF01 samples clustered along the LMWL indicating that surface runoff at these locations closely reflect the isotopic composition of meteoric water at the site. The August and October samples collected from TRIBEWF01 were more enriched in heavy isotopes compared to MH-22, MW13-06 and the downstream locations TRIBEWF03, MH-15, perhaps because of evaporation or the input of heavy isotopes enriched precipitation. TRIBEWF03, and MH-15 had a comparable $\delta^{18}O$ signature and chloride content as MW13-06 but the latter was slightly enriched in δD and had higher sulphate, sodium and zinc contents. The current groundwater flow model indicates that bedrock groundwater emerges upstream of MH-15. It likely undergoes significantly attenuation along the flow path in the waste rock pile, dilution in shallow depth before emerging and further dilution from runoff at the surface.

The stable isotopic composition of surface water at MH-22 stations was depleted in $\delta^{18}O$ isotope compared to the downstream locations because of recharge of high-altitude precipitation. The December 2018 sample at MH-22 plotted close to the October 2018 MW13-06 sample indicating common recharge water despite its four times lower median sulphate concentration and higher zinc content.

The patterns of δD along the flow path are generally similar in August and October despite the difference in absolute values but the $\delta^{18}O$ pattern are quite different between the three sampling periods. The December δD and $\delta^{18}O$ patterns are different from August and October indicating a strong isotopic variation of surface water during early winter. $\delta^{18}O$ becomes gradually enriched in heavy isotope from TRIBEWF01 to MH-15 in December while δD remains nearly

unchanged. This trend occurs because of kinetic fractionation during evaporation in arid climates and could be prevailing in the lower reach of Burnick catchment.

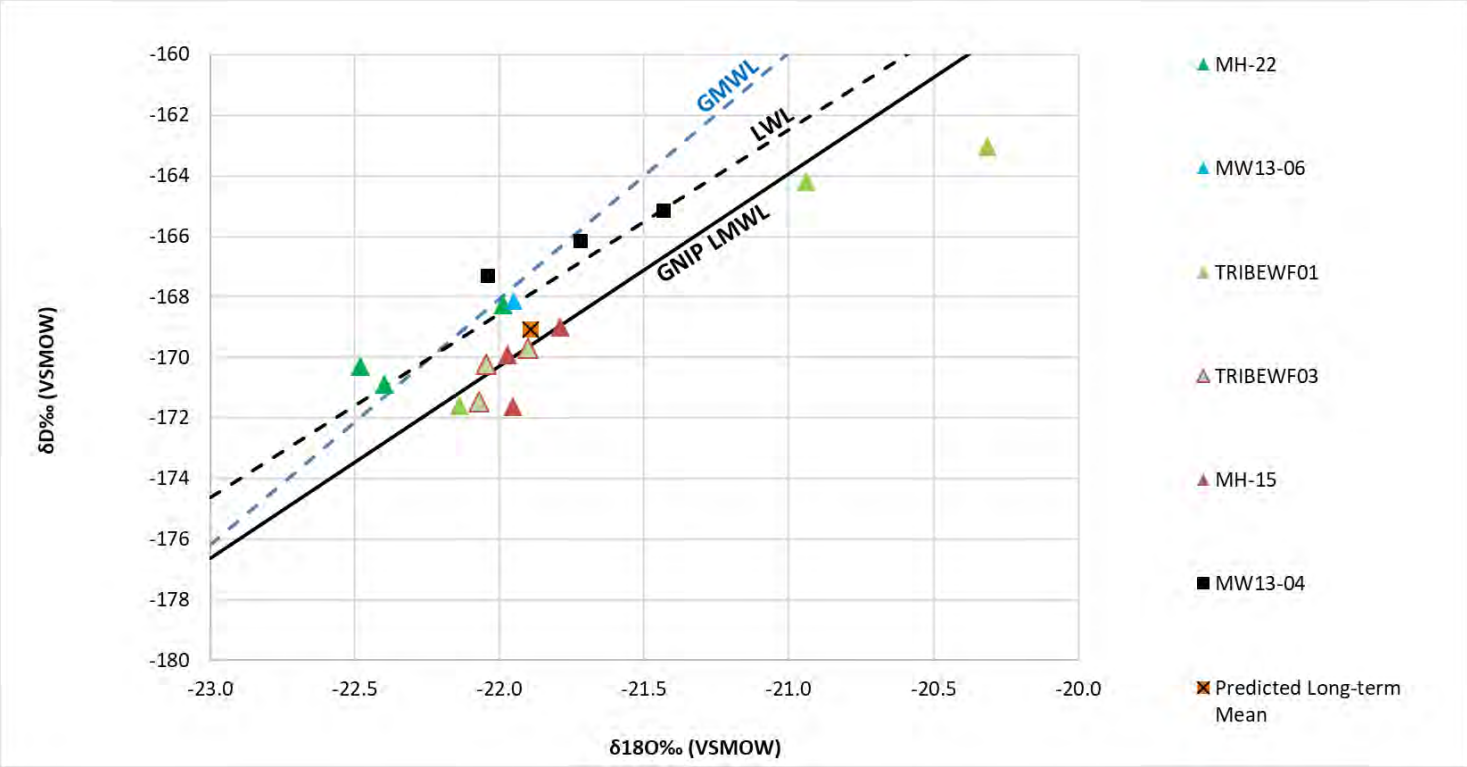


Figure 3-6 δD versus $\delta^{18}O$ of Groundwater, Surface Water and Portal in Burnick Catchment

Background groundwater monitoring well (MW13-04) and predicted long-term precipitation mean shown for reference

3.3.2.3 North Tailings Catchment

The stable isotopic compositions of surface water in the North Tailings catchment are plotted on Figure 3-7. The figure shows that most samples plotted along the GMWL and directly above the meteoric water signature except the seepage from the tailings dam (MH-02) which is the most enriched in heavy isotopes. Surface water samples at MH-08 are the most depleted in heavy isotope reflecting a recharge from high-altitude precipitation. Samples from stations MH-23, located downstream of MH-08 have comparable sulphate, sodium and zinc with MH-08 although the latter is slightly enriched in heavy stable isotopes. This means that they share common water source but inputs of low-altitude recharged runoffs along the flow path between the two stations resulted in the isotopic variation. Stations NC-01, NC-02 and MH-12 fall in the same area as MH-23 on the δD and $\delta^{18}O$ diagram reflecting common water source despite their higher (twice) sulphate concentration. The dam seepage samples collected at MH-02 are more enriched in heavy isotopes and contain higher sulphate, chloride, sodium and zinc than all the stations. It is evident from these isotope and water quality data that the dam seepage had little impact on surface water along the North Creek downstream of it although the increase of sulphate at NC-01, NC-02 and MH-12 compared to MH-08 could indicate minor discharge of the MH-02 along that stretch.

The patterns of δD and $\delta^{18}O$ along the flow path were generally similar in August and October despite the difference in absolute values. However, slight variations of pattern were noticeable in December indicating variation of surface water isotopic composition during early winter when the samples are more enriched in $\delta^{18}O$.

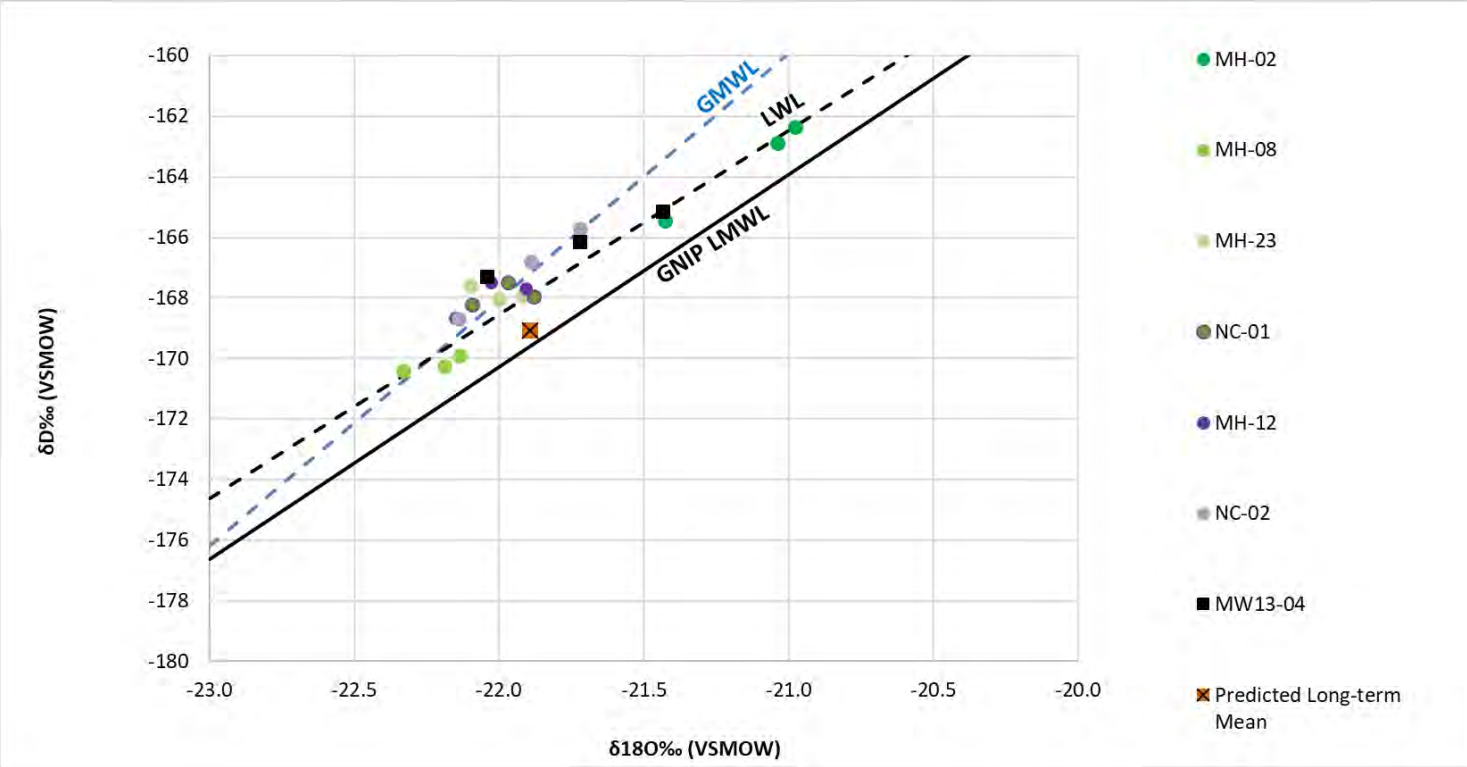


Figure 3-7 δD versus $\delta^{18}O$ of Groundwater, Surface Water and Portal in North Tailings Catchment

Background groundwater monitoring well (MW13-04) and predicted long-term precipitation mean shown for reference

3.4 TEMPERATURE

In situ measurements of water temperature can provide qualitative indications of groundwater input to surface waters. Relatively narrow seasonal temperature variation is expected at locations where groundwater makes a sizeable contribution to surface water owing to the limited temperature range typical observed for shallow groundwaters. Surface water temperature "anomalies" due to groundwater discharge might manifest in summer when the contribution of cooler groundwater could contrast with warmer surface water-dominated sites.

Figure 3-8 shows temperature measurements taken in 2018 during the summer (August), fall (October), and winter (December) sampling events at sites located in the 1380 Portal, Burnick, and North Tailings catchments.

3.4.1 1380 PORTAL CATCHMENT

The pumphouse site (PH-01) showed the smallest temperature variation (1.1 to 2.1°C) for the three sampling events, with notably lower temperature observed during August 2018 (2.1°C) than observed at the more downstream sites (8-9°C) and slightly warmer temperature during winter. This suggests there is a significant groundwater component to the water sampled at PH-01, which is consistent with field observations that site PH-01 indicates the location where the creek surfaces from the ground. Site CC-1, located on a sub-drainage north of Camp Creek, also displayed relatively limited temperature variation, especially in summer, suggestive of a sizeable groundwater component. Site MH-4, located on Camp Creek downstream of both CC-1 and PH-01, exhibited a slightly wider seasonal temperature range (-0.4 to 3.6°C), but still smaller than the farther downstream stations, reflecting the groundwater contribution to this location. The wide seasonal temperature range and higher summer temperatures recorded at the downstream sites MH-28, MH-27, and MW-11 (-0.4 to 9°C) suggests the fraction of groundwater flow to these sites is relatively minor, at least during the summer.

3.4.2 BURNICK CATCHMENT

Water collected from the Burnick Portal discharge (site MH-22) exhibited the smallest temperature range (0.3 to 3.2°C) for the three 2018 sampling events. The temperature of the water collected at this site in August (3.2°C) was also markedly lower than that measured in the West Fork of Tributary E waters (9.2 to 10.3°C). This is not unexpected given that groundwater likely supplies the majority of the discharge from the Burnick Portal. Temperature data for the three sites located on the West Fork of Tributary E show marked seasonal variation (-0.4 to 10.3°C) with no clear evidence of a substantial point source of groundwater discharge at these monitoring locations, although it should be noted that upstream point source groundwater discharges, or diffuse groundwater discharge along the reach may not be reflected in the temperature data.

3.4.3 NORTH TAILINGS CATCHMENT

Station MH-08, located on Burnick Creek which is a tributary to North Creek, exhibited that smallest seasonal temperature range (0.9 to 3.2°C) and had the lowest temperature recorded for the August sampling event (3.2°C), suggestive of a strong groundwater contribution. Conversely, seepage from the North Tailings dam (MH-02) returned the widest temperature range (-0.4 to 13.4°C), with its August temperature (13.4°C) markedly higher than that measured at downstream surface water stations (6.8 to 8.3°C), suggesting it is primarily sourced from warmer surface or very shallow subsurface waters. The four downstream stations located on North Creek shared similar seasonal temperatures (-0.4 to 8.3°C).

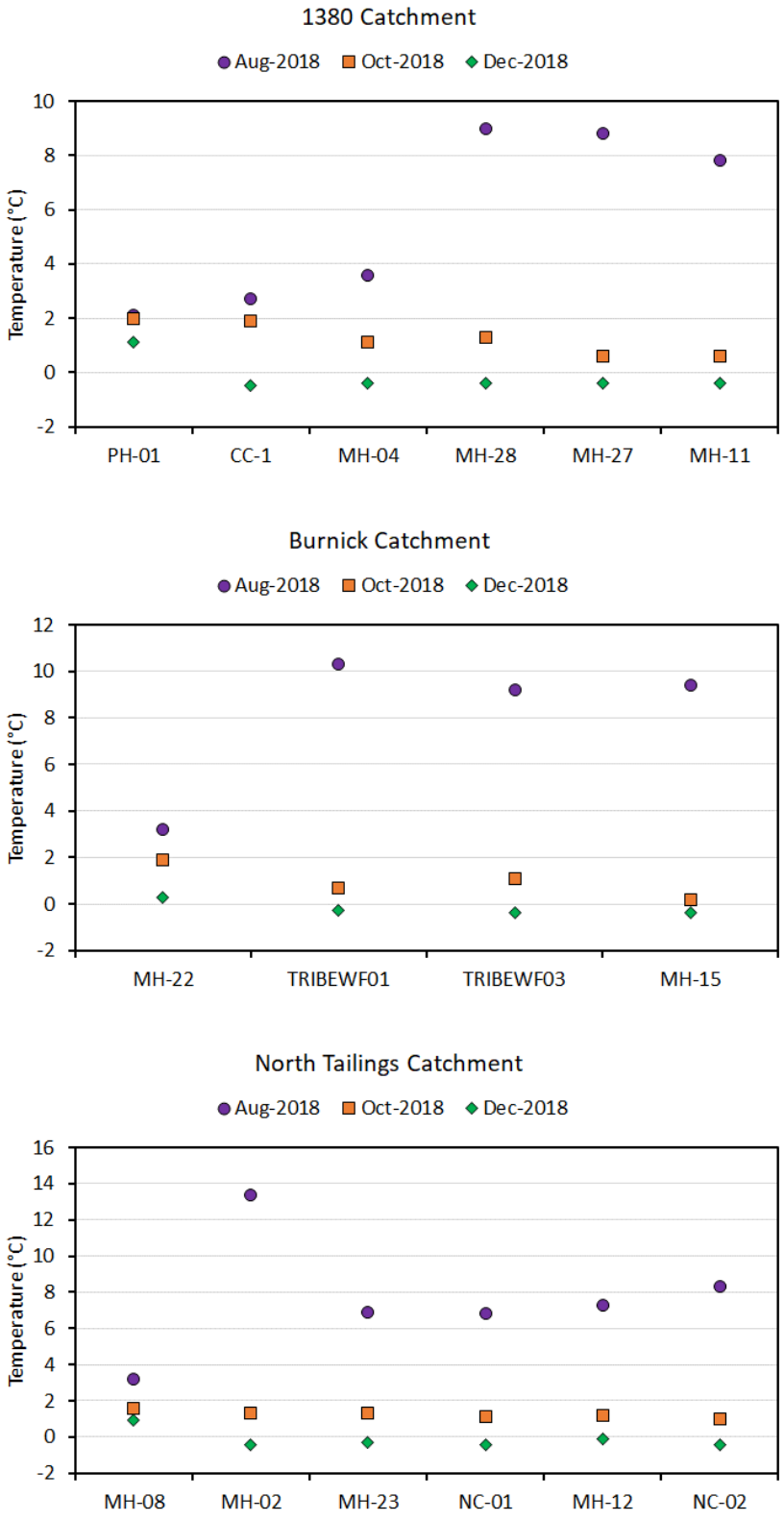


Figure 3-8 Temperature Variation at Surface Water Sites in the 1380 Portal, Burnick, and North Tailings Catchments During 2018

3.5 MASS BALANCE

Changes in mass loadings for conservative constituents were evaluated along the reach of each catchment. Dissolved sulphate and sodium were selected for this exercise since they are expected to act conservatively; i.e., they are not anticipated to be removed from solution via geochemical chemical processes (precipitation, sorption) or biological (organism uptake) processes. Thus, the variations in sulphate and sodium concentrations are expected to result only from physical processes such as dilution, evapo-concentration, etc. Other conservative constituents such as chloride, lithium, and potassium were not considered since these parameters were often below or close to detection limits. The chemical data collected under this program is provided as lab reports in Appendix B.

3.5.1 1380 PORTAL CATCHMENT

As part of their investigation into the fate and transport of constituents discharged from the 1380 Portal, SRK (2013) evaluated sulphate and zinc loadings in the 1380 Portal catchment using September 2012 data. SRK (2013) and others documented significant attenuation of zinc between the 1380 Portal and the nearest surface water monitoring stations on Camp Creek (PH-01 and MH-04) owing to precipitation of zinc carbonate along the flow path. Conversely, additional sulphate load was measured in the Camp Creek surface water stations, indicative of a substantive groundwater contribution to the Camp Creek water chemistry.

A similar evaluation was conducted using data from the August, October, and December 2018 sampling events. The change in sulphate and sodium loading along Camp Creek, including its headwater sub-drainage station CC-1, is shown on Figure 3-9 and summarized in Table 3-2. Station CC-1 is in a sub-drainage that is not affected by the 1380 Portal and is therefore considered to represent the local background groundwater quality. Sulphate concentrations measured at PH-01 (average 32 mg/L) were elevated compared to site CC-1 (average 8.8 mg/L), suggesting that subsurface flow from the 1380 Portal (historical sulphate averaging 175 mg/L) influences the water quality at PH-01. Along the flow path from the Portal to PH-01, the mine-related discharge is apparently diluted when it mixes with local groundwater having lower sulphate concentrations (similar to CC-1).

A marked increase in sulphate and sodium load (55% to 85% increase) was observed between MH-04 and MH-28 for all three sampling events. That this increase was observed during December (64% and 69% higher for sulphate and sodium, respectively), when surface water run-off would be expected to be negligible, suggests that (1) there is a significant groundwater contribution to Camp Creek between these two sites; and (2) the South Tailings and Reclaim Pond areas may provide sulphate loading to the Creek. The relatively minor net loss or gain in constituent load farther downstream (from MH-28 to MH-27) suggests the groundwater contribution is much lower over this reach (Table 3-2).

During the fall 2018 evaluation, it was not possible to measure the flow or collect water samples of the 1380 Portal discharge due to the lack of access to the Portal (MH-25) and the ephemeral nature of seepage from the waste rock (SDH-S2) through which the Portal discharge flows. Instead, a scoping assessment of the load change between the 1380 Portal and upper Camp Creek was conducted based on historical data. Flow and chemistry data collected at the 1380 Portal (MH-25) for August sampling events between 2007 and 2014 (when the portal discharge chemistry exhibited stable conditions) were used to calculate the historical average sulphate and sodium load contribution from the Portal discharge. These historical averages were then taken as a surrogate for August 2018 and used to calculate the net gain or loss of load in upper Camp Creek water at PH-01 and MH-04, as described by SRK (2013).

The load change at PH-01 was calculated by subtracting the measured load at PH-01 from the calculated average 1380 Portal load. Similarly, the load change at MH-04 was calculated by subtracting the measured load at MH-04 from the sum of the average 1380 Portal load and the measured CC-1 sub-drainage load. For August 2018, the measured chemical loads at PH-01 and MH-04 were greater than the combined load estimated for the 1380 Portal and CC-1, indicating that

a significant additional load was supplied these downgradient sites. It was computed that 72% to 75% of the measured sulphate and 82% to 96% of the measured sodium loads at MH-04 and PH-01 were derived from natural sources not related to the 1380 Portal or the sub-drainage containing CC-1 (Table 3-2). These results suggest that natural groundwater and surface water inputs provide most of the chemical loading to the upper Camp Creek watershed and are consistent with the estimate of SRK (2013) that groundwater discharge contributed 96% of the flow at PH-01. While the contribution from the 1380 Portal is not insignificant, it does not dominate the water chemistry at either PH-01 or MH-04.

The net increase in flow and loading between the 1380 Portal and both PH-01 and MH-04 can be used to estimate the sulphate and sodium concentrations of groundwater that is assumed to discharge over this reach. For the 1380 Portal to PH-01 reach, this scoping calculation returned sulphate and sodium concentrations of 25 and 0.75 mg/L, respectively. For the 1380 Portal to MH-04 reach, the estimated groundwater sulphate and sodium concentrations were 15 and 0.84 mg/L, respectively. These calculated groundwater sulphate concentrations are broadly consistent with:

- The estimated groundwater sulphate concentrations calculated by SRK (2013) using a similar method for PH-01 (23 mg/L) and MH-04 (13 mg/L); and
- The average concentrations measured to date (2013 to 2018) at groundwater monitoring wells MW13-13 (34 mg/L sulphate and 0.73 mg/L sodium) and MW13-01 (11 mg/L sulphate and 0.84 mg/L sodium), which are both located along the inferred groundwater flow path between the 1380 Portal and upper Camp Creek.

Although this scoping calculation assumes that only groundwater is responsible for this increase in load and flow, rather than surface runoff, the broad agreement with the average local groundwater sulphate and sodium concentrations lends support to the assumption that groundwater is the principal contributor of load and flow to the headwaters of Camp Creek.

Progressing downstream, Table 3-2 shows that the sulphate load contribution from the 1380 Portal represents 20% of the measured load at MH-04 and 9% of the load at MH-28/MH-27. The values in Table 3-2 show that the sulphate and sodium loads increase significantly in progressing from MH-04 to MH-28 (55% to 84% increase depending on sampling event) but does not change appreciably downstream from MH-28 to MH-27. Given the interpreted flow paths on Figure 3-2, this finding suggests that a chemical load to Camp Creek may come from the South Tailings and Reclaim Pond areas.

Table 3-2 Change in Measured Sulphate and Sodium Load in the 1380 Portal Catchment in 2018

	Sulphate (kg/d)				Sodium (kg/d)		
Site	**Aug**	**Oct**	**Dec**		**Aug**	**Oct**	**Dec**
1380 Portal	4.3	-	-		0.02	-	-
CC-1	1.79	0.54	-		0.18	0.05	-
PH-01	17.4	5.1	7.0		0.41	0.12	0.19
MH-04	22.0	10.3	7.9		1.11	0.54	0.46
MH-28	48.5	62.4	22.1		2.81	2.80	1.47
MH-27	46.0	53.0	27.9		3.14	2.60	1.99
Net Change in Loading							
	Sulphate (kg/d)				**Sodium (kg/d)**		
Site	**Aug**	**Oct**	**Dec**		**Aug**	**Oct**	**Dec**
PH-01	13.1	-	-		0.39	-	-
MH-04	15.8	-	-		0.91	-	-
MH-28	26.5	52	14		1.7	2.3	1.0
MH-27	-2.5	-9.4	5.7		0.33	-0.20	0.52
Percent Change in Loading							
	Sulphate				**Sodium**		
Site	**Aug**	**Oct**	**Dec**		**Aug**	**Oct**	**Dec**
PH-01	75%	-	-		96%	-	-
MH-04	72%	-	-		82%	-	-
MH-28	55%	84%	64%		61%	81%	69%
MH-27	-5%	-18%	21%		11%	-8%	26%

[a] Load calculated based on average sulphate concentration (175 mg/L) and flow (0.29 L/s) measured at the 1380 Portal (MH-25) during August sampling events between 2007 and 2014 (i.e., when sulphate concentrations in the 1380 Portal discharge had stabilized and sample collection at site MH-25 was feasible).

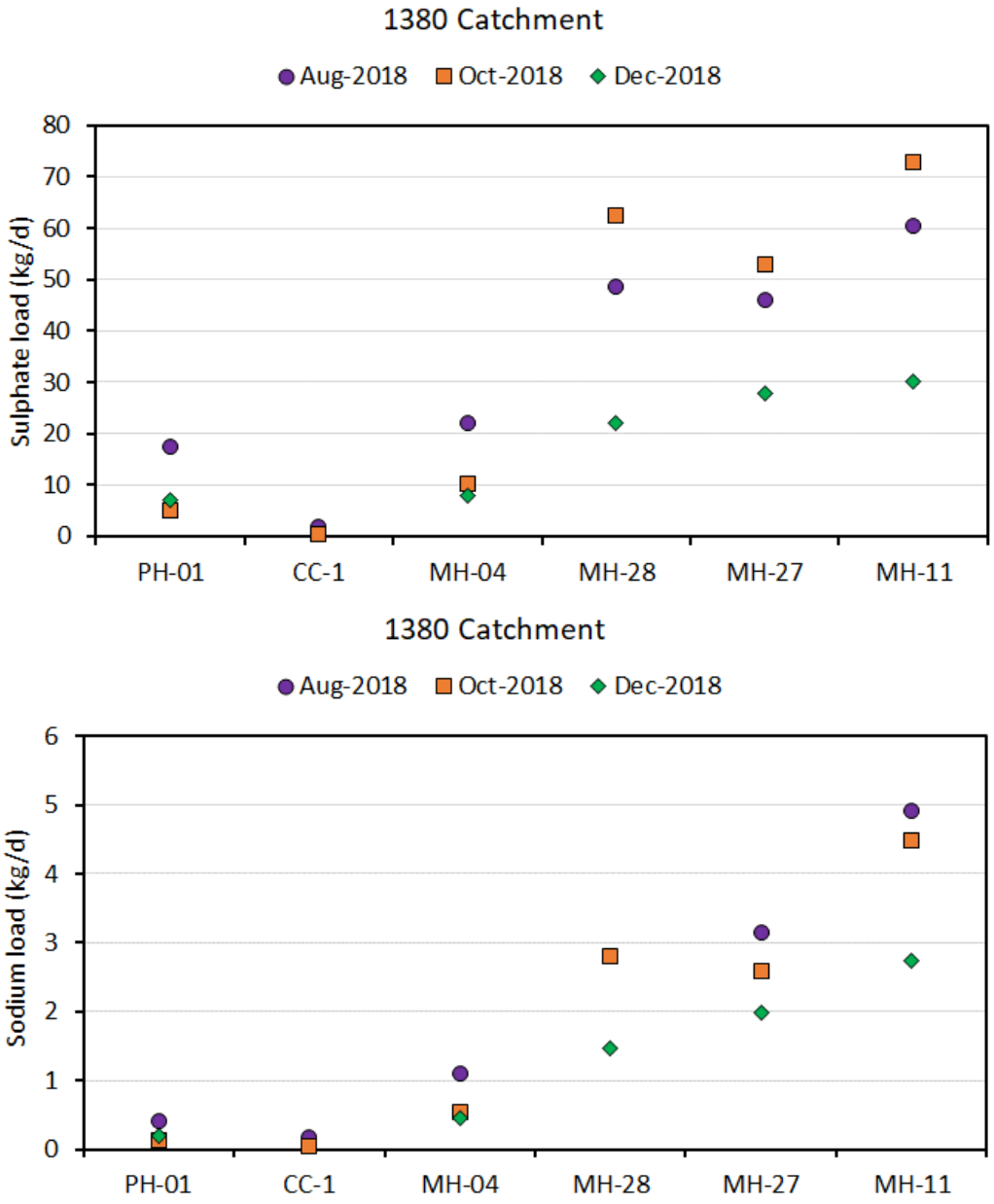


Figure 3-9 Variation in Sulphate and Sodium Load Measured at Surface Water Sites in the 1380 Portal Catchment During 2018

3.5.2 BURNICK CATCHMENT

The change in sulphate and sodium loading from the Burnick Portal and at surface water stations located on the West Fork of Tributary E (West Fork) shown in Figure 3-10 and summarized in Table 3-3. The interpretation of mass loading in this catchment is limited due to the swampy nature of West Fork in addition to the presence of beaver dams, resulting in a lack of flow data between the farthest upstream and downstream sites (TRIBEWF01 and MH-15, respectively). Site MH-15 returned the highest sulphate (10 to 19 kg/d) and sodium (4.3 to 5.4 kg/d) load compared with TRIBEWF01 (0.7 to 2.5 kg/d sulphate and 0.6 to 0.9 kg/day sodium) located approximately 6 km upstream and the Burnick Portal (0.6 to 1.25 kg/d sulphate and 0.013 to 0.026 kg/day sodium). It is unclear whether site TRIBEWF01 receives flow from the Burnick Portal, but it seems likely that the majority of any load from the portal that reaches West Fork does so downstream of TRIBEFW01 based on the site topography and estimated groundwater flow paths. The change in load at site MH-15 was calculated assuming that the load from the Burnick Portal does not influence TRIBEWF01 (i.e., change in load = MH-15 – TRIBEFW01 – MH-22). The calculations indicate that the majority of sulphate and sodium load (80% to 85%) is received along the 6 km reach of West Fork between TRIBEFW01 and MH-15. While surface runoff may account for some of the load increase, the loads measured in December when runoff is expected to be negligible are similar to those recorded during the open water season. Combined with the absence of stream tributaries, this suggests that groundwater discharge along the reach of West Fork is responsible for this load increase.

Assuming that the net gain in load at MH-15 is derived from groundwater discharge, the average sulphate and sodium concentration of such groundwater can be estimated by dividing the net gain in load by the net change in flow at MH-15. This scoping calculation returned average groundwater concentrations of 2.3 mg/L sulphate and 1.1 mg/L sodium. This is much lower than the average sulphate and sodium concentration measured at the monitoring well located at the Burnick Portal (MW13-06; 148 mg/L sulphate and 8.7 mg/L sodium for 2013 to 2018 dataset), which likely reflects local mineralization. That the calculated average sodium and sulphate concentrations of the additional water supplying West Fork between TRIBEFW01 and MH-15 are much lower than the MW13-06 concentrations suggest that there is dilution from non-mineralized regional groundwater or surface water runoff. Dilution by regional groundwater seems likely given that the sulphate and sodium loads observed in December (when runoff would expected to be negligible) were comparable to those observed in August and October. Furthermore, the average sulphate and sodium concentrations observed at well MW13-04 (5.4 mg/L sulphate and 1.0 mg/L sodium), which was installed to determine the chemistry of non-mineralized regional background groundwater, are comparable to the calculated average constituent concentrations of the groundwater inferred to discharge to West Fork between TRIBEFW01 and MH-15. Such data provide an additional line of evidence suggesting that water sampled at MH-15 integrates a substantial groundwater discharge, which includes the Burnick Portal, the signature of which is not discernable in West Fork due to dilution.

Table 3-3 Change in Measured Sulphate and Sodium Load in the Burnick Catchment in 2018

	Sulphate (kg/d)				Sodium (kg/d)		
Site	**Aug**	**Oct**	**Dec**		**Aug**	**Oct**	**Dec**
MH-22	1.1	1.2	0.61		0.025	0.026	0.013
TRIBEWF01	0.7	2.5	-		0.86	0.62	-
MH-15	10.0	18.6	17.2		5.0	4.3	5.4
Net Change in Loading							
	Sulphate (kg/d)				**Sodium (kg/d)**		
Site	**Aug**	**Oct**	**Dec**		**Aug**	**Oct**	**Dec**
MH-15	8.1	15.0	-		4.1	3.7	-
Percent Change in Loading							
	Sulphate				**Sodium**		
Site	**Aug**	**Oct**	**Dec**		**Aug**	**Oct**	**Dec**
MH-15	82%	80%	-		82%	85%	-

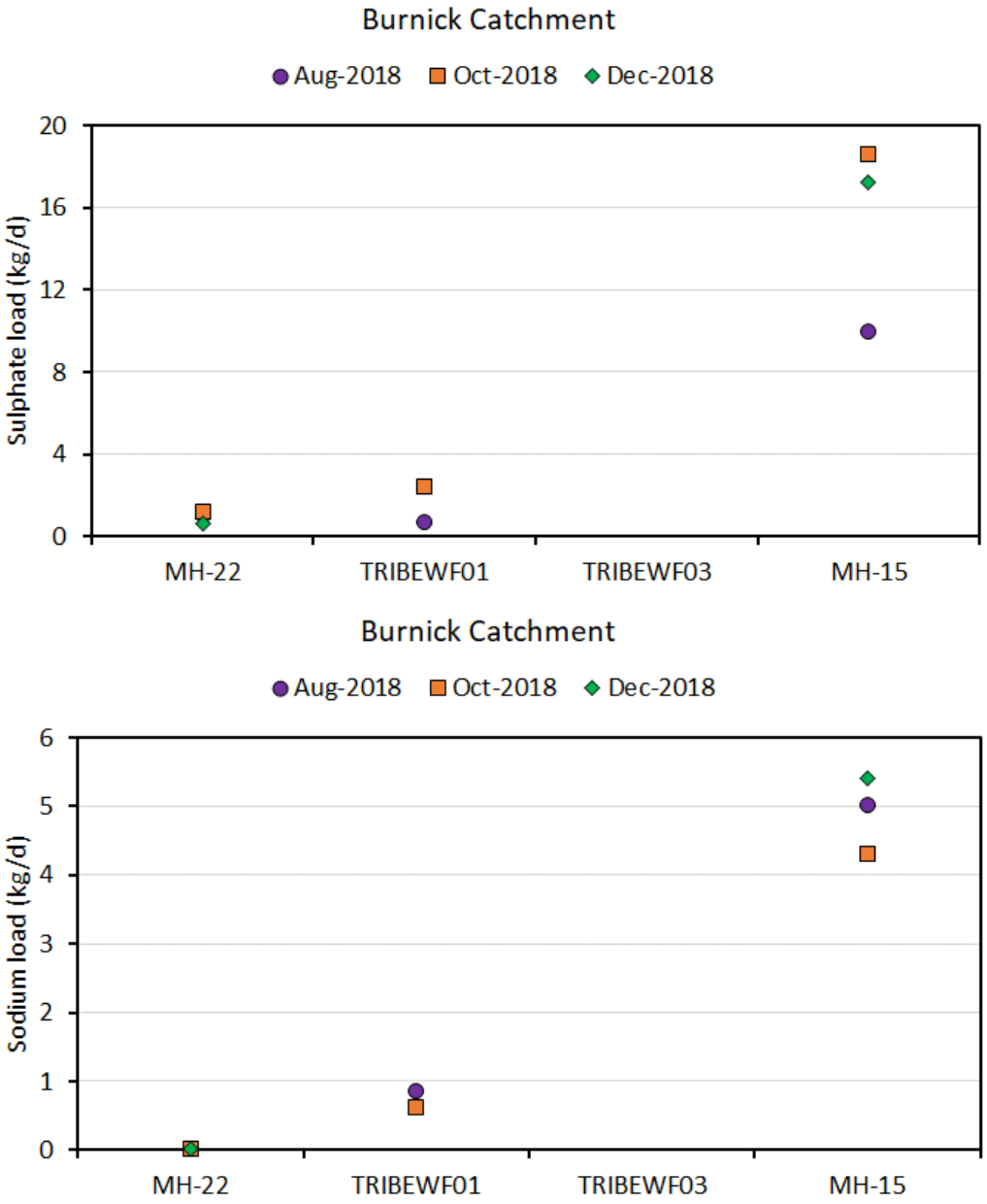


Figure 3-10 Variation in Sulphate and Sodium Load Measured at Surface Water Sites in the Burnick Catchment During 2018

3.5.3 NORTH TAILINGS CATCHMENT

The change in sulphate and sodium loading in the North Tailings dam seep and at surface water stations located on North Creek is shown in Figure 3-11 and summarized in Table 3-4. MH-08, which is located on Burnick Creek as a tributary to Flat Creek upstream of the North Tailings dam, is a minor source of constituent load (0.15 to 1.1 kg/d sulphate and 0.02 to 0.17 kg/d sodium) due to its low flow rate (20 to 144 L/min) and relatively low sulphate and sodium concentrations (average 5.5 mg/L sulphate and 0.82 mg/L sodium). The North Tailings dam seep (MH-02) has markedly higher sulphate and sodium concentrations (average 302 and 9.7 mg/L, respectively), but lower average flow (~20 L/min), resulting in higher sulphate loads (3 to 4.2 kg/d) than MH-08, but comparable sodium loads (0.11 to 0.15 kg/d). MH-23, located on North Creek downstream of its confluence with a small ephemeral creek (flow only observed in this creek during freshet), has higher sodium and sulphate loads (7 to 12 kg/d and 1.1 to 2.1 kg/d, respectively) than either MH-08 or MH-02, but has similar dissolved sulphate and sodium concentrations to MH-08 (average 5.2 mg/L sulphate and 0.87 mg/L sodium), suggesting that either the tailings dam seepage does not reach MH-23 (i.e., it is upgradient) or that there is significant dilution. Farther downstream North Creek at NC-01, sulphate concentrations (average 10.8 mg/L) are approximately double those measured at MH-23, suggestive of a contribution from the North tailings dam seepage. The increase in sulphate loading at NC-01 (32 to 37% increase) is likely due to capture of shallow subsurface flow from the North Tailings dam seepage to North Creek, but the flow contribution is relatively minor compared to the North Creek surface flow since there is little marked change in measured discharge between MH-23 and NC-01 (Figure 3-3). Moving farther downstream to MH-12, average sulphate (10.7 mg/L) and sodium (1.0 mg/L) concentrations are comparable to those at NC-01, however, there is a net loss of sulphate and sodium load due to much lower flow measured at NC-01.

Table 3-4 Change in Measured Sulphate and Sodium Load in the North Tailings Catchment in 2018

	Sulphate (kg/d)				Sodium (kg/d)		
Site	**Aug**	**Oct**	**Dec**		**Aug**	**Oct**	**Dec**
MH-02	4.22	3.12	-		0.15	0.11	-
MH-08	0.15	1.1	-		0.02	0.17	-
MH-23	12.0	7.3	6.9		2.1	1.1	1.2
NC-01	25.8	15.4	14.0		2.4	1.5	1.4
MH-12	23.4	9.9	11.6		2.2	1.0	1.1
Net Change in Loading							
	Sulphate (kg/d)				**Sodium (kg/d)**		
Site	**Aug**	**Oct**	**Dec**		**Aug**	**Oct**	**Dec**
NC-01	9.6	5.0	-		0.2	0.27	-
MH-12	-2.4	-5.5	-2.4		-0.16	-0.54	-0.34
Percent Change in Loading							
	Sulphate				**Sodium**		
Site	**Aug**	**Oct**	**Dec**		**Aug**	**Oct**	**Dec**
NC-01	37%	32%	-		7%	18%	-
MH-12	-10%	-56%	-21%		-7%	-56%	-32%

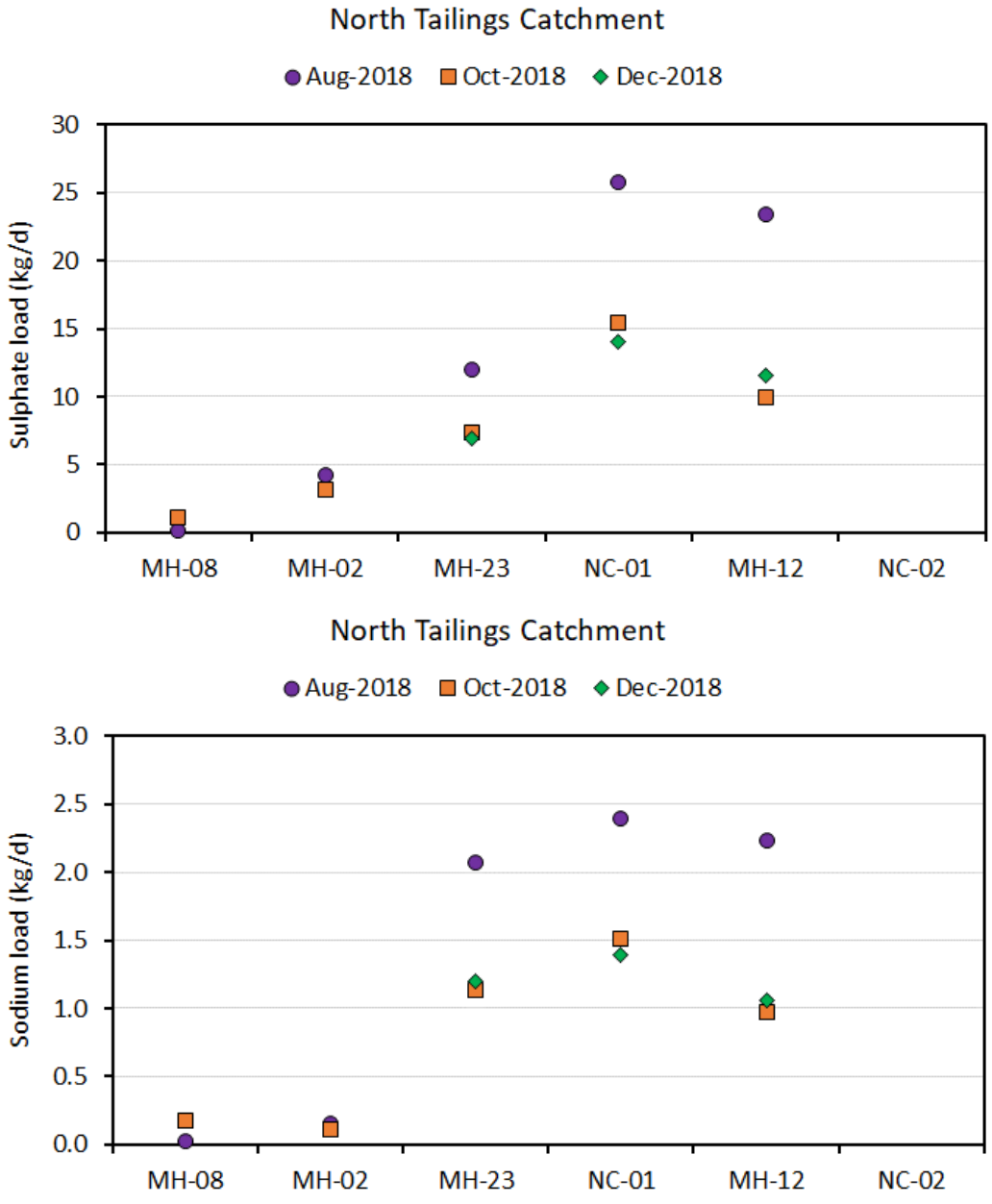


Figure 3-11 Variation in Sulphate and Sodium Load Measured at Surface Water Sites in the North Tailings Catchment During 2018

4. SURFACE WATER AND GROUNDWATER INTERACTION

4.1 1380 PORTAL CATCHMENT

The 1380 portal discharge originates from a short Main Zone adit that intercepted a water bearing fault, allowing water to flow from the fault into the adit where it contacted weathered mineral-rich skarn resulting in affected mine drainage. The adit was reclaimed so that discharge now infiltrates through marble waste rock and into the subsurface toward the 1380 gully, and ultimately reaches Camp Creek. During freshet the discharge combines with snow melt and daylights as a seep at the base of the waste rock (SDH-S2) for approximately three weeks a year, before infiltrating back onto the subsurface just downstream. Groundwater levels and surface contours indicate that groundwater from the slopes of the 1380 gully, including the portal discharge, would flow into the gully and ultimately discharge to Camp Creek surface water. Figure 4-1 provides the locations of monitoring wells and surface water stations and shows the interpreted groundwater-surface water flow paths for the 1380 Portal catchment.

MW13-13 is located in the upper portion of the gully (400 m downgradient of the portal), with annual groundwater levels fluctuating by more than 4 meters and with peaks following freshet. In October and December, as groundwater levels were at the lowest point and the surface water contribution has dropped, the isotope signatures of the samples from the MW13-13 well were comparable with the 1380 portal discharge implying a connection of the portal water to groundwater at MW13-3. The 1380 portal discharge signature was not as strong in August, when the groundwater was still being recharged by recharge from snowmelt.

Farther down the gully, 800 m from the portal, is monitoring well MW13-01. Groundwater levels in this well also peak following freshet, but water levels fluctuate only about 2 meters seasonally. Isotope data appear to indicate a lesser affect of the 1380 portal water on groundwater at MW13-01. The isotopic signature at MW13-01 appears more similar to natural background groundwater signature.

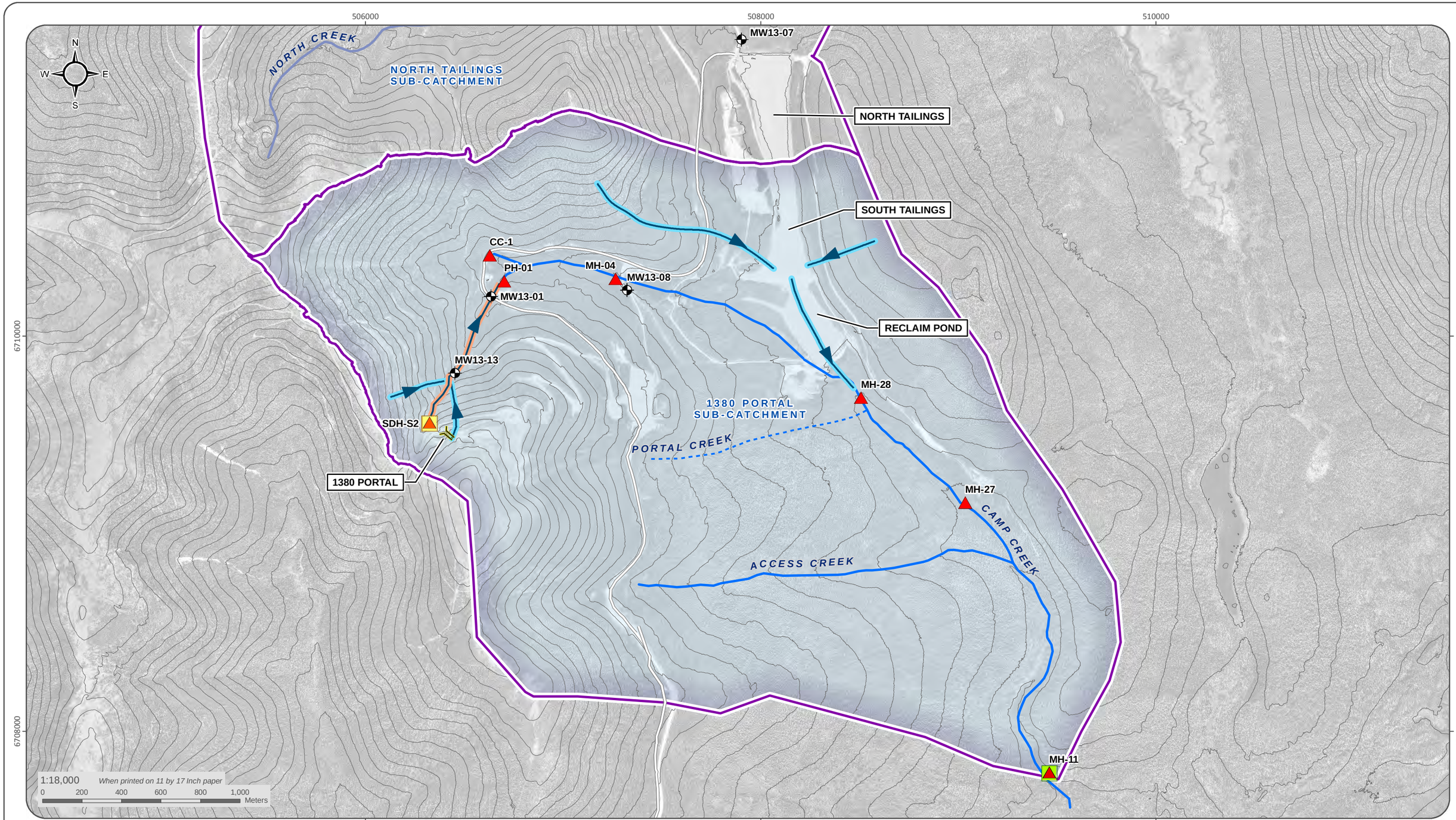
Camp Creek becomes perennial near the old pumphouse where it is sampled at surface water station PH-01. PH-01 is primarily fed by groundwater, which is supported by temperature and isotope data. Temperature data from PH-01 vary little from August, October, and December (1.1 to 2.1°C). August temperatures measured at PH-01 were considerably cooler than downstream monitoring sites and the opposite was observed in December, as temperatures measured at PH-01 were slightly warmer than downstream monitoring sites, indicating the effect of surface water on downstream sites.

Isotope data at PH-01 appears to be a mix of groundwater from portal discharge, MW13-01, and MW13-13, with a strong indication that the source of surface water was primarily groundwater discharge. The sulphate concentration at PH-01 (32 mg/L) which would be expected to receive any portal discharge, is elevated compared to the spring (CC-1) in the nearby sub-drainage (8.8 mg/L), This is consistent with the interpretation that elevated sulphate at PH-01 is sourced by the 1380 Portal discharge, which has a sulphate concentration of about 175 mg/L. The reduction in sulphate concentration from the portal to PH-01 indicates substantial dilution from local groundwater that has a relatively low sulphate content. Such dilution is consistent with the load balance and isotope data presented by SRK (2013), which indicated that the 1380 Portal discharge is significantly diluted by local groundwater.

In going from station PH-01 to station MH-04, the surface water was slightly enriched in light isotopes and sulphate concentrations were reduced. This is interpreted as a result of flow contributions from the CC-1 spring and the natural groundwater discharge from other parts of the watershed. Note that water originating at the CC-1 spring likely joins Camp Creek about 100 m downstream of station PH-01, so it affects water chemistry at MH-04.

From MH-04 down the drainage through MH-28 and MH-27, and ultimately to MH-11, the discharge nearly triples as the Camp Creek receives surface water runoff and natural groundwater discharge. The influence of surface water inputs is reflected by observations that in August the discharge was approximately twice as large as it was in December at each point from MH-04 to MH-11. Isotope data along the lower reach of Camp Creek (MH-28, MH-27 and MH-11) indicated a surface water signature that differed compared with the upper catchment area. At MH-28, the Camp Creek surface water station downstream of the reclaimed South Tailings, sulphate data showed a slight increase in concentration, possibly due to a groundwater input from the South Tailings area into Camp Creek.

Ultimately the data for the 1380 portal catchment indicate that the headwaters of this catchment (PH-01 to MH-04) are primarily fed by groundwater contributions which incorporate and dilute the 1380 discharge. In the lower reach of the catchment (MH-28 to MH-11) the main contributor is surface water and contributions from the headwaters are further diluted by additional surface water inputs.



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- Groundwater Monitoring Well
- Surface Water Quality Source Monitoring Station
- Water License Compliance Surface Water Quality Monitoring Station
- Surface Water Quality Station
- Portal
- Watercourse/Creek
- Seasonal Surface Flow
- Groundwater Flow Path
- Source Groundwater Flow Path
- Sub-Catchment Boundaries
- Reclaimed Ponds
- Watercourse
- Access Road
- Contour (20m)

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SURFACE WATER- GROUNDWATER INTERACTION STUDY

FIGURE 4-1
1380 MAIN ZONE PORTAL

MARCH 2019

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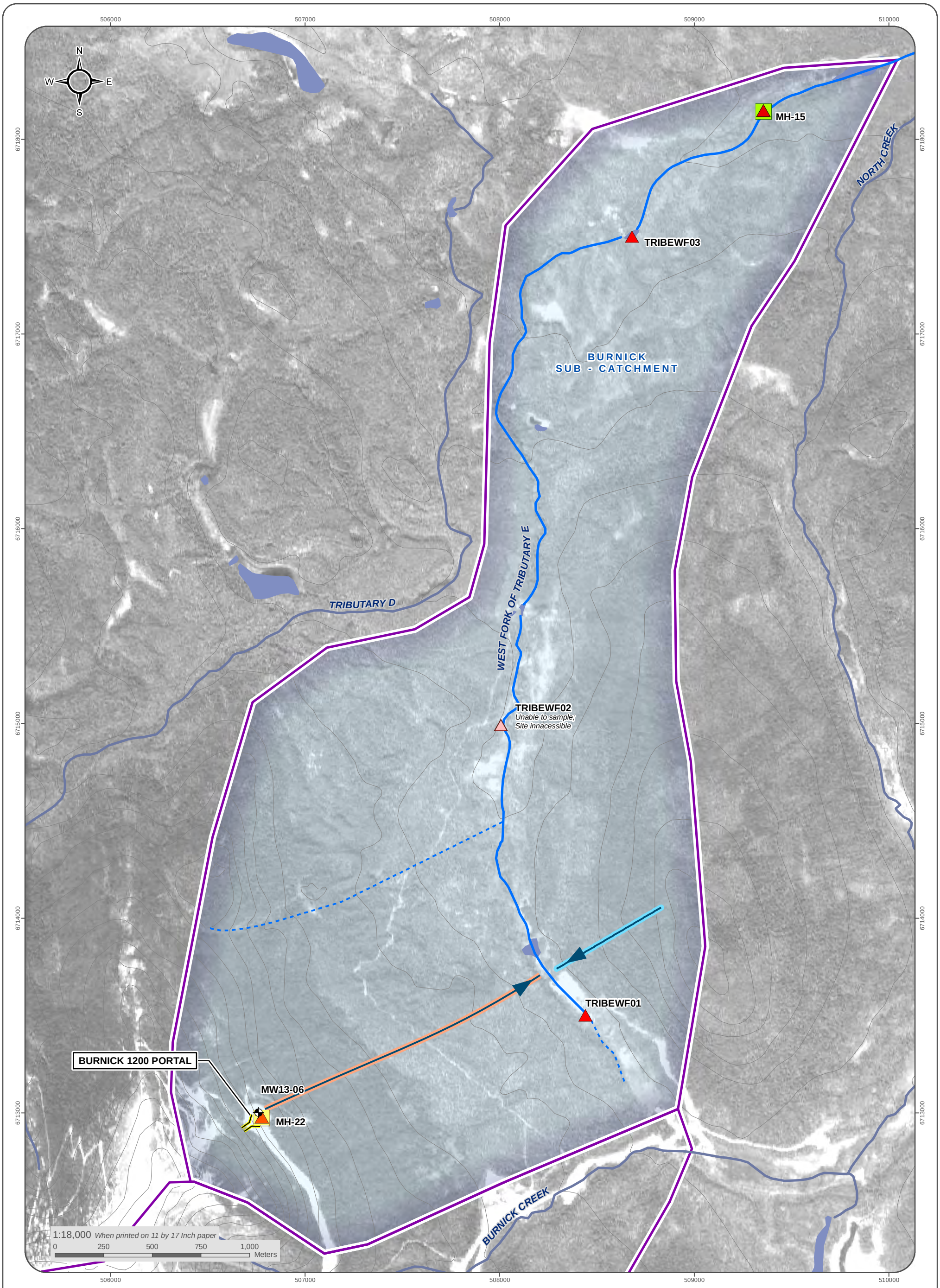
4.2 BURNICK CATCHMENT

The Burnick 1200 portal was reclaimed so that its discharge is directed onto waste rock and immediately infiltrates to groundwater. Based on the groundwater level contour map (Figure 3-2), the interpreted groundwater flow path is east-northeast towards the West Fork of Tributary E (West Fork). The groundwater discharges either in the low swampy area of the West Fork valley or directly into the stream channel. It is interpreted that the 1200 Burnick portal (MH-22) water likely reaches the West Fork channel downstream of surface water monitoring point TRIBEWF01. Seep surveys were conducted on the hillside downgradient of the 1200 portal; however, no evidence of seepage was found suggesting that portal discharge flows mix with the groundwater as it flows downslope, and stays subsurface until the West Fork (SRK, 2014). Figure 4-2shows the interpreted groundwater-surface water flow path originating at the 1200 Burnick portal. Full characterization of this area was hindered by poor site conditions, which prevented sampling at TRIBEWF02, and limited the ability to sample TRIBEWF01 and TRIBEWF03.

The headwater of the West Fork, upgradient of TRIBEWF01, is marshy and channeled surface flow is intermittent. TRIBEWF01 represents the first point along the catchment where collecting consistent channelized flow is possible. Isotope data from TRIBEWF01 in August and October indicate water that has been influenced by evaporation, which would be expected in a marshy area.

West Fork discharge measurements are limited due to swampy site conditions and a poorly defined channel. The data, however, provide evidence that West Fork gains water along the entire reach from TRIBEWF01 downstream to MH-15. Discharge in August is not significantly higher than October or December, which may be related to the beaver dams present along the reach which pool water and dampen the surface runoff contributions such that streamflow does not exhibit large seasonal fluctuations. December flow and sulphate/sodium loads at the farthest downstream station on West Fork (MH-15) were comparable to those measured in August and October suggesting that groundwater discharge may supply a significant proportion of the water gained along the lower reach of the creek.



- Groundwater Monitoring Well
- Surface Water Quality Source Monitoring Station
- Water License Compliance Surface Water Quality Monitoring Station
- Surface Water Quality Station
- Watercourse/Creek
- Seasonal Surface Flow
- Groundwater Flow Path
- Source Groundwater Flow Path
- Portal
- Sub-Catchment Boundary
- Contours (100ft)

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SURFACE WATER - GROUNDWATER INTERACTION STUDY

FIGURE 4-2
BURNICK CATCHMENT
CONCEPTUAL SW-GW FLOW

MARCH 2019

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4.3 NORTH TAILINGS CATCHMENT

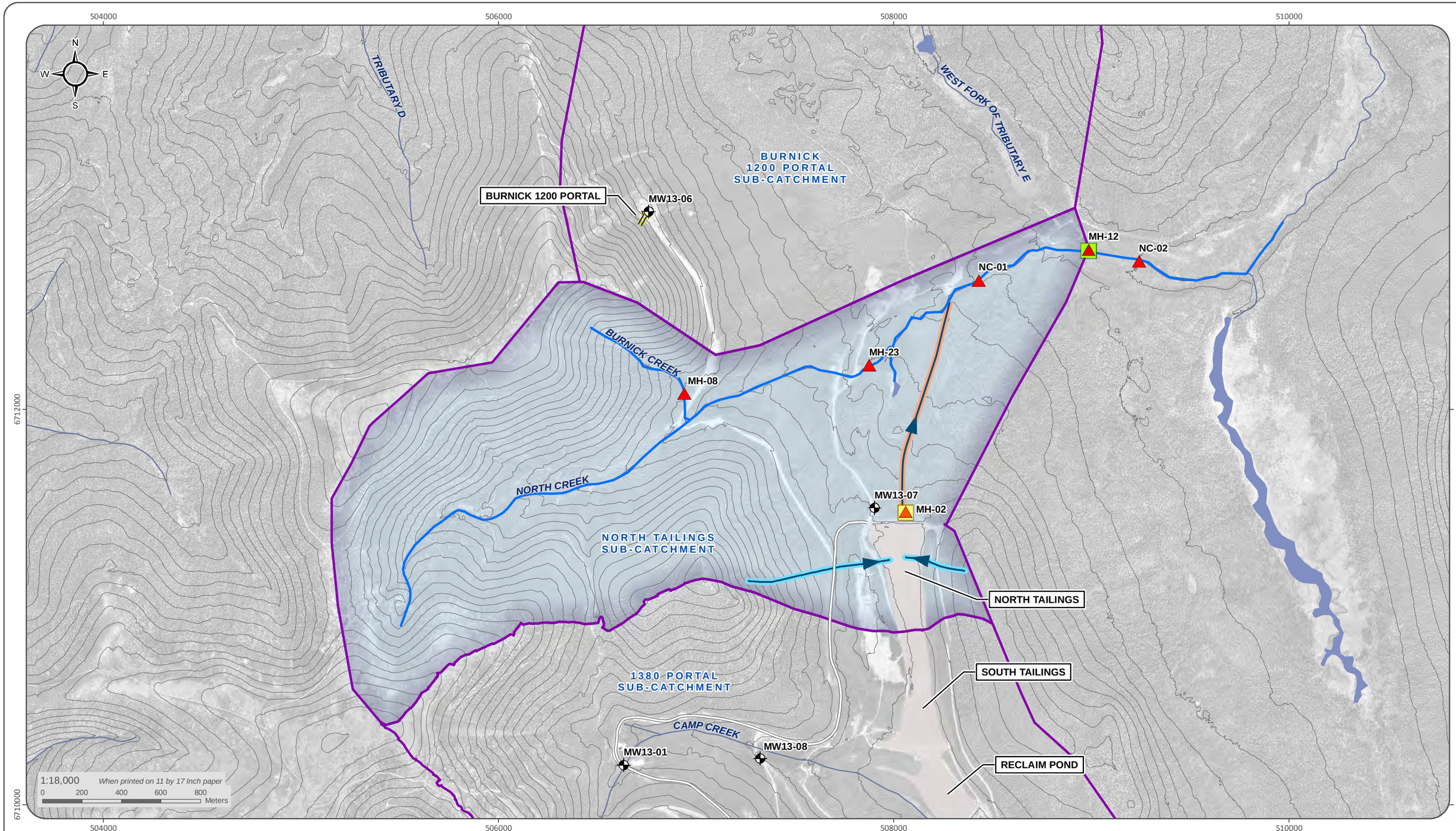
Seepage discharge from the North Tailings was measured as approximately 10 L/min in August and October 2018, and was too small to measure in December. Groundwater level contour mapping and estimated flow paths indicate that seepage discharge would be a mixture of tailings porewater, natural groundwater, and hillside surface run-off, which is supported by isotope and chemical loading estimates. Groundwater levels near the tailings fluctuate seasonal by about 2 meters and are very close to ground surface (3 to 5 meters below ground). Seepage from the tailings infiltrates into the groundwater and migrates in the subsurface flows towards North Creek downstream of MH-23. Figure 4-3 provides the monitoring locations and groundwater-surface water flow paths for the North Tailings catchment.

Burnick Creek is a tributary that flows into North Creek upstream of MH-23. The measured flows in Burnick Creek (at MH-08) where 18 and 2 L/min in August and October, respectively. In December, the flow at this station was too small to measure.

The Burnick Creek and North Tailings flows are very small compared to flows measured at the North Creek stations (MH-23, NC-01, and MH-12), which were 150 times greater in August, and 100 times greater in October and December. The 2018 discharge data show a small decrease in North Creek flow downstream from NC-01 and MH-12, which may indicate some discharge of surface water into groundwater. However, this conclusion is tentative as the flow differences are relatively small and the measured flow rates could be affected by measurement errors.

Sulphate concentrations in North Creek station NC-01 were approximately double those measured upstream at MH-23, which could suggest an input of seepage from the North Tailings area. The associated increase in sulphate loading at NC-01 (32 to 37% increase) is likely due to the discharge of groundwater originating at the North Tailings dam; however, the flow contribution is relatively minor compared to the North Creek surface flow since there is little marked change in measured discharge in going from MH-23 and NC-01 (Figure 3-3). This may also explain the similar isotopic signature of North Creek water upstream (MH-23) and downstream (NC-01, MH-12, and NC-02) of the North Tailings dam seepage. The implication is that the isotopically distinct North Tailings dam seepage is greatly diluted by North Creek surface water, so the isotopic signature of the creek water is not much affected by the North Tailings input.

At downstream station MH-12, the average sulphate and sodium concentrations (10.7 mg/L and 1.0 mg/L, respectively) are similar to those at NC-01, suggesting that the North Tailings chemical loading observed between MH-23 and NC-01 is not greatly affected by downstream inputs of surface water and groundwater. This would be consistent with the idea that the downstream reach of North Creek is slightly losing, and surface water inputs are minor.



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Datum: NAD 83; Map Projection: UTM Zone 9N

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- Groundwater Monitoring Well
- Surface Water Quality Source Monitoring Station
- Water License Compliance Surface Water Quality Monitoring Station
- Surface Water Quality Station
- Portal
- Watercourse/Creek
- Groundwater Flow Path
- Source Groundwater Flow Path
- Reclaimed Pond
- Sub-Catchment Boundary
- Access Road
- Contour (20m)

Teck

AEG

SÄ DENA HES
SURFACE WATER-GROUNDWATER INTERACTION STUDY

FIGURE 4-3
NORTH TAILINGS PORTAL CATCHMENT

MARCH 2019

D:\Project\AllProjects\Sa_Dena_Hess\GIS\Maps\04-Studies\SW_GW_Interaction\North_Tailings_Catchment_20190314.mxd (*Last edited by: amatashevska;15/03/2019/11:13 AM*)

5. CONCLUSION

Following reclamation, the SDH site has the following three potential chemical source areas, each within a distinct drainage:

- 1380 Main Zone Portal discharge (SDH-02), monitored by compliance station MH-11;
- 1200 Burnick Portal discharge (MH-22), monitored by compliance station MH-15; and
- North Dam Seepage from the tailings impoundment (MH-02), monitored by compliance station MH-12.

Each drainage is monitored by a network of groundwater monitoring wells and surface water stations under the site EMSRP and AMP.

The additional characterization for the surface water - groundwater interaction study was conducted from August to December 2018 to characterize groundwater flow paths and evaluate groundwater/surface water gains and losses within each of the three receiving catchments. The intent of this additional characterization was to address the Water Board's request to provide additional support that the compliance monitoring points are appropriately located to capture potential chemical inputs from the three sources described above.

Additional data were collected in August, October, and December 2018, which represents the period of largest decline in groundwater levels across the site. Groundwater levels, surface flows, and water chemistry data, including stable isotopes, were collected to refine the conceptual groundwater-surface water flow models developed for each catchment. Following refinement using the 2018 data, the conceptual models for the three catchments indicated flow paths that were similar tot those described in previous technical reports for the SDH site. The surface water-groundwater interactions in each catchment are summarized as follows:

- 1380 Portal Catchment
  - Mine water at the 1380 Portal infiltrates and migrates northward as subsurface flow towards the upper portion of the 1380 gully, and then migrates as groundwater below the channel until it surfaces at station PH-01 (where the drainage becomes perennial). Along this pathway, the mine water is diluted by groundwater inputs and surface water runoff from other portions of the watershed.
  - Along Camp Creek, from stations PH-01 to MH-04, it is expected that most or all of the original portal water has discharged to surface water, and this flow within the Camp Creek channel is further diluted by surface water runoff and groundwater discharges to the Creek.
  - From stations MH-04 to MH-28, the Creek flow has the potential to receive residual subsurface mine-related water associated with the now decommissioned South Tailings facility.
  - Along the lower reach of Camp Creek, from stations MH-28 to MH-11, the flow is mainly fed by surface water runoff, so that any upstream mine-related chemicals are greatly diluted by the surface water contribution.
- Burnick Catchment
  - Mine water at the 1200 Burnick Portal infiltrates and migrates as subsurface groundwater flow to the east-northeast where it would ultimately discharge to surface water in the West Fork of Tributary E between sampling points TRIBEWF01 and TRIBEW02. Along this groundwater flow path, it is expected that the mine water is diluted by natural infiltration of rainfall/snowmelt, and the chemicals of concern are attenuated by geochemical processes.
  - If and when the original mine water was to discharge (as groundwater) into the West Fork of Tributary E, it would be further diluted by surface water runoff and groundwater contributions to the Tributary occurring between TRIBEWF02 and station MH-15. The Tributary is affected by beaver dams that collect

and store surface water, and data suggest that there are significant groundwater discharges to the Tributary from other portions of the watershed.

- North Tailings Catchment
  - The visible North Tailings seepage (MH-02) is a mixture of residual tailings porewater, natural groundwater, and hillside surface runoff. This water infiltrates and migrates as groundwater in the north-northeast direction, where it discharges to North Creek upstream and in the vicinity of station NC-01. Along the groundwater flow path, the tailings-related water is subject to dilution by meteoric infiltration and attenuation by geochemical processes.
  - The tailings water has elevated sulphate, and along North Creek from station MH-23 to station NC-01, sulphate concentration in the Creek water nearly doubles (from about 5.2 mg/L to 10.8 mg/L in the downstream direction). This observation provides evidence that tailings-related water has migrated to North Creek and at least a portion of it discharges into the channel upstream of NC-01. There is little change in surface water flow between MH-23 and NC-01, suggesting that the groundwater contribution to stream flow is relatively minor.
  - Gauging data suggest that the lower portion of North Creek, from NC-01 to MH-12, is slightly losing, which would indicate some discharge of surface water into groundwater. However, this conclusion is tentative because the flow differences are relatively small and the measured flow rates could be affected by measurement errors.

Given the groundwater – surface water interactions described above, AEG concludes that the current surface water monitoring network is adequate to sample all water that could be potentially affected by the mine during long-term closure. It is very unlikely that impacted surface water (if any) would not be detected by the distribution of monitoring stations.

6. REFERENCES

Alexco Environmental Group, 2016. *Standard Operating Protocol, Surface Water Hydrology, Data Collection and Management.*

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Golder Associates Ltd. 2014. *Sä Dena Hes Mine Closure – 2013 Analytical Data Summary for Hydrogeological Assessment work.* Technical Memo prepared for Teck Metals Ltd. 9 April 2014.

International Atomic Energy Association. (2019). *Global Network of Isotopes in Precipitation*. Accessed on February 07, 2019. https://nucleus.iaea.org/wiser

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SRK Consulting (Canada) Inc. 2013. *Sä Dena Hes – 1380 Poral Discharge Investigation.* Prepared for Teck Resources Ltd. February 2013.

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APPENDIX A.

2018 Isotope Certificate of Analysis

Final Report

Activation Laboratories

Report Number: A18-11466

Report Date: 11/9/2018

Analyte Symbol	d18O-	dD
Unit Symbol	per mill	per mill
Detection Limit		
Analysis Method	ISO	ISO
NC-02	-21.89	-166.8
MH-12	-22.03	-167.5
NC-01	-21.97	-167.5
MH-23	-22.1	-167.6
MH-02	-21.04	-162.9
MH-27	-21.7	-166.3
MH-28	-21.53	-165.2
MH-22	-22.48	-170.3
MH-08	-22.33	-170.4
MH-04	-22.08	-167.8
PH-01	-21.9	-166.5
CC-1	-22.1	-168.2
MH-15	-21.79	-169
TRIBEFW03	-21.9	-169.7
TRIBEFW01	-20.94	-164.2
MW13-01	-22.23	-169.2
MW13-13	-21.59	-164.3
MW13-04	-22.04	-167.3
MH-11	-21.76	-166.4

Laboratoire d'isotopes stables Ján Veizer (anciennement G.G. Hatch)
Ján Veizer Stable Isotope Laboratory (formerly G.G. Hatch)

Customer Information

First Name:	Andrew
Last Name:	Gault
Initial:	0
Address (Line 1):	Alexco Environmental Group
Address (Line 2):	0
Address (Line 3):	0
City:	0
State or Province:	0
Postal Code:	0
Country:	Canada
Email:	agault@alexcoresource.com
Phone Number:	613-329-0085
Submission Date:	23/10/2018
Project Title:	wt-od-P - RUSH
Isotope Ratios Req:	2H and 18O
Numeric Media Code:	1
Supervisor:	0

Invoice Information

PO # or Account Code:	R76951
First Name:	Colette
Last Name:	MacMillan
Initial:	0
Address (Line 1):	Alexco Environmental Group
Address (Line 2):	Suite 1225- Two Bentall Centre, 555 Burrard Stree
Address (Line 3):	0
City:	Vancouver
State or Province:	British Columbia
Postal Code:	V7X 1M9
Country:	Canada
Email:	ap@accessconsulting.ca
Phone Number:	867-668-6463

Completed: 2018-nov-05
Cost: (20 x $30) x 3rush = $1800

Work done by: lab

Amount of water in vials: 1.8mL
Amount of water used per injection: 1.8uL
- first 3 are discarded; second 3 are averaged.

See Methodology tab below for details.

Optional Project Comment:	Paul - these are surface and groundwater samples from an abaondoned mine.
	No alcohols or hydrocarbons expected so the cheaper laser cavity option is fine for us.
	RUSH
	0

QCD = quality control duplicate (No charge)

OurLabID	Sample ID	Delta 2H (VSMOW)	Delta 18O (VSMOW)	Contaminant Flag	Comments	Hatch Lab ID
W-40271	NC-02	-165.7	-21.72		0	B1819-343-001
W-40272	MH-12	-167.7	-21.91		0	B1819-343-002
W-40273	NC-01	-168.0	-21.88		0	B1819-343-003
W-40274	MH-23	-167.9	-21.92		0	B1819-343-004
W-40275	MH-02	-162.4	-20.98		0	B1819-343-005
W-40276	MH-22	-170.9	-22.40		0	B1819-343-006
W-40277	MH-08	-170.3	-22.19		0	B1819-343-007
W-40278	MH-04	-167.1	-21.70		0	B1819-343-008
W-40279	CC-1	-168.5	-22.02		0	B1819-343-009
W-40280	PH-01	-167.0	-21.85		0	B1819-343-010
W-40281	MW13-01	-167.2	-22.01		0	B1819-343-011
W-40282	**MW13-01 dup**	**-168.3**	**-22.07**		**0**	**B1819-343-012**
W-40283	MW13-13	-162.5	-21.24		0	B1819-343-013
W-40284	MW13-06	-168.1	-21.95		0	B1819-343-014
W-40285	MW13-04	-166.2	-21.72		0	B1819-343-015
W-40286	MH-28	-165.0	-21.49		0	B1819-343-016
W-40287	MH-27	-164.9	-21.43		0	B1819-343-017
W-40288	MH-11	-164.9	-21.44		0	B1819-343-018
W-40289	MH-15	-169.9	-21.97		0	B1819-343-019
W-40290	TRIBEFW03	-170.2	-22.05		0	B1819-343-020
W-40291	TRIBEFW01	-163.0	-20.31		0	B1819-343-021
W-40292	**TRIBEFW01 dup**	**-163.3**	**-20.38**		**0**	**B1819-343-022**

Blind Standard: W-24

delta 18O = -7.8, n = 4, st.dev. = 0.03 Expected value to date: -7.9
delta 2H = -50.9, n = 4, st.dev. = 0.2 Expected value to date: -51.6

Laboratoire d'isotopes stables Ján Veizer (anciennement G.G. Hatch)
Ján Veizer Stable Isotope Laboratory (formerly G.G. Hatch)

Customer Information

First Name:	Andrew
Last Name:	Gault
Initial:	0
Address (Line 1):	Alexco Environmental Group
Address (Line 2):	0
Address (Line 3):	0
City:	0
State or Province:	0
Postal Code:	0
Country:	Canada
Email:	agault@alexcoresource.com
Phone Number:	613-329-0085
Submission Date:	11/12/2018
Project Title:	wt-od-L
Isotope Ratios Req:	2H and 18O
Numeric Media Code:	1
Supervisor:	0

Invoice Information

PO # or Account Code:	R77219
First Name:	Colette
Last Name:	MacMillan
Initial:	0
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Address (Line 2):	Suite 1225- Two Bentall Centre, 555 Burrard Street
Address (Line 3):	0
City:	Vancouver
State or Province:	British Columbia
Postal Code:	V7X 1M9
Country:	Canada
Email:	ap@accessconsulting.ca
Phone Number:	867-668-6463

Completed: 2018-dec-17
Cost: 19 x $25 = $475

Work done by: lab (Wendy)
Amount of water in vials: 1.0mL
Amount of water used per injection: 900uL
Number of injections per vial: 10, first 4 ignored

See Methodology tab below for details.

BBS = Broad Band Spectrum
NBS = Narrow Band Spectrum
See tab below labelled "Contaminant Flagging" for more information.

Optional Project Comment:	Surface and groundwater samples from an abaondoned mine.
	No alcohols or hydrocarbons expected.
	Field filtered with 0.45micron
	pH=7-8 salinity is max 0.7PSU

QCD = quality control duplicate (No charge)

OurLabID	Sample ID	Delta 2H (VSMOW)	Delta 18O (VSMOW)	Delta 17O (VSMOW)	Contaminant Flag	Comments	Hatch Lab ID
W-40696	NC-02	-168.7	-22.14	-11.58		0	B1819-462-001
W-40697	**NC-02 QCD**	**-169.4**	**-22.17**	**-11.59**		**0**	**B1819-462-002**
W-40698	MH-12	-168.7	-22.15	-11.07		0	B1819-462-003
W-40699	NC-01	-168.2	-22.09	-10.91		0	B1819-462-004
W-40700	MH-23	-168.0	-22.00	-10.74		0	B1819-462-005
W-40701	MH-02	-165.4	-21.43	-11.54		0	B1819-462-006
W-40702	MH-22	-168.2	-21.99	-11.71		0	B1819-462-007
W-40703	MH-08	-169.9	-22.14	-11.70		0	B1819-462-008
W-40704	MH-04	-167.8	-21.94	-11.57		0	B1819-462-009
W-40705	CC-1	-168.4	-22.04	-11.63		0	B1819-462-010
W-40706	**CC-1 QCD**	**-167.9**	**-22.00**	**-11.57**		**0**	**B1819-462-011**
W-40707	PH-01	-166.8	-21.85	-11.51		0	B1819-462-012
W-40708	MW13-01	-168.8	-22.10	-11.65		0	B1819-462-013
W-40709	MW13-13	-161.9	-21.20	-11.43		0	B1819-462-014
W-40710	MW13-06					cancelled	B1819-462-015
W-40711	MW13-04	-165.2	-21.43	-11.46		0	B1819-462-016
W-40712	MH-28	-167.4	-21.80	-11.51		0	B1819-462-017
W-40713	MH-27	-166.7	-21.56	-11.32		0	B1819-462-018
W-40714	MH-11	-168.2	-21.79	-11.42		0	B1819-462-019
W-40715	MH-15	-171.6	-21.95	-11.46		0	B1819-462-020
W-40716	TRIBEFW03	-171.5	-22.07	-11.40		0	B1819-462-021
W-40717	TRIBEFW01	-171.6	-22.14	-11.39		0	B1819-462-022

Blind Standard: W-24

delta 18O =	-7.8, n = 4, st.dev. = 0.3	Expected value: -7.9
delta 17O =	-4.2, n = 4, st.dev. = 0.4	Expected value: -4.2
delta 2H =	-49.7, n = 4, st.dev. = 1.0	Expected value: -51.6

APPENDIX B.

2018 ALS Certificate of Analyses

TECK METALS LTD.
ATTN: Michelle Unger
601 Knightton Road
KIMBERLEY BC V1A 3E1

Date Received: 20-AUG-18
Report Date: 28-AUG-18 14:49 (MT)
Version: FINAL

Client Phone: 250-427-8404

Certificate of Analysis

Lab Work Order #: L2149780

Project P.O. #: 9179
Job Reference: TECK-18-1
C of C Numbers:
Legal Site Desc:

Can Dang
Senior Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2149780-1	L2149780-2	L2149780-3	L2149780-4	L2149780-5
Description	Water	Water	Water	Water	Water
Sampled Date	13-AUG-18	15-AUG-18	14-AUG-18	14-AUG-18	13-AUG-18
Sampled Time	14:45	12:25	12:50	13:16	07:04
Client ID	MH-12(LP)	MH-04(LP)	MH-11(LP)	MH-29(LP)	MH-02(LP)
Grouping / **Analyte**					
WATER					
Physical Tests Conductivity (uS/cm)	312	289	354	330	928
Hardness (as CaCO3) (mg/L)	164	158	196	183	533
pH (pH)	8.42	8.32	8.36	8.35	8.20
Total Suspended Solids (mg/L)	1.0	1.3	<1.0	<1.0	<1.0
Total Dissolved Solids (mg/L)	187	178	214	208	680
Anions and Nutrients Alkalinity, Total (as CaCO3) (mg/L)	164	146	187	185	257
Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	0.0074	<0.0050	<0.0050
Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.25 DLDS
Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<2.5 DLDS
Fluoride (F) (mg/L)	0.116	0.146	0.089	0.054	<0.10 DLDS
Nitrate (as N) (mg/L)	0.0146	0.186	0.0568	0.0202	<0.025 DLDS
Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050
Sulfate (SO4) (mg/L)	10.7	16.4	13.7	3.75	293
Total Metals Aluminum (Al)-Total (mg/L)	0.0184	0.0111	0.0082	0.0076	<0.0030
Antimony (Sb)-Total (mg/L)	0.00022	0.00015	0.00016	0.00020	<0.00010
Arsenic (As)-Total (mg/L)	0.00088	0.00041	0.00065	0.00082	0.00046
Barium (Ba)-Total (mg/L)	0.0741	0.0215	0.0663	0.0513	0.0501
Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Total (mg/L)	0.0000504	0.000292	0.0000499	0.0000529	<0.0000050
Calcium (Ca)-Total (mg/L)	48.2	49.0	59.3	56.0	155
Chromium (Cr)-Total (mg/L)	0.00027	0.00023	0.00016	0.00013	<0.00010
Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00057
Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron (Fe)-Total (mg/L)	0.031	0.017	0.064	0.013	0.029
Lead (Pb)-Total (mg/L)	0.000913	0.000525	0.000236	<0.000050	0.000053
Lithium (Li)-Total (mg/L)	0.0014	0.0015	0.0016	0.0014	0.0013
Magnesium (Mg)-Total (mg/L)	5.71	3.24	7.49	5.32	18.3
Manganese (Mn)-Total (mg/L)	0.00317	0.00100	0.00828	0.00251	0.0701
Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Total (mg/L)	0.00129	0.000721	0.000884	0.000700	0.000438
Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Total (mg/L)	0.42	0.39	0.37	0.25	2.10
Selenium (Se)-Total (mg/L)	0.000710	0.000834	0.000476	0.000470	0.000059
Silicon (Si)-Total (mg/L)	4.02	3.19	3.57	3.83	4.60

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2149780-6 Water 15-AUG-18 10:45 MH-22(LP)	L2149780-7 Water 16-AUG-18 14:20 MH-30(LP)	L2149780-8 Water 16-AUG-18 10:33 MH-15(LP)	L2149780-9 Water 14-AUG-18 13:00 MH-SW(LQR)	L2149780-10 Water 15-AUG-18 12:35 MH-FB(LQFB)
Sample ID						
Description						
Sampled Date						
Sampled Time						
Client ID						
WATER						
Physical Tests	Conductivity (uS/cm)	280	270	361	358	<2.0
	Hardness (as CaCO3) (mg/L)	146	154	212	197	<0.50
	pH (pH)	8.17	8.24	8.40	8.37	5.54
	Total Suspended Solids (mg/L)	<1.0	1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	179	157	207	216	<10
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	110	147	207	182	<1.0
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	1.19	0.052	0.101	0.086	<0.020
	Nitrate (as N) (mg/L)	0.141	<0.0050	<0.0050	0.0577	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	0.0014
	Sulfate (SO4) (mg/L)	37.5	4.32	2.16	13.4	<0.30
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0030	0.0073	0.0057	0.0086	<0.0030
	Antimony (Sb)-Total (mg/L)	0.00235	<0.00010	<0.00010	0.00015	<0.00010
	Arsenic (As)-Total (mg/L)	0.00396	0.00033	0.00057	0.00067	<0.00010
	Barium (Ba)-Total (mg/L)	0.0162	0.199	0.190	0.0665	<0.00010
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.00360	0.0000245	0.0000055	0.0000498	<0.0000050
	Calcium (Ca)-Total (mg/L)	38.4	33.9	50.3	59.0	<0.050
	Chromium (Cr)-Total (mg/L)	0.00016	<0.00010	<0.00010	0.00020	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	<0.010	0.300	0.184	0.067	<0.010
	Lead (Pb)-Total (mg/L)	0.000299	<0.000050	<0.000050	0.000227	<0.000050
	Lithium (Li)-Total (mg/L)	0.0047	<0.0010	0.0011	0.0015	<0.0010
	Magnesium (Mg)-Total (mg/L)	6.28	13.1	13.7	7.54	<0.10
	Manganese (Mn)-Total (mg/L)	0.00030	0.0106	0.0131	0.00824	<0.00010
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.00846	0.00134	0.00186	0.000902	<0.000050
	Nickel (Ni)-Total (mg/L)	0.00361	0.00068	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.54	0.26	0.27	0.36	<0.10
	Selenium (Se)-Total (mg/L)	0.0117	0.000380	0.000272	0.000487	<0.000050
	Silicon (Si)-Total (mg/L)	4.25	2.50	3.75	3.62	<0.10

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2149780-12 Water 16-AUG-18 15:20 MH-13(LP)	L2149780-13 Water 16-AUG-18 13:25 TRIBEWF01	L2149780-15 Water 16-AUG-18 12:08 TRIBEWF03	L2149780-16 Water 15-AUG-18 13:15 PH-01	L2149780-17 Water 15-AUG-18 13:38 CC-01
WATER						
Physical Tests	Conductivity (uS/cm)	348	314	348	306	243
	Hardness (as CaCO3) (mg/L)	195	179	200	159	130
	pH (pH)	8.38	8.21	8.32	8.19	8.26
	Total Suspended Solids (mg/L)	<1.0	<1.0	1.6	<1.0	<1.0
	Total Dissolved Solids (mg/L)	204	182	217	187	145
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	193	178	200	131	127
	Ammonia, Total (as N) (mg/L)	0.0066	0.0052	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.061	0.087	0.095	0.225	0.058
	Nitrate (as N) (mg/L)	0.0105	<0.0050	0.0149	0.419	0.102
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sulfate (SO4) (mg/L)	7.77	0.90	2.64	31.8	7.79
Total Metals	Aluminum (Al)-Total (mg/L)	0.0083	0.0047	0.0154	<0.0030	<0.0030
	Antimony (Sb)-Total (mg/L)	0.00012	<0.00010	0.00012	0.00014	0.00013
	Arsenic (As)-Total (mg/L)	0.00053	0.00209	0.00074	0.00060	0.00038
	Barium (Ba)-Total (mg/L)	0.145	0.175	0.205	0.0184	0.0117
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.0000138	0.0000055	0.0000213	0.000752	0.0000882
	Calcium (Ca)-Total (mg/L)	47.4	44.1	50.6	58.1	41.2
	Chromium (Cr)-Total (mg/L)	<0.00010	0.00014	0.00011	0.00017	0.00032
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.198	0.565	0.347	<0.010	<0.010
	Lead (Pb)-Total (mg/L)	0.000059	<0.000050	0.000143	0.00112	0.000254
	Lithium (Li)-Total (mg/L)	0.0011	0.0011	0.0011	0.0018	0.0010
	Magnesium (Mg)-Total (mg/L)	13.1	11.1	12.6	3.87	2.09
	Manganese (Mn)-Total (mg/L)	0.00655	0.0300	0.0283	0.00019	0.00020
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.00112	0.00171	0.00222	0.00100	0.000620
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.34	0.17	0.42	0.52	0.29
	Selenium (Se)-Total (mg/L)	0.000461	0.000237	0.000555	0.00149	0.000308
	Silicon (Si)-Total (mg/L)	3.18	3.98	3.61	3.06	2.65

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2149780-18 Water 14-AUG-18 13:50 MH-27	L2149780-19 Water 14-AUG-18 14:50 MH-28	L2149780-20 Water 13-AUG-18 16:30 MH-23	L2149780-21 Water 13-AUG-18 15:20 NC-01	L2149780-22 Water 13-AUG-18 14:04 NC-02
WATER						
Physical Tests	Conductivity (uS/cm)	354	336	265	306	316
	Hardness (as CaCO3) (mg/L)	202	189	145	170	168
	pH (pH)	8.36	8.34	8.44	8.46	8.19
	Total Suspended Solids (mg/L)	1.1	1.5	1.2	1.7	<1.0
	Total Dissolved Solids (mg/L)	232	211	175	200	198
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	183	171	147	165	170
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.099	0.115	0.131	0.117	0.115
	Nitrate (as N) (mg/L)	0.0723	0.114	0.0180	0.0358	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sulfate (SO4) (mg/L)	17.0	18.3	4.80	10.8	8.21
Total Metals	Aluminum (Al)-Total (mg/L)	0.0075	0.0141	0.0202	0.0201	0.0031
	Antimony (Sb)-Total (mg/L)	0.00015	0.00015	0.00023	0.00024	0.00015
	Arsenic (As)-Total (mg/L)	0.00066	0.00060	0.00127	0.00099	0.00050
	Barium (Ba)-Total (mg/L)	0.0612	0.0481	0.0568	0.0728	0.0708
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.0000500	0.000119	0.0000520	0.0000531	0.0000069
	Calcium (Ca)-Total (mg/L)	57.1	55.2	42.7	50.4	53.0
	Chromium (Cr)-Total (mg/L)	0.00011	0.00024	0.00028	0.00032	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.098	0.186	0.063	0.046	0.066
	Lead (Pb)-Total (mg/L)	0.000287	0.00111	0.00216	0.00153	<0.000050
	Lithium (Li)-Total (mg/L)	0.0015	0.0014	0.0015	0.0015	0.0013
	Magnesium (Mg)-Total (mg/L)	7.01	5.65	4.66	5.58	5.44
	Manganese (Mn)-Total (mg/L)	0.0126	0.0256	0.0214	0.00573	0.0163
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000950	0.00100	0.00132	0.00129	0.00111
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.39	0.45	0.30	0.40	0.30
	Selenium (Se)-Total (mg/L)	0.000516	0.000699	0.000468	0.000739	0.000217
	Silicon (Si)-Total (mg/L)	3.54	3.27	4.16	4.17	4.17

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2149780-23				
	Description	Water				
	Sampled Date	15-AUG-18				
	Sampled Time	11:15				
	Client ID	MH-08				
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	274				
	Hardness (as CaCO3) (mg/L)	145				
	pH (pH)	8.28				
	Total Suspended Solids (mg/L)	9.5				
	Total Dissolved Solids (mg/L)	170				
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	146				
	Ammonia, Total (as N) (mg/L)	<0.0050				
	Bromide (Br) (mg/L)	<0.050				
	Chloride (Cl) (mg/L)	<0.50				
	Fluoride (F) (mg/L)	0.294				
	Nitrate (as N) (mg/L)	0.0784				
	Nitrite (as N) (mg/L)	<0.0010				
	Sulfate (SO4) (mg/L)	5.36				
Total Metals	Aluminum (Al)-Total (mg/L)	0.0065				
	Antimony (Sb)-Total (mg/L)	0.00038				
	Arsenic (As)-Total (mg/L)	0.00212				
	Barium (Ba)-Total (mg/L)	0.0414				
	Beryllium (Be)-Total (mg/L)	<0.000020				
	Bismuth (Bi)-Total (mg/L)	<0.000050				
	Boron (B)-Total (mg/L)	<0.010				
	Cadmium (Cd)-Total (mg/L)	0.0000803				
	Calcium (Ca)-Total (mg/L)	44.5				
	Chromium (Cr)-Total (mg/L)	0.00076				
	Cobalt (Co)-Total (mg/L)	<0.00010				
	Copper (Cu)-Total (mg/L)	<0.00050				
	Iron (Fe)-Total (mg/L)	<0.010				
	Lead (Pb)-Total (mg/L)	<0.000050				
	Lithium (Li)-Total (mg/L)	0.0026				
	Magnesium (Mg)-Total (mg/L)	5.14				
	Manganese (Mn)-Total (mg/L)	0.00039				
	Mercury (Hg)-Total (mg/L)	<0.0000050				
	Molybdenum (Mo)-Total (mg/L)	0.000691				
	Nickel (Ni)-Total (mg/L)	<0.00050				
	Phosphorus (P)-Total (mg/L)	<0.050				
	Potassium (K)-Total (mg/L)	0.45				
	Selenium (Se)-Total (mg/L)	0.00188				
	Silicon (Si)-Total (mg/L)	6.04				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2149780-1	L2149780-2	L2149780-3	L2149780-4	L2149780-5
Description	Water	Water	Water	Water	Water
Sampled Date	13-AUG-18	15-AUG-18	14-AUG-18	14-AUG-18	13-AUG-18
Sampled Time	14:45	12:25	12:50	13:16	07:04
Client ID	MH-12(LP)	MH-04(LP)	MH-11(LP)	MH-29(LP)	MH-02(LP)
Grouping / **Analyte**					
WATER					
Total Metals Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total (mg/L)	1.03	0.845	1.14	0.947	11.4
Strontium (Sr)-Total (mg/L)	0.206	0.193	0.244	0.214	0.605
Sulfur (S)-Total (mg/L)	3.37	5.32	4.70	0.91	98.2
Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total (mg/L)	0.00040	<0.00030	<0.00030	<0.00030	<0.00030
Uranium (U)-Total (mg/L)	0.000932	0.000852	0.00111	0.000701	0.00139
Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total (mg/L)	<0.0030	0.0057	0.0037	<0.0030	<0.0030
Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved (mg/L)	0.0028	0.0017	0.0027	0.0033	<0.0010
Antimony (Sb)-Dissolved (mg/L)	0.00023	0.00015	0.00017	0.00020	0.00010
Arsenic (As)-Dissolved (mg/L)	0.00098	0.00039	0.00063	0.00078	0.00041
Barium (Ba)-Dissolved (mg/L)	0.0733	0.0211	0.0646	0.0486	0.0458
Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved (mg/L)	0.0000424	0.000263	0.0000393	0.0000506	0.0000058
Calcium (Ca)-Dissolved (mg/L)	56.6	58.3	66.2	64.6	186
Chromium (Cr)-Dissolved (mg/L)	0.00028	0.00012	0.00011	0.00011	<0.00010
Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00050
Copper (Cu)-Dissolved (mg/L)	0.00026	<0.00020	0.00031	0.00041	<0.00020
Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	0.024	<0.010	<0.010
Lead (Pb)-Dissolved (mg/L)	0.000409	0.000143	0.000053	<0.000050	<0.000050
Lithium (Li)-Dissolved (mg/L)	0.0015	0.0015	0.0016	0.0015	0.0014
Magnesium (Mg)-Dissolved (mg/L)	5.59	3.09	7.32	5.26	17.0
Manganese (Mn)-Dissolved (mg/L)	0.00123	0.00032	0.00524	0.00153	0.0651
Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)	0.00125	0.000719	0.000882	0.000677	0.000451
Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved (mg/L)	0.43	0.39	0.37	0.27	2.04
Selenium (Se)-Dissolved (mg/L)	0.000671	0.000788	0.000471	0.000469	0.000081
Silicon (Si)-Dissolved (mg/L)	3.78	2.94	3.33	3.71	4.27

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2149780-6	L2149780-7	L2149780-8	L2149780-9	L2149780-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	15-AUG-18	16-AUG-18	16-AUG-18	14-AUG-18	15-AUG-18
	Sampled Time	10:45	14:20	10:33	13:00	12:35
	Client ID	MH-22(LP)	MH-30(LP)	MH-15(LP)	MH-SW(LQR)	MH-FB(LQFB)
Grouping	**Analyte**					
WATER						
Total Metals	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.836	0.702	1.06	1.14	<0.050
	Strontium (Sr)-Total (mg/L)	0.214	0.109	0.184	0.240	<0.00020
	Sulfur (S)-Total (mg/L)	11.7	1.39	0.62	4.52	<0.50
	Thallium (Tl)-Total (mg/L)	0.000021	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Total (mg/L)	0.00357	0.00118	0.000699	0.00108	<0.000010
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	0.555	<0.0030	<0.0030	0.0037	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0015	0.0033	0.0015	0.0028	<0.0010
	Antimony (Sb)-Dissolved (mg/L)	0.00253	<0.00010	<0.00010	0.00016	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00395	0.00027	0.00044	0.00061	<0.00010
	Barium (Ba)-Dissolved (mg/L)	0.0155	0.190	0.187	0.0639	<0.00010
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	0.00359	0.0000151	0.0000070	0.0000431	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	47.7	39.8	61.4	66.6	<0.050
	Chromium (Cr)-Dissolved (mg/L)	0.00014	<0.00010	<0.00010	0.00012	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00026	0.00031	<0.00020	0.00036	<0.00020
	Iron (Fe)-Dissolved (mg/L)	<0.010	0.202	0.085	0.025	<0.010
	Lead (Pb)-Dissolved (mg/L)	0.000254	<0.000050	<0.000050	0.000062	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0056	<0.0010	0.0012	0.0016	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	6.41	13.2	14.2	7.43	<0.10
	Manganese (Mn)-Dissolved (mg/L)	0.00030	0.00951	0.00690	0.00528	<0.00010
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.00836	0.00127	0.00176	0.000875	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	0.00376	0.00068	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.57	0.28	0.31	0.36	<0.10
	Selenium (Se)-Dissolved (mg/L)	0.0122	0.000336	0.000298	0.000592	<0.000050
	Silicon (Si)-Dissolved (mg/L)	4.24	2.27	3.65	3.34	<0.050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2149780-12	L2149780-13	L2149780-15	L2149780-16	L2149780-17
Description	Water	Water	Water	Water	Water
Sampled Date	16-AUG-18	16-AUG-18	16-AUG-18	15-AUG-18	15-AUG-18
Sampled Time	15:20	13:25	12:08	13:15	13:38
Client ID	MH-13(LP)	TRIBEWF01	TRIBEWF03	PH-01	CC-01
Grouping / **Analyte**					
WATER					
Total Metals Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total (mg/L)	0.973	1.04	1.16	0.746	0.812
Strontium (Sr)-Total (mg/L)	0.197	0.167	0.173	0.145	0.186
Sulfur (S)-Total (mg/L)	2.56	<0.50	0.62	10.7	2.53
Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	0.00037	<0.00030	<0.00030
Uranium (U)-Total (mg/L)	0.00142	0.000430	0.000862	0.000943	0.000714
Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	0.0130	0.0038
Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved (mg/L)	0.0022	0.0016	0.0022	<0.0010	<0.0010
Antimony (Sb)-Dissolved (mg/L)	0.00013	<0.00010	0.00012	0.00015	0.00014
Arsenic (As)-Dissolved (mg/L)	0.00042	0.00148	0.00055	0.00059	0.00037
Barium (Ba)-Dissolved (mg/L)	0.142	0.172	0.202	0.0177	0.0118
Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved (mg/L)	0.0000124	0.0000060	0.0000063	0.000705	0.0000800
Calcium (Ca)-Dissolved (mg/L)	56.9	53.1	59.3	57.6	48.7
Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	0.00011	0.00025	0.00025
Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved (mg/L)	0.00035	<0.00020	<0.00020	<0.00020	<0.00020
Iron (Fe)-Dissolved (mg/L)	0.060	0.142	0.094	<0.010	<0.010
Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	0.00102	0.000236
Lithium (Li)-Dissolved (mg/L)	0.0011	0.0012	0.0012	0.0019	0.0011
Magnesium (Mg)-Dissolved (mg/L)	12.8	11.2	12.6	3.65	2.07
Manganese (Mn)-Dissolved (mg/L)	0.00390	0.0290	0.0262	<0.00010	0.00015
Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)	0.00109	0.00168	0.00216	0.000968	0.000598
Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved (mg/L)	0.34	0.18	0.37	0.55	0.30
Selenium (Se)-Dissolved (mg/L)	0.000534	0.000247	0.000523	0.00160	0.000397
Silicon (Si)-Dissolved (mg/L)	2.97	3.91	3.44	3.15	2.48

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2149780-18	L2149780-19	L2149780-20	L2149780-21	L2149780-22
Description	Water	Water	Water	Water	Water
Sampled Date	14-AUG-18	14-AUG-18	13-AUG-18	13-AUG-18	13-AUG-18
Sampled Time	13:50	14:50	16:30	15:20	14:04
Client ID	MH-27	MH-28	MH-23	NC-01	NC-02
Grouping / **Analyte**					
WATER					
Total Metals Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total (mg/L)	1.13	1.04	0.834	1.00	1.02
Strontium (Sr)-Total (mg/L)	0.257	0.247	0.177	0.206	0.209
Sulfur (S)-Total (mg/L)	6.21	5.96	1.18	3.23	2.39
Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	0.00045	0.00069	<0.00030
Uranium (U)-Total (mg/L)	0.00109	0.00109	0.000610	0.000911	0.000659
Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total (mg/L)	0.0048	0.0102	0.0044	0.0036	<0.0030
Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved (mg/L)	0.0028	0.0022	0.0027	0.0030	0.0011
Antimony (Sb)-Dissolved (mg/L)	0.00016	0.00015	0.00024	0.00022	0.00014
Arsenic (As)-Dissolved (mg/L)	0.00062	0.00049	0.00115	0.00092	0.00042
Barium (Ba)-Dissolved (mg/L)	0.0611	0.0498	0.0607	0.0744	0.0765
Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved (mg/L)	0.0000471	0.0000796	0.0000389	0.0000388	0.0000062
Calcium (Ca)-Dissolved (mg/L)	69.3	65.9	50.0	58.7	58.0
Chromium (Cr)-Dissolved (mg/L)	0.00019	<0.00010	0.00013	0.00017	<0.00010
Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved (mg/L)	0.00033	0.00029	0.00022	0.00024	<0.00020
Iron (Fe)-Dissolved (mg/L)	0.042	0.067	0.019	<0.010	0.032
Lead (Pb)-Dissolved (mg/L)	0.000133	0.000285	0.000378	0.000248	<0.000050
Lithium (Li)-Dissolved (mg/L)	0.0017	0.0015	0.0015	0.0015	0.0013
Magnesium (Mg)-Dissolved (mg/L)	7.07	5.96	4.85	5.66	5.61
Manganese (Mn)-Dissolved (mg/L)	0.00940	0.0226	0.0179	0.00224	0.0122
Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)	0.000926	0.000951	0.00128	0.00124	0.00104
Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved (mg/L)	0.42	0.48	0.30	0.42	0.30
Selenium (Se)-Dissolved (mg/L)	0.000609	0.000611	0.000466	0.000646	0.000275
Silicon (Si)-Dissolved (mg/L)	3.26	2.80	3.60	3.54	3.63

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2149780-23				
	Description	Water				
	Sampled Date	15-AUG-18				
	Sampled Time	11:15				
	Client ID	MH-08				
Grouping	**Analyte**					
WATER						
Total Metals	Silver (Ag)-Total (mg/L)	<0.000010				
	Sodium (Na)-Total (mg/L)	0.831				
	Strontium (Sr)-Total (mg/L)	0.163				
	Sulfur (S)-Total (mg/L)	1.46				
	Thallium (Tl)-Total (mg/L)	<0.000010				
	Tin (Sn)-Total (mg/L)	<0.00010				
	Titanium (Ti)-Total (mg/L)	<0.00030				
	Uranium (U)-Total (mg/L)	0.000742				
	Vanadium (V)-Total (mg/L)	<0.00050				
	Zinc (Zn)-Total (mg/L)	<0.0030				
	Zirconium (Zr)-Total (mg/L)	<0.00030				
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD				
	Dissolved Metals Filtration Location	FIELD				
	Aluminum (Al)-Dissolved (mg/L)	0.0015				
	Antimony (Sb)-Dissolved (mg/L)	0.00038				
	Arsenic (As)-Dissolved (mg/L)	0.00187				
	Barium (Ba)-Dissolved (mg/L)	0.0431				
	Beryllium (Be)-Dissolved (mg/L)	<0.000020				
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050				
	Boron (B)-Dissolved (mg/L)	<0.010				
	Cadmium (Cd)-Dissolved (mg/L)	0.0000825				
	Calcium (Ca)-Dissolved (mg/L)	49.6				
	Chromium (Cr)-Dissolved (mg/L)	0.00054				
	Cobalt (Co)-Dissolved (mg/L)	<0.00010				
	Copper (Cu)-Dissolved (mg/L)	<0.00020				
	Iron (Fe)-Dissolved (mg/L)	<0.010				
	Lead (Pb)-Dissolved (mg/L)	<0.000050				
	Lithium (Li)-Dissolved (mg/L)	0.0026				
	Magnesium (Mg)-Dissolved (mg/L)	5.22				
	Manganese (Mn)-Dissolved (mg/L)	<0.00010				
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050				
	Molybdenum (Mo)-Dissolved (mg/L)	0.000672				
	Nickel (Ni)-Dissolved (mg/L)	<0.00050				
	Phosphorus (P)-Dissolved (mg/L)	<0.050				
	Potassium (K)-Dissolved (mg/L)	0.46				
	Selenium (Se)-Dissolved (mg/L)	0.00173				
	Silicon (Si)-Dissolved (mg/L)	5.18				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2149780-1	L2149780-2	L2149780-3	L2149780-4	L2149780-5
Description	Water	Water	Water	Water	Water
Sampled Date	13-AUG-18	15-AUG-18	14-AUG-18	14-AUG-18	13-AUG-18
Sampled Time	14:45	12:25	12:50	13:16	07:04
Client ID	MH-12(LP)	MH-04(LP)	MH-11(LP)	MH-29(LP)	MH-02(LP)
Grouping / **Analyte**					
WATER					
Dissolved Metals Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved (mg/L)	1.02	0.827	1.11	0.923	10.7
Strontium (Sr)-Dissolved (mg/L)	0.210	0.194	0.248	0.216	0.642
Sulfur (S)-Dissolved (mg/L)	3.34	5.44	4.69	1.38	96.6
Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium (U)-Dissolved (mg/L)	0.000910	0.000823	0.000992	0.000662	0.00134
Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved (mg/L)	0.0015	0.0051	0.0031	<0.0010	0.0025
Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals Chromium (III)-Total (mg/L)	0.00027	0.00023	0.00016	0.00013	<0.00010
Hexavalent Chromium (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2149780-6 Water 15-AUG-18 10:45 MH-22(LP)	L2149780-7 Water 16-AUG-18 14:20 MH-30(LP)	L2149780-8 Water 16-AUG-18 10:33 MH-15(LP)	L2149780-9 Water 14-AUG-18 13:00 MH-SW(LQR)	L2149780-10 Water 15-AUG-18 12:35 MH-FB(LQFB)
Sample ID						
Description						
Sampled Date						
Sampled Time						
Client ID						
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.865	0.705	1.09	1.10	<0.050
	Strontium (Sr)-Dissolved (mg/L)	0.220	0.113	0.190	0.249	<0.00020
	Sulfur (S)-Dissolved (mg/L)	12.1	1.59	0.83	4.53	<0.50
	Thallium (Tl)-Dissolved (mg/L)	0.000017	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.00346	0.00113	0.000687	0.000989	<0.000010
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.584	<0.0010	<0.0010	0.0031	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals	Chromium (III)-Total (mg/L)	0.00016	<0.00010	<0.00010	0.00020	
	Hexavalent Chromium (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2149780-12	L2149780-13	L2149780-15	L2149780-16	L2149780-17
	Description	Water	Water	Water	Water	Water
	Sampled Date	16-AUG-18	16-AUG-18	16-AUG-18	15-AUG-18	15-AUG-18
	Sampled Time	15:20	13:25	12:08	13:15	13:38
	Client ID	MH-13(LP)	TRIBEWF01	TRIBEWF03	PH-01	CC-01
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.946	1.05	1.07	0.742	0.797
	Strontium (Sr)-Dissolved (mg/L)	0.202	0.172	0.175	0.144	0.188
	Sulfur (S)-Dissolved (mg/L)	2.61	<0.50	0.89	10.4	2.59
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.00130	0.000425	0.000832	0.000948	0.000706
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	0.0135	0.0037
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals	Chromium (III)-Total (mg/L)	<0.00010	0.00014	0.00011	0.00017	0.00032
	Hexavalent Chromium (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2149780-18	L2149780-19	L2149780-20	L2149780-21	L2149780-22
Description	Water	Water	Water	Water	Water
Sampled Date	14-AUG-18	14-AUG-18	13-AUG-18	13-AUG-18	13-AUG-18
Sampled Time	13:50	14:50	16:30	15:20	14:04
Client ID	MH-27	MH-28	MH-23	NC-01	NC-02
Grouping / **Analyte**					
WATER					
Dissolved Metals Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved (mg/L)	1.16	1.06	0.833	1.00	1.02
Strontium (Sr)-Dissolved (mg/L)	0.266	0.250	0.178	0.207	0.209
Sulfur (S)-Dissolved (mg/L)	5.77	5.69	1.31	3.16	2.48
Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium (U)-Dissolved (mg/L)	0.00108	0.00102	0.000603	0.000856	0.000589
Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved (mg/L)	0.0041	0.0083	0.0029	0.0017	<0.0010
Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals Chromium (III)-Total (mg/L)	0.00011	0.00024	0.00028	0.00032	<0.00010
Hexavalent Chromium (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2149780-23				
	Description	Water				
	Sampled Date	15-AUG-18				
	Sampled Time	11:15				
	Client ID	MH-08				
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010				
	Sodium (Na)-Dissolved (mg/L)	0.807				
	Strontium (Sr)-Dissolved (mg/L)	0.158				
	Sulfur (S)-Dissolved (mg/L)	1.34				
	Thallium (Tl)-Dissolved (mg/L)	<0.000010				
	Tin (Sn)-Dissolved (mg/L)	<0.00010				
	Titanium (Ti)-Dissolved (mg/L)	<0.00030				
	Uranium (U)-Dissolved (mg/L)	0.000664				
	Vanadium (V)-Dissolved (mg/L)	<0.00050				
	Zinc (Zn)-Dissolved (mg/L)	0.0020				
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030				
Speciated Metals	Chromium (III)-Total (mg/L)	<0.00072				
	Hexavalent Chromium (mg/L)	0.00060 RRV				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Conductivity	B	L2149780-10, -12, -13, -15, -16, -17, -18, -19, -2, -3, -4, -5, -6, -7, -8, -9
Laboratory Control Sample	Sulfur (S)-Total	MES	L2149780-1, -10, -12, -13, -15, -17, -18, -19, -2, -20, -21, -22, -23, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2149780-1, -10, -12, -13, -15, -16, -17, -18, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2149780-19, -20, -21, -22, -23
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2149780-1, -10, -12, -13, -15, -16, -17, -18, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2149780-19, -20, -21, -22, -23
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2149780-1, -10, -12, -13, -15, -16, -17, -18, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2149780-19, -20, -21, -22, -23
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2149780-19, -20, -21, -22, -23
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2149780-1, -10, -12, -13, -15, -16, -17, -18, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2149780-19, -20, -21, -22, -23
Matrix Spike	Barium (Ba)-Total	MS-B	L2149780-1, -10, -12, -13, -15, -17, -18, -19, -2, -20, -21, -22, -23, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L2149780-1, -10, -12, -13, -15, -17, -18, -19, -2, -20, -21, -22, -23, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L2149780-16
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2149780-1, -10, -12, -13, -15, -17, -18, -19, -2, -20, -21, -22, -23, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Sodium (Na)-Total	MS-B	L2149780-16
Matrix Spike	Strontium (Sr)-Total	MS-B	L2149780-1, -10, -12, -13, -15, -17, -18, -19, -2, -20, -21, -22, -23, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Total	MS-B	L2149780-16

Qualifiers for Individual Parameters Listed:

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.
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).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". 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.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CR-CR3-TOT-CALC-ED	Water	Total Trivalent Chromium in Water	CALCULATION

Reference Information

Chromium (III)-Total is calculated as the difference between the total chromium and the total hexavalent chromium (Cr(VI)) results.The Limit of Reporting for Chromium (III) varies as a function of the test results.

CR-CR6-ED Water Chromium, Hexavalent (Cr +6) APHA 3500-Cr C (Ion Chromatography)

This analysis is carried out using procedures adapted from method 3500-Cr C in "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1636 published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution.
Results are based on an un-filtered, field-preserved sample.

EC-PCT-VA Water Conductivity (Automated) APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA Water Conductivity Screen (Internal Use Only) APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water 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-VA 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-VA 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.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TSS-LOW-VA Water Total Suspended Solids by Grav. (1 mg/L) APHA 2540D

Reference Information

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
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.

** 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
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, 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.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2149780-COFC

COC Number: 15 -

Page 1 of 2

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:	TECK Metals Ltd	Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)	Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply
Contact:	Michelle Unger	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:	250-4278422	☐ 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	Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm
Street:	601 Knightton Road	Email 1 or Fax: chenry@accessconsulting.ca	For tests that can not be performed according to the service level selected, you will be contacted.
City/Province:	Kimberly, BC	Email 2: amacphail@accessconsulting.ca,mducharme@acc	
Postal Code:	V1A 3E1	Email 3: Michelle.unger@teck.com	
Invoice To	Same as Report To ☑ YES ☐ NO	Invoice Distribution	
	Copy of Invoice with Report ☐ YES ☑ NO	Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	
Company:		Email 1 or Fax: Michelle.unger@teck.com	
Contact:		Email 2: roxanne.menear@teck.com	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:	Q62635	AFE/Cost Center:	PO#:
Job #:	TECK-18-1	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)		ALS Contact: Can Dang	Sampler: A. MacPhail

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 (low level) + Hg	Dissolved Metals (low level) +Hg	pH, SPC, alkalinity, hardness	Anions(Nitrate, Nitrite, Sulphate, Cl, F, Br)	Ammonia	TDS, TSS(low)	Chromium Speciation	Number of Containers
					P	F/P		P	P		P	
	MH-12 (LP)	13-Aug-18	14:45	Water	R	R	R	R	R	R	R	8
	MH-04 (LP)	15-Aug-18	12:25	Water	R	R	R	R	R	R	R	8
	MH-11 (LP)	14-Aug-18	12:50	Water	R	R	R	R	R	R	R	8
	MH-29 (LP)	14-Aug-18	13:16	Water	R	R	R	R	R	R	R	8
	MH-02 (LP)	13-Aug-18	17:04	Water	R	R	R	R	R	R	R	8
	MH-22 (LP)	15-Aug-18	10:45	Water	R	R	R	R	R	R	R	8
	MH-30 (LP)	16-Aug-18	14:20	Water	R	R	R	R	R	R	R	8
	MH-15 (LP)	16-Aug-18	10:33	Water	R	R	R	R	R	R	R	8
	MH-SW (LQR)	14-Aug-18	13:00	Water	R	R	R	R	R	R	R	8
	MH-FB (LQFB)	15-Aug-18	12:35	Water	R	R	R	R	R	R		6
	~~Trip Blank (LQTB)~~			~~Water~~	R	R	R	R	R	R		~~8~~
	SDH-S2 (LP)			Water	R	R	R	R	R	R	R	8

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		
		5			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Andrew MacPhail	Date: ~~7-June-18~~ 17-Aug-18	Time: 15:00	Received by:	Date:	Time:	Received by: HA	Date: 8/20	Time: 12:20P

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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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

L2149780-COFC

COC Number: 15 -

Report To	Contact and company name below will appear on the final report
Company:	TECK Metals Ltd
Contact:	Michelle Unger
Phone:	250-4278422
	Company address below will appear on the final report
Street:	601 Knightton Road
City/Province:	Kimberly, BC
Postal Code:	V1A 3E1
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	
Contact:	

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	chenry@accessconsulting.ca
Email 2	amacphail@accessconsulting.ca,mducharme@acc
Email 3	Michelle.unger@teck.com
Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	Michelle.unger@teck.com
Email 2	roxanne.menear@teck.com

Project Information	
ALS Account # / Quote #:	Q62635
Job #:	TECK-18-1
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: Can Dang **Sampler:** A. MacPhail

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: dd-mmm-yy hh:mm

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	Total Metals (low level) + Hg	Dissolved Metals (low level) +Hg	pH, SPC, alkalinity, hardness	Anions(Nitrate, Nitrite, Sulphate, Cl, F, Br)	Ammonia	TDS, TSS(low)	Chromium Speciation	Number of Containers
					P	F/P		P	P		P	
	MH-13 (LP)	16-Aug-18	15:20	Water	R	R	R	R	R	R	R	8
	TRIBEWF01	16-Aug-18	13:25	Water	R	R	R	R	R	R	R	8
	TRIBEWF02			Water	R	R	R	R	R	R	R	8
	TRIBEWF03	16-Aug-18	12:08	Water	R	R	R	R	R	R	R	8
	PH-01	15-Aug-18	13:15	Water	R	R	R	R	R	R	R	8
	CC-01	15-Aug-18	13:38	Water	R	R	R	R	R	R	R	8
	MH-27	14-Aug-18	13:50	Water	R	R	R	R	R	R	R	8
	MH-28	14-Aug-18	14:50	Water	R	R	R	R	R	R	R	8
	MH-23	13-Aug-18	16:30	Water	R	R	R	R	R	R	R	8
	NC-01	13-Aug-18	15:20	Water	R	R	R	R	R	R	R	6
	NC-02	13-Aug-18	14:04	Water	R	R	R	R	R	R	R	6
	MH-08	15-Aug-18	11:15	Water	R	R	R	R	R	R	R	8

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: Andrew MacPhail	Date: ~~7-June-18~~ 17-Aug-18	Time: 18:00	Received by:	Date:	Time:	Received by: HA	Date: 8/20	Time: 12:20p

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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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.**

TECK METALS LTD.
ATTN: Michelle Unger
601 Knightton Road
KIMBERLEY BC V1A 3E1

Date Received: 20-AUG-18
Report Date: 04-SEP-18 12:35 (MT)
Version: FINAL

Client Phone: 250-427-8404

Certificate of Analysis

Lab Work Order #: L2149783

Project P.O. #: 9179
Job Reference: TECK-18-01
C of C Numbers:
Legal Site Desc:

Can Dang
Senior Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2149783-1	L2149783-2	L2149783-3	L2149783-5	L2149783-6
Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Sampled Date	14-AUG-18	17-AUG-18	15-AUG-18	14-AUG-18	15-AUG-18
Sampled Time	09:50	11:00	16:15	11:55	12:15
Client ID	MW13-01 (LP)	MW13-04 (LP)	MW13-05 (LP)	MW13-07 (LP)	MW13-08 (LP)
Grouping / **Analyte**					
WATER					
Physical Tests					
Conductivity (uS/cm)	301	263	337	509	506
Hardness (as CaCO3) (mg/L)	146	132	167	226	264
pH (pH)	7.97	8.12	7.96	8.01	7.94
Anions and Nutrients					
Alkalinity, Total (as CaCO3) (mg/L)	152	133	117	233	276
Ammonia, Total (as N) (mg/L)	<0.0050	0.0211	0.0337	0.177	0.0251
Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	0.61	<0.50
Fluoride (F) (mg/L)	0.352	0.055	0.071	0.394	0.050
Nitrate (as N) (mg/L)	0.357	0.400	1.51	<0.0050	0.303
Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Sulfate (SO4) (mg/L)	10.2	5.45	48.1	47.2	10.1
Dissolved Metals					
Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved (mg/L)	0.0029	0.0123	0.0084	0.0026	0.0039
Antimony (Sb)-Dissolved (mg/L)	0.00012	0.00026	0.00032	<0.00010	0.00016
Arsenic (As)-Dissolved (mg/L)	0.00036	0.00057	0.00074	0.00339	0.00028
Barium (Ba)-Dissolved (mg/L)	0.0212	0.0583	0.0552	0.0270	0.166
Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	0.023	<0.010
Cadmium (Cd)-Dissolved (mg/L)	0.000658	0.000159	0.0000454	<0.0000050	0.0000756
Calcium (Ca)-Dissolved (mg/L)	52.7	46.8	61.3	63.1	89.9
Chromium (Cr)-Dissolved (mg/L)	0.00020	0.00029	0.00019	<0.00010	0.00023
Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	0.00057	0.00031
Copper (Cu)-Dissolved (mg/L)	<0.00020	0.00093	0.00051	<0.00020	0.00049
Iron (Fe)-Dissolved (mg/L)	<0.010	0.014	0.015	2.68	0.014
Lead (Pb)-Dissolved (mg/L)	0.00152	0.000253	0.000135	0.000070	0.000174
Lithium (Li)-Dissolved (mg/L)	0.0013	0.0014	0.0015	0.0076	0.0016
Magnesium (Mg)-Dissolved (mg/L)	3.61	3.68	3.48	16.6	9.58
Manganese (Mn)-Dissolved (mg/L)	0.00116	0.00055	0.00023	1.15	0.0100
Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)	0.000624	0.000684	0.000733	0.00342	0.000628
Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	0.00178	0.00058
Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	0.132	<0.050
Potassium (K)-Dissolved (mg/L)	0.63	0.55	0.48	3.39	0.65
Selenium (Se)-Dissolved (mg/L)	0.000939	0.00101	0.00236	<0.000050	0.00113
Silicon (Si)-Dissolved (mg/L)	3.21	3.78	3.98	7.15	3.81

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2149783-7	L2149783-8	L2149783-9	L2149783-13	L2149783-14
Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Sampled Date	14-AUG-18	15-AUG-18	14-AUG-18	15-AUG-18	
Sampled Time	16:01	15:30	10:30	15:35	
Client ID	MW13-10 (LP)	MW13-13 (LP)	MW14-01 (LP)	MW-GW (LQR)	TRIP BLANK (LQTB)
Grouping / **Analyte**					
WATER					
Physical Tests Conductivity (uS/cm)	450	277	423	280	<2.0
Hardness (as CaCO3) (mg/L)	225	121	212	138	<0.50
pH (pH)	8.09	8.08	8.15	8.06	5.52
Anions and Nutrients Alkalinity, Total (as CaCO3) (mg/L)	207	87.1	226	87.3	<1.0
Ammonia, Total (as N) (mg/L)	0.0176	0.0070	0.0277	0.0070	<0.020
Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
Fluoride (F) (mg/L)	0.059	0.146	0.093	0.144	<0.020
Nitrate (as N) (mg/L)	0.527	0.604	0.329	0.619	<0.0050
Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Sulfate (SO4) (mg/L)	34.4	49.8	6.71	52.5	<0.30
Dissolved Metals Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved (mg/L)	0.0081	0.0129	0.0177	0.0118	<0.0010
Antimony (Sb)-Dissolved (mg/L)	0.00012	0.00014	0.00015	0.00012	<0.00010
Arsenic (As)-Dissolved (mg/L)	0.00108	0.00037	0.00029	0.00040	<0.00010
Barium (Ba)-Dissolved (mg/L)	0.00776	0.0130	0.123	0.0147	<0.00010
Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved (mg/L)	0.0000195	0.000725	0.0000346	0.00160	<0.0000050
Calcium (Ca)-Dissolved (mg/L)	76.2	44.8	66.8	52.0	<0.050
Chromium (Cr)-Dissolved (mg/L)	0.00037	0.00017	0.00057	<0.00010	<0.00010
Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved (mg/L)	0.00052	0.00070	0.00052	0.00076	<0.00020
Iron (Fe)-Dissolved (mg/L)	0.013	0.016	0.028	0.012	<0.010
Lead (Pb)-Dissolved (mg/L)	0.000247	0.000882	0.000233	0.000728	<0.000050
Lithium (Li)-Dissolved (mg/L)	0.0016	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium (Mg)-Dissolved (mg/L)	8.34	2.08	11.0	2.02	<0.10
Manganese (Mn)-Dissolved (mg/L)	0.00104	0.00045	0.00164	0.00052	<0.00010
Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)	0.00190	0.000337	0.00213	0.000232	<0.000050
Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved (mg/L)	1.21	0.71	0.80	0.62	<0.10
Selenium (Se)-Dissolved (mg/L)	0.00144	0.00108	0.000873	0.00114	<0.000050
Silicon (Si)-Dissolved (mg/L)	3.89	2.26	4.57	1.92	<0.050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2149783-1	L2149783-2	L2149783-3	L2149783-5	L2149783-6
Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Sampled Date	14-AUG-18	17-AUG-18	15-AUG-18	14-AUG-18	15-AUG-18
Sampled Time	09:50	11:00	16:15	11:55	12:15
Client ID	MW13-01 (LP)	MW13-04 (LP)	MW13-05 (LP)	MW13-07 (LP)	MW13-08 (LP)
Grouping / **Analyte**					
WATER					
Dissolved Metals					
Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved (mg/L)	0.781	1.02	0.828	15.7	1.05
Strontium (Sr)-Dissolved (mg/L)	0.163	0.117	0.168	0.471	0.303
Sulfur (S)-Dissolved (mg/L)	3.00	1.47	14.3	14.9	2.93
Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	0.00039	<0.00010	<0.00010
Titanium (Ti)-Dissolved (mg/L)	<0.00030	0.00053	0.00038	<0.00030	<0.00030
Uranium (U)-Dissolved (mg/L)	0.000957	0.000643	0.000720	0.00762	0.00154
Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved (mg/L)	0.0247	0.0053	<0.0010	0.0010	0.0011
Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Volatile Organic Compounds					
Benzene (mg/L)		<0.00050	<0.00050	<0.00050	
Ethylbenzene (mg/L)		<0.00050	<0.00050	<0.00050	
Methyl t-butyl ether (MTBE) (mg/L)		<0.00050	<0.00050	<0.00050	
Styrene (mg/L)		<0.00050	<0.00050	<0.00050	
Toluene (mg/L)		<0.00045	<0.00045	<0.00045	
ortho-Xylene (mg/L)		<0.00050	<0.00050	<0.00050	
meta- & para-Xylene (mg/L)		<0.00050	<0.00050	<0.00050	
Xylenes (mg/L)		<0.00075	<0.00075	<0.00075	
Surrogate: 4-Bromofluorobenzene (SS) (%)		93.2	88.3	98.5	
Surrogate: 1,4-Difluorobenzene (SS) (%)		97.2	97.5	104.0	
Hydrocarbons					
EPH10-19 (mg/L)		<0.25	<0.25	<0.25	
EPH19-32 (mg/L)		<0.25	<0.25	<0.25	
LEPH (mg/L)		<0.25	<0.25	<0.25	
HEPH (mg/L)		<0.25	<0.25	<0.25	
Volatile Hydrocarbons (VH6-10) (mg/L)		<0.10	<0.10	<0.10	
VPH (C6-C10) (mg/L)		<0.10	<0.10	<0.10	
Surrogate: 2-Bromobenzotrifluoride (%)		108.2	109.8	107.7	
Surrogate: 3,4-Dichlorotoluene (SS) (%)		87.4	80.4	89.1	
Polycyclic Aromatic Hydrocarbons					
Acenaphthene (mg/L)		<0.000010	<0.000010	<0.000010	
Acenaphthylene (mg/L)		<0.000010	<0.000010	<0.000010	
Acridine (mg/L)		<0.000010	<0.000010	<0.000010	
Anthracene (mg/L)		<0.000010	<0.000010	<0.000010	
Benz(a)anthracene (mg/L)		<0.000010	<0.000010	<0.000010	
Benzo(a)pyrene (mg/L)		<0.0000050	<0.0000050	<0.0000050	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2149783-7	L2149783-8	L2149783-9	L2149783-13	L2149783-14
Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Sampled Date	14-AUG-18	15-AUG-18	14-AUG-18	15-AUG-18	
Sampled Time	16:01	15:30	10:30	15:35	
Client ID	MW13-10 (LP)	MW13-13 (LP)	MW14-01 (LP)	MW-GW (LQR)	TRIP BLANK (LQTB)
Grouping / **Analyte**					
WATER					
Dissolved Metals					
Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved (mg/L)	1.95	0.691	2.63	0.648	<0.050
Strontium (Sr)-Dissolved (mg/L)	0.369	0.0843	0.236	0.0871	<0.00020
Sulfur (S)-Dissolved (mg/L)	11.4	15.0	1.94	15.9	<0.50
Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Dissolved (mg/L)	<0.00010	0.00014	<0.00010	0.00011	<0.00010
Titanium (Ti)-Dissolved (mg/L)	0.00039	0.00035	0.00048	0.00032	<0.00030
Uranium (U)-Dissolved (mg/L)	0.00302	0.000711	0.000862	0.000426	<0.000010
Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved (mg/L)	0.0015	0.0178	0.0013	0.0443	0.0012 RRV
Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Volatile Organic Compounds					
Benzene (mg/L)	<0.00050		<0.00050		<0.00050
Ethylbenzene (mg/L)	<0.00050		<0.00050		<0.00050
Methyl t-butyl ether (MTBE) (mg/L)	<0.00050		<0.00050		<0.00050
Styrene (mg/L)	<0.00050		<0.00050		<0.00050
Toluene (mg/L)	<0.00045		<0.00045		<0.00045
ortho-Xylene (mg/L)	<0.00050		<0.00050		<0.00050
meta- & para-Xylene (mg/L)	<0.00050		<0.00050		<0.00050
Xylenes (mg/L)	<0.00075		<0.00075		<0.00075
Surrogate: 4-Bromofluorobenzene (SS) (%)	99.9		78.2		73.4
Surrogate: 1,4-Difluorobenzene (SS) (%)	89.1		99.2		98.2
Hydrocarbons					
EPH10-19 (mg/L)	<0.25		<0.25		<0.25
EPH19-32 (mg/L)	<0.25		<0.25		<0.25
LEPH (mg/L)	<0.25		<0.25		<0.25
HEPH (mg/L)	<0.25		<0.25		<0.25
Volatile Hydrocarbons (VH6-10) (mg/L)	<0.10		<0.10		<0.10
VPH (C6-C10) (mg/L)	<0.10		<0.10		<0.10
Surrogate: 2-Bromobenzotrifluoride (%)	104.2		105.8		105.2
Surrogate: 3,4-Dichlorotoluene (SS) (%)	85.5		91.6		58.4 SURR-ND
Polycyclic Aromatic Hydrocarbons					
Acenaphthene (mg/L)	<0.000010		<0.000010		<0.000010
Acenaphthylene (mg/L)	<0.000010		<0.000010		<0.000010
Acridine (mg/L)	<0.000010		<0.000010		<0.000010
Anthracene (mg/L)	<0.000010		<0.000010		<0.000010
Benz(a)anthracene (mg/L)	<0.000010		<0.000010		<0.000010
Benzo(a)pyrene (mg/L)	<0.0000050		<0.0000050		<0.0000050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2149783-1	L2149783-2	L2149783-3	L2149783-5	L2149783-6
Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Sampled Date	14-AUG-18	17-AUG-18	15-AUG-18	14-AUG-18	15-AUG-18
Sampled Time	09:50	11:00	16:15	11:55	12:15
Client ID	MW13-01 (LP)	MW13-04 (LP)	MW13-05 (LP)	MW13-07 (LP)	MW13-08 (LP)
Grouping / **Analyte**					
WATER					
Polycyclic Aromatic Hydrocarbons					
Benzo(b&j)fluoranthene (mg/L)		<0.000010	<0.000010	<0.000010	
Benzo(b+j+k)fluoranthene (mg/L)		<0.000015	<0.000015	<0.000015	
Benzo(g,h,i)perylene (mg/L)		<0.000010	<0.000010	<0.000010	
Benzo(k)fluoranthene (mg/L)		<0.000010	<0.000010	<0.000010	
Chrysene (mg/L)		<0.000010	<0.000010	<0.000010	
Dibenz(a,h)anthracene (mg/L)		<0.0000050	<0.0000050	<0.0000050	
Fluoranthene (mg/L)		<0.000010	<0.000010	<0.000010	
Fluorene (mg/L)		<0.000010	<0.000010	<0.000010	
Indeno(1,2,3-c,d)pyrene (mg/L)		<0.000010	<0.000010	<0.000010	
1-Methylnaphthalene (mg/L)		<0.000050	<0.000050	<0.000050	
2-Methylnaphthalene (mg/L)		<0.000050	<0.000050	<0.000050	
Naphthalene (mg/L)		<0.000050	<0.000050	<0.000050	
Phenanthrene (mg/L)		<0.000020	<0.000020	<0.000020	
Pyrene (mg/L)		<0.000010	<0.000010	<0.000010	
Quinoline (mg/L)		<0.000050	<0.000050	<0.000050	
Surrogate: Acridine d9 (%)		86.5	80.4	85.7	
Surrogate: Chrysene d12 (%)		74.1	72.9	78.2	
Surrogate: Naphthalene d8 (%)		98.9	90.4	93.1	
Surrogate: Phenanthrene d10 (%)		97.2	95.2	96.2	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2149783-7	L2149783-8	L2149783-9	L2149783-13	L2149783-14
	Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
	Sampled Date	14-AUG-18	15-AUG-18	14-AUG-18	15-AUG-18	
	Sampled Time	16:01	15:30	10:30	15:35	
	Client ID	MW13-10 (LP)	MW13-13 (LP)	MW14-01 (LP)	MW-GW (LQR)	TRIP BLANK (LQTB)
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Benzo(b&j)fluoranthene (mg/L)	<0.000010		<0.000010		<0.000010
	Benzo(b+j+k)fluoranthene (mg/L)	<0.000015		<0.000015		<0.000015
	Benzo(g,h,i)perylene (mg/L)	<0.000010		<0.000010		<0.000010
	Benzo(k)fluoranthene (mg/L)	<0.000010		<0.000010		<0.000010
	Chrysene (mg/L)	<0.000010		<0.000010		<0.000010
	Dibenz(a,h)anthracene (mg/L)	<0.0000050		<0.0000050		<0.0000050
	Fluoranthene (mg/L)	<0.000010		<0.000010		<0.000010
	Fluorene (mg/L)	<0.000010		<0.000010		<0.000010
	Indeno(1,2,3-c,d)pyrene (mg/L)	<0.000010		<0.000010		<0.000010
	1-Methylnaphthalene (mg/L)	<0.000050		<0.000050		<0.000050
	2-Methylnaphthalene (mg/L)	<0.000050		<0.000050		<0.000050
	Naphthalene (mg/L)	<0.000050		<0.000050		<0.000050
	Phenanthrene (mg/L)	<0.000020		<0.000020		<0.000020
	Pyrene (mg/L)	<0.000010		<0.000010		<0.000010
	Quinoline (mg/L)	<0.000050		<0.000050		<0.000050
	Surrogate: Acridine d9 (%)	80.9		81.4		91.1
	Surrogate: Chrysene d12 (%)	78.3		72.8		97.8
	Surrogate: Naphthalene d8 (%)	92.6		87.6		95.4
	Surrogate: Phenanthrene d10 (%)	94.0		91.7		102.9

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Magnesium (Mg)-Dissolved	B	L2149783-1, -2, -5, -6, -7, -8, -9
Laboratory Control Sample	Sulfur (S)-Dissolved	MES	L2149783-1, -2, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2149783-13, -14, -3
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2149783-14
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2149783-1, -2, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2149783-13, -14, -3
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2149783-14
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2149783-1, -2, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2149783-13, -14, -3
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2149783-14
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2149783-13, -14, -3
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2149783-14
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2149783-1, -2, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2149783-13, -14, -3
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2149783-14

Qualifiers for Individual Parameters Listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
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).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis
SURR-ND	Surrogate recovery marginally exceeded ALS DQO. Reported non-detect results for associated samples were deemed to be unaffected.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". 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.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.			
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.			
EPH-ME-FID-VA	Water	EPH in Water	BC Lab Manual
EPH is extracted from water using a hexane micro-extraction technique, with analysis by GC-FID, as per the BC Lab Manual. EPH results include PAHs and are therefore not equivalent to LEPH or HEPH.			
F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			

Reference Information

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

LEPH/HEPH-CALC-VA	Water	LEPHs and HEPHs	BC MOE LEPH/HEPH

LEPHw and HEPHw are measures of Light and Heavy Extractable Petroleum Hydrocarbons in water. Results are calculated by subtraction of applicable PAH concentrations from EPH10-19 and EPH19-32, as per the BC Lab Manual LEPH/HEPH calculation procedure.
LEPHw = EPH10-19 minus Acenaphthene, Acridine, Anthracene, Fluorene, Naphthalene and Phenanthrene.
HEPH = EPH19-32 minus Benz(a)anthracene, Benzo(a)pyrene, Fluoranthene, and Pyrene.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water 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-VA	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-VA	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.

PAH-ME-MS-VA	Water	PAHs in Water	EPA 3511/8270D (mod)

PAHs are extracted from water using a hexane micro-extraction technique, with analysis by GC/MS. Because the two isomers cannot be readily separated chromatographically, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

VH-HSFID-VA	Water	VH in Water by Headspace GCFID	BC Env. Lab Manual (VH in Water)

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Compounds eluting between n-hexane and n-decane are measured and summed together using flame-ionization detection.

VH-SURR-FID-VA	Water	VH Surrogates for Waters	BC Env. Lab Manual (VH in Solids)
VOC7-HSMS-VA	Water	BTEX/MTBE/Styrene by Headspace GCMS	EPA 5021A/8260C

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

VOC7/VOC-SURR-MS-VA	Water	VOC7 and/or VOC Surrogates for Waters	EPA 5035A/5021A/8260C
VPH-CALC-VA	Water	VPH is VH minus select aromatics	BC MOE VPH

VPHw measures Volatile Petroleum Hydrocarbons in water. Results are calculated by subtraction of specific Monocyclic Aromatic Hydrocarbons from VH6-10, as per the BC Lab Manual VPH calculation procedure.
VPHw = VH6-10 minus Benzene, Toluene, Ethylbenzene, Xylenes, and Styrene

XYLENES-CALC-VA	Water	Sum of Xylene Isomer Concentrations	CALCULATION

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** 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
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

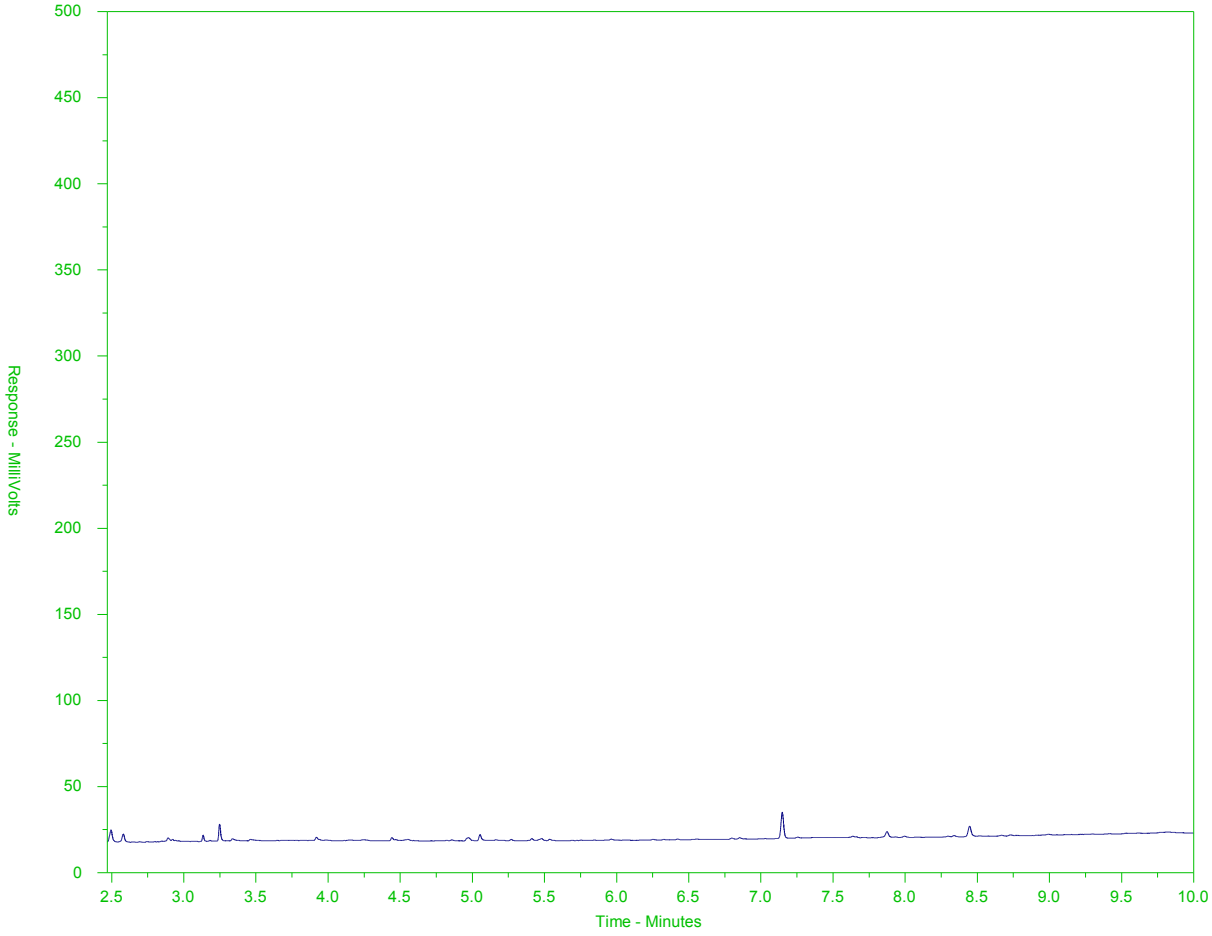
GLOSSARY OF REPORT TERMS

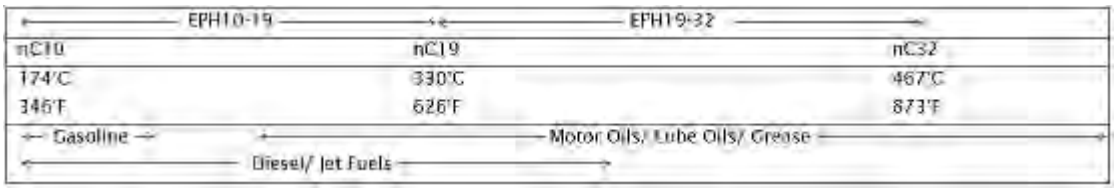
Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - 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.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2149783-2
Client Sample ID: MW13-04 (LP)





The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

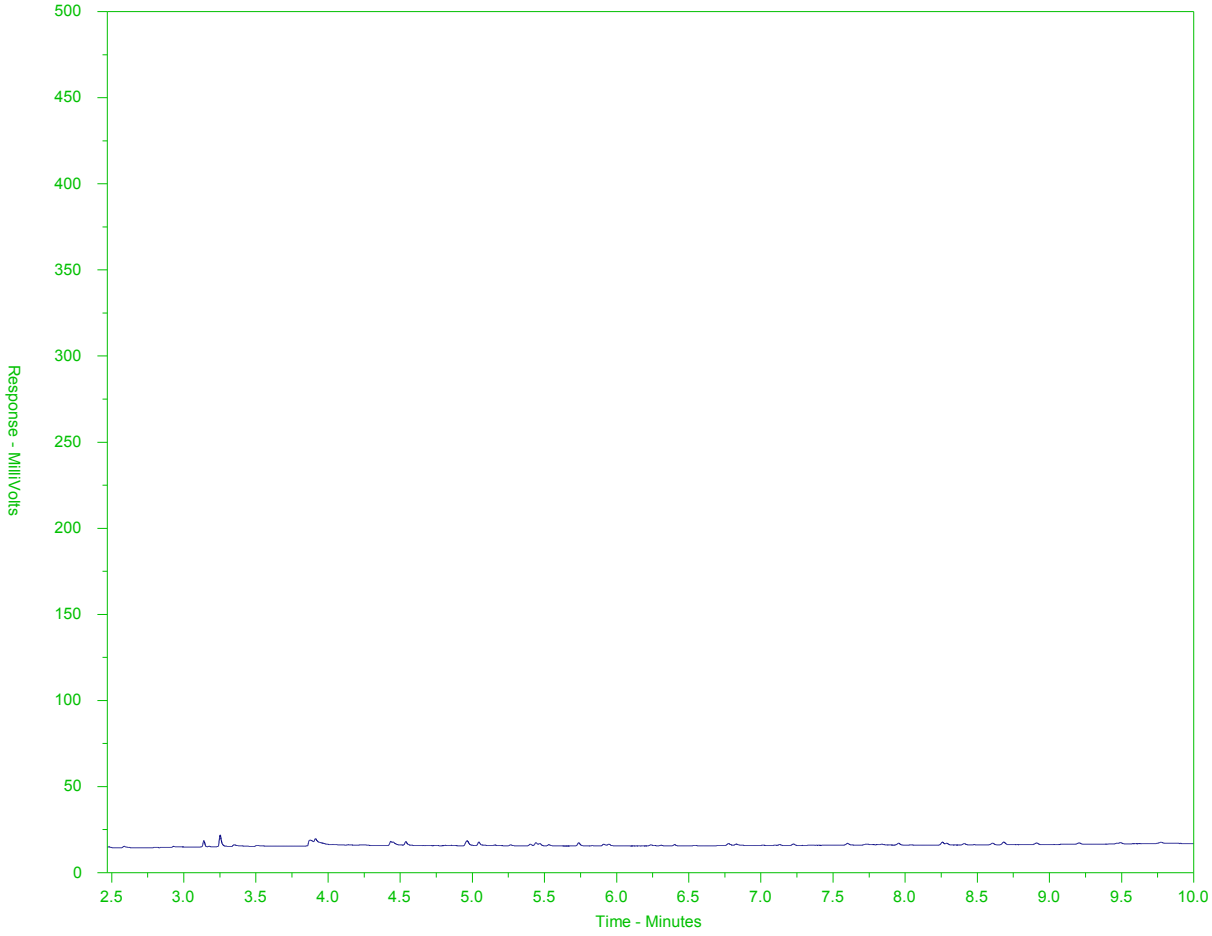
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

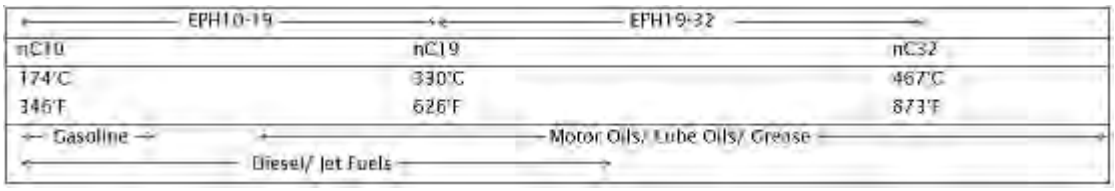
A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2149783-3
Client Sample ID: MW13-05 (LP)





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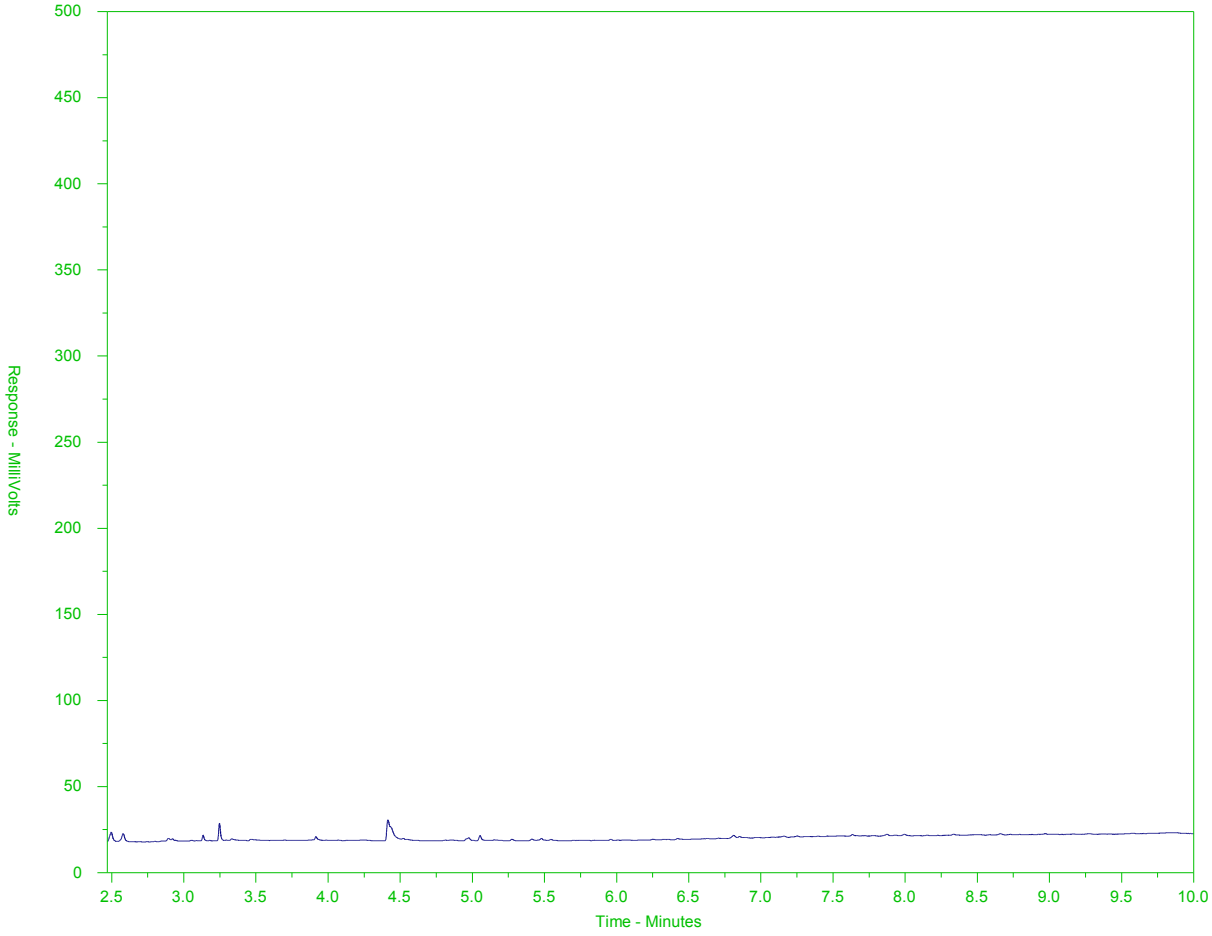
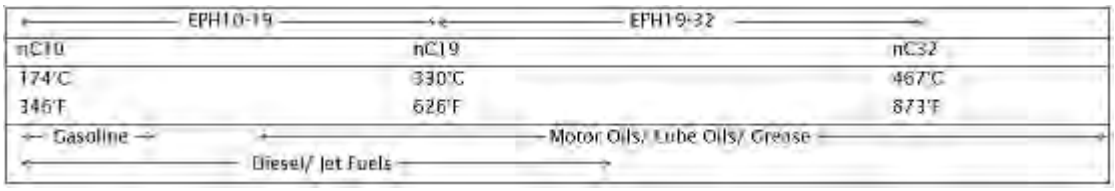
Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2149783-5
Client Sample ID: MW13-07 (LP)





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The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

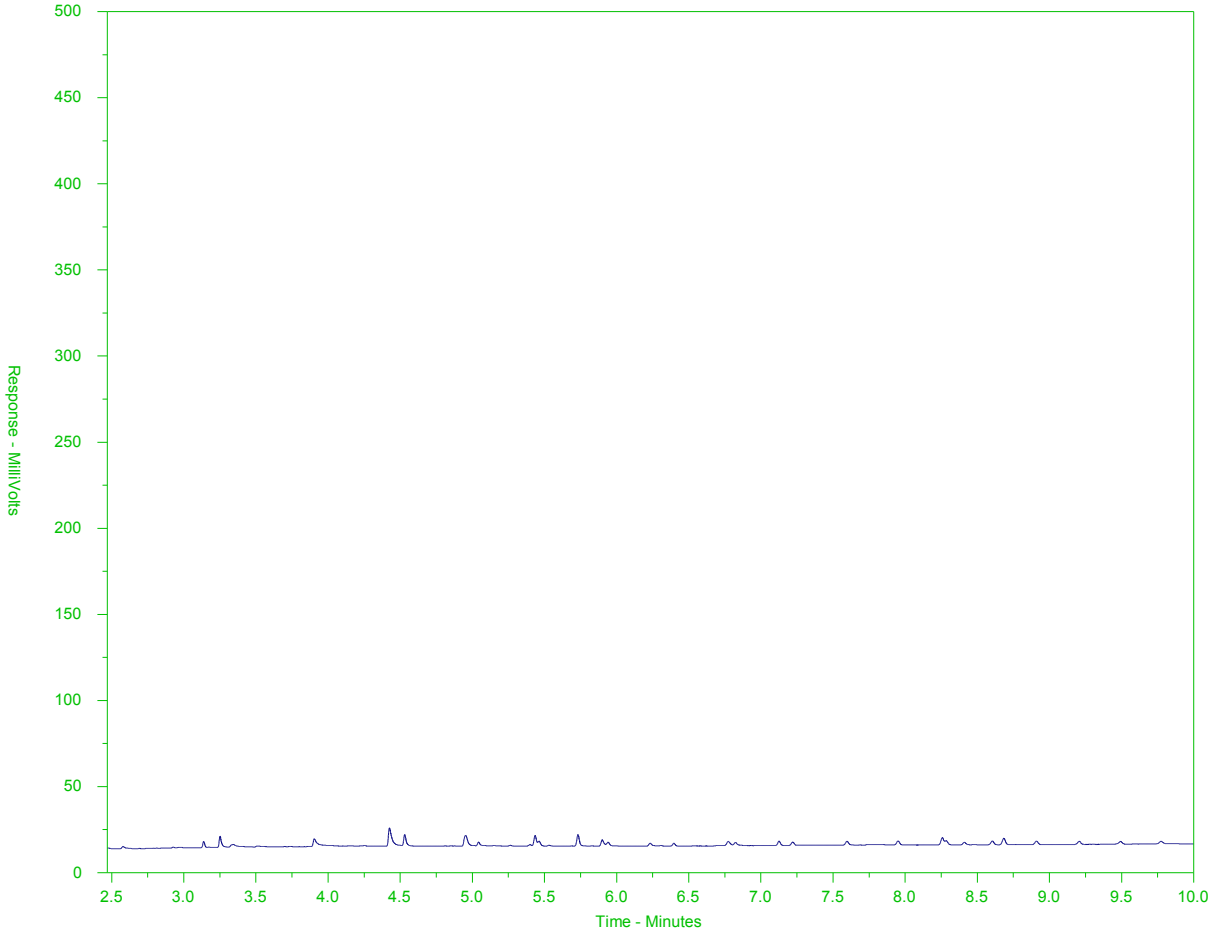
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

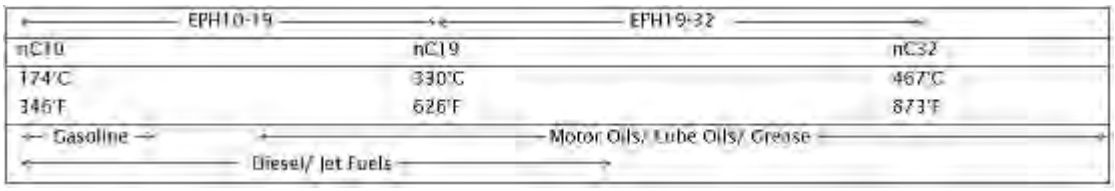
A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2149783-7
Client Sample ID: MW13-10 (LP)





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The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

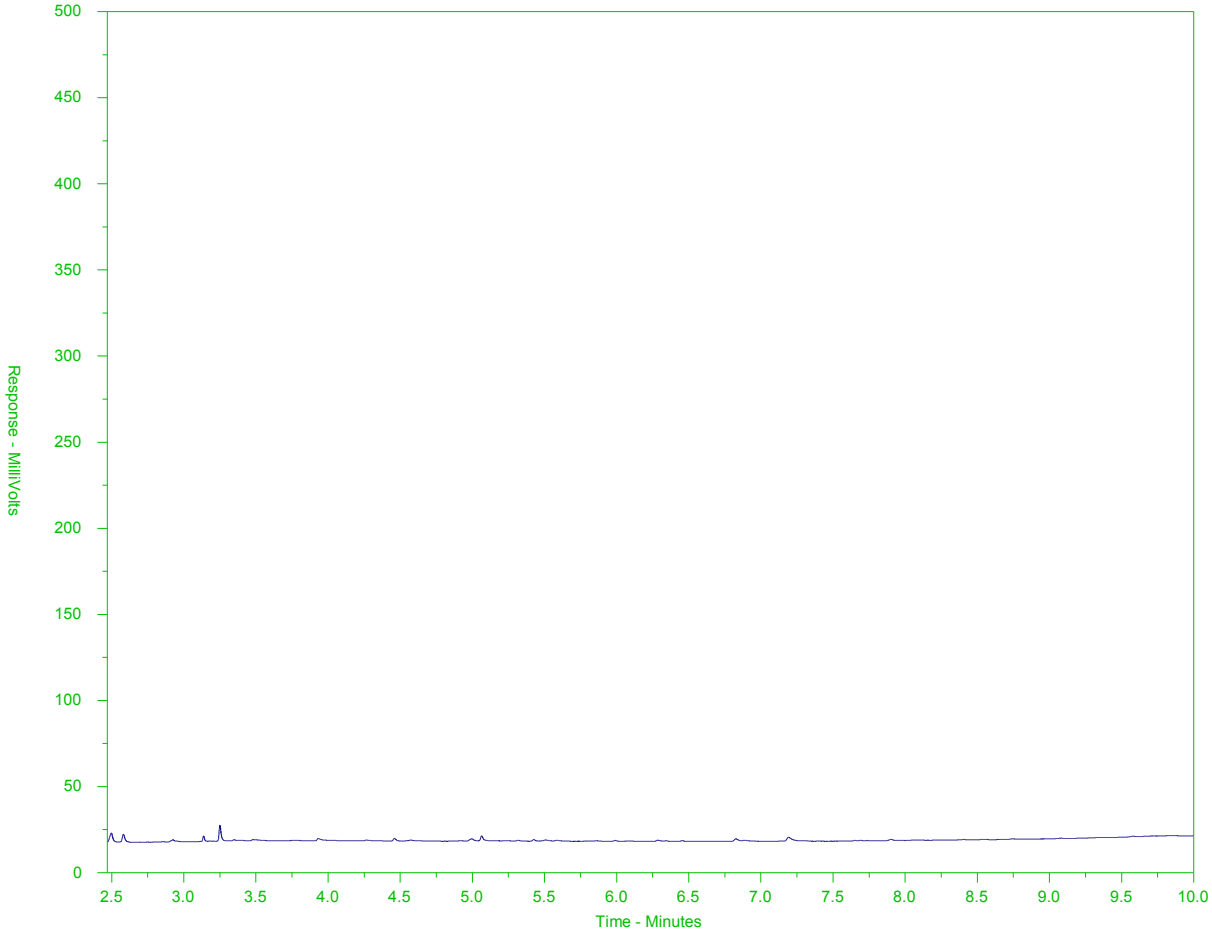
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

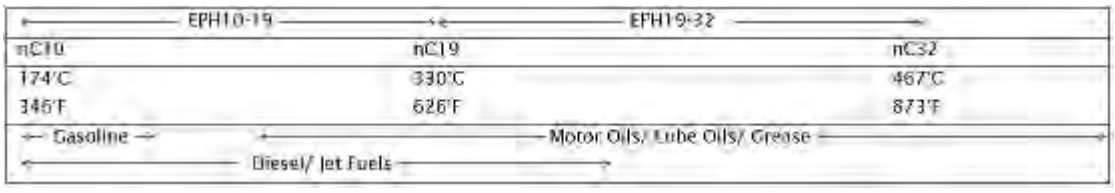
A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2149783-9
Client Sample ID: MW14-01 (LP)





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The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

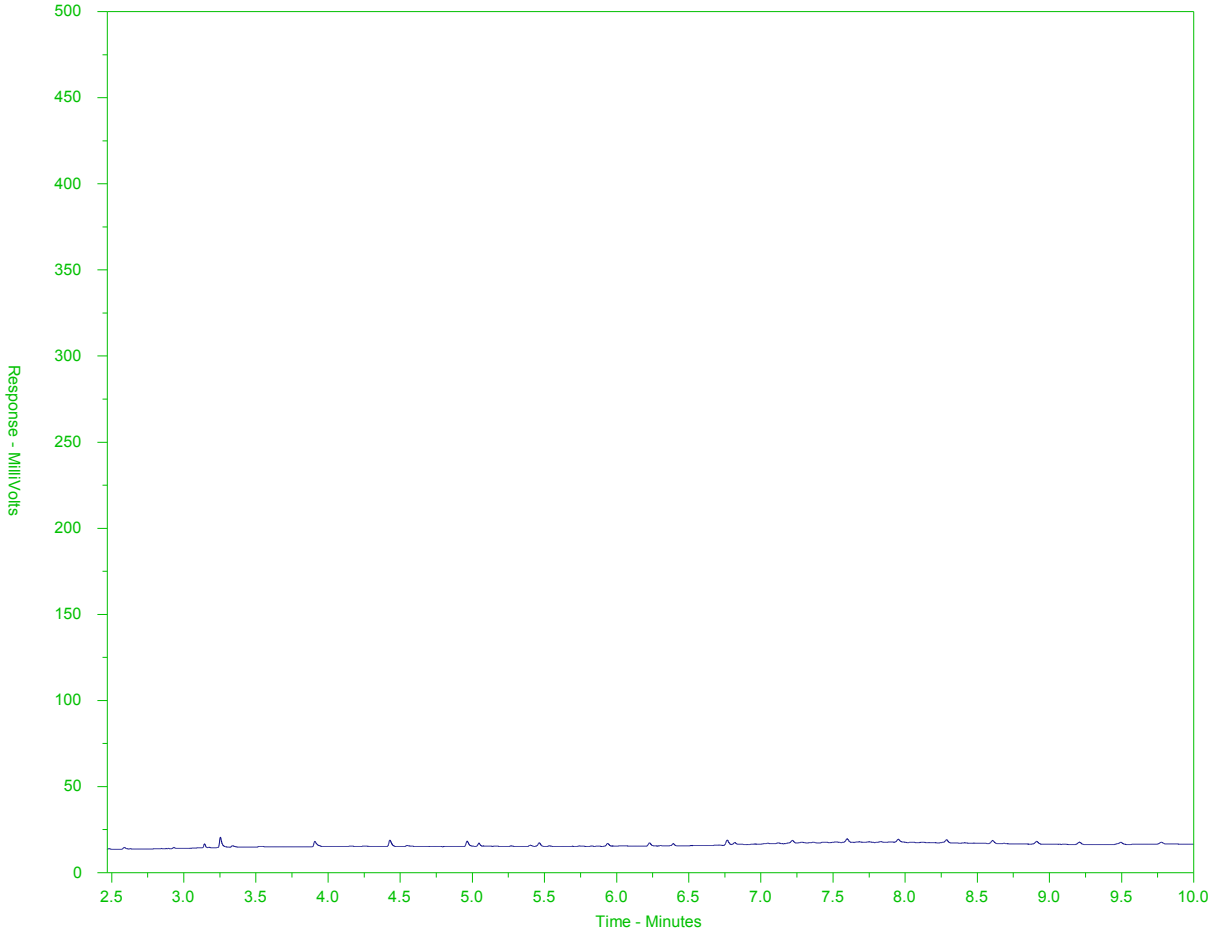
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

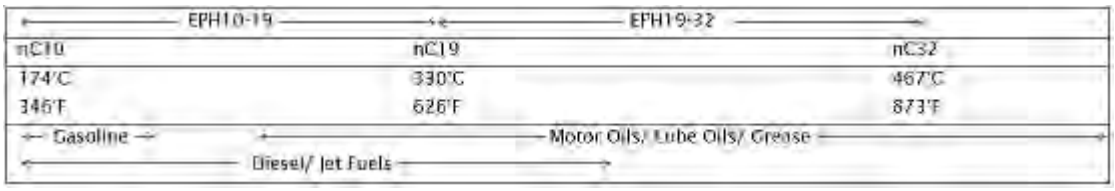
A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2149783-14
Client Sample ID: TRIP BLANK (LQTB)





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The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

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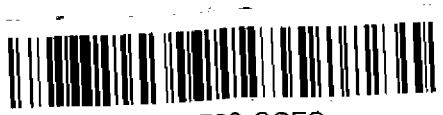
A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

ALS Environmental

Chai



COC #

Report To		Report Fo	Service Requested (Rush for routine analysis subject to availability)
Company:	TECK Metals Ltd	☑ Standard ☐ Other	◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Michelle Unger	☑ PDF ☑ Excel ☑ Digital ☐ Fax	○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	601 Knightlon Road	Email 1: amacphail@accessconsulting.ca	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Kimberly, BC	Email 2: marieducharme@accessconsulting.ca	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	250-427-8422 Fax:	Email 3: michelle.unger@teck.com	**Analysis Request**
Invoice To	Same as Report ? ☑ Yes ☐ No	**Client / Project Information**	Please indicate below Filtered, Preserved or both (F, P, F/P)
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #: TECK-18-01	
Company:		PO / AFE:	
Contact:		LSD:	
Address:			
Phone:		Quote #: Q62635	

Lab Work Order # (lab use only)

ALS Contact: Can Dang Sampler: AM

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	pH, SPC, alkalinity, hardness	dissolved metals low level +Hg (F/P)	Anions (nitrate, nitrite, sulphate, Cl, F, Br)	Ammonia (P)	BTEX, LEPH, HEPH (P)	VPH, PAH (P)								Number of Containers
	MW13-01 (LP)	14-Aug-18	9:50	Groundwater	X	X	X	X										5
	MW13-04 (LP)	17-Aug-18	11:00	Groundwater	X	X	X	X	X	X								9
	MW13-05 (LP)	15-Aug-18	16:15	Groundwater	X	X	X	X	X	X								9
	MW13-06 (LP)			Groundwater	X	X	X	X										5
	MW13-07 (LP)	14-Aug-18	11:55	Groundwater	X	X	X	X	X	X								9
	MW13-08 (LP)	15-Aug-18	12:15	Groundwater	X	X	X	X										5
	MW13-10 (LP)	14-Aug-18	16:01	Groundwater	X	X	X	X	X	X								9
	MW13-13 (LP)	15-Aug-18	15:30	Groundwater	X	X	X	X										5
	MW14-01 (LP)	14-Aug-18	10:30	Groundwater	X	X	X	X	X	X								9
	MW14-02 (LP)			Groundwater	X	X	X	X	X	X								9
	MW14-03 (LP)			Groundwater	X	X	X	X	X	X								9
	MW14-04 (LP)			Groundwater	X	X	X	X	X	X								9
	MW-GW (LQR)	15-Aug-18	15:35	Groundwater	X	X	X	X	X	X								9
	Trip Blank CLQTB				X	X	X	X	X	X								9

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Yukon EQWin and ACC200 digital formats. General A: pH, EC, TSS (low) **General B:** pH, EC, TSS (low), anions-all
General C: pH, EC, TSS (low), anions-all, ion balance, alkalinity **General D:** pH, EC, TSS (low), SO4, ion balance, alkalinity **General E:** pH, EC, TSS (low), SO4, ion balance

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:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Obsc Observations: Yes, Yes / No ? If Ye If Yes add SIF
Andrew MacPhail	17-Aug-18	18:00	MA	8/20	12:20 P	5 °C				

Ice Packed

TECK METALS LTD.
ATTN: Michelle Unger
601 Knightton Road
KIMBERLEY BC V1A 3E1

Date Received: 22-OCT-18
Report Date: 31-OCT-18 18:46 (MT)
Version: FINAL

Client Phone: 250-427-8404

Certificate of Analysis

Lab Work Order #: L2184945

Project P.O. #: TECK-18-1
Job Reference: TECK-18-1
C of C Numbers: 1 of 2, 2 of 2
Legal Site Desc:

Comments: The samples, "SDH-S2" and "TRIBEWF02", were not received.

Can Dang
Senior Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2184945-1 Water 18-OCT-18 14:00 MH-12	L2184945-2 Water 19-OCT-18 15:10 MH-04	L2184945-3 Water 20-OCT-18 10:45 MH-11	L2184945-4 Water 20-OCT-18 11:05 MH-29	L2184945-5 Water 18-OCT-18 16:25 MH-02
WATER						
Physical Tests	Conductivity (uS/cm)	303	301	363	319	794
	Hardness (as CaCO3) (mg/L)	168	161	202	177	433
	pH (pH)	8.36	8.33	8.36	8.35	8.21
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	192	185	233	207	581
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	162	151	188	181	238
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.25 DLDS
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<2.5 DLDS
	Fluoride (F) (mg/L)	0.120	0.154	0.085	0.049	<0.10 DLDS
	Nitrate (as N) (mg/L)	0.0343	0.215	0.0739	0.0380	<0.025 DLDS
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050
	Sulfate (SO4) (mg/L)	10.6	16.6	18.8	4.30	217
Total Metals	Aluminum (Al)-Total (mg/L)	0.0039	0.0489	0.0063	0.0043	<0.0030
	Antimony (Sb)-Total (mg/L)	0.00020	0.00015	0.00015	0.00016	<0.00010
	Arsenic (As)-Total (mg/L)	0.00076	0.00046	0.00052	0.00062	0.00032
	Barium (Ba)-Total (mg/L)	0.0765	0.0232	0.0636	0.0451	0.0340
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.0000345	0.000309	0.0000437	0.0000407	0.0000058
	Calcium (Ca)-Total (mg/L)	57.1	59.2	68.2	61.9	152
	Chromium (Cr)-Total (mg/L)	0.00014	0.00022	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00044
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	<0.010	0.080	0.048	<0.010	0.011
	Lead (Pb)-Total (mg/L)	0.000140	0.00155	0.000163	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	0.0014	0.0016	0.0015	0.0012	<0.0010
	Magnesium (Mg)-Total (mg/L)	6.08	3.51	8.53	6.05	15.1
	Manganese (Mn)-Total (mg/L)	0.00064	0.00312	0.00710	0.00174	0.0174
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.00127	0.000744	0.000913	0.000646	0.000255
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.43	0.41	0.47	0.25	2.29
	Selenium (Se)-Total (mg/L)	0.000650	0.000845	0.000770	0.000491	0.000085
	Silicon (Si)-Total (mg/L)	4.16	3.39	3.70	3.72	4.33

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2184945-6 Water 21-OCT-18 12:22 MH-13	L2184945-7 Water 21-OCT-18 11:40 MH-30	L2184945-8 Water 21-OCT-18 09:05 MH-15	L2184945-9 Water 18-OCT-18 16:40 MH-SW	L2184945-10 Water 20-OCT-18 14:35 MH-FB
WATER						
Physical Tests	Conductivity (uS/cm)	337	263	336	799	<2.0
	Hardness (as CaCO3) (mg/L)	191	150	192	440	<0.50
	pH (pH)	8.36	8.18	8.36	8.25	5.45
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	1.4	<1.0
	Total Dissolved Solids (mg/L)	206	154	209	580	<10
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	188	145	191	237	<1.0
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0086	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.25 DLDS	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<2.5 DLDS	<0.50
	Fluoride (F) (mg/L)	0.062	0.051	0.093	<0.10 DLDS	<0.020
	Nitrate (as N) (mg/L)	0.0312	0.0100	<0.0050	<0.025 DLDS	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0050 DLDS	<0.0010
	Sulfate (SO4) (mg/L)	10.4	5.13	4.62	227	<0.30
Total Metals	Aluminum (Al)-Total (mg/L)	0.0059	0.0047	0.0053	<0.0030	<0.0030
	Antimony (Sb)-Total (mg/L)	0.00011	<0.00010	0.00011	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00041	0.00027	0.00033	0.00033	<0.00010
	Barium (Ba)-Total (mg/L)	0.139	0.183	0.163	0.0337	<0.00010
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.0000118	0.0000310	0.0000075	0.0000052	<0.0000050
	Calcium (Ca)-Total (mg/L)	54.2	37.5	53.7	152	<0.050
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	0.00044	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.188	0.359	0.082	<0.010	<0.010
	Lead (Pb)-Total (mg/L)	<0.000050	0.000051	0.000234	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	0.0011	<0.0010	0.0011	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	13.5	13.5	13.2	15.0	<0.10
	Manganese (Mn)-Total (mg/L)	0.00758	0.0206	0.00758	0.0171	<0.00010
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000989	0.00121	0.00176	0.000251	<0.000050
	Nickel (Ni)-Total (mg/L)	<0.00050	0.00061	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.38	0.38	0.42	2.30	<0.10
	Selenium (Se)-Total (mg/L)	0.000540	0.000385	0.000436	0.000093	<0.000050
	Silicon (Si)-Total (mg/L)	3.26	2.92	3.79	4.21	<0.10

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2184945-11	L2184945-13	L2184945-14	L2184945-16	L2184945-17
Description	Water	Water	Water	Water	Water
Sampled Date		19-OCT-18	21-OCT-18	21-OCT-18	19-OCT-18
Sampled Time		11:25	11:00	10:05	16:10
Client ID	TRIP BLANK	MH-22	TRIBEWF01	TRIBEWF03	PH-01
Grouping / **Analyte**					
WATER					
Physical Tests					
Conductivity (uS/cm)	<2.0	295	319	339	311
Hardness (as CaCO3) (mg/L)	<0.50 HTC	150	179	189	163
pH (pH)	5.44	8.21	8.19	8.34	8.19
Total Suspended Solids (mg/L)	<1.0	<1.0	1.3	<1.0	<1.0
Total Dissolved Solids (mg/L)	<10	194	217	202	202
Anions and Nutrients					
Alkalinity, Total (as CaCO3) (mg/L)	<1.0	114	176	192	137
Ammonia, Total (as N) (mg/L)	<0.060 RRV	<0.0050	0.0064	0.0083	<0.0050
Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
Fluoride (F) (mg/L)	<0.020	1.30	0.087	0.094	0.240
Nitrate (as N) (mg/L)	<0.0050	0.134	<0.0050	0.0264	0.447
Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Sulfate (SO4) (mg/L)	<0.30	41.5	3.97	4.27	32.5
Total Metals					
Aluminum (Al)-Total (mg/L)	<0.0030	<0.0030	0.0040	0.0075	<0.0030
Antimony (Sb)-Total (mg/L)	<0.00010	0.00263	0.00013	0.00013	0.00015
Arsenic (As)-Total (mg/L)	<0.00010	0.00375	0.00101	0.00044	0.00063
Barium (Ba)-Total (mg/L)	<0.00010	0.0169	0.181	0.195	0.0189
Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Total (mg/L)	<0.0000050	0.00417	0.0000089	0.0000133	0.000736
Calcium (Ca)-Total (mg/L)	<0.050	50.0	53.3	55.1	59.1
Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00014
Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron (Fe)-Total (mg/L)	<0.010	<0.010	0.491	0.184	<0.010
Lead (Pb)-Total (mg/L)	<0.000050	0.000322	0.000068	<0.000050	0.00122
Lithium (Li)-Total (mg/L)	<0.0010	0.0058	0.0011	0.0011	0.0020
Magnesium (Mg)-Total (mg/L)	<0.10	6.81	10.6	12.7	4.08
Manganese (Mn)-Total (mg/L)	<0.00010	0.00012	0.0488	0.0152	0.00028
Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Total (mg/L)	<0.000050	0.00876	0.00180	0.00211	0.00108
Nickel (Ni)-Total (mg/L)	<0.00050	0.00352	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Total (mg/L)	<0.10	0.57	0.36	0.42	0.54
Selenium (Se)-Total (mg/L)	<0.000050	0.0145	0.000485	0.000609	0.00173
Silicon (Si)-Total (mg/L)	<0.10	4.53	4.59	3.88	3.47

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2184945-18 Water 19-OCT-18 15:30 CC-01	L2184945-19 Water 20-OCT-18 11:38 MH-27	L2184945-20 Water 20-OCT-18 12:16 MH-28	L2184945-21 Water 18-OCT-18 15:55 MH-23	L2184945-22 Water 18-OCT-18 14:25 NC-01
WATER						
Physical Tests	Conductivity (uS/cm)	250	379	383	269	302
	Hardness (as CaCO3) (mg/L)	132	210	209	146	166
	pH (pH)	8.28	8.37	8.35	8.34	8.37
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	2.2	<1.0
	Total Dissolved Solids (mg/L)	163	244	236	169	190
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	131	192	194	148	164
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	0.0055	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.059	0.095	0.111	0.137	0.121
	Nitrate (as N) (mg/L)	0.114	0.0976	0.134	0.0367	0.0508
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	0.0010	<0.0010	<0.0010
	Sulfate (SO4) (mg/L)	9.44	24.7	26.1	5.71	10.6
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0030	0.0050	0.0079	0.0181	0.0098
	Antimony (Sb)-Total (mg/L)	0.00014	0.00015	0.00016	0.00022	0.00021
	Arsenic (As)-Total (mg/L)	0.00042	0.00052	0.00050	0.00108	0.00080
	Barium (Ba)-Total (mg/L)	0.0116	0.0614	0.0551	0.0652	0.0763
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.0000928	0.0000479	0.000107	0.0000444	0.0000395
	Calcium (Ca)-Total (mg/L)	49.6	69.5	71.4	50.6	56.1
	Chromium (Cr)-Total (mg/L)	0.00021	<0.00010	<0.00010	0.00019	0.00017
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	0.00076	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	<0.010	0.069	0.161	0.054	0.015
	Lead (Pb)-Total (mg/L)	0.000264	0.000162	0.000576	0.00134	0.000285
	Lithium (Li)-Total (mg/L)	0.0012	0.0015	0.0016	0.0015	0.0014
	Magnesium (Mg)-Total (mg/L)	2.24	8.61	7.60	5.46	6.16
	Manganese (Mn)-Total (mg/L)	0.00012	0.0100	0.0264	0.0136	0.00178
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000670	0.00101	0.00102	0.00131	0.00131
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.32	0.56	0.64	0.34	0.42
	Selenium (Se)-Total (mg/L)	0.000328	0.000895	0.000973	0.000535	0.000675
	Silicon (Si)-Total (mg/L)	2.75	3.56	3.59	4.26	3.99

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2184945-23	L2184945-24			
	Description	Water	Water			
	Sampled Date	18-OCT-18	19-OCT-18			
	Sampled Time	12:40	12:30			
	Client ID	NC-02	MH-08			
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	291	254			
	Hardness (as CaCO3) (mg/L)	156	142			
	pH (pH)	8.19	8.33			
	Total Suspended Solids (mg/L)	4.0	10.0			
	Total Dissolved Solids (mg/L)	175	173			
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	157	138			
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050			
	Bromide (Br) (mg/L)	<0.050	<0.050			
	Chloride (Cl) (mg/L)	<0.50	<0.50			
	Fluoride (F) (mg/L)	0.113	0.308			
	Nitrate (as N) (mg/L)	<0.0050	0.0429			
	Nitrite (as N) (mg/L)	<0.0010	<0.0010			
	Sulfate (SO4) (mg/L)	8.78	5.54			
Total Metals	Aluminum (Al)-Total (mg/L)	0.0283	0.0559			
	Antimony (Sb)-Total (mg/L)	0.00015	0.00042			
	Arsenic (As)-Total (mg/L)	0.00053	0.00207			
	Barium (Ba)-Total (mg/L)	0.0592	0.0410			
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020			
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050			
	Boron (B)-Total (mg/L)	<0.010	<0.010			
	Cadmium (Cd)-Total (mg/L)	0.000183	0.0000828			
	Calcium (Ca)-Total (mg/L)	52.6	45.7			
	Chromium (Cr)-Total (mg/L)	<0.00010	0.00192			
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010			
	Copper (Cu)-Total (mg/L)	0.00100	<0.00050			
	Iron (Fe)-Total (mg/L)	0.188	0.102			
	Lead (Pb)-Total (mg/L)	0.000737	0.000254			
	Lithium (Li)-Total (mg/L)	0.0011	0.0026			
	Magnesium (Mg)-Total (mg/L)	5.76	5.18			
	Manganese (Mn)-Total (mg/L)	0.0157	0.00700			
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Total (mg/L)	0.000871	0.000710			
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050			
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050			
	Potassium (K)-Total (mg/L)	0.63	0.54			
	Selenium (Se)-Total (mg/L)	0.000325	0.00184			
	Silicon (Si)-Total (mg/L)	3.76	6.16			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2184945-1	L2184945-2	L2184945-3	L2184945-4	L2184945-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	18-OCT-18	19-OCT-18	20-OCT-18	20-OCT-18	18-OCT-18
	Sampled Time	14:00	15:10	10:45	11:05	16:25
	Client ID	MH-12	MH-04	MH-11	MH-29	MH-02
Grouping	**Analyte**					
WATER						
Total Metals	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	1.07	0.889	1.16	0.938	8.02
	Strontium (Sr)-Total (mg/L)	0.207	0.214	0.269	0.227	0.522
	Sulfur (S)-Total (mg/L)	3.69	5.93	6.76	1.63	83.7
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	0.00126	<0.00030	<0.00030	<0.00030
	Uranium (U)-Total (mg/L)	0.000883	0.000856	0.00111	0.000648	0.00166
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	0.0082	0.0034	<0.0030	0.0031
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0013	0.0019	0.0018	0.0023	<0.0010
	Antimony (Sb)-Dissolved (mg/L)	0.00020	0.00013	0.00013	0.00015	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00072	0.00039	0.00046	0.00059	0.00027
	Barium (Ba)-Dissolved (mg/L)	0.0764	0.0225	0.0632	0.0447	0.0330
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	0.0000310	0.000260	0.0000388	0.0000377	0.0000069
	Calcium (Ca)-Dissolved (mg/L)	57.0	58.9	66.5	60.8	149
	Chromium (Cr)-Dissolved (mg/L)	0.00015	0.00016	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00040
	Copper (Cu)-Dissolved (mg/L)	<0.00020	<0.00020	0.00027	0.00032	<0.00020
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	0.023	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	0.000107	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0014	0.0014	0.0014	0.0012	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	6.33	3.51	8.81	6.05	14.7
	Manganese (Mn)-Dissolved (mg/L)	0.00023	0.00040	0.00528	0.00136	0.0166
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.00127	0.000739	0.000884	0.000569	0.000264
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.45	0.41	0.47	0.25	2.30
	Selenium (Se)-Dissolved (mg/L)	0.000705	0.000815	0.000872	0.000461	0.000078
	Silicon (Si)-Dissolved (mg/L)	4.10	3.34	3.61	3.74	4.21

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2184945-6 Water 21-OCT-18 12:22 MH-13	L2184945-7 Water 21-OCT-18 11:40 MH-30	L2184945-8 Water 21-OCT-18 09:05 MH-15	L2184945-9 Water 18-OCT-18 16:40 MH-SW	L2184945-10 Water 20-OCT-18 14:35 MH-FB
WATER						
Total Metals	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.968	0.754	1.04	7.98	<0.050
	Strontium (Sr)-Total (mg/L)	0.197	0.107	0.174	0.536	<0.00020
	Sulfur (S)-Total (mg/L)	3.78	2.02	1.81	82.2	<0.50
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Total (mg/L)	0.00129	0.00107	0.000768	0.00161	<0.000010
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	0.0035	<0.0030	0.0031	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0014	0.0024	0.0014	<0.0010	<0.0010
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	0.00011	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00029	0.00018	0.00027	0.00026	<0.00010
	Barium (Ba)-Dissolved (mg/L)	0.138	0.181	0.165	0.0342	<0.00010
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	0.0000089	0.0000152	<0.0000050	0.0000072	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	54.9	37.6	54.5	151	<0.050
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	0.00040	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00022	0.00021	<0.00020	<0.00020	<0.00020
	Iron (Fe)-Dissolved (mg/L)	0.037	0.239	0.065	0.013	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	0.000068	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0010	<0.0010	0.0011	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	13.2	13.6	13.5	15.1	<0.10
	Manganese (Mn)-Dissolved (mg/L)	0.00496	0.0197	0.00631	0.0170	<0.00010
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000985	0.00123	0.00172	0.000269	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.39	0.35	0.43	2.39	<0.10
	Selenium (Se)-Dissolved (mg/L)	0.000524	0.000457	0.000471	0.000080	<0.000050
	Silicon (Si)-Dissolved (mg/L)	3.23	2.94	3.91	4.26	<0.050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2184945-11	L2184945-13	L2184945-14	L2184945-16	L2184945-17
Description	Water	Water	Water	Water	Water
Sampled Date		19-OCT-18	21-OCT-18	21-OCT-18	19-OCT-18
Sampled Time		11:25	11:00	10:05	16:10
Client ID	TRIP BLANK	MH-22	TRIBEWF01	TRIBEWF03	PH-01
Grouping / **Analyte**					
WATER					
Total Metals Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total (mg/L)	<0.050	0.864	0.960	1.02	0.789
Strontium (Sr)-Total (mg/L)	<0.00020	0.244	0.167	0.172	0.156
Sulfur (S)-Total (mg/L)	<0.50	14.6	1.50	1.56	11.5
Thallium (Tl)-Total (mg/L)	<0.000010	0.000018	<0.000010	<0.000010	<0.000010
Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium (U)-Total (mg/L)	<0.000010	0.00366	0.000606	0.000842	0.000977
Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total (mg/L)	<0.0030	0.759	<0.0030	0.0061	0.0135
Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals Dissolved Mercury Filtration Location		FIELD	FIELD	FIELD	FIELD
Dissolved Metals Filtration Location		FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved (mg/L)		0.0011	<0.0010	0.0013	<0.0010
Antimony (Sb)-Dissolved (mg/L)		0.00253	0.00012	0.00012	0.00013
Arsenic (As)-Dissolved (mg/L)		0.00366	0.00075	0.00033	0.00059
Barium (Ba)-Dissolved (mg/L)		0.0166	0.172	0.196	0.0185
Beryllium (Be)-Dissolved (mg/L)		<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Dissolved (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved (mg/L)		<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved (mg/L)		0.00407	0.0000064	0.0000085	0.000717
Calcium (Ca)-Dissolved (mg/L)		48.9	53.6	54.6	58.7
Chromium (Cr)-Dissolved (mg/L)		0.00013	<0.00010	<0.00010	0.00016
Cobalt (Co)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved (mg/L)		0.00030	<0.00020	<0.00020	<0.00020
Iron (Fe)-Dissolved (mg/L)		<0.010	0.168	0.085	<0.010
Lead (Pb)-Dissolved (mg/L)		0.000336	<0.000050	<0.000050	0.00102
Lithium (Li)-Dissolved (mg/L)		0.0057	0.0010	0.0011	0.0019
Magnesium (Mg)-Dissolved (mg/L)		6.86	11.0	12.7	4.02
Manganese (Mn)-Dissolved (mg/L)		0.00028	0.0487	0.0149	<0.00010
Mercury (Hg)-Dissolved (mg/L)		<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)		0.00847	0.00175	0.00209	0.00106
Nickel (Ni)-Dissolved (mg/L)		0.00352	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Dissolved (mg/L)		<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved (mg/L)		0.59	0.38	0.42	0.54
Selenium (Se)-Dissolved (mg/L)		0.0149	0.000398	0.000618	0.00177
Silicon (Si)-Dissolved (mg/L)		4.62	4.64	3.92	3.48

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2184945-18	L2184945-19	L2184945-20	L2184945-21	L2184945-22
	Description	Water	Water	Water	Water	Water
	Sampled Date	19-OCT-18	20-OCT-18	20-OCT-18	18-OCT-18	18-OCT-18
	Sampled Time	15:30	11:38	12:16	15:55	14:25
	Client ID	CC-01	MH-27	MH-28	MH-23	NC-01
Grouping	**Analyte**					
WATER						
Total Metals	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.786	1.18	1.14	0.891	1.03
	Strontium (Sr)-Total (mg/L)	0.207	0.278	0.290	0.183	0.217
	Sulfur (S)-Total (mg/L)	3.36	8.80	9.48	2.12	3.72
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	0.00061	<0.00030
	Uranium (U)-Total (mg/L)	0.000756	0.00124	0.00132	0.000683	0.000909
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	0.0036	0.0048	0.0122	0.0040	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	<0.0010	0.0018	0.0019	0.0014	0.0015
	Antimony (Sb)-Dissolved (mg/L)	0.00013	0.00014	0.00014	0.00020	0.00019
	Arsenic (As)-Dissolved (mg/L)	0.00039	0.00045	0.00038	0.00097	0.00076
	Barium (Ba)-Dissolved (mg/L)	0.0112	0.0624	0.0540	0.0677	0.0761
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	0.0000883	0.0000390	0.0000982	0.0000332	0.0000330
	Calcium (Ca)-Dissolved (mg/L)	48.9	70.2	71.1	49.5	56.2
	Chromium (Cr)-Dissolved (mg/L)	0.00019	<0.00010	<0.00010	0.00015	0.00017
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	<0.00020	0.00024	0.00026	<0.00020	<0.00020
	Iron (Fe)-Dissolved (mg/L)	<0.010	0.036	0.072	0.015	<0.010
	Lead (Pb)-Dissolved (mg/L)	0.000230	0.000054	0.000159	0.000123	0.000055
	Lithium (Li)-Dissolved (mg/L)	0.0011	0.0015	0.0015	0.0015	0.0014
	Magnesium (Mg)-Dissolved (mg/L)	2.31	8.34	7.56	5.50	6.12
	Manganese (Mn)-Dissolved (mg/L)	<0.00010	0.00868	0.0244	0.00988	0.00046
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000623	0.00101	0.000955	0.00126	0.00128
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.32	0.57	0.65	0.35	0.43
	Selenium (Se)-Dissolved (mg/L)	0.000275	0.000927	0.000879	0.000665	0.000793
	Silicon (Si)-Dissolved (mg/L)	2.82	3.64	3.56	4.16	4.07

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2184945-23	L2184945-24			
	Description	Water	Water			
	Sampled Date	18-OCT-18	19-OCT-18			
	Sampled Time	12:40	12:30			
	Client ID	NC-02	MH-08			
Grouping	**Analyte**					
WATER						
Total Metals	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Total (mg/L)	1.09	0.812			
	Strontium (Sr)-Total (mg/L)	0.193	0.158			
	Sulfur (S)-Total (mg/L)	3.05	1.96			
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010			
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Total (mg/L)	<0.00075 DLM	0.00149			
	Uranium (U)-Total (mg/L)	0.000542	0.000673			
	Vanadium (V)-Total (mg/L)	<0.00050	0.00069			
	Zinc (Zn)-Total (mg/L)	0.0047	0.0038			
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030			
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD			
	Dissolved Metals Filtration Location	FIELD	FIELD			
	Aluminum (Al)-Dissolved (mg/L)	0.0016	<0.0010			
	Antimony (Sb)-Dissolved (mg/L)	0.00013	0.00042			
	Arsenic (As)-Dissolved (mg/L)	0.00032	0.00200			
	Barium (Ba)-Dissolved (mg/L)	0.0668	0.0384			
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020			
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050			
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010			
	Cadmium (Cd)-Dissolved (mg/L)	0.000495 DTMF	0.0000634			
	Calcium (Ca)-Dissolved (mg/L)	52.8	48.2			
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	0.00048			
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010			
	Copper (Cu)-Dissolved (mg/L)	0.00133	<0.00020			
	Iron (Fe)-Dissolved (mg/L)	0.050	<0.010			
	Lead (Pb)-Dissolved (mg/L)	0.000259	<0.000050			
	Lithium (Li)-Dissolved (mg/L)	0.0011	0.0026			
	Magnesium (Mg)-Dissolved (mg/L)	5.94	5.27			
	Manganese (Mn)-Dissolved (mg/L)	0.0129	0.00204			
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Dissolved (mg/L)	0.000876	0.000733			
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050			
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050			
	Potassium (K)-Dissolved (mg/L)	0.88 DTMF	0.58			
	Selenium (Se)-Dissolved (mg/L)	0.000287	0.00189			
	Silicon (Si)-Dissolved (mg/L)	3.72	5.63			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2184945-1	L2184945-2	L2184945-3	L2184945-4	L2184945-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	18-OCT-18	19-OCT-18	20-OCT-18	20-OCT-18	18-OCT-18
	Sampled Time	14:00	15:10	10:45	11:05	16:25
	Client ID	MH-12	MH-04	MH-11	MH-29	MH-02
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.04	0.867	1.16	0.931	7.94
	Strontium (Sr)-Dissolved (mg/L)	0.214	0.208	0.255	0.218	0.516
	Sulfur (S)-Dissolved (mg/L)	3.52	5.63	6.55	1.46	77.5
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.000868	0.000818	0.00111	0.000647	0.00158
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0013	0.0053	0.0033	<0.0010	0.0032
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals	Chromium (III)-Total (mg/L)	0.00014	0.00022	<0.00010	<0.00010	<0.00010
	Hexavalent Chromium (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2184945-6	L2184945-7	L2184945-8	L2184945-9	L2184945-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	21-OCT-18	21-OCT-18	21-OCT-18	18-OCT-18	20-OCT-18
	Sampled Time	12:22	11:40	09:05	16:40	14:35
	Client ID	MH-13	MH-30	MH-15	MH-SW	MH-FB
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.973	0.711	1.07	8.28	<0.050
	Strontium (Sr)-Dissolved (mg/L)	0.198	0.108	0.169	0.539	<0.00020
	Sulfur (S)-Dissolved (mg/L)	3.47	1.73	1.67	77.2	<0.50
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.00126	0.00105	0.000728	0.00157	<0.000010
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	0.0011	0.0012	0.0033	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals	Chromium (III)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Hexavalent Chromium (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2184945-11	L2184945-13	L2184945-14	L2184945-16	L2184945-17
Description	Water	Water	Water	Water	Water
Sampled Date		19-OCT-18	21-OCT-18	21-OCT-18	19-OCT-18
Sampled Time		11:25	11:00	10:05	16:10
Client ID	TRIP BLANK	MH-22	TRIBEWF01	TRIBEWF03	PH-01
Grouping / **Analyte**					
WATER					
Dissolved Metals Silver (Ag)-Dissolved (mg/L)		<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved (mg/L)		0.895	0.996	1.09	0.768
Strontium (Sr)-Dissolved (mg/L)		0.240	0.164	0.170	0.155
Sulfur (S)-Dissolved (mg/L)		14.1	1.35	1.49	11.2
Thallium (Tl)-Dissolved (mg/L)		0.000016	<0.000010	<0.000010	<0.000010
Tin (Sn)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved (mg/L)		<0.00030	<0.00030	<0.00030	<0.00030
Uranium (U)-Dissolved (mg/L)		0.00355	0.000574	0.000820	0.000958
Vanadium (V)-Dissolved (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved (mg/L)		0.847	<0.0010	<0.0010	0.0144
Zirconium (Zr)-Dissolved (mg/L)		<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals Chromium (III)-Total (mg/L)		<0.00010	<0.00010	<0.00010	0.00014
Hexavalent Chromium (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2184945-18	L2184945-19	L2184945-20	L2184945-21	L2184945-22
	Description	Water	Water	Water	Water	Water
	Sampled Date	19-OCT-18	20-OCT-18	20-OCT-18	18-OCT-18	18-OCT-18
	Sampled Time	15:30	11:38	12:16	15:55	14:25
	Client ID	CC-01	MH-27	MH-28	MH-23	NC-01
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.806	1.21	1.17	0.883	1.04
	Strontium (Sr)-Dissolved (mg/L)	0.202	0.281	0.285	0.180	0.213
	Sulfur (S)-Dissolved (mg/L)	3.44	8.68	9.12	1.93	4.00
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.000726	0.00122	0.00130	0.000648	0.000889
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0041	0.0050	0.0122	0.0029	0.0017
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals	Chromium (III)-Total (mg/L)	0.00021	<0.00010	<0.00010	0.00019	0.00017
	Hexavalent Chromium (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2184945-23	L2184945-24			
	Description	Water	Water			
	Sampled Date	18-OCT-18	19-OCT-18			
	Sampled Time	12:40	12:30			
	Client ID	NC-02	MH-08			
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Dissolved (mg/L)	1.31	0.839			
	Strontium (Sr)-Dissolved (mg/L)	0.193	0.157			
	Sulfur (S)-Dissolved (mg/L)	3.07	1.67			
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010			
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030			
	Uranium (U)-Dissolved (mg/L)	0.000548	0.000671			
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Dissolved (mg/L)	0.0088	0.0016			
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030			
Speciated Metals	Chromium (III)-Total (mg/L)	<0.00010	0.00192			
	Hexavalent Chromium (mg/L)	<0.00050	<0.00050			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2184945-1, -10, -13, -14, -16, -17, -18, -19, -2, -20, -21, -22, -23, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2184945-24
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2184945-1, -10, -13, -14, -16, -17, -18, -19, -2, -20, -21, -22, -23, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2184945-24
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2184945-1, -10, -13, -14, -16, -17, -18, -19, -2, -20, -21, -22, -23, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2184945-24
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2184945-1, -10, -13, -14, -16, -17, -18, -19, -2, -20, -21, -22, -23, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2184945-24
Matrix Spike	Barium (Ba)-Total	MS-B	L2184945-1, -10, -11, -13, -14, -16, -17, -18, -19, -2, -20, -21, -22, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Boron (B)-Total	MS-B	L2184945-23, -24
Matrix Spike	Calcium (Ca)-Total	MS-B	L2184945-1, -10, -11, -13, -14, -16, -17, -18, -19, -2, -20, -21, -22, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2184945-1, -10, -11, -13, -14, -16, -17, -18, -19, -2, -20, -21, -22, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2184945-23, -24
Matrix Spike	Potassium (K)-Total	MS-B	L2184945-23, -24
Matrix Spike	Sodium (Na)-Total	MS-B	L2184945-23, -24
Matrix Spike	Strontium (Sr)-Total	MS-B	L2184945-1, -10, -11, -13, -14, -16, -17, -18, -19, -2, -20, -21, -22, -3, -4, -5, -6, -7, -8, -9

Qualifiers for Individual Parameters Listed:

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).
DTMF	Dissolved concentration exceeds total for field-filtered metals sample. Metallic contaminants may have been introduced to dissolved sample during field filtration.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". 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.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CR-CR3-TOT-CALC-ED	Water	Total Trivalent Chromium in Water	CALCULATION

Chromium (III)-Total is calculated as the difference between the total chromium and the total hexavalent chromium (Cr(VI)) results.The Limit of Reporting for Chromium (III) varies as a function of the test results.

CR-CR6-ED	Water	Chromium, Hexavalent (Cr +6)	APHA 3500-Cr C (Ion Chromatography)

Reference Information

This analysis is carried out using procedures adapted from method 3500-Cr C in "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1636 published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution.
Results are based on an un-filtered, field-preserved sample.

EC-PCT-VA Water Conductivity (Automated) APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA Water Conductivity Screen (Internal Use Only) APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water 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-VA 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-VA 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.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TSS-LOW-VA Water Total Suspended Solids by Grav. (1 mg/L) APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
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.

Reference Information

** 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
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

1 of 2 2 of 2

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.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2184945-COFC

COC Number: 15 -

Report To	Contact and company name below will appear on the final report
Company:	TECK Metals Ltd
Contact:	Michelle Unger
Phone:	250-4278422
	Company address below will appear on the final report
Street:	601 Knightton Road
City/Province:	Kimberly, BC
Postal Code:	V1A 3E1
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	
Contact:	

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: amacphail@accessconsulting.ca,mducharme@acc

Email 2: Michelle.unger@teck.com

Email 3:

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: Michelle.unger@teck.com

Email 2: roxanne.menear@teck.com

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 #:	Q62635	AFE/Cost Center:	PO#
Job #:	TECK-18-1	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)		ALS Contact: Can Dang	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 (low level) + Hg	Dissolved Metals (low level) +Hg	pH, SPC, alkalinity, hardness	Anions(Nitrate, Nitrite, Sulphate, Cl, F, Br)	Ammonia	TDS, TSS(low)	Chromium Speciation	Number of Containers
					P	F/P		P	P		P	
	MH-12 (LP)	18-Oct-18	14:00	Water	R	R	R	R	R	R	R	8
	MH-04 (LP)	19-Oct-18	15:10	Water	R	R	R	R	R	R	R	8
	MH-11 (LP)	20-Oct-18	10:45	Water	R	R	R	R	R	R	R	8
	MH-29 (LP)	20-Oct-18	11:05	Water	R	R	R	R	R	R	R	8
	MH-02 (LP)	18-Oct-18	16:25	Water	R	R	R	R	R	R	R	8
	MH-13 (LP)	21-Oct-18	12:22	Water	R	R	R	R	R	R	R	8
	MH-30 (LP)	21-Oct-18	11:40	Water	R	R	R	R	R	R	R	8
	MH-15 (LP)	21-Oct-18	9:05	Water	R	R	R	R	R	R	R	8
	MH-SW (LQR)	18-Oct-18	16:40	Water	R	R	R	R	R	R	R	8
	MH-FB (LQFB)	20-Oct-18	14:35	Water	R	R	R	R	R	R		7
	Trip Blank (LQTB)	n/a	n/a	Water	R	R	R	R	R	R		7
	SDH-S2 (LP)			Water	R	R	R	R	R	R	R	8

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	13	2/2	2		6

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Andrew MacPhail	Date: 22-Oct-18	Time: 13:00	Received by:	Date: OCT 22, 2018	Time: 13:02	Received by: HD	Date: 10/23	Time: 12:48P

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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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

L2184945-COFC

COC Number: 15 -

Report To	Contact and company name below will appear on the final report
Company:	TECK Metals Ltd
Contact:	Michelle Unger
Phone:	250-4278422
	Company address below will appear on the final report
Street:	601 Knightton Road
City/Province:	Kimberly, BC
Postal Code:	V1A 3E1
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	
Contact:	

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	scott@accessconsulting.ca, chenry@accessconsu
Email 2	amacphail@accessconsulting.ca,mducharme@acc
Email 3	Michelle.unger@teck.com

Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	Michelle.unger@teck.com
Email 2	roxanne.menear@teck.com

Project Information	
ALS Account # / Quote #:	Q62635
Job #:	TECK-18-1
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: Can Dang **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	Total Metals (low level) + Hg	Dissolved Metals (low level) +Hg	pH, SPC, alkalinity, hardness	Anions(Nitrate, Nitrite, Sulphate, Cl, F, Br)	Ammonia	TDS, TSS(low)	Chromium Speciation	Number of Containers
					P	F/P		P	P		P	
	MH-22 (LP)	19-Oct-18	11:25	Water	R	R	R	R	R	R	R	8
	TRIBEWF01 (LM)	21-Oct-18	11:00	Water	R	R	R	R	R	R	R	8
	TRIBEWF02 (LM)			Water	R	R	R	R	R	R	R	8
	TRIBEWF03 (LM)	21-Oct-18	10:05	Water	R	R	R	R	R	R	R	8
	PH-01 (LM)	19-Oct-18	16:10	Water	R	R	R	R	R	R	R	8
	CC-01 (LM)	19-Oct-18	15:30	Water	R	R	R	R	R	R	R	8
	MH-27 (LM)	20-Oct-18	11:38	Water	R	R	R	R	R	R	R	8
	MH-28 (LM)	20-Oct-18	12:16	Water	R	R	R	R	R	R	R	8
	MH-23 (LM)	18-Oct-18	15:55	Water	R	R	R	R	R	R	R	8
	NC-01 (LM)	18-Oct-18	14:25	Water	R	R	R	R	R	R	R	8
	NC-02 (LM)	18-Oct-18	12:40	Water	R	R	R	R	R	R	R	8
	MH-08 (LM)	19-Oct-18	12:30	Water	R	R	R	R	R	R	R	8

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

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Andrew MacPhail	Date: 22-Oct-18	Time: 13:00	Received by:	Date:	Time:	Received by: HA	Date: 10/23	Time: 12148

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.**

TECK METALS LTD.
ATTN: Michelle Unger
601 Knightton Road
KIMBERLEY BC V1A 3E1

Date Received: 22-OCT-18
Report Date: 31-OCT-18 18:34 (MT)
Version: FINAL

Client Phone: 250-427-8404

Certificate of Analysis

Lab Work Order #: L2184929

Project P.O. #: NOT SUBMITTED
Job Reference: TECK-18-01
C of C Numbers: 1 of 1
Legal Site Desc:

Can Dang
Senior Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2184929-1	L2184929-2	L2184929-3	L2184929-4	L2184929-5
	Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
	Sampled Date	20-OCT-18	18-OCT-18	19-OCT-18	20-OCT-18	19-OCT-18
	Sampled Time	16:20	17:30	10:53	13:05	14:40
	Client ID	MW13-01	MW13-04	MW13-06	MW13-07	MW13-08
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	305	326	657	478	544
	Hardness (as CaCO3) (mg/L)	167	183	351	244	330
	pH (pH)	8.15	8.27	7.95	8.23	8.00
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	158	182	209	232	306
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0183	0.0126	0.160	0.0118
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	0.57	<0.50
	Fluoride (F) (mg/L)	0.362	0.055	0.627	0.389	0.046
	Nitrate (as N) (mg/L)	0.360	0.981	<0.0050	<0.0050	0.289
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sulfate (SO4) (mg/L)	10.4	3.89	160	43.2	15.7
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0019	0.0037	0.0017	0.0023	0.0026
	Antimony (Sb)-Dissolved (mg/L)	0.00012	0.00026	0.00014	<0.00010	0.00018
	Arsenic (As)-Dissolved (mg/L)	0.00034	0.00079	0.0531	0.00320	0.00020
	Barium (Ba)-Dissolved (mg/L)	0.0215	0.0448	0.0244	0.0264	0.215
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	0.012	0.023	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	0.000669	0.000509	0.0000621	<0.0000050	0.0000645
	Calcium (Ca)-Dissolved (mg/L)	60.1	66.1	127	70.0	113
	Chromium (Cr)-Dissolved (mg/L)	0.00018	0.00029	0.00280	0.00014	0.00038
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	0.00291	0.00059	<0.00010
	Copper (Cu)-Dissolved (mg/L)	<0.00020	0.00092	0.00042	<0.00020	0.00033
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	0.674	2.32	<0.010
	Lead (Pb)-Dissolved (mg/L)	0.000942	0.000340	<0.000050	<0.000050	0.000119
	Lithium (Li)-Dissolved (mg/L)	0.0014	0.0016	0.0084	0.0080	0.0020
	Magnesium (Mg)-Dissolved (mg/L)	4.00	4.43	8.39	16.8	11.5
	Manganese (Mn)-Dissolved (mg/L)	0.00036	0.00061	0.351	1.03	<0.00030 DLB
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000557	0.000509	0.0411	0.00376	0.000576
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	0.0309	0.00223	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	0.171	0.095	<0.050
	Potassium (K)-Dissolved (mg/L)	0.65	0.56	2.01	3.31	0.70
	Selenium (Se)-Dissolved (mg/L)	0.00116	0.000792	<0.000050	0.000090	0.00200
	Silicon (Si)-Dissolved (mg/L)	3.35	3.56	15.6	7.19	3.92

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2184929-6	L2184929-7	L2184929-8	L2184929-9	L2184929-10
Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Sampled Date	19-OCT-18	20-OCT-18	20-OCT-18	20-OCT-18	20-OCT-18
Sampled Time	13:53	09:47	15:21	14:50	16:25
Client ID	MW13-10	MW13-13	MW14-01	MW14-04	MW-GW
Grouping / **Analyte**					
WATER					
Physical Tests					
Conductivity (uS/cm)	433	257	395	303	306
Hardness (as CaCO3) (mg/L)	251	131	226	173	169
pH (pH)	8.24	8.15	8.22	8.17	8.11
Anions and Nutrients					
Alkalinity, Total (as CaCO3) (mg/L)	212	105	233	226	159
Ammonia, Total (as N) (mg/L)	0.0057	0.0073	0.0251	0.0308	<0.0050
Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	0.54	<0.50
Fluoride (F) (mg/L)	0.058	0.164	0.141	0.073	0.355
Nitrate (as N) (mg/L)	0.539	0.951	0.225	0.0486	0.361
Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Sulfate (SO4) (mg/L)	34.9	33.3	3.98	4.58	10.4
Dissolved Metals					
Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved (mg/L)	0.0040	0.0180	0.0143	0.0053	0.0062
Antimony (Sb)-Dissolved (mg/L)	0.00012	0.00015	0.00016	0.00022	0.00013
Arsenic (As)-Dissolved (mg/L)	0.00112	0.00046	0.00032	0.00053	0.00040
Barium (Ba)-Dissolved (mg/L)	0.00786	0.0118	0.127	0.108	0.0214
Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved (mg/L)	0.0000156	0.000599	0.0000392	0.0000409	0.000616
Calcium (Ca)-Dissolved (mg/L)	86.2	49.2	72.5	57.9	60.9
Chromium (Cr)-Dissolved (mg/L)	0.00045	0.00024	0.00061	0.00034	0.00022
Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved (mg/L)	<0.00020	0.00049	0.00074	0.00099	<0.00020
Iron (Fe)-Dissolved (mg/L)	<0.010	0.022	0.028	<0.010	<0.010
Lead (Pb)-Dissolved (mg/L)	0.000209	0.000775	0.000160	0.000083	0.000984
Lithium (Li)-Dissolved (mg/L)	0.0016	<0.0010	<0.0010	0.0017	0.0016
Magnesium (Mg)-Dissolved (mg/L)	8.62	2.08	10.9	6.84	4.13
Manganese (Mn)-Dissolved (mg/L)	0.00038	0.00049	0.00108	0.00150	0.00079
Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)	0.00186	0.000450	0.00214	0.00406	0.000597
Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved (mg/L)	1.09	0.72	0.70	1.25	0.66
Selenium (Se)-Dissolved (mg/L)	0.00168	0.000714	0.00108	0.000203	0.00120
Silicon (Si)-Dissolved (mg/L)	3.83	2.48	4.49	3.36	3.34

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2184929-1	L2184929-2	L2184929-3	L2184929-4	L2184929-5
Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Sampled Date	20-OCT-18	18-OCT-18	19-OCT-18	20-OCT-18	19-OCT-18
Sampled Time	16:20	17:30	10:53	13:05	14:40
Client ID	MW13-01	MW13-04	MW13-06	MW13-07	MW13-08
Grouping / **Analyte**					
WATER					
Dissolved Metals					
Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved (mg/L)	0.820	1.02	10.8	12.7	1.09
Strontium (Sr)-Dissolved (mg/L)	0.167	0.156	0.385	0.481	0.341
Sulfur (S)-Dissolved (mg/L)	3.68	1.35	55.7	15.3	5.42
Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	0.000016	<0.000010	<0.000010
Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium (U)-Dissolved (mg/L)	0.000854	0.000752	0.0151	0.00712	0.00164
Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved (mg/L)	0.0241	0.0127	0.106	0.0026	<0.0010
Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Volatile Organic Compounds					
Benzene (mg/L)		<0.00050		<0.00050	
Ethylbenzene (mg/L)		<0.00050		<0.00050	
Methyl t-butyl ether (MTBE) (mg/L)		<0.00050		<0.00050	
Styrene (mg/L)		<0.00050		<0.00050	
Toluene (mg/L)		<0.00045		<0.00045	
ortho-Xylene (mg/L)		<0.00050		<0.00050	
meta- & para-Xylene (mg/L)		<0.00050		<0.00050	
Xylenes (mg/L)		<0.00075		<0.00075	
Surrogate: 4-Bromofluorobenzene (SS) (%)		88.1		85.0	
Surrogate: 1,4-Difluorobenzene (SS) (%)		101.8		102.4	
Hydrocarbons					
EPH10-19 (mg/L)		<0.25		<0.25	
EPH19-32 (mg/L)		<0.25		<0.25	
LEPH (mg/L)		<0.25		<0.25	
HEPH (mg/L)		<0.25		<0.25	
Volatile Hydrocarbons (VH6-10) (mg/L)		<0.10		<0.10	
VPH (C6-C10) (mg/L)		<0.10		<0.10	
Surrogate: 2-Bromobenzotrifluoride (%)		85.0		90.2	
Surrogate: 3,4-Dichlorotoluene (SS) (%)		101.2		68.7 SURR-ND	
Polycyclic Aromatic Hydrocarbons					
Acenaphthene (mg/L)		<0.000010		<0.000010	
Acenaphthylene (mg/L)		<0.000010		<0.000010	
Acridine (mg/L)		<0.000010		<0.000010	
Anthracene (mg/L)		<0.000010		<0.000010	
Benz(a)anthracene (mg/L)		<0.000010		<0.000010	
Benzo(a)pyrene (mg/L)		<0.0000050		<0.0000050	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2184929-6 Groundwater 19-OCT-18 13:53 MW13-10	L2184929-7 Groundwater 20-OCT-18 09:47 MW13-13	L2184929-8 Groundwater 20-OCT-18 15:21 MW14-01	L2184929-9 Groundwater 20-OCT-18 14:50 MW14-04	L2184929-10 Groundwater 20-OCT-18 16:25 MW-GW
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.89	0.637	1.42	1.59	0.813
	Strontium (Sr)-Dissolved (mg/L)	0.352	0.0850	0.234	0.205	0.180
	Sulfur (S)-Dissolved (mg/L)	12.0	10.9	1.47	1.64	3.53
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.0045 DLM	0.00053	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.00300	0.000642	0.000613	0.000542	0.000899
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0016	0.0124	<0.0010	0.0014	0.0223
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Volatile Organic Compounds	Benzene (mg/L)	<0.00050		<0.00050	<0.00050	
	Ethylbenzene (mg/L)	<0.00050		<0.00050	<0.00050	
	Methyl t-butyl ether (MTBE) (mg/L)	<0.00050		<0.00050	<0.00050	
	Styrene (mg/L)	<0.00050		<0.00050	<0.00050	
	Toluene (mg/L)	<0.00045		<0.00045	<0.00045	
	ortho-Xylene (mg/L)	<0.00050		<0.00050	<0.00050	
	meta- & para-Xylene (mg/L)	<0.00050		<0.00050	<0.00050	
	Xylenes (mg/L)	<0.00075		<0.00075	<0.00075	
	Surrogate: 4-Bromofluorobenzene (SS) (%)	92.8		94.2	92.9	
	Surrogate: 1,4-Difluorobenzene (SS) (%)	95.9		98.6	91.4	
Hydrocarbons	EPH10-19 (mg/L)	<0.25		<0.25	<0.25	
	EPH19-32 (mg/L)	<0.25		<0.25	<0.25	
	LEPH (mg/L)	<0.25		<0.25	<0.25	
	HEPH (mg/L)	<0.25		<0.25	<0.25	
	Volatile Hydrocarbons (VH6-10) (mg/L)	<0.10		<0.10	<0.10	
	VPH (C6-C10) (mg/L)	<0.10		<0.10	<0.10	
	Surrogate: 2-Bromobenzotrifluoride (%)	100.1		92.8	99.8	
	Surrogate: 3,4-Dichlorotoluene (SS) (%)	99.5		104.2	91.2	
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)	<0.000010		<0.000010	<0.000020 DLQ	
	Acenaphthylene (mg/L)	<0.000010		<0.000010	<0.000010	
	Acridine (mg/L)	<0.000010		<0.000010	<0.000010	
	Anthracene (mg/L)	<0.000010		<0.000010	<0.000010	
	Benz(a)anthracene (mg/L)	<0.000010		<0.000010	<0.000010	
	Benzo(a)pyrene (mg/L)	<0.0000050		<0.0000050	<0.0000050	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2184929-1	L2184929-2	L2184929-3	L2184929-4	L2184929-5
Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Sampled Date	20-OCT-18	18-OCT-18	19-OCT-18	20-OCT-18	19-OCT-18
Sampled Time	16:20	17:30	10:53	13:05	14:40
Client ID	MW13-01	MW13-04	MW13-06	MW13-07	MW13-08
Grouping / **Analyte**					
WATER					
Polycyclic Aromatic Hydrocarbons					
Benzo(b&j)fluoranthene (mg/L)		<0.000010		<0.000010	
Benzo(b+j+k)fluoranthene (mg/L)		<0.000015		<0.000015	
Benzo(g,h,i)perylene (mg/L)		<0.000010		<0.000010	
Benzo(k)fluoranthene (mg/L)		<0.000010		<0.000010	
Chrysene (mg/L)		<0.000010		<0.000010	
Dibenz(a,h)anthracene (mg/L)		<0.0000050		<0.0000050	
Fluoranthene (mg/L)		<0.000010		<0.000010	
Fluorene (mg/L)		<0.000010		<0.000010	
Indeno(1,2,3-c,d)pyrene (mg/L)		<0.000010		<0.000010	
1-Methylnaphthalene (mg/L)		<0.000050		<0.000050	
2-Methylnaphthalene (mg/L)		<0.000050		<0.000050	
Naphthalene (mg/L)		<0.000050		<0.000050	
Phenanthrene (mg/L)		<0.000020		<0.000020	
Pyrene (mg/L)		<0.000010		<0.000010	
Quinoline (mg/L)		<0.000050		<0.000050	
Surrogate: Acridine d9 (%)		77.9		90.1	
Surrogate: Chrysene d12 (%)		69.0		99.8	
Surrogate: Naphthalene d8 (%)		103.5		110.0	
Surrogate: Phenanthrene d10 (%)		76.2		95.1	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2184929-6 Groundwater 19-OCT-18 13:53 MW13-10	L2184929-7 Groundwater 20-OCT-18 09:47 MW13-13	L2184929-8 Groundwater 20-OCT-18 15:21 MW14-01	L2184929-9 Groundwater 20-OCT-18 14:50 MW14-04	L2184929-10 Groundwater 20-OCT-18 16:25 MW-GW
WATER						
Polycyclic Aromatic Hydrocarbons	Benzo(b&j)fluoranthene (mg/L)	<0.000010		<0.000010	<0.000010	
	Benzo(b+j+k)fluoranthene (mg/L)	<0.000015		<0.000015	<0.000015	
	Benzo(g,h,i)perylene (mg/L)	<0.000010		<0.000010	<0.000010	
	Benzo(k)fluoranthene (mg/L)	<0.000010		<0.000010	<0.000010	
	Chrysene (mg/L)	<0.000010		<0.000010	<0.000010	
	Dibenz(a,h)anthracene (mg/L)	<0.0000050		<0.0000050	<0.0000050	
	Fluoranthene (mg/L)	<0.000010		<0.000010	<0.000010	
	Fluorene (mg/L)	<0.000010		<0.000010	<0.000010	
	Indeno(1,2,3-c,d)pyrene (mg/L)	<0.000010		<0.000010	<0.000010	
	1-Methylnaphthalene (mg/L)	<0.000050		<0.000050	<0.000050	
	2-Methylnaphthalene (mg/L)	<0.000050		<0.000050	<0.000050	
	Naphthalene (mg/L)	<0.000050		<0.000050	<0.000050	
	Phenanthrene (mg/L)	<0.000020		<0.000020	<0.000020	
	Pyrene (mg/L)	<0.000010		<0.000010	<0.000010	
	Quinoline (mg/L)	<0.000050		<0.000050	<0.000050	
	Surrogate: Acridine d9 (%)	82.8		76.2	87.9	
	Surrogate: Chrysene d12 (%)	93.2		78.8	93.0	
	Surrogate: Naphthalene d8 (%)	109.2		101.1	118.6	
	Surrogate: Phenanthrene d10 (%)	92.2		86.9	99.9	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2184929-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2184929-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2184929-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2184929-1, -10, -2, -3, -4, -5, -6, -7, -8, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLB	Detection Limit Raised. Analyte detected at comparable level in Method Blank.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DLQ	Detection Limit raised due to co-eluting interference. GCMS qualifier ion ratio did not meet acceptance criteria.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
SURR-ND	Surrogate recovery marginally exceeded ALS DQO. Reported non-detect results for associated samples were deemed to be unaffected.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". 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.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

EPH-ME-FID-VA	Water	EPH in Water	BC Lab Manual

EPH is extracted from water using a hexane micro-extraction technique, with analysis by GC-FID, as per the BC Lab Manual. EPH results include PAHs and are therefore not equivalent to LEPH or HEPH.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

LEPH/HEPH-CALC-VA	Water	LEPHs and HEPHs	BC MOE LEPH/HEPH

LEPHw and HEPHw are measures of Light and Heavy Extractable Petroleum Hydrocarbons in water. Results are calculated by subtraction of applicable PAH concentrations from EPH10-19 and EPH19-32, as per the BC Lab Manual LEPH/HEPH calculation procedure.

LEPHw = EPH10-19 minus Acenaphthene, Acridine, Anthracene, Fluorene, Naphthalene and Phenanthrene.

HEPHw = EPH19-32 minus Benz(a)anthracene, Benzo(a)pyrene, Fluoranthene, and Pyrene.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Reference Information

NH3-F-VA	Water	Ammonia in Water 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-VA	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-VA	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.

PAH-ME-MS-VA	Water	PAHs in Water	EPA 3511/8270D (mod)

PAHs are extracted from water using a hexane micro-extraction technique, with analysis by GC/MS. Because the two isomers cannot be readily separated chromatographically, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

VH-HSFID-VA	Water	VH in Water by Headspace GCFID	BC Env. Lab Manual (VH in Water)

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Compounds eluting between n-hexane and n-decane are measured and summed together using flame-ionization detection.

VH-SURR-FID-VA	Water	VH Surrogates for Waters	BC Env. Lab Manual (VH in Solids)
VOC7-HSMS-VA	Water	BTEX/MTBE/Styrene by Headspace GCMS	EPA 5021A/8260C

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

VOC7/VOC-SURR-MS-VA	Water	VOC7 and/or VOC Surrogates for Waters	EPA 5035A/5021A/8260C
VPH-CALC-VA	Water	VPH is VH minus select aromatics	BC MOE VPH

VPHw measures Volatile Petroleum Hydrocarbons in water. Results are calculated by subtraction of specific Monocyclic Aromatic Hydrocarbons from VH6-10, as per the BC Lab Manual VPH calculation procedure.
VPHw = VH6-10 minus Benzene, Toluene, Ethylbenzene, Xylenes, and Styrene

XYLENES-CALC-VA	Water	Sum of Xylene Isomer Concentrations	CALCULATION

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** 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
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

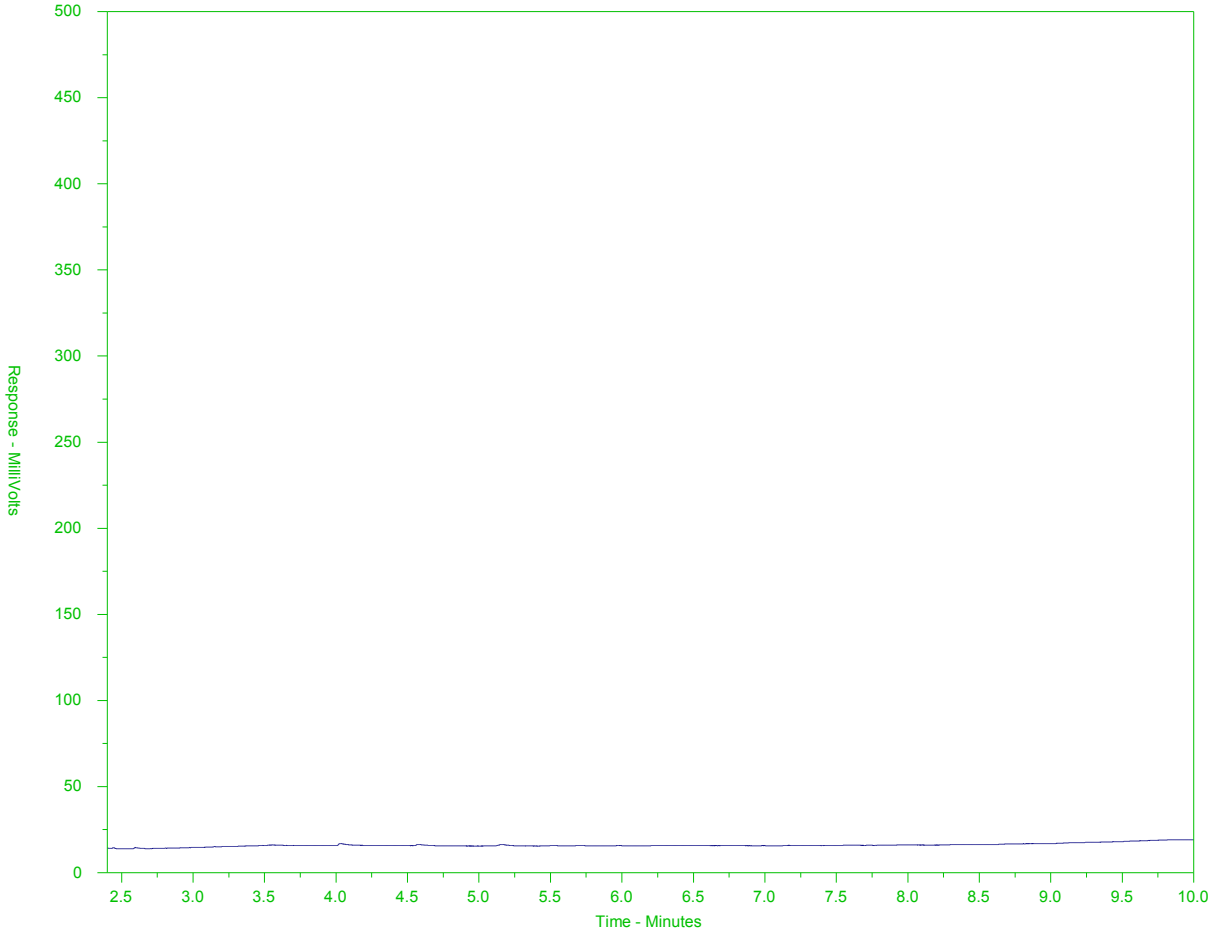
GLOSSARY OF REPORT TERMS

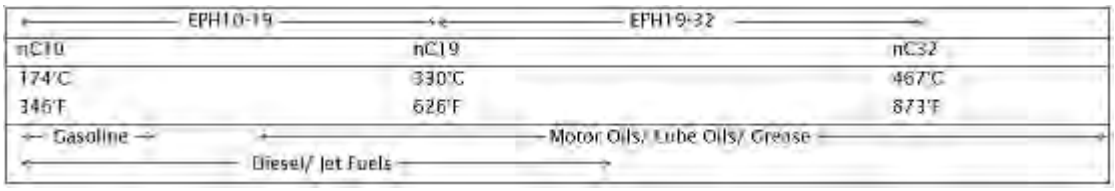
Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - 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.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2184929-2
Client Sample ID: MW13-04





The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

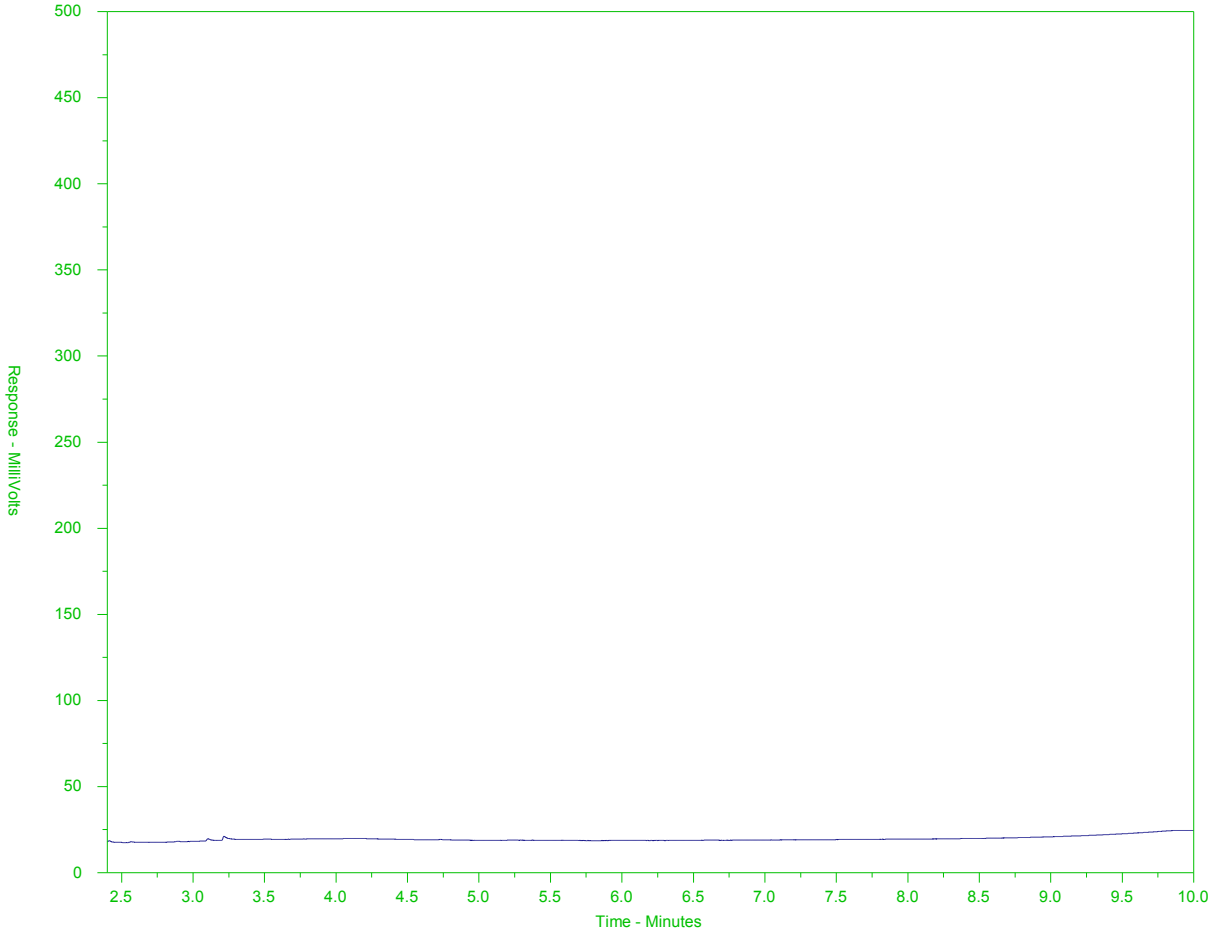
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

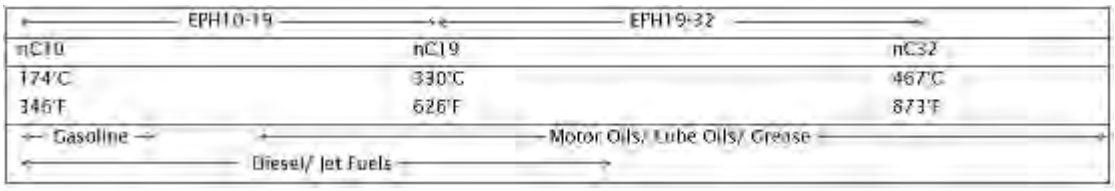
A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2184929-4
Client Sample ID: MW13-07





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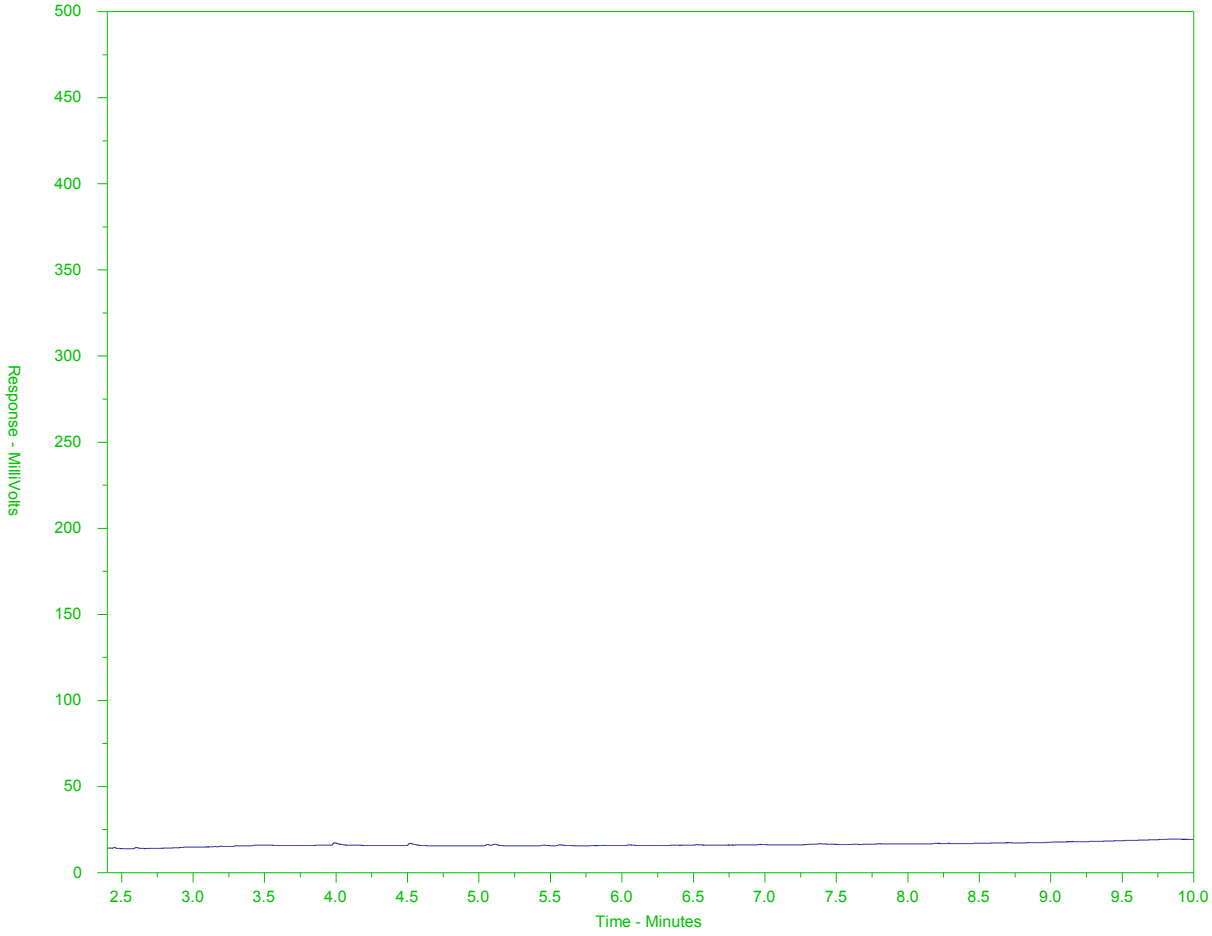
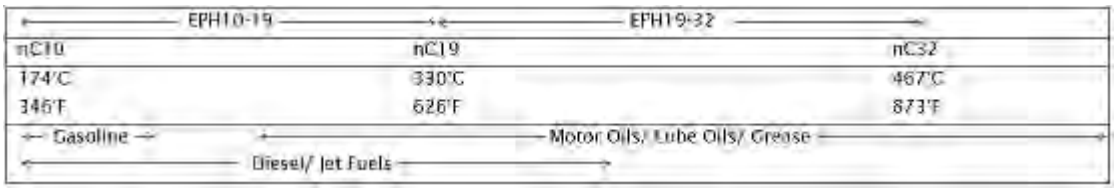
BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2184929-6
Client Sample ID: MW13-10





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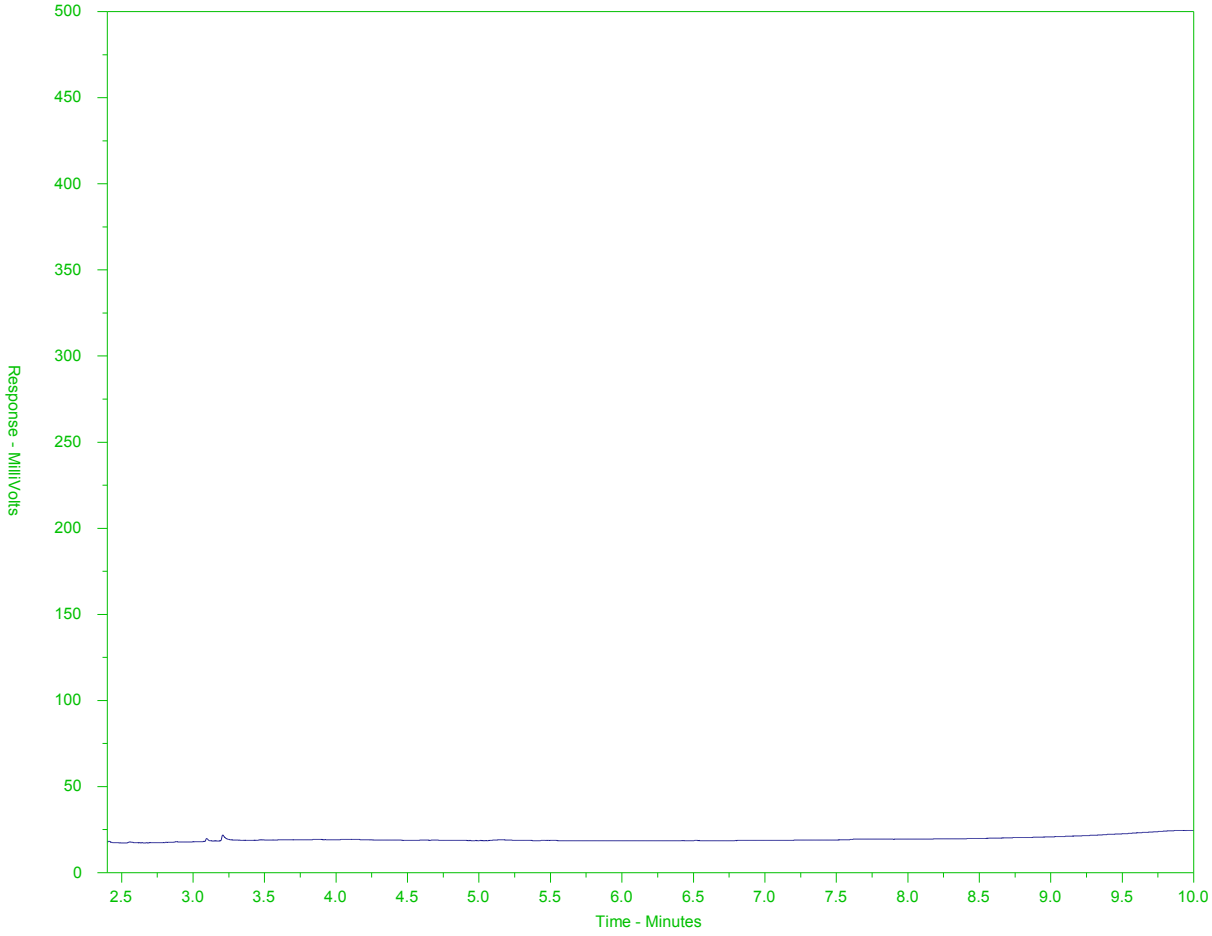
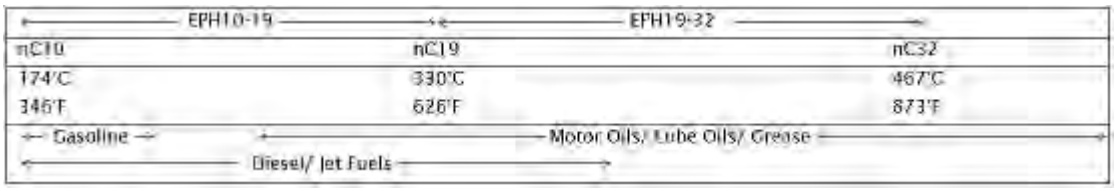
Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2184929-8
Client Sample ID: MW14-01





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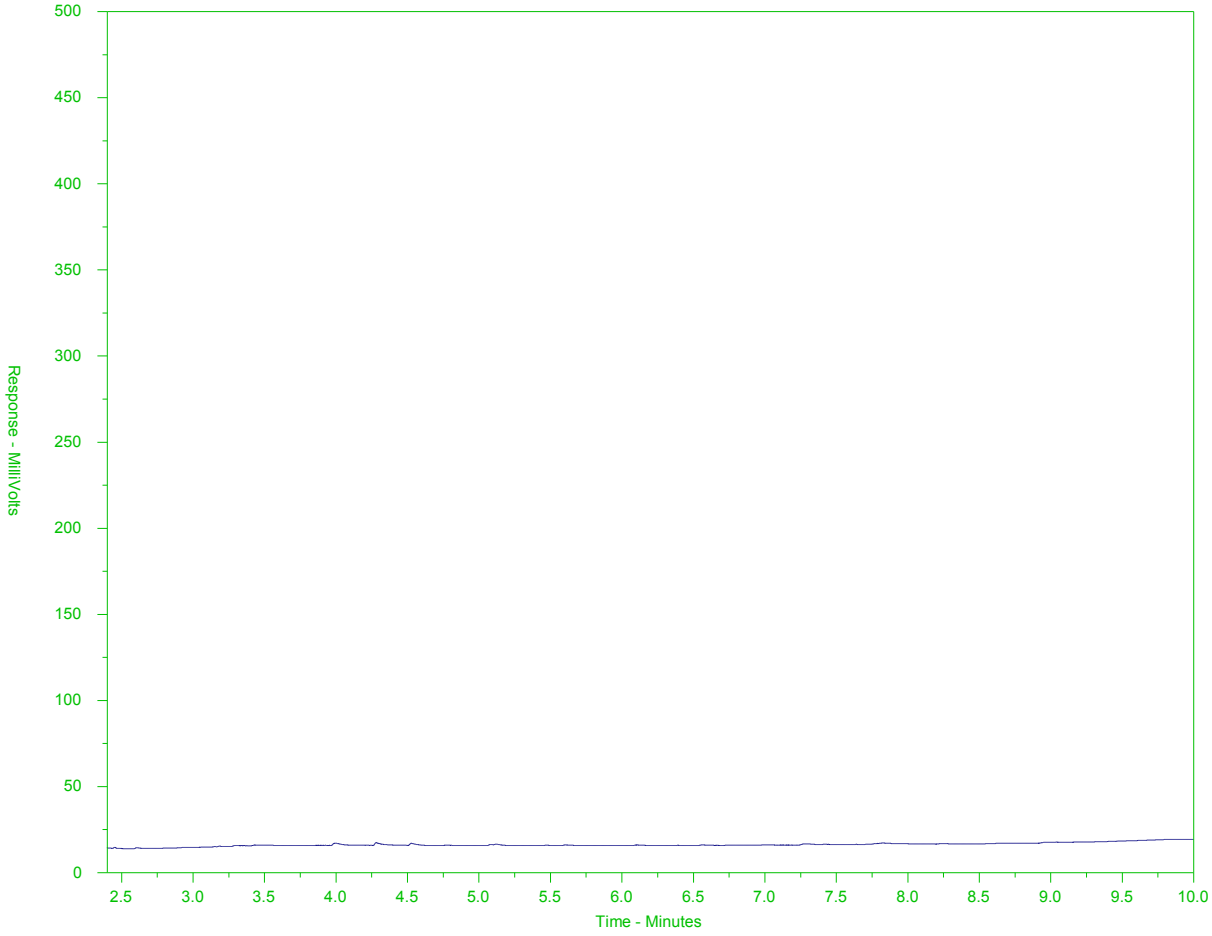
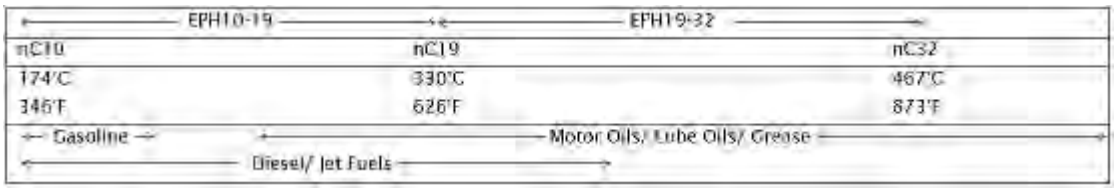
Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2184929-9
Client Sample ID: MW14-04





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ALS Environmental

Chain of Custody / Analy
Canada Toll Free: 1
www.alsglob

L2184929-COFC

COC #

Page 1 of 1

Report To		Report Format / Distribution	Service Requested (Rush for routine analysis subject to availability)
Company:	TECK Metals Ltd	☑ Standard ☐ Other	◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Michelle Unger	☑ PDF ☑ Excel ☑ Digital ☐ Fax	○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	601 Knightton Road	Email 1: amacphail@accessconsulting.ca, marieducharme	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Kimberly, BC	Email 2: michelle.unger@teck.com	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	250-427-8422 Fax:	Email 3:	
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information	
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #: TECK-18-01	
Company:		PO / AFE:	
Contact:		LSD:	
Address:			
Phone:		Quote #: Q62635	

Lab Work Order # (lab use only):

ALS Contact: Can Dang Sampler: A. MacPhail

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	pH, SPC, alkalinity, hardness	dissolved metals low level +Hg	Anions (nitrate, nitrite, sulphate, Cl, F, Br)	Ammonia	BTEX, LEPH, HEPH	VPH, PAH	Number of Containers
						F/P		P	P	P	
	MW13-01 (LP)	20-Oct-18	16:20	Groundwater	X	X	X	X			
	MW13-04 (LP)	18-Oct-18	17:30	Groundwater	X	X	X	X	X	X	
	MW13-05 (LP)			Groundwater	X	X	X	X	X	X	
	MW13-06 (LP)	19-Oct-18	10:53	Groundwater	X	X	X	X			
	MW13-07 (LP)	20-Oct-18	13:05	Groundwater	X	X	X	X	X	X	
	MW13-08 (LP)	19-Oct-18	14:40	Groundwater	X	X	X	X			
	MW13-10 (LP)	19-Oct-18	13:53	Groundwater	X	X	X	X	X	X	
	MW13-13 (LP)	19-Oct-18	9:47	Groundwater	X	X	X	X			
	MW14-01 (LP)	18-Oct-18	15:21	Groundwater	X	X	X	X	X	X	
	MW14-02 (LP)			Groundwater	X	X	X	X	X	X	
	MW14-03 (LP)			Groundwater	X	X	X	X	X	X	
	MW14-04 (LP)	19-Oct-18	14:50	Groundwater	X	X	X	X	X	X	
	MW-GW (LQR)	20-Oct-18	16:25	Groundwater	X	X	X	X	X	X	

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Yukon EQWin and ACC200 digital formats. **General A:** pH, EC, TSS (low) **General B:** pH, EC, TSS (low), anions-all
General C: pH, EC, TSS (low), anions-all, ion balance, alkalinity **General D:** pH, EC, TSS (low), SO4, ion balance, alkalinity **General E:** pH, EC, TSS (low), SO4, ion balance

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: Andrew MacPhail	Date (dd-mmm-yy): 22-Oct-18	Time (hh-mm): 13:00	Received by:	Date: oct 22/18	Time: 13:02	Temperature: 2°/3 °C	Verified by:	Date:	Time:	Obse Observations: Yes , Yes / No ? If Ye If Yes add SIF

GENF 20.00 Front

TECK METALS LTD.
ATTN: Michelle Unger
601 Knightton Road
KIMBERLEY BC V1A 3E1

Date Received: 06-DEC-18
Report Date: 18-DEC-18 18:17 (MT)
Version: FINAL

Client Phone: 250-427-8404

Certificate of Analysis

Lab Work Order #: L2206836

Project P.O. #: NOT SUBMITTED
Job Reference: TECK-18-1
C of C Numbers: 1 of 3, 2 of 3, 3 of 3
Legal Site Desc:

Can Dang
Senior Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2206836-1 Water 01-DEC-18 16:55 MH-12 (LP)	L2206836-2 Water 02-DEC-18 15:03 MH-04 (LP)	L2206836-3 Water 03-DEC-18 12:33 MH-11 (LP)	L2206836-4 Water 03-DEC-18 13:05 MH-29 (LP)	L2206836-5 Water 03-DEC-18 15:52 MH-02 (LP)
WATER						
Physical Tests	Conductivity (uS/cm)	322	302	382	340	1050
	Hardness (as CaCO3) (mg/L)	153	163	207	186	572
	pH (pH)	8.30	8.29	8.30	8.31	8.02
	Total Suspended Solids (mg/L)	1.3	1.5	<1.0	<1.0	18.1
	Total Dissolved Solids (mg/L)	209	197	234	216	784
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	165	152	201	191	300
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	0.0059
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.25 DLDS
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<2.5 DLDS
	Fluoride (F) (mg/L)	0.112	0.149	0.088	0.051	<0.10 DLDS
	Nitrate (as N) (mg/L)	0.103	0.243	0.125	0.103	<0.025 DLDS
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	0.0052
	Sulfate (SO4) (mg/L)	10.9	15.7	14.4	4.61	317
Total Metals	Aluminum (Al)-Total (mg/L)	0.0042	0.0047	0.0046	0.0061	0.166
	Antimony (Sb)-Total (mg/L)	0.00020	0.00015	0.00013	0.00016	0.00011
	Arsenic (As)-Total (mg/L)	0.00065	0.00037	0.00044	0.00047	0.00323
	Barium (Ba)-Total (mg/L)	0.0704	0.0221	0.0640	0.0459	0.0644
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.0000363	0.000260	0.0000435	0.0000424	0.000104
	Calcium (Ca)-Total (mg/L)	60.5	61.2	71.9	67.6	219
	Chromium (Cr)-Total (mg/L)	<0.00030 DLB	<0.00040 DLB	<0.00020 DLB	<0.00010	0.00033
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00120
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	0.00059
	Iron (Fe)-Total (mg/L)	<0.010	<0.010	<0.040 DLB	0.018	1.11
	Lead (Pb)-Total (mg/L)	0.000086	0.000190	0.000104	<0.000050	0.00938
	Lithium (Li)-Total (mg/L)	0.0013	0.0015	0.0016	0.0013	0.0016
	Magnesium (Mg)-Total (mg/L)	6.32	3.39	8.20	5.96	20.5
	Manganese (Mn)-Total (mg/L)	<0.00040 DLB	<0.00070 DLB	0.00806	0.00362	0.858
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.000025 DLM
	Molybdenum (Mo)-Total (mg/L)	0.00131	0.000727	0.000832	0.000591	0.000217
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	0.00079
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.40	0.39	0.38	0.23	1.46
	Selenium (Se)-Total (mg/L)	0.000716	0.00105	0.000734	0.000667	0.000098
	Silicon (Si)-Total (mg/L)	3.78	3.26	3.64	3.69	5.21

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2206836-6 Water 04-DEC-18 13:33 MH-13 (LP)	L2206836-7 Water 04-DEC-18 13:00 MH-30 (LP)	L2206836-8 Water 04-DEC-18 09:52 MH-15 (LP)	L2206836-9 Water 03-DEC-18 12:40 MH-SW (LQR)	L2206836-10 Water 05-DEC-18 10:50 MH-FB (LQTB)
WATER						
Physical Tests	Conductivity (uS/cm)	359	297	372	383	<2.0
	Hardness (as CaCO3) (mg/L)	197	161	211	208	<0.50
	pH (pH)	8.28	8.15	8.25	8.31	5.44
	Total Suspended Solids (mg/L)	<1.0	1.3	3.9	<1.0	<1.0
	Total Dissolved Solids (mg/L)	235	176	228	234	<10
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	201	161	207	197	<1.0
	Ammonia, Total (as N) (mg/L)	0.0070	0.0162	0.0088	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.058	0.050	0.091	0.087	<0.020
	Nitrate (as N) (mg/L)	0.0886	0.0437	0.0585	0.125	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sulfate (SO4) (mg/L)	8.57	5.08	3.88	14.5	<0.30
Total Metals	Aluminum (Al)-Total (mg/L)	0.0062	0.0069	0.0046	0.0038	<0.0030
	Antimony (Sb)-Total (mg/L)	0.00011	<0.00010	0.00012	0.00013	<0.00010
	Arsenic (As)-Total (mg/L)	0.00034	0.00024	0.00030	0.00044	<0.00010
	Barium (Ba)-Total (mg/L)	0.153	0.208	0.193	0.0620	<0.00010
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.0000166	0.0000273	0.0000059	0.0000366	<0.0000050
	Calcium (Ca)-Total (mg/L)	58.6	42.4	62.8	71.4	<0.050
	Chromium (Cr)-Total (mg/L)	<0.00030 DLB	<0.00020 DLB	<0.00020 DLB	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.172	0.458	0.184	<0.040 DLB	<0.010
	Lead (Pb)-Total (mg/L)	0.000161	0.000142	<0.000050	0.000099	<0.000050
	Lithium (Li)-Total (mg/L)	0.0011	<0.0010	0.0012	0.0016	<0.0010
	Magnesium (Mg)-Total (mg/L)	15.5	15.4	14.4	8.19	<0.10
	Manganese (Mn)-Total (mg/L)	0.00952	0.0251	0.0161	0.00797	<0.00010
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.00103	0.00139	0.00196	0.000818	<0.000050
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.40	0.33	0.38	0.39	<0.10
	Selenium (Se)-Total (mg/L)	0.000681	0.000488	0.000668	0.000706	<0.000050
	Silicon (Si)-Total (mg/L)	3.27	3.23	4.13	3.62	<0.10

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2206836-11	L2206836-12	L2206836-13	L2206836-14	L2206836-15
Description	Water	Water	Water	Water	Water
Sampled Date		02-DEC-18	04-DEC-18	04-DEC-18	02-DEC-18
Sampled Time		13:55	12:25	11:15	16:16
Client ID	TRIP BLANK (LQTB)	MH-22 (LP)	TRIBEWF01 (LM)	TRIBEWF03 (LM)	PH-01 (LM)
Grouping / **Analyte**					
WATER					
Physical Tests					
Conductivity (uS/cm)	<2.0	299	389	355	312
Hardness (as CaCO3) (mg/L)	<0.50 HTC	149	208	200	173
pH (pH)	5.49	8.18	8.14	8.32	8.25
Total Suspended Solids (mg/L)	<1.0	<1.0	4.5	6.7	<1.0
Total Dissolved Solids (mg/L)	<10	183	251	218	203
Anions and Nutrients					
Alkalinity, Total (as CaCO3) (mg/L)	<1.0	115	221	206	138
Ammonia, Total (as N) (mg/L)	<0.010 RRV	<0.0050	0.0531	0.0131	0.0065
Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
Fluoride (F) (mg/L)	<0.020	1.31	0.081	0.090	0.233
Nitrate (as N) (mg/L)	<0.0050	0.133	0.0076	0.0659	0.439
Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Sulfate (SO4) (mg/L)	<0.30	42.4	2.39	3.60	30.2
Total Metals					
Aluminum (Al)-Total (mg/L)	<0.0030	<0.0030	0.0084	0.0101	<0.0030
Antimony (Sb)-Total (mg/L)	<0.00010	0.00267	<0.00010	0.00014	0.00014
Arsenic (As)-Total (mg/L)	<0.00010	0.00363	0.00275	0.00050	0.00062
Barium (Ba)-Total (mg/L)	<0.00010	0.0159	0.199	0.207	0.0176
Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Total (mg/L)	<0.0000050	0.00442	0.0000072	0.0000196	0.000737
Calcium (Ca)-Total (mg/L)	<0.050	49.8	65.5	60.4	58.9
Chromium (Cr)-Total (mg/L)	0.00020 RRV	<0.00020 DLB	<0.00010	<0.00020 DLB	0.00018
Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	0.00021	<0.00010	<0.00010
Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron (Fe)-Total (mg/L)	<0.010	<0.010	1.71	0.413	<0.010
Lead (Pb)-Total (mg/L)	<0.000050	0.000380	0.000053	<0.000050	0.00113
Lithium (Li)-Total (mg/L)	<0.0010	0.0058	0.0012	0.0012	0.0020
Magnesium (Mg)-Total (mg/L)	<0.10	6.74	13.3	13.3	4.09
Manganese (Mn)-Total (mg/L)	<0.00010	<0.00020 DLB	0.130	0.0251	<0.00010
Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Total (mg/L)	<0.000050	0.00920	0.00113	0.00214	0.00104
Nickel (Ni)-Total (mg/L)	<0.00050	0.00340	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Total (mg/L)	<0.10	0.59	0.36	0.40	0.57
Selenium (Se)-Total (mg/L)	<0.000050	0.0156	0.000300	0.000720	0.00193
Silicon (Si)-Total (mg/L)	<0.10	4.38	5.59	4.14	3.31

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2206836-16	L2206836-17	L2206836-18	L2206836-19	L2206836-20
Description	Water	Water	Water	Water	Water
Sampled Date	02-DEC-18	03-DEC-18	03-DEC-18	02-DEC-18	02-DEC-18
Sampled Time	15:54	14:07	14:43	12:03	11:23
Client ID	CC-01 (LM)	MH-27 (LM)	MH-28 (LM)	MH-23 (LM)	NC-01 (LM)
Grouping / **Analyte**					
WATER					
Physical Tests					
Conductivity (uS/cm)	255	390	379	279	321
Hardness (as CaCO3) (mg/L)	143	218	213	156	183
pH (pH)	8.30	8.32	8.35	8.30	8.36
Total Suspended Solids (mg/L)	2.5	1.3	<1.0	<1.0	1.0
Total Dissolved Solids (mg/L)	174	238	239	172	200
Anions and Nutrients					
Alkalinity, Total (as CaCO3) (mg/L)	133	201	195	150	169
Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	0.0061	<0.0050	<0.0050
Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
Fluoride (F) (mg/L)	0.060	0.099	0.116	0.129	0.111
Nitrate (as N) (mg/L)	0.129	0.144	0.174	0.0863	0.109
Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Sulfate (SO4) (mg/L)	9.19	18.1	17.8	5.13	10.9
Total Metals					
Aluminum (Al)-Total (mg/L)	0.0139	0.0048	0.0141	0.0144	0.0100
Antimony (Sb)-Total (mg/L)	0.00014	0.00014	0.00013	0.00021	0.00020
Arsenic (As)-Total (mg/L)	0.00048	0.00041	0.00040	0.00091	0.00076
Barium (Ba)-Total (mg/L)	0.0106	0.0649	0.0562	0.0629	0.0731
Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Total (mg/L)	0.000101	0.0000469	0.0000804	0.0000442	0.0000374
Calcium (Ca)-Total (mg/L)	50.9	74.6	73.1	50.3	60.9
Chromium (Cr)-Total (mg/L)	<0.00030 DLB	<0.00010	<0.00010	<0.00020 DLB	0.00018
Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron (Fe)-Total (mg/L)	<0.020 DLB	<0.070 DLB	0.139	<0.040 DLB	0.012
Lead (Pb)-Total (mg/L)	0.000904	0.000170	0.000674	0.000849	0.000270
Lithium (Li)-Total (mg/L)	0.0012	0.0016	0.0015	0.0014	0.0014
Magnesium (Mg)-Total (mg/L)	2.21	8.34	6.38	5.77	6.70
Manganese (Mn)-Total (mg/L)	<0.00090 DLB	0.0160	0.0270	0.0106	0.00115
Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Total (mg/L)	0.000699	0.000861	0.000827	0.00126	0.00131
Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Total (mg/L)	0.33	0.48	0.52	0.33	0.42
Selenium (Se)-Total (mg/L)	0.000335	0.000755	0.000817	0.000730	0.000814
Silicon (Si)-Total (mg/L)	2.62	3.75	3.63	4.07	3.93

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2206836-21	L2206836-22	L2206836-23	L2206836-24	L2206836-25
Description	Water	Water	Water	Water	Water
Sampled Date	01-DEC-18	02-DEC-18	05-DEC-18	05-DEC-18	03-DEC-18
Sampled Time	16:15	14:30	09:56	10:39	16:48
Client ID	NC-02 (LM)	MH-08 (LM)	MW13-01 (LP)	MW13-04 (LP)	MW13-13 (LP)
Grouping / **Analyte**					
WATER					
Physical Tests					
Conductivity (uS/cm)	330	253	302	310	246
Hardness (as CaCO3) (mg/L)	199	147	172	196	140
pH (pH)	8.03	8.21	7.76	8.05	7.96
Total Suspended Solids (mg/L)	<1.0	<1.0			
Total Dissolved Solids (mg/L)	212	158			
Anions and Nutrients					
Alkalinity, Total (as CaCO3) (mg/L)	159	133	149	167	107
Ammonia, Total (as N) (mg/L)	0.0080	<0.0050	<0.0050	0.0167	0.0325
Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
Fluoride (F) (mg/L)	0.105	0.307	0.348	0.052	0.159
Nitrate (as N) (mg/L)	<0.0050	0.105	0.385	0.924	0.764
Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Sulfate (SO4) (mg/L)	10.5	5.27	10.7	4.41	20.9
Total Metals					
Aluminum (Al)-Total (mg/L)	0.0065	0.0058			
Antimony (Sb)-Total (mg/L)	0.00014	0.00041			
Arsenic (As)-Total (mg/L)	0.00065	0.00234			
Barium (Ba)-Total (mg/L)	0.0748	0.0383			
Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020			
Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050			
Boron (B)-Total (mg/L)	<0.010	<0.010			
Cadmium (Cd)-Total (mg/L)	0.0000226	0.0000757			
Calcium (Ca)-Total (mg/L)	66.0	48.0			
Chromium (Cr)-Total (mg/L)	<0.00010	0.00075			
Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010			
Copper (Cu)-Total (mg/L)	<0.00050	<0.00050			
Iron (Fe)-Total (mg/L)	0.277	<0.010			
Lead (Pb)-Total (mg/L)	0.000505	<0.000050			
Lithium (Li)-Total (mg/L)	0.0012	0.0028			
Magnesium (Mg)-Total (mg/L)	6.82	5.32			
Manganese (Mn)-Total (mg/L)	0.154	0.00038			
Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050			
Molybdenum (Mo)-Total (mg/L)	0.000800	0.000719			
Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050			
Phosphorus (P)-Total (mg/L)	<0.050	<0.050			
Potassium (K)-Total (mg/L)	0.61	0.47			
Selenium (Se)-Total (mg/L)	0.000266	0.00196			
Silicon (Si)-Total (mg/L)	4.18	5.65			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2206836-26				
	Description	Water				
	Sampled Date	05-DEC-18				
	Sampled Time	10:00				
	Client ID	MWGW (LQR)				
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	303				
	Hardness (as CaCO3) (mg/L)	176				
	pH (pH)	7.79				
	Total Suspended Solids (mg/L)					
	Total Dissolved Solids (mg/L)					
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	152				
	Ammonia, Total (as N) (mg/L)	<0.0050				
	Bromide (Br) (mg/L)	<0.050				
	Chloride (Cl) (mg/L)	<0.50				
	Fluoride (F) (mg/L)	0.340				
	Nitrate (as N) (mg/L)	0.394				
	Nitrite (as N) (mg/L)	<0.0010				
	Sulfate (SO4) (mg/L)	10.7				
Total Metals	Aluminum (Al)-Total (mg/L)					
	Antimony (Sb)-Total (mg/L)					
	Arsenic (As)-Total (mg/L)					
	Barium (Ba)-Total (mg/L)					
	Beryllium (Be)-Total (mg/L)					
	Bismuth (Bi)-Total (mg/L)					
	Boron (B)-Total (mg/L)					
	Cadmium (Cd)-Total (mg/L)					
	Calcium (Ca)-Total (mg/L)					
	Chromium (Cr)-Total (mg/L)					
	Cobalt (Co)-Total (mg/L)					
	Copper (Cu)-Total (mg/L)					
	Iron (Fe)-Total (mg/L)					
	Lead (Pb)-Total (mg/L)					
	Lithium (Li)-Total (mg/L)					
	Magnesium (Mg)-Total (mg/L)					
	Manganese (Mn)-Total (mg/L)					
	Mercury (Hg)-Total (mg/L)					
	Molybdenum (Mo)-Total (mg/L)					
	Nickel (Ni)-Total (mg/L)					
	Phosphorus (P)-Total (mg/L)					
	Potassium (K)-Total (mg/L)					
	Selenium (Se)-Total (mg/L)					
	Silicon (Si)-Total (mg/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2206836-1	L2206836-2	L2206836-3	L2206836-4	L2206836-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	01-DEC-18	02-DEC-18	03-DEC-18	03-DEC-18	03-DEC-18
	Sampled Time	16:55	15:03	12:33	13:05	15:52
	Client ID	MH-12 (LP)	MH-04 (LP)	MH-11 (LP)	MH-29 (LP)	MH-02 (LP)
Grouping	**Analyte**					
WATER						
Total Metals	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	0.000017
	Sodium (Na)-Total (mg/L)	0.981	0.831	1.15	0.885	10.8
	Strontium (Sr)-Total (mg/L)	0.217	0.210	0.278	0.229	0.705
	Sulfur (S)-Total (mg/L)	4.04	5.96	5.44	1.87	120
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	0.00313
	Uranium (U)-Total (mg/L)	0.00104	0.000909	0.00115	0.000733	0.00214
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0060 DLB	<0.012 DLB	<0.0090 DLB	<0.0030	0.0360
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0013	0.0013	0.0016	0.0017	<0.0010
	Antimony (Sb)-Dissolved (mg/L)	0.00015	<0.00010	0.00010	0.00012	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00053	0.00034	0.00036	0.00046	0.00054
	Barium (Ba)-Dissolved (mg/L)	0.0713	0.0248	0.0705	0.0515	0.0550
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	0.0000343	0.000249	0.0000360	0.0000380	0.0000137
	Calcium (Ca)-Dissolved (mg/L)	52.1	59.6	69.6	65.2	200
	Chromium (Cr)-Dissolved (mg/L)	0.00012	0.00011	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00057
	Copper (Cu)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	0.00023	<0.00020
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	0.015	0.019	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0013	0.0015	0.0016	0.0013	0.0012
	Magnesium (Mg)-Dissolved (mg/L)	5.57	3.32	7.96	5.69	17.8
	Manganese (Mn)-Dissolved (mg/L)	<0.00010	0.00023	0.00714	0.00231	0.109
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.00110	0.000687	0.000811	0.000559	0.000150
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.38	0.39	0.40	0.23	1.33
	Selenium (Se)-Dissolved (mg/L)	0.000854	0.000802	0.000701	0.000593	<0.000050
	Silicon (Si)-Dissolved (mg/L)	3.36	3.20	3.78	3.68	4.80

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2206836-6	L2206836-7	L2206836-8	L2206836-9	L2206836-10
Description	Water	Water	Water	Water	Water
Sampled Date	04-DEC-18	04-DEC-18	04-DEC-18	03-DEC-18	05-DEC-18
Sampled Time	13:33	13:00	09:52	12:40	10:50
Client ID	MH-13 (LP)	MH-30 (LP)	MH-15 (LP)	MH-SW (LQR)	MH-FB (LQTB)
Grouping / **Analyte**					
WATER					
Total Metals Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total (mg/L)	1.00	0.720	1.06	1.13	<0.050
Strontium (Sr)-Total (mg/L)	0.201	0.115	0.191	0.272	<0.00020
Sulfur (S)-Total (mg/L)	3.58	2.14	1.71	5.40	<0.50
Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium (U)-Total (mg/L)	0.00141	0.00130	0.000888	0.00120	<0.000010
Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total (mg/L)	<0.0060 DLB	<0.0060 DLB	<0.0030	<0.0060 DLB	<0.0030
Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved (mg/L)	0.0011	0.0017	0.0010	0.0013	<0.0010
Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	0.00033 DTMF	0.00011	<0.00010
Arsenic (As)-Dissolved (mg/L)	0.00019	0.00017	0.00018	0.00035	<0.00010
Barium (Ba)-Dissolved (mg/L)	0.151	0.208	0.201	0.0703	0.00025 RRV
Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved (mg/L)	0.0000117	0.0000202	0.0000054	0.0000368	<0.0000050
Calcium (Ca)-Dissolved (mg/L)	56.2	41.0	62.3	70.5	<0.050
Chromium (Cr)-Dissolved (mg/L)	0.00016	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved (mg/L)	0.00021	0.00026	<0.00020	<0.00020	<0.00020
Iron (Fe)-Dissolved (mg/L)	0.018	0.154	0.032	0.016	<0.010
Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Dissolved (mg/L)	0.0012	<0.0010	0.0013	0.0016	<0.0010
Magnesium (Mg)-Dissolved (mg/L)	13.7	14.2	13.5	7.84	<0.10
Manganese (Mn)-Dissolved (mg/L)	0.00645	0.0236	0.0126	0.00712	<0.00010
Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)	0.000947	0.00123	0.00191	0.000799	<0.000050
Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved (mg/L)	0.38	0.35	0.40	0.38	<0.10
Selenium (Se)-Dissolved (mg/L)	0.000616	0.000424	0.000642	0.000637	<0.000050
Silicon (Si)-Dissolved (mg/L)	3.35	3.23	4.27	3.70	<0.050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2206836-11	L2206836-12	L2206836-13	L2206836-14	L2206836-15
Description	Water	Water	Water	Water	Water
Sampled Date		02-DEC-18	04-DEC-18	04-DEC-18	02-DEC-18
Sampled Time		13:55	12:25	11:15	16:16
Client ID	TRIP BLANK (LQTB)	MH-22 (LP)	TRIBEWF01 (LM)	TRIBEWF03 (LM)	PH-01 (LM)
Grouping / **Analyte**					
WATER					
Total Metals Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total (mg/L)	<0.050	0.809	1.10	1.04	0.748
Strontium (Sr)-Total (mg/L)	<0.00020	0.257	0.204	0.185	0.154
Sulfur (S)-Total (mg/L)	<0.50	14.7	1.11	1.55	10.7
Thallium (Tl)-Total (mg/L)	<0.000010	0.000016	<0.000010	<0.000010	<0.000010
Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium (U)-Total (mg/L)	<0.000010	0.00380	0.000573	0.000963	0.00105
Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total (mg/L)	<0.0030	0.783	<0.0030	<0.0030	0.0128
Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals Dissolved Mercury Filtration Location		FIELD	FIELD	FIELD	FIELD
Dissolved Metals Filtration Location		FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved (mg/L)		<0.0010	<0.0010	0.0012	0.0010
Antimony (Sb)-Dissolved (mg/L)		0.00249	<0.00010	0.00012	0.00014
Arsenic (As)-Dissolved (mg/L)		0.00331	0.00128	0.00026	0.00055
Barium (Ba)-Dissolved (mg/L)		0.0176	0.182	0.199	0.0195
Beryllium (Be)-Dissolved (mg/L)		<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Dissolved (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved (mg/L)		<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved (mg/L)		0.00430	0.0000090	0.0000103	0.000741
Calcium (Ca)-Dissolved (mg/L)		49.4	63.5	59.8	62.6
Chromium (Cr)-Dissolved (mg/L)		<0.00010	<0.00010	0.00012	0.00019
Cobalt (Co)-Dissolved (mg/L)		<0.00010	0.00019	<0.00010	<0.00010
Copper (Cu)-Dissolved (mg/L)		<0.00020	<0.00020	<0.00020	<0.00020
Iron (Fe)-Dissolved (mg/L)		<0.010	0.252	0.045	<0.010
Lead (Pb)-Dissolved (mg/L)		0.000339	<0.000050	<0.000050	0.00109
Lithium (Li)-Dissolved (mg/L)		0.0059	0.0012	0.0012	0.0021
Magnesium (Mg)-Dissolved (mg/L)		6.27	12.1	12.3	3.96
Manganese (Mn)-Dissolved (mg/L)		<0.00010	0.123	0.0183	<0.00010
Mercury (Hg)-Dissolved (mg/L)		<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)		0.00853	0.00108	0.00222	0.00111
Nickel (Ni)-Dissolved (mg/L)		0.00337	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Dissolved (mg/L)		<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved (mg/L)		0.57	0.43	0.37	0.56
Selenium (Se)-Dissolved (mg/L)		0.0135	0.000218	0.000674	0.00161
Silicon (Si)-Dissolved (mg/L)		4.24	5.16	4.07	3.30

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2206836-16 Water 02-DEC-18 15:54 CC-01 (LM)	L2206836-17 Water 03-DEC-18 14:07 MH-27 (LM)	L2206836-18 Water 03-DEC-18 14:43 MH-28 (LM)	L2206836-19 Water 02-DEC-18 12:03 MH-23 (LM)	L2206836-20 Water 02-DEC-18 11:23 NC-01 (LM)
WATER						
Total Metals	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.768	1.23	1.11	0.854	1.03
	Strontium (Sr)-Total (mg/L)	0.212	0.282	0.269	0.189	0.221
	Sulfur (S)-Total (mg/L)	3.54	6.79	6.89	2.05	4.33
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	0.00032	<0.00030	0.00042	0.00046	0.00070
	Uranium (U)-Total (mg/L)	0.000801	0.00129	0.00127	0.000680	0.00100
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0060 DLB	<0.0090 DLB	0.0136	<0.0090 DLB	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	<0.0010	0.0011	0.0011	0.0012	0.0011
	Antimony (Sb)-Dissolved (mg/L)	0.00015	0.00012	0.00013	0.00019	0.00019
	Arsenic (As)-Dissolved (mg/L)	0.00038	0.00031	0.00026	0.00075	0.00063
	Barium (Ba)-Dissolved (mg/L)	0.0121	0.0688	0.0562	0.0667	0.0762
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	0.000100	0.0000432	0.0000771	0.0000382	0.0000402
	Calcium (Ca)-Dissolved (mg/L)	53.5	75.1	75.5	53.5	63.2
	Chromium (Cr)-Dissolved (mg/L)	0.00023	<0.00010	<0.00010	0.00016	0.00022
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	0.00029
	Iron (Fe)-Dissolved (mg/L)	<0.010	0.024	0.028	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	0.000273	<0.000050	0.000053	0.000128	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0012	0.0016	0.0015	0.0014	0.0013
	Magnesium (Mg)-Dissolved (mg/L)	2.28	7.53	6.04	5.50	6.11
	Manganese (Mn)-Dissolved (mg/L)	<0.00010	0.0123	0.0247	0.00901	0.00013
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000741	0.000848	0.000819	0.00120	0.00128
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.33	0.46	0.50	0.30	0.40
	Selenium (Se)-Dissolved (mg/L)	0.000248	0.000599	0.000736	0.000580	0.000701
	Silicon (Si)-Dissolved (mg/L)	2.63	3.55	3.58	3.90	3.76

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2206836-21	L2206836-22	L2206836-23	L2206836-24	L2206836-25
Description	Water	Water	Water	Water	Water
Sampled Date	01-DEC-18	02-DEC-18	05-DEC-18	05-DEC-18	03-DEC-18
Sampled Time	16:15	14:30	09:56	10:39	16:48
Client ID	NC-02 (LM)	MH-08 (LM)	MW13-01 (LP)	MW13-04 (LP)	MW13-13 (LP)
Grouping / **Analyte**					
WATER					
Total Metals Silver (Ag)-Total (mg/L)	<0.000010	<0.000010			
Sodium (Na)-Total (mg/L)	1.24	0.795			
Strontium (Sr)-Total (mg/L)	0.231	0.158			
Sulfur (S)-Total (mg/L)	3.79	1.80			
Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010			
Tin (Sn)-Total (mg/L)	<0.00010	<0.00010			
Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030			
Uranium (U)-Total (mg/L)	0.000496	0.000688			
Vanadium (V)-Total (mg/L)	<0.00050	<0.00050			
Zinc (Zn)-Total (mg/L)	0.0899	<0.0030			
Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030			
Dissolved Metals Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved (mg/L)	0.0010	<0.0010	0.0011	0.0040	0.0073
Antimony (Sb)-Dissolved (mg/L)	0.00011	0.00040	0.00012	0.00024	0.00015
Arsenic (As)-Dissolved (mg/L)	0.00065	0.00214	0.00032	0.00090	0.00047
Barium (Ba)-Dissolved (mg/L)	0.0795	0.0402	0.0233	0.0485	0.0134
Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved (mg/L)	0.0000255	0.0000648	0.000770	0.000364	0.000515
Calcium (Ca)-Dissolved (mg/L)	68.6	50.5	62.4	71.1	52.9
Chromium (Cr)-Dissolved (mg/L)	<0.00010	0.00070	0.00032	0.00054	0.00022
Cobalt (Co)-Dissolved (mg/L)	0.00012	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved (mg/L)	0.00029	<0.00020	0.00030	0.00088	0.00055
Iron (Fe)-Dissolved (mg/L)	0.048	<0.010	<0.010	<0.010	<0.010
Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	0.000871	0.000296	0.000241
Lithium (Li)-Dissolved (mg/L)	0.0012	0.0028	0.0015	0.0015	<0.0010
Magnesium (Mg)-Dissolved (mg/L)	6.68	5.06	3.88	4.54	2.03
Manganese (Mn)-Dissolved (mg/L)	0.225 DTMF	<0.00010	0.00131	0.00024	0.00027
Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)	0.000857	0.000700	0.000563	0.000687	0.000427
Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved (mg/L)	0.76	0.46	0.69	0.54	0.74
Selenium (Se)-Dissolved (mg/L)	0.000265	0.00177	0.00124	0.000707	0.000476
Silicon (Si)-Dissolved (mg/L)	4.19	5.65	3.28	3.52	2.63

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2206836-26				
	Description	Water				
	Sampled Date	05-DEC-18				
	Sampled Time	10:00				
	Client ID	MWGW (LQR)				
Grouping	**Analyte**					
WATER						
Total Metals	Silver (Ag)-Total (mg/L)					
	Sodium (Na)-Total (mg/L)					
	Strontium (Sr)-Total (mg/L)					
	Sulfur (S)-Total (mg/L)					
	Thallium (Tl)-Total (mg/L)					
	Tin (Sn)-Total (mg/L)					
	Titanium (Ti)-Total (mg/L)					
	Uranium (U)-Total (mg/L)					
	Vanadium (V)-Total (mg/L)					
	Zinc (Zn)-Total (mg/L)					
	Zirconium (Zr)-Total (mg/L)					
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD				
	Dissolved Metals Filtration Location	FIELD				
	Aluminum (Al)-Dissolved (mg/L)	0.0017				
	Antimony (Sb)-Dissolved (mg/L)	0.00013				
	Arsenic (As)-Dissolved (mg/L)	0.00032				
	Barium (Ba)-Dissolved (mg/L)	0.0245				
	Beryllium (Be)-Dissolved (mg/L)	<0.000020				
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050				
	Boron (B)-Dissolved (mg/L)	<0.010				
	Cadmium (Cd)-Dissolved (mg/L)	0.000794				
	Calcium (Ca)-Dissolved (mg/L)	64.0				
	Chromium (Cr)-Dissolved (mg/L)	0.00036				
	Cobalt (Co)-Dissolved (mg/L)	<0.00010				
	Copper (Cu)-Dissolved (mg/L)	0.00029				
	Iron (Fe)-Dissolved (mg/L)	<0.010				
	Lead (Pb)-Dissolved (mg/L)	0.000934				
	Lithium (Li)-Dissolved (mg/L)	0.0015				
	Magnesium (Mg)-Dissolved (mg/L)	3.95				
	Manganese (Mn)-Dissolved (mg/L)	0.00134				
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050				
	Molybdenum (Mo)-Dissolved (mg/L)	0.000527				
	Nickel (Ni)-Dissolved (mg/L)	<0.00050				
	Phosphorus (P)-Dissolved (mg/L)	<0.050				
	Potassium (K)-Dissolved (mg/L)	0.70				
	Selenium (Se)-Dissolved (mg/L)	0.00113				
	Silicon (Si)-Dissolved (mg/L)	3.36				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2206836-1	L2206836-2	L2206836-3	L2206836-4	L2206836-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	01-DEC-18	02-DEC-18	03-DEC-18	03-DEC-18	03-DEC-18
	Sampled Time	16:55	15:03	12:33	13:05	15:52
	Client ID	MH-12 (LP)	MH-04 (LP)	MH-11 (LP)	MH-29 (LP)	MH-02 (LP)
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.993	0.914	1.30	0.979	10.3
	Strontium (Sr)-Dissolved (mg/L)	0.191	0.199	0.262	0.223	0.666
	Sulfur (S)-Dissolved (mg/L)	3.12	5.26	4.86	1.60	105
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.000904	0.000936	0.00121	0.000688	0.00197
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0013	0.0044	0.0039	0.0017	0.0110
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals	Chromium (III)-Total (mg/L)	<0.00030	<0.00040	<0.00020	<0.00010	0.00033
	Hexavalent Chromium (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Volatile Organic Compounds	Benzene (mg/L)					
	Ethylbenzene (mg/L)					
	Methyl t-butyl ether (MTBE) (mg/L)					
	Styrene (mg/L)					
	Toluene (mg/L)					
	ortho-Xylene (mg/L)					
	meta- & para-Xylene (mg/L)					
	Xylenes (mg/L)					
	Surrogate: 4-Bromofluorobenzene (SS) (%)					
	Surrogate: 1,4-Difluorobenzene (SS) (%)					
Hydrocarbons	EPH10-19 (mg/L)					
	EPH19-32 (mg/L)					
	LEPH (mg/L)					
	HEPH (mg/L)					
	Volatile Hydrocarbons (VH6-10) (mg/L)					
	VPH (C6-C10) (mg/L)					
	Surrogate: 2-Bromobenzotrifluoride (%)					
	Surrogate: 3,4-Dichlorotoluene (SS) (%)					
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)					
	Acenaphthylene (mg/L)					
	Acridine (mg/L)					
	Anthracene (mg/L)					
	Benz(a)anthracene (mg/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2206836-6	L2206836-7	L2206836-8	L2206836-9	L2206836-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	04-DEC-18	04-DEC-18	04-DEC-18	03-DEC-18	05-DEC-18
	Sampled Time	13:33	13:00	09:52	12:40	10:50
	Client ID	MH-13 (LP)	MH-30 (LP)	MH-15 (LP)	MH-SW (LQR)	MH-FB (LQTB)
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.07	0.843	1.22	1.27	<0.050
	Strontium (Sr)-Dissolved (mg/L)	0.195	0.110	0.189	0.268	<0.00020
	Sulfur (S)-Dissolved (mg/L)	2.96	1.63	1.35	4.67	<0.50
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.00143	0.00131	0.000957	0.00125	<0.000010
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0012	0.0028	<0.0010	0.0035	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals	Chromium (III)-Total (mg/L)	<0.00030	<0.00020	<0.00020	<0.00010	
	Hexavalent Chromium (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
Volatile Organic Compounds	Benzene (mg/L)					
	Ethylbenzene (mg/L)					
	Methyl t-butyl ether (MTBE) (mg/L)					
	Styrene (mg/L)					
	Toluene (mg/L)					
	ortho-Xylene (mg/L)					
	meta- & para-Xylene (mg/L)					
	Xylenes (mg/L)					
	Surrogate: 4-Bromofluorobenzene (SS) (%)					
	Surrogate: 1,4-Difluorobenzene (SS) (%)					
Hydrocarbons	EPH10-19 (mg/L)					
	EPH19-32 (mg/L)					
	LEPH (mg/L)					
	HEPH (mg/L)					
	Volatile Hydrocarbons (VH6-10) (mg/L)					
	VPH (C6-C10) (mg/L)					
	Surrogate: 2-Bromobenzotrifluoride (%)					
	Surrogate: 3,4-Dichlorotoluene (SS) (%)					
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)					
	Acenaphthylene (mg/L)					
	Acridine (mg/L)					
	Anthracene (mg/L)					
	Benz(a)anthracene (mg/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2206836-11	L2206836-12	L2206836-13	L2206836-14	L2206836-15
Description	Water	Water	Water	Water	Water
Sampled Date		02-DEC-18	04-DEC-18	04-DEC-18	02-DEC-18
Sampled Time		13:55	12:25	11:15	16:16
Client ID	TRIP BLANK (LQTB)	MH-22 (LP)	TRIBEWF01 (LM)	TRIBEWF03 (LM)	PH-01 (LM)
Grouping / **Analyte**					
WATER					
Dissolved Metals Silver (Ag)-Dissolved (mg/L)		<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved (mg/L)		0.891	1.24	1.07	0.817
Strontium (Sr)-Dissolved (mg/L)		0.236	0.192	0.196	0.172
Sulfur (S)-Dissolved (mg/L)		12.6	0.70	1.33	9.49
Thallium (Tl)-Dissolved (mg/L)		0.000015	<0.000010	<0.000010	<0.000010
Tin (Sn)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved (mg/L)		<0.00030	<0.00030	<0.00030	<0.00030
Uranium (U)-Dissolved (mg/L)		0.00382	0.000566	0.00102	0.00118
Vanadium (V)-Dissolved (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved (mg/L)		0.791	0.0012	<0.0010	0.0159
Zirconium (Zr)-Dissolved (mg/L)		<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals Chromium (III)-Total (mg/L)		<0.00020	<0.00010	<0.00020	0.00018
Hexavalent Chromium (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050
Volatile Organic Compounds Benzene (mg/L)					
Ethylbenzene (mg/L)					
Methyl t-butyl ether (MTBE) (mg/L)					
Styrene (mg/L)					
Toluene (mg/L)					
ortho-Xylene (mg/L)					
meta- & para-Xylene (mg/L)					
Xylenes (mg/L)					
Surrogate: 4-Bromofluorobenzene (SS) (%)					
Surrogate: 1,4-Difluorobenzene (SS) (%)					
Hydrocarbons EPH10-19 (mg/L)					
EPH19-32 (mg/L)					
LEPH (mg/L)					
HEPH (mg/L)					
Volatile Hydrocarbons (VH6-10) (mg/L)					
VPH (C6-C10) (mg/L)					
Surrogate: 2-Bromobenzotrifluoride (%)					
Surrogate: 3,4-Dichlorotoluene (SS) (%)					
Polycyclic Aromatic Hydrocarbons Acenaphthene (mg/L)					
Acenaphthylene (mg/L)					
Acridine (mg/L)					
Anthracene (mg/L)					
Benz(a)anthracene (mg/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2206836-16	L2206836-17	L2206836-18	L2206836-19	L2206836-20
	Description	Water	Water	Water	Water	Water
	Sampled Date	02-DEC-18	03-DEC-18	03-DEC-18	02-DEC-18	02-DEC-18
	Sampled Time	15:54	14:07	14:43	12:03	11:23
	Client ID	CC-01 (LM)	MH-27 (LM)	MH-28 (LM)	MH-23 (LM)	NC-01 (LM)
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.850	1.29	1.18	0.890	1.08
	Strontium (Sr)-Dissolved (mg/L)	0.232	0.294	0.286	0.188	0.226
	Sulfur (S)-Dissolved (mg/L)	2.97	5.38	5.70	1.64	3.45
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.000899	0.00140	0.00138	0.000766	0.00109
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0041	0.0058	0.0113	0.0047	0.0031
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals	Chromium (III)-Total (mg/L)	<0.00030	<0.00010	<0.00010	<0.00020	0.00018
	Hexavalent Chromium (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Volatile Organic Compounds	Benzene (mg/L)					
	Ethylbenzene (mg/L)					
	Methyl t-butyl ether (MTBE) (mg/L)					
	Styrene (mg/L)					
	Toluene (mg/L)					
	ortho-Xylene (mg/L)					
	meta- & para-Xylene (mg/L)					
	Xylenes (mg/L)					
	Surrogate: 4-Bromofluorobenzene (SS) (%)					
	Surrogate: 1,4-Difluorobenzene (SS) (%)					
Hydrocarbons	EPH10-19 (mg/L)					
	EPH19-32 (mg/L)					
	LEPH (mg/L)					
	HEPH (mg/L)					
	Volatile Hydrocarbons (VH6-10) (mg/L)					
	VPH (C6-C10) (mg/L)					
	Surrogate: 2-Bromobenzotrifluoride (%)					
	Surrogate: 3,4-Dichlorotoluene (SS) (%)					
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)					
	Acenaphthylene (mg/L)					
	Acridine (mg/L)					
	Anthracene (mg/L)					
	Benz(a)anthracene (mg/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2206836-21	L2206836-22	L2206836-23	L2206836-24	L2206836-25
Description	Water	Water	Water	Water	Water
Sampled Date	01-DEC-18	02-DEC-18	05-DEC-18	05-DEC-18	03-DEC-18
Sampled Time	16:15	14:30	09:56	10:39	16:48
Client ID	NC-02 (LM)	MH-08 (LM)	MW13-01 (LP)	MW13-04 (LP)	MW13-13 (LP)
Grouping / **Analyte**					
WATER					
Dissolved Metals Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved (mg/L)	1.35	0.838	0.871	2.57	0.739
Strontium (Sr)-Dissolved (mg/L)	0.241	0.164	0.183	0.173	0.0899
Sulfur (S)-Dissolved (mg/L)	2.79	1.40	3.38	1.37	6.20
Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium (U)-Dissolved (mg/L)	0.000589	0.000745	0.000886	0.000982	0.000596
Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved (mg/L)	0.0616	0.0019	0.0325	0.0074	0.0093
Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals Chromium (III)-Total (mg/L)	<0.00010	0.00075			
Hexavalent Chromium (mg/L)	<0.00050	<0.00050			
Volatile Organic Compounds Benzene (mg/L)				<0.00050	
Ethylbenzene (mg/L)				<0.00050	
Methyl t-butyl ether (MTBE) (mg/L)				<0.00050	
Styrene (mg/L)				<0.00050	
Toluene (mg/L)				<0.00045	
ortho-Xylene (mg/L)				<0.00050	
meta- & para-Xylene (mg/L)				<0.00050	
Xylenes (mg/L)				<0.00075	
Surrogate: 4-Bromofluorobenzene (SS) (%)				111.8	
Surrogate: 1,4-Difluorobenzene (SS) (%)				110.8	
Hydrocarbons EPH10-19 (mg/L)				<0.25	
EPH19-32 (mg/L)				<0.25	
LEPH (mg/L)				<0.25	
HEPH (mg/L)				<0.25	
Volatile Hydrocarbons (VH6-10) (mg/L)				<0.10	
VPH (C6-C10) (mg/L)				<0.10	
Surrogate: 2-Bromobenzotrifluoride (%)				99.2	
Surrogate: 3,4-Dichlorotoluene (SS) (%)				92.3	
Polycyclic Aromatic Hydrocarbons Acenaphthene (mg/L)				<0.000010	
Acenaphthylene (mg/L)				<0.000010	
Acridine (mg/L)				<0.000010	
Anthracene (mg/L)				<0.000010	
Benz(a)anthracene (mg/L)				<0.000010	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2206836-26				
	Description	Water				
	Sampled Date	05-DEC-18				
	Sampled Time	10:00				
	Client ID	MWGW (LQR)				
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010				
	Sodium (Na)-Dissolved (mg/L)	0.896				
	Strontium (Sr)-Dissolved (mg/L)	0.184				
	Sulfur (S)-Dissolved (mg/L)	3.35				
	Thallium (Tl)-Dissolved (mg/L)	<0.000010				
	Tin (Sn)-Dissolved (mg/L)	<0.00010				
	Titanium (Ti)-Dissolved (mg/L)	<0.00030				
	Uranium (U)-Dissolved (mg/L)	0.000881				
	Vanadium (V)-Dissolved (mg/L)	<0.00050				
	Zinc (Zn)-Dissolved (mg/L)	0.0327				
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030				
Speciated Metals	Chromium (III)-Total (mg/L)					
	Hexavalent Chromium (mg/L)					
Volatile Organic Compounds	Benzene (mg/L)					
	Ethylbenzene (mg/L)					
	Methyl t-butyl ether (MTBE) (mg/L)					
	Styrene (mg/L)					
	Toluene (mg/L)					
	ortho-Xylene (mg/L)					
	meta- & para-Xylene (mg/L)					
	Xylenes (mg/L)					
	Surrogate: 4-Bromofluorobenzene (SS) (%)					
	Surrogate: 1,4-Difluorobenzene (SS) (%)					
Hydrocarbons	EPH10-19 (mg/L)					
	EPH19-32 (mg/L)					
	LEPH (mg/L)					
	HEPH (mg/L)					
	Volatile Hydrocarbons (VH6-10) (mg/L)					
	VPH (C6-C10) (mg/L)					
	Surrogate: 2-Bromobenzotrifluoride (%)					
	Surrogate: 3,4-Dichlorotoluene (SS) (%)					
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)					
	Acenaphthylene (mg/L)					
	Acridine (mg/L)					
	Anthracene (mg/L)					
	Benz(a)anthracene (mg/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2206836-1	L2206836-2	L2206836-3	L2206836-4	L2206836-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	01-DEC-18	02-DEC-18	03-DEC-18	03-DEC-18	03-DEC-18
	Sampled Time	16:55	15:03	12:33	13:05	15:52
	Client ID	MH-12 (LP)	MH-04 (LP)	MH-11 (LP)	MH-29 (LP)	MH-02 (LP)
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Benzo(a)pyrene (mg/L)					
	Benzo(b&j)fluoranthene (mg/L)					
	Benzo(b+j+k)fluoranthene (mg/L)					
	Benzo(g,h,i)perylene (mg/L)					
	Benzo(k)fluoranthene (mg/L)					
	Chrysene (mg/L)					
	Dibenz(a,h)anthracene (mg/L)					
	Fluoranthene (mg/L)					
	Fluorene (mg/L)					
	Indeno(1,2,3-c,d)pyrene (mg/L)					
	1-Methylnaphthalene (mg/L)					
	2-Methylnaphthalene (mg/L)					
	Naphthalene (mg/L)					
	Phenanthrene (mg/L)					
	Pyrene (mg/L)					
	Quinoline (mg/L)					
	Surrogate: Acridine d9 (%)					
	Surrogate: Chrysene d12 (%)					
	Surrogate: Naphthalene d8 (%)					
	Surrogate: Phenanthrene d10 (%)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2206836-6	L2206836-7	L2206836-8	L2206836-9	L2206836-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	04-DEC-18	04-DEC-18	04-DEC-18	03-DEC-18	05-DEC-18
	Sampled Time	13:33	13:00	09:52	12:40	10:50
	Client ID	MH-13 (LP)	MH-30 (LP)	MH-15 (LP)	MH-SW (LQR)	MH-FB (LQTB)
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Benzo(a)pyrene (mg/L)					
	Benzo(b&j)fluoranthene (mg/L)					
	Benzo(b+j+k)fluoranthene (mg/L)					
	Benzo(g,h,i)perylene (mg/L)					
	Benzo(k)fluoranthene (mg/L)					
	Chrysene (mg/L)					
	Dibenz(a,h)anthracene (mg/L)					
	Fluoranthene (mg/L)					
	Fluorene (mg/L)					
	Indeno(1,2,3-c,d)pyrene (mg/L)					
	1-Methylnaphthalene (mg/L)					
	2-Methylnaphthalene (mg/L)					
	Naphthalene (mg/L)					
	Phenanthrene (mg/L)					
	Pyrene (mg/L)					
	Quinoline (mg/L)					
	Surrogate: Acridine d9 (%)					
	Surrogate: Chrysene d12 (%)					
	Surrogate: Naphthalene d8 (%)					
	Surrogate: Phenanthrene d10 (%)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2206836-11	L2206836-12	L2206836-13	L2206836-14	L2206836-15
	Description	Water	Water	Water	Water	Water
	Sampled Date		02-DEC-18	04-DEC-18	04-DEC-18	02-DEC-18
	Sampled Time		13:55	12:25	11:15	16:16
	Client ID	TRIP BLANK (LQTB)	MH-22 (LP)	TRIBEWF01 (LM)	TRIBEWF03 (LM)	PH-01 (LM)
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Benzo(a)pyrene (mg/L)					
	Benzo(b&j)fluoranthene (mg/L)					
	Benzo(b+j+k)fluoranthene (mg/L)					
	Benzo(g,h,i)perylene (mg/L)					
	Benzo(k)fluoranthene (mg/L)					
	Chrysene (mg/L)					
	Dibenz(a,h)anthracene (mg/L)					
	Fluoranthene (mg/L)					
	Fluorene (mg/L)					
	Indeno(1,2,3-c,d)pyrene (mg/L)					
	1-Methylnaphthalene (mg/L)					
	2-Methylnaphthalene (mg/L)					
	Naphthalene (mg/L)					
	Phenanthrene (mg/L)					
	Pyrene (mg/L)					
	Quinoline (mg/L)					
	Surrogate: Acridine d9 (%)					
	Surrogate: Chrysene d12 (%)					
	Surrogate: Naphthalene d8 (%)					
	Surrogate: Phenanthrene d10 (%)					

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2206836-16	L2206836-17	L2206836-18	L2206836-19	L2206836-20
	Description	Water	Water	Water	Water	Water
	Sampled Date	02-DEC-18	03-DEC-18	03-DEC-18	02-DEC-18	02-DEC-18
	Sampled Time	15:54	14:07	14:43	12:03	11:23
	Client ID	CC-01 (LM)	MH-27 (LM)	MH-28 (LM)	MH-23 (LM)	NC-01 (LM)
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Benzo(a)pyrene (mg/L)					
	Benzo(b&j)fluoranthene (mg/L)					
	Benzo(b+j+k)fluoranthene (mg/L)					
	Benzo(g,h,i)perylene (mg/L)					
	Benzo(k)fluoranthene (mg/L)					
	Chrysene (mg/L)					
	Dibenz(a,h)anthracene (mg/L)					
	Fluoranthene (mg/L)					
	Fluorene (mg/L)					
	Indeno(1,2,3-c,d)pyrene (mg/L)					
	1-Methylnaphthalene (mg/L)					
	2-Methylnaphthalene (mg/L)					
	Naphthalene (mg/L)					
	Phenanthrene (mg/L)					
	Pyrene (mg/L)					
	Quinoline (mg/L)					
	Surrogate: Acridine d9 (%)					
	Surrogate: Chrysene d12 (%)					
	Surrogate: Naphthalene d8 (%)					
	Surrogate: Phenanthrene d10 (%)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2206836-21	L2206836-22	L2206836-23	L2206836-24	L2206836-25
	Description	Water	Water	Water	Water	Water
	Sampled Date	01-DEC-18	02-DEC-18	05-DEC-18	05-DEC-18	03-DEC-18
	Sampled Time	16:15	14:30	09:56	10:39	16:48
	Client ID	NC-02 (LM)	MH-08 (LM)	MW13-01 (LP)	MW13-04 (LP)	MW13-13 (LP)
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Benzo(a)pyrene (mg/L)				<0.0000050	
	Benzo(b&j)fluoranthene (mg/L)				<0.000010	
	Benzo(b+j+k)fluoranthene (mg/L)				<0.000015	
	Benzo(g,h,i)perylene (mg/L)				<0.000010	
	Benzo(k)fluoranthene (mg/L)				<0.000010	
	Chrysene (mg/L)				<0.000010	
	Dibenz(a,h)anthracene (mg/L)				<0.0000050	
	Fluoranthene (mg/L)				<0.000010	
	Fluorene (mg/L)				<0.000010	
	Indeno(1,2,3-c,d)pyrene (mg/L)				<0.000010	
	1-Methylnaphthalene (mg/L)				<0.000050	
	2-Methylnaphthalene (mg/L)				<0.000050	
	Naphthalene (mg/L)				<0.000050	
	Phenanthrene (mg/L)				<0.000020	
	Pyrene (mg/L)				<0.000010	
	Quinoline (mg/L)				<0.000050	
	Surrogate: Acridine d9 (%)				96.8	
	Surrogate: Chrysene d12 (%)				99.4	
	Surrogate: Naphthalene d8 (%)				91.7	
	Surrogate: Phenanthrene d10 (%)				98.2	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2206836-26				
	Description	Water				
	Sampled Date	05-DEC-18				
	Sampled Time	10:00				
	Client ID	MWGW (LQR)				
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Benzo(a)pyrene (mg/L)					
	Benzo(b&j)fluoranthene (mg/L)					
	Benzo(b+j+k)fluoranthene (mg/L)					
	Benzo(g,h,i)perylene (mg/L)					
	Benzo(k)fluoranthene (mg/L)					
	Chrysene (mg/L)					
	Dibenz(a,h)anthracene (mg/L)					
	Fluoranthene (mg/L)					
	Fluorene (mg/L)					
	Indeno(1,2,3-c,d)pyrene (mg/L)					
	1-Methylnaphthalene (mg/L)					
	2-Methylnaphthalene (mg/L)					
	Naphthalene (mg/L)					
	Phenanthrene (mg/L)					
	Pyrene (mg/L)					
	Quinoline (mg/L)					
	Surrogate: Acridine d9 (%)					
	Surrogate: Chrysene d12 (%)					
	Surrogate: Naphthalene d8 (%)					
	Surrogate: Phenanthrene d10 (%)					

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Arsenic (As)-Total	MB-LOR	L2206836-10, -11, -15, -18, -20, -4, -5
Method Blank	Bismuth (Bi)-Total	MB-LOR	L2206836-10, -11, -15, -18, -20, -4, -5
Method Blank	Cadmium (Cd)-Total	MB-LOR	L2206836-10, -11, -15, -18, -20, -4, -5
Method Blank	Chromium (Cr)-Total	MB-LOR	L2206836-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -3, -5, -6, -7, -8, -9
Method Blank	Iron (Fe)-Total	MB-LOR	L2206836-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -3, -5, -6, -7, -8, -9
Method Blank	Magnesium (Mg)-Total	MB-LOR	L2206836-10, -11, -15, -18, -20, -4, -5
Method Blank	Manganese (Mn)-Total	MB-LOR	L2206836-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -3, -5, -6, -7, -8, -9
Method Blank	Selenium (Se)-Total	MB-LOR	L2206836-10, -11, -15, -18, -20, -4, -5
Method Blank	Thallium (Tl)-Total	MB-LOR	L2206836-10, -11, -15, -18, -20, -4, -5
Method Blank	Zinc (Zn)-Total	MB-LOR	L2206836-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -3, -5, -6, -7, -8, -9
Laboratory Control Sample	Zinc (Zn)-Dissolved	MES	L2206836-10
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2206836-1, -10, -12, -13, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2206836-10
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2206836-1, -10, -12, -13, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2206836-14, -15, -16, -17, -18, -19, -20, -21, -22, -23, -24, -25, -26
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2206836-10
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2206836-1, -10, -12, -13, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2206836-14, -15, -16, -17, -18, -19, -20, -21, -22, -23, -24, -25, -26
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2206836-10
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2206836-10
Matrix Spike	Potassium (K)-Dissolved	MS-B	L2206836-10
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2206836-1, -10, -12, -13, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2206836-10
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2206836-1, -10, -12, -13, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2206836-14, -15, -16, -17, -18, -19, -20, -21, -22, -23, -24, -25, -26
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2206836-10
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2206836-1, -10, -12, -13, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2206836-10
Matrix Spike	Barium (Ba)-Total	MS-B	L2206836-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Total	MS-B	L2206836-21, -22
Matrix Spike	Barium (Ba)-Total	MS-B	L2206836-10, -11, -15, -18, -20, -4, -5
Matrix Spike	Calcium (Ca)-Total	MS-B	L2206836-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L2206836-21, -22
Matrix Spike	Calcium (Ca)-Total	MS-B	L2206836-10, -11, -15, -18, -20, -4, -5
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2206836-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2206836-21, -22
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2206836-10, -11, -15, -18, -20, -4, -5
Matrix Spike	Manganese (Mn)-Total	MS-B	L2206836-21, -22
Matrix Spike	Strontium (Sr)-Total	MS-B	L2206836-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Total	MS-B	L2206836-21, -22
Matrix Spike	Strontium (Sr)-Total	MS-B	L2206836-10, -11, -15, -18, -20, -4, -5

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLB	Detection Limit Raised. Analyte detected at comparable level in Method Blank.

Reference Information

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.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
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).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". 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.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
CR-CR3-TOT-CALC-ED	Water	Total Trivalent Chromium in Water	CALCULATION
Chromium (III)-Total is calculated as the difference between the total chromium and the total hexavalent chromium (Cr(VI)) results.The Limit of Reporting for Chromium (III) varies as a function of the test results.			
CR-CR6-ED	Water	Chromium, Hexavalent (Cr +6)	APHA 3500-Cr C (Ion Chromatography)
This analysis is carried out using procedures adapted from method 3500-Cr C in "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1636 published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution. Results are based on an un-filtered, field-preserved sample.			
EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.			
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.			
EPH-ME-FID-VA	Water	EPH in Water	BC Lab Manual
EPH is extracted from water using a hexane micro-extraction technique, with analysis by GC-FID, as per the BC Lab Manual. EPH results include PAHs and are therefore not equivalent to LEPH or HEPH.			
F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			

Reference Information

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

LEPH/HEPH-CALC-VA Water LEPHs and HEPHs BC MOE LEPH/HEPH

LEPHw and HEPHw are measures of Light and Heavy Extractable Petroleum Hydrocarbons in water. Results are calculated by subtraction of applicable PAH concentrations from EPH10-19 and EPH19-32, as per the BC Lab Manual LEPH/HEPH calculation procedure.

LEPHw = EPH10-19 minus Acenaphthene, Acridine, Anthracene, Fluorene, Naphthalene and Phenanthrene.

HEPHw = EPH19-32 minus Benz(a)anthracene, Benzo(a)pyrene, Fluoranthene, and Pyrene.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water 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-VA 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-VA 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.

PAH-ME-MS-VA Water PAHs in Water EPA 3511/8270D (mod)

PAHs are extracted from water using a hexane micro-extraction technique, with analysis by GC/MS. Because the two isomers cannot be readily separated chromatographically, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TSS-LOW-VA Water Total Suspended Solids by Grav. (1 mg/L) APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
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.

VH-HSFID-VA Water VH in Water by Headspace GCFID BC Env. Lab Manual (VH in Water)

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Compounds eluting between n-hexane and n-decane are measured and summed together using flame-ionization detection.

VH-SURR-FID-VA Water VH Surrogates for Waters BC Env. Lab Manual (VH in Solids)

VOC7-HSMS-VA Water BTEX/MTBE/Styrene by Headspace GCMS EPA 5021A/8260C

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

VOC7/VOC-SURR-MS-VA Water VOC7 and/or VOC Surrogates for Waters EPA 5035A/5021A/8260C

VPH-CALC-VA Water VPH is VH minus select aromatics BC MOE VPH

Reference Information

VPHw measures Volatile Petroleum Hydrocarbons in water. Results are calculated by subtraction of specific Monocyclic Aromatic Hydrocarbons from VH6-10, as per the BC Lab Manual VPH calculation procedure.
VPHw = VH6-10 minus Benzene, Toluene, Ethylbenzene, Xylenes, and Styrene

XYLENES-CALC-VA	Water	Sum of Xylene Isomer Concentrations	CALCULATION

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** 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
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

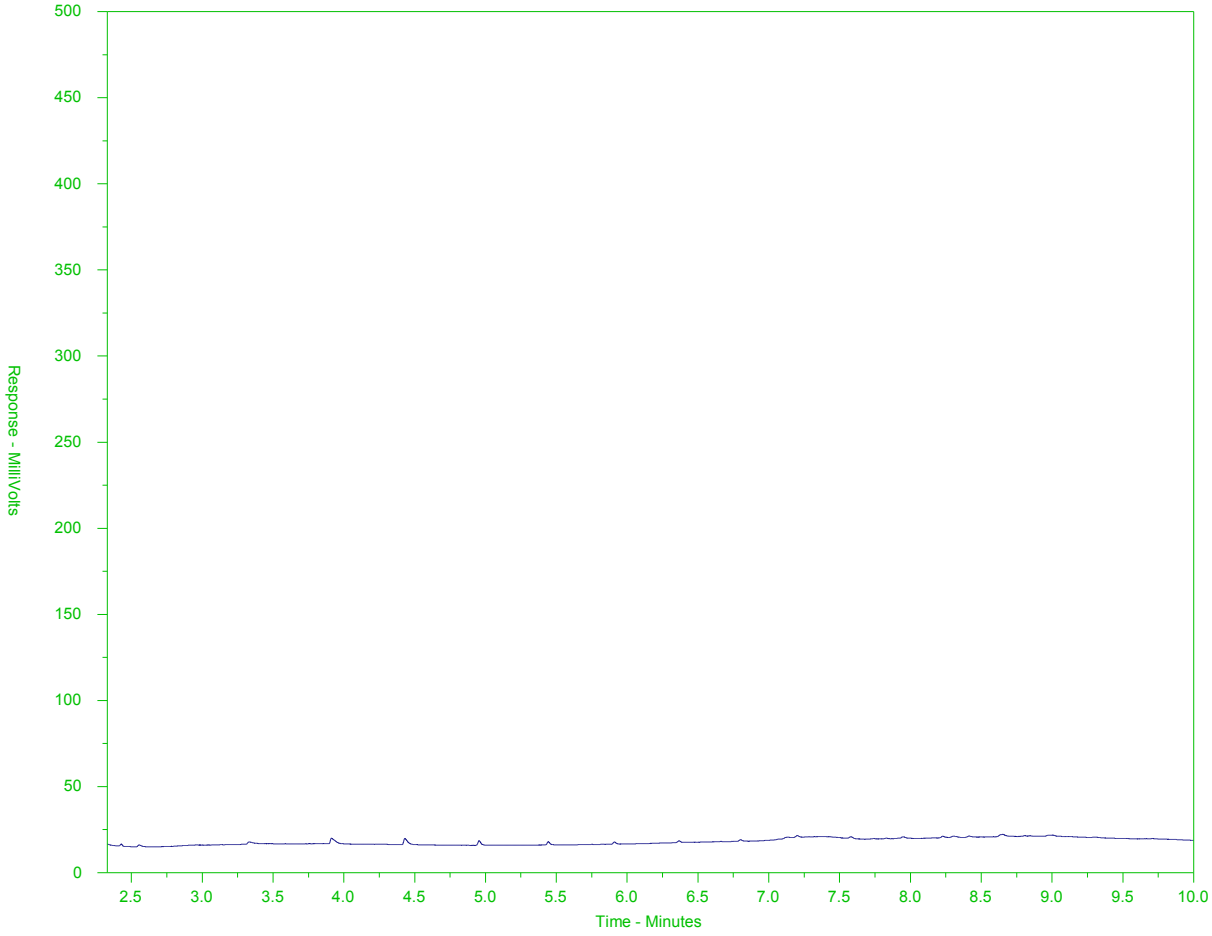
1 of 3 2 of 3 3 of 3

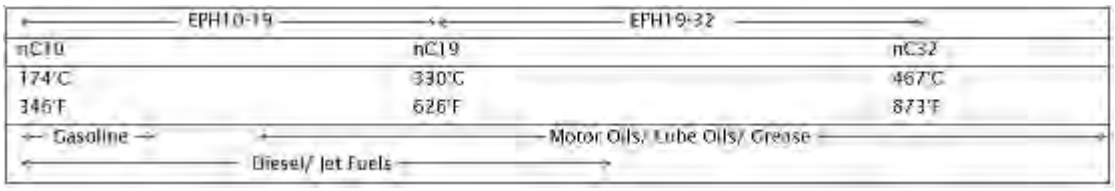
GLOSSARY OF REPORT TERMS
Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight 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.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2206836-24
Client Sample ID: MW13-04 (LP)





The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2206836-COFC

COC Number: 15 -

Page 1 of 3

Report To	Contact and company name below will appear on the final report
Company:	TECK Metals Ltd
Contact:	Michelle Unger
Phone:	250-4278422
	Company address below will appear on the final report
Street:	601 Knightton Road
City/Province:	Kimberly, BC
Postal Code:	V1A 3E1
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	
Contact:	

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	amacphail@accessconsulting.ca,mducharme@acc
Email 2	Michelle.unger@teck.com
Email 3	

Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	Michelle.unger@teck.com
Email 2	roxanne.menear@teck.com

Project Information	
ALS Account # / Quote #:	Q62635
Job #:	TECK-18-1
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: Can Dang	Sampler: KN

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: dd-mmm-yy hh:mm

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	Total Metals (low level) + Hg	Dissolved Metals (low level) +Hg	pH, SPC, alkalinity, hardness	Anions(Nitrate, Nitrite, Sulphate, Cl, F, Br)	Ammonia	TDS, TSS(low)	Chromium Speciation							Number of Containers
					P	F/P		P	P		P							
	MH-12 (LP)	1-Dec-18	16:55	Water	R	R	R	R	R	R	R							8
	MH-04 (LP)	2-Dec-18	15:03	Water	R	R	R	R	R	R	R							8
	MH-11 (LP)	3-Dec-18	12:33	Water	R	R	R	R	R	R	R							8
	MH-29 (LP)	3-Dec-18	13:05	Water	R	R	R	R	R	R	R							8
	MH-02 (LP)	3-Dec-18	15:52	Water	R	R	R	R	R	R	R							8
	MH-13 (LP)	4-Dec-18	13:33	Water	R	R	R	R	R	R	R							8
	MH-30 (LP)	4-Dec-18	13:00	Water	R	R	R	R	R	R	R							8
	MH-15 (LP)	4-Dec-18	9:52	Water	R	R	R	R	R	R	R							8
	MH-SW (LQR)	3-Dec-18	12:40	Water	R	R	R	R	R	R	R							8
	MH-FB (LQFB)	5-Dec-18	10:50	Water	R	R	R	R	R	R								7
	Trip Blank (LQTB)	n/a	n/a	Water	R	R	R	R	R	R								7
	SDH-S2 (LP)			Water	R	R	R	R	R	R	R							8

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		
3°	4°	6°			

SHIPMENT RELEASE (client use)		
Released by: Kyle Nault	Date: 6-12-18	Time:

INITIAL SHIPMENT RECEPTION (lab use only)		
Received by:	Date: DEC 6, 2018	Time: 09:24

FINAL SHIPMENT RECEPTION (lab use only)		
Received by:	Date: 12/7	Time: 12:45p

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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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

L2206836-COFC

COC Number: 15 -

Page 2 of 3

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:	TECK Metals Ltd	Select Report Format:	☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)	Regular [R]	☑ Standard TAT if received by 3 pm - business days - no surcharges apply
Contact:	Michelle Unger	Quality Control (QC) Report with Report	☐ YES ☐ NO	PRIORITY (Business Days) 4 day [P4]	☐ EMERGENCY 1 Business day [E1] ☐
Phone:	250-4278422	☐ Compare Results to Criteria on Report - provide details below if box checked		3 day [P3] ☐	Same Day, Weekend or Statutory holiday [E0] ☐
	Company address below will appear on the final report	Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX	2 day [P2] ☐	
Street:	601 Knightton Road	Email 1 or Fax	amacphail@accessconsulting.ca,mducharme@acc	Date and Time Required for all E&P TATs:	dd-mmm-yy hh:mm
City/Province:	Kimberly, BC	Email 2	Michelle.unger@teck.com	For tests that can not be performed according to the service level selected, you will be contacted.	
Postal Code:	V1A 3E1	Email 3			
Invoice To	Same as Report To ☑ YES ☐ NO	Invoice Distribution			
	Copy of Invoice with Report ☐ YES ☑ NO	Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX		
Company:		Email 1 or Fax	Michelle.unger@teck.com		
Contact:		Email 2	roxanne.menear@teck.com		

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:	Q62635	AFE/Cost Center:	PO#
Job #:	TECK-18-1	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)		ALS Contact: Can Dang	Sampler: KN

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 (low level) + Hg (P)	Dissolved Metals (low level) +Hg (F/P)	pH, SPC, alkalinity, hardness	Anions(Nitrate, Nitrite, Sulphate, Cl, F, Br) (P)	Ammonia (P)	TDS, TSS(low)	Chromium Speciation (P)	Number of Containers
	MH-22 (LP)	2-Dec-18	13:55	Water	R	R	R	R	R	R	R	8
	TRIBEWF01 (LM)	4-Dec-18	12:25	Water	R	R	R	R	R	R	R	8
	TRIBEWF02 (LM)			Water	R	R	R	R	R	R	R	8
	TRIBEWF03 (LM)	4-Dec-18	11:15	Water	R	R	R	R	R	R	R	8
	PH-01 (LM)	2-Dec-18	16:16	Water	R	R	R	R	R	R	R	8
	CC-01 (LM)	2-Dec-18	15:54	Water	R	R	R	R	R	R	R	8
	MH-27 (LM)	3-Dec-18	14:07	Water	R	R	R	R	R	R	R	8
	MH-28 (LM)	3-Dec-18	14:43	Water	R	R	R	R	R	R	R	8
	MH-23 (LM)	2-Dec-18	12:03	Water	R	R	R	R	R	R	R	8
	NC-01 (LM)	2-Dec-18	11:23	Water	R	R	R	R	R	R	R	8
	NC-02 (LM)	1-Dec-18	16:15	Water	R	R	R	R	R	R	R	8
	MH-08 (LM)	2-Dec-18	14:30	Water	R	R	R	R	R	R	R	8

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		
					9

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Kyle Nault	Date: 6-12-18	Time:	Received by:	Date:	Time:	Received by: NA	Date: 12/7	Time: 1214 5p

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**.

ALS Environmental

Chain of Custody / Ana
Canada Toll Free:
www.alsgl

L2206836-COFC

COC #

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Report To		Report Format / Distribution		Service Requested (Rush for routine analysis subject to availability)
Company:	TECK Metals Ltd	☑ Standard ☐ Other		◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Michelle Unger	☑ PDF ☑ Excel ☑ Digital ☐ Fax		○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	601 Knightton Road	Email 1:	arnacphail@accessconsulting.ca, mducharme@a	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Kimberly, BC	Email 2:	michelle.unger@teck.com	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	250-427-8422 Fax:	Email 3:		
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information		Analysis Request
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	TECK-18-01	Please indicate below Filtered, Preserved or both (F, P, F/P)
Company:		PO / AFE:		
Contact:		LSD:		
Address:				
Phone:		Quote #:	Q62635	
Lab Work Order # (lab use only)		ALS Contact:	Can Dang	Sampler: kn

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	pH, SPC, alkalinity, hardness	F/P dissolved metals low level +Hg	Anions (nitrate, nitrite, sulphate, Cl, F, Br)	P Ammonia	P BTEX, LEPH, HEPH	P VPH, PAH	Number of Containers
	MW13-01 (LP)	05-Dec-18	9:56	Groundwater	X	X	X	X			
	MW13-04 (LP)	05-Dec-18	10:39	Groundwater	X	X	X	X	X	X	
	MW13-05 (LP)			Groundwater	X	X	X	X	X	X	
	MW13-06 (LP)			Groundwater	X	X	X	X			
	MW13-07 (LP)			Groundwater	X	X	X	X	X	X	
	MW13-08 (LP)			Groundwater	X	X	X	X			
	MW13-10 (LP)			Groundwater	X	X	X	X	X	X	
	MW13-13 (LP)	03-Dec-18	16:48	Groundwater	X	X	X	X			
	MW14-01 (LP)			Groundwater	X	X	X	X	X	X	
	MW14-02 (LP)			Groundwater	X	X	X	X	X	X	
	MW14-03 (LP)			Groundwater	X	X	X	X	X	X	
	MW14-04 (LP)			Groundwater	X	X	X	X	X	X	
	MW-GW (LQR)	05-Dec-18	10:00	Groundwater	X	X	X	X	X	X	

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Yukon EQWin and ACC200 digital formats. General A: pH, EC, TSS (low) **General B:** pH, EC, TSS (low), anions-all
General C: pH, EC, TSS (low), anions-all, ion balance, alkalinity **General D:** pH, EC, TSS (low), SO4, ion balance, alkalinity **General E:** pH, EC, TSS (low), SO4, ion balance

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
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SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
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APPENDIX G

2018 DAM SAFETY INSPECTION

Teck

Sä Dena Hes Mine, Yukon Territory
2018 Dam Safety Inspection

Prepared for

Teck Resources Limited

Prepared by

SRK Consulting (Canada) Inc.
November 2018

Sä Dena Hes Mine, Yukon Territory
2018 Dam Safety Inspection

November 2018

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Project No: 1CT008.068

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Executive Summary

This report presents the results of the 2018 Annual Dam Safety Inspection (DSI) of the structures and features associated with the Tailings Management Area (TMA) that forms part of the closed Sä Dena Hes mine located near Watson Lake, Yukon. The only remaining tailings retaining embankment at the closed site is the North Dam. A small dyke referred to as the Sediment Retaining Structure (SRS) was also retained after closure of the site to collect any sediment that would be generated from the till cap that was placed over the exposed tailings. Other structures included in the DSI scope are a series of newly constructed (2014) riprapped lined diversion channels and the reclaimed waste rock dumps at the location of the closed portals adjacent to the Main, Jewelbox and Burnick ore zones.

The inspection was completed by Mr. Peter Healey PEng., an associate of SRK Consulting (Canada) Inc., on July 24, 2018 while accompanied by Gerry Murdoch of Teck. Mr. Healey is the Engineer of Record (EoR) for the site and has been completing the annual dam inspections since 1992.

Summary of Facility Description

The original TMA consisted of three earth structures, which were referred to as the North Dam, the South Dam and the Reclaim Dam. The North and South dams, which impounded the tailings, were constructed between July 1990 and October 1991. The starter dams for both structures were built to a height of about 13 metres.

In addition to the North and South Dams, a Reclaim Dam was built to detain supernatant water decanted from the tailings pond. The mine operation involved recycling of the detained water to the mill, with a controlled discharge when required into the adjacent Camp Creek from April to October each year.

Operations at Sä Dena Hes mine, which commenced in July 1991, were suspended in December 1992 due to low lead and zinc prices. Decommissioning of the site began in 2014 and was completed in 2015.

Summary of Key Hazards and Consequences

As a required component of a dam safety inspection, the following key hazards at the site were identified and the consequences of different failure modes of the North Dam and the SRS were assessed:

- runoff from extreme precipitation events,
- seismic events,
- ice build up and debris in the SRS spillway,
- flow capacity of the SRS spillway, and
- potential for liquefaction of the tailings.

The key failure modes assessed included:

- Dam Overtopping,
- Piping,
- Slope Stability

The assessment concluded that the North Dam and the SRS Dyke are in good condition, meet current expectations and fall within acceptable guidelines for stability. None of the above failure modes are of concern.

Consequence Classifications

Consequence classification is not related to the likelihood of a failure, but rather the potential impact resulting from a failure if it did occur. The last Dam Safety Review was carried out by AMECFW (now the Wood Group) in 2015. Based on this review, the CDA Dam Consequence Classification of the North Dam was changed from “Low” to “Significant”. This classification does not indicate a risk of failure, but rather the consequence of failure in the extremely unlikely event of a failure. This review concluded that there were no dam safety or stability issues associated with the North Dam and that the dam was in good condition. The Consequence Classification of the Sediment Retaining Structure is “Low”.

As stated in the last DSI report, the next DSR is scheduled for 2020 or 5 years from the last DSR. In the CDA 2014 guidelines, the suggested frequency for DSR’s ranges from 5 to 10 years, depending on the consequences of failure and changes in the dams. A risk assessment for the site is scheduled for December 2018 and a review of the Dam Consequence Category for the North Dam and the frequency of DSR’s for the site would be reviewed during this assessment.

Summary of Key Observations

North Dam

The North Dam is in good condition and shows no signs of deformation or abnormal settling. The downstream slope of the dam shows no signs of surficial movement or erosion nor is there any sign of bulging at the downstream toe.

The piezometers and settlement gauges on the North Dam are in good condition and continue to function as designed. However, two of the piezometers are missing labelled plastic caps. The seasonal fluctuations recorded in the latter part of 2017 and in the spring and summer of 2018 in the piezometers are consistent with those observed in previous years.

The readings taken of the settlement gauges in the North Dam indicate that there has been no significant settlement of the embankment over the 24-year period that readings have been taken, with settlement readings varying to a maximum of 51 mm (or less than 1% of the total height of the dam) from the initial readings taken in 1993. In the last three years, settlement readings have fluctuated no more than 1mm.

Sediment Retaining Structure

The SRS is in good physical condition and the spillway is functioning in accordance with design parameters.

North Creek

Beaver activity was again event at the inlet to the channel with the construction of a beaver dam. The dam raises the water level of the pond behind the structure and increases the risk of a rapid release of water that could result in erosion of the riprap protection in the channel. The dam was removed in 2018. Best Practice dictates that beaver dams be removed when identified during the routine inspections.

Summary of Significant Changes

There are no significant changes to the stability of either the North Dam or the SRS since they were constructed in 1991 and 2014 respectively.

Summary of Review of OMS and EPRP Manuals

The current OMS Manual was prepared by SRK in 2015. The manual was reviewed as part of this 2018 DSI.

Changes to the OMS manual are provided in section 5.6. The changes focus on (i) the design criteria for the North Dam and the SRS dyke based on the passive care phase of closure, (ii) key roles and responsibilities, (iii) the organization chart, (iv) Dam consequence category for the North Dam and the frequency of DSR reviews, (v) Piezometer maintenance (vi) frequency of routine inspections (vii) Beaver dams (viii) erosion monitoring pins.

The current EPRP was prepared by SRK in 2015. Changes to the plan are provided in section 5.7 of this report. The key changes relate to (i) key roles and responsibilities (ii) the organization chart.

Summary Table of Deficiencies and Non-Conformances

There are no outstanding deficiencies or non-conformances from the 2017 or earlier DSI's. A list of deficiency's or non conformances noted from the 2018 dam safety inspection are summarized below:

Structure	ID No.	Deficiency or Non Conformance	Applicable Regulatory or OMS Reference	Recommended Action	Priority[1]	Recommended Deadline/ Status
North Dam	2018-1	NDW-2B and 1A missing caps	OMS 5.3.2	Install plastic caps and label	3	Before end of 2018 Completed October 18, 2018 Closed

Structure	ID No.	Deficiency or Non Conformance	Applicable Regulatory or OMS Reference	Recommended Action	Priority[1]	Recommended Deadline/ Status
North Creek Channel	2018-2	Beaver Dam at inlet to channel	OMS 5.6.3	Remove beaver dam in channel	3	Before End of 2018 / Completed July 26 Closed
Jewelbox Waste Rock Dump	2018-3	Erosion Gully in North east corner	OMS 6.5.6 and 5.3.1	Install additional Monitoring pins	3	Before End of 2018 / Completed July 26 Closed

General Description of Priority Rankings[1]

Priority	Description
1	A high probability or actual dam safety issue considered immediately dangerous to life, health or the environment, or a significant regulatory concern.
2	If not corrected, could likely result in dam safety issues leading to injury, environmental impact or significant regulatory action; or, a repetitive deficiency that demonstrates a systematic breakdown of procedures.
3	Single occurrences of deficiencies or non-conformances that alone would not be expected to result in dam safety issues.
4	Best Management Practice as a suggestion for continuous improvement towards industry best practices that could further reduce potential risks. This typically includes ongoing construction items within the appropriate construction cycle.

[1] Based on the Health, Safety and Reclamation Code (HSRC) for Mines in British Columbia (2016 revision).

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List of Abbreviations

AEP	Annual Exceedance Probability
CDA	Canadian Dam Association
CSP	Corrugated Steel Pipe
DCC	Dam Consequence Classification
DDRP	Detailed Decommissioning Reclamation Plan
DSI	Dam Safety inspection
DSR	Dam Safety review
ECCC	Environment Climate Change Canada
EoR	Engineer of Record
HSRC	Health, Safety and Reclamation Code
IDF	Inflow Flood Design
KCB	Klohn Crippen Berger
PGA	Peak Ground Acceleration
PMF	Probable Maximum Flood
PMP	Probable Maximum Precipitation
SRS	Sediment Retaining Structure
TMA	Tailings Management Area
TWRS	Tailings and Water Retaining Structures

1 Introduction

1.1 Purpose, Scope of Work, and Methodology

This report presents the results of the 2018 Annual Dam Safety Inspection (DSI) of the structures and features associated with the Tailings Management Area (TMA) that forms part of the closed Sä Dena Hes mine located near Watson Lake, Yukon. The work was carried out in accordance with our proposal dated March 7, 2018 and Teck PO # 9354, The current Yukon Water Licence (QZ16-051) and Teck's Guideline for Tailings and Water Retaining Structures (Teck 2014). The work was authorized by Mr. Gerry Murdoch, Teck Resources Limited (Teck).

Mr. Peter Healey PEng, an associate of SRK Consulting (Canada) Inc., completed the site inspection on July 24, 2018 while accompanied by Gerry Murdoch. Mr. Healey is the Engineer of Record (EoR) for the site and has been completing the annual dam inspections since 1992.

The scope of the work consisted of:

- A visual inspection of the physical condition of the following structures and features to identify any deficiencies and non-conformances:
  - The North Tailings Dam
  - The decommissioned North Creek Dyke and Second Crossing
  - The relocated Camp Creek Diversion Channel
  - The North Channel and South Channels
  - The Sediment Retaining Structure (SRS)
  - The Burnick, Main and Jewelbox Waste Rock Dump areas
- A review of the Operation, Maintenance and Surveillance Manual (OMS) and Emergency Preparedness and Response Plan (EPRP) for the TMA
- A review of the Dam Consequence Classifications
- A review of the site inspection forms provided by Teck
- A review of the piezometer and settlement records of the North Dam provided by Teck
- A review of the 2015 Dam Safety Review (DSR) carried out by AMEC Foster Wheeler (AMECFW), now the Wood Group.

It should be noted that all elevations referenced in this report are based on a datum that was established during a LiDAR survey carried out in 2012. The original site datum used to design and build the structures in the early 90's was about 2 m lower than the 2012 datum. All previous inspection reports, prior to 2014, used the 1990 datum.

1.2 Regulatory Requirements and Guidelines

This DSI addresses the performance of the TMA, the associated water management infrastructure including the Jewelbox and Main Zone open pits, and the Jewelbox, Main Zone and Burnick waste rock dumps. The work was completed in accordance with the following regulatory requirements and guidelines, which in combination, fall within Teck's internal requirements included in Teck's Tailings and Water Retaining Structures (TWRS) guideline and policy:

- Canadian Dam Association (CDA) Dam Safety Guidelines 2007 (2013 Edition)
- Canadian Dam Association (CDA) Application of Dam Safety Guidelines to Mining Dams. Technical Bulletin, 2014
- The Yukon Territory Sä Dena Hes Water Licence (QZ99-045). New Licence issued April 2017 (QZ16-051)
- The Yukon Territory Sä Dena Hes Quartz Mining Licence (QML-0004)

While the DSI is focused on the TMA, the waste rock dumps are included in the DSI in accordance with Clause 45 of the current Water Licence (QZ16-51)

1.3 Facility Description

1.3.1 Overview

This section provides a description of the components remaining at the mine site after the TMA was decommissioned in 2014 and 2015. A map showing the overall mine site is provided on Figure 1. A general arrangement map of the TMA is provided in Figure 2.

1.3.2 North Dam

The North Dam is approximately 15 m high with a crest elevation of 1,100 m, a crest length of about 260 m, and a crest width of 10 m. A site plan and section through the dam are shown in Figures 3 and 4. The North Dam for this report is considered a mining dam as it is a barrier constructed for the retention of tailings (CDA 2014).

Most of the tailings lie within the northern half of the TMA above the original cofferdam, which has since been removed. The tailings behind the North Dam were capped with a till cover in 2014. The cover was graded flush with the crest of the dam and graded south toward the SRS. A few small low lying areas remain within the cover that seasonally collect water, but overall the North Dam has not retained water since the mine decommissioning was completed. Given the cover grades away from the dam crest, the dam would only need to retain ponded water under extreme conditions as discussed below.

In 2016, SRK carried out a hydrological study (SRK 2017) to assess the likelihood of overtopping of the North Dam in the event of a design flood event. The results indicated that during an extreme case, such as the Probable Maximum Flood (PMF), the North Dam crest is not overtopped. Although the backwater effect arising from a blockage scenario in the central channel

does result in an increased flood extent, with ponded water reaching within a few centimetres of the dam crest, an overtopping scenario is not reached. The maximum depth of water would vary from 0.5 m in the central channel to less than 0.1 m adjacent to the upstream crest of the dam. The model predicted that during the peak of the event, water would only be lapping up against the dam for about 12 hours before it dissipates. The minimum freeboard adjacent to the low point along the upstream edge of the crest at the peak of the event varied from 5 to 8 cm.

1.3.3 Sediment Retaining Structure (SRS)

The SRS was constructed by leaving in place a low-profile dyke composed of the former South Dam toe material. The SRS dyke is approximately 80 m in length and has a crest width of 4 m at an approximate elevation of 1,087.7 m. The upstream face of the SRS was graded to 2H:1V and the downstream face was graded to 2.5H:1V. While the SRS is only 5 m high, for this report it is also considered a mining dam as it is a barrier constructed for the retention of ponded water (CDA 2014). The depth of water behind the structure is about 1 m.

An emergency spillway was constructed through the SRS dyke to accommodate the 1 in 1000 year Inflow Design Flood (IDF) event (5.4m^3/s) and to convey runoff from the upstream catchment to the South Drainage Channel. The as-built spillway and drainage channel geometries are presented in Figures 5 and 6. The spillway channel invert elevation is 1,085.7 m and has a length of 33.3 m.

1.3.4 Water Management Infrastructure

Overview

Three drainage channels were built as part of the 2014 TMA decommissioning (see Figure 7). The longest of the three was constructed through the former Reclaim Dam and the pond area to route Camp Creek flows along its historical alignment. The other two drainages (the North Channel and the South Channel) were constructed to direct runoff from the covered tailings areas to the new Camp Creek Drainage Channel. There is also a drainage channel located down the middle of the cover that directs runoff from the tailings cover at the northern end of the TMA.

South Drainage Channel

The South Drainage Channel was constructed from the SRS spillway through the former South Dam and connects with the Camp Creek Drainage Channel. The channel length is about 230 m and it was installed with riprap erosion protection placed on top of a non-woven geotextile (see Figure 8). The channel is designed for the 1 in 1000-year IDF. Upstream and downstream side slopes are 2:1 (H:V). Average grade of the channel is 0.04.

Camp Creek Drainage Channel

The Camp Creek Drainage Channel was constructed through the former Reclaim Dam and pond area to route Camp Creek flows along its historical alignment (see Figure 8). The channel length is about 940 m and it was installed with riprap erosion protection placed on top of a non-woven

geotextile (see Figure 8). The channel is designed for the 1 in 1000-year IDF. Upstream and downstream side slopes are 2:1 (H:V). Average grade of the channel is 0.05.

North Drainage Channel

The North Drainage Channel was constructed along the east side of the former South Pond to convey water from the North Tailings Area to the SRS. Conveyed water is detained in the SRS to allow for sediments to deposit before the water is discharged into Camp Creek (see Figure 9). The channel length is about 300 m and it was installed with riprap erosion protection placed on top of a non-woven geotextile. The channel is designed for the 1 in 1000-year (IDF). Upstream and downstream side slopes are 2:1 (H:V). Average grade of the channel is 0.03.

North Creek

During operation of the mine, a dyke was built over the North Creek as a water storage facility for the mill. The dyke (see Figure 1 for location) was decommissioned in 2015 and a riprapped channel was built through the old dyke to convey the flow along North Creek to False Canyon Creek. A similar channel was also built downstream to convey the North Creek flow through a decommissioned access road.

1.3.5 Tailings Cover

The soil cover over the tailings discussed previously varies up to 2.2 m in thickness. It covers all the exposed deposited tailings, specifically in the North Tailings Area and the tailings deposited in South Pond area. The cover was constructed of excavated dam fill material. It provides an effective means of controlling wind erosion of tailings and a growth medium over the tailings for revegetation. The cover was sloped away from the crest of the North Dam in a southerly direction towards the SRS. Water is no longer impounded behind the dam. A shallow swale was constructed down the middle of the cover to direct surface runoff on the cover to the SRS.

The total covered area of the TMA is 155,081 m^2. The reclaimed North Tailings Area is 87,745 m^2, the reclaimed South Pond including the grassy area is 28,444 m^2, and the reclaimed Reclaim Pond is 38,892 m^2.

1.3.6 Waste Rock Dumps

During operation of the mine, waste rock dumps were developed at each of the main portals, associated with the Main Zone, the Jewelbox Zone and the Burnick Zone ore bodies. At closure, the portals were closed off with waste rock, and the dumps were resloped to direct runoff away from the openings and to provide more stable conditions.

1.4 Background Information and History

The original TMA, which extended from the North Dam to the South Dam covered an area of approximately 0.205 sq. km (Figure 2). During the operating life of the mine, approximately 700,000 tonnes of tailings were deposited into the impoundment, primarily at the northern end. The North and South dams, which impounded the tailings, were constructed between July 1990

and October 1991. The starter dams for both structures were built to a height of about 13 metres. Between the two dams, at the location of a topographic saddle, was a 2 m high cofferdam, which had a gated culvert to control the flow of water and tailings from the northern half of the impoundment to the southern half.

In addition to the North and South Dams, a Reclaim Dam was built to detain supernatant water. A decant tower, in the South Tailings Pond, was used to discharge the supernatant water in the tailings pond into the Reclaim Pond through a 0.5 m diameter corrugated steel (CSP) decant pipe. The mine operation involved recycling of the detained water to the mill with a controlled discharge, when required, into the adjacent Camp Creek from April to October each year.

An open channel emergency spillway was located at the west side of the Reclaim Pond. This spillway was designed to accommodate the design flood event from the TMA catchment only. Flow through this spillway was directed to the primary spillway system, which was part of the Camp Creek diversion channel constructed along the west side of the Reclaim Pond. This primary spillway consisted of two 1,200 mm diameter CSP culverts and was designed to accommodate the 1 in 200-year Inflow Design Flood (IDF). Camp Creek was diverted into the diversion channel and discharged through the two culverts into a riprap lined exit chute.

An emergency spillway was also located in the west abutment of the South Dam and was designed to accommodate the 200-year IDF. The spillway consisted of two 900 mm diameter CSP culverts. The discharge from the spillway entered the Reclaim Pond downstream via an unlined channel.

Two additional surface water diversions, the east and west interceptor ditches, were located on both sides of the TMA to intercept surface runoff from upslope of the TMA.

In March of 1992, the previous operators, Curragh Resources, built a rockfill buttress along the toe of the Reclaim dam to provide extra protection against sloughing and erosion of the toe due to seepage.

In September 1992, work commenced on a 2-metre raise of the South Dam to El. 1098. Work on the extension was shut down on October 14, 1992 because of the construction difficulties experienced due to sub-zero temperatures.

Operations at Sä Dena Hes mine, which commenced in July 1991, were suspended in December 1992 due to low lead and zinc prices.

During the care and maintenance period after the mine shut down in 1992, water was released from the tailings pond to the Reclaim Pond seasonally by way of syphons to maintain a safe operating level. Water was discharged from the Reclaim Pond to Camp Creek in accordance with the limits imposed by the Water License.

In 2003, Teck Cominco installed an HDPE pipeline through one of the spillway culverts as a siphon to facilitate the transfer of water from the South Tailings Pond.

With the 2014 decommissioning work, the TMA has been significantly modified. The Reclaim Dam was completely removed, and the final excavated surface of the Reclaim Dam was graded to blend into the surrounded topography.

In 2014, most of the South Dam was removed to form the Sediment Retaining Structure (SRS). The decant tower and the pipe were decommissioned and removed to the on-site landfill. The South Dam overflow spillway was decommissioned by removing the two 900 mm diameter culverts that were disposed of at the landfill. Similarly, to the decommissioning of the Reclaim Dam, the dam footprint was excavated to original ground (with exception of the SRS) and blended into the surrounded topography.

The Camp Creek Diversion Channel, exit chute, and culverts were decommissioned in 2015. The interceptor ditches were decommissioned in 2015.

Many of the access roads at the site have been decommissioned and access to the decommissioned Main Zone, Jewelbox and Burnick areas are via all-terrain vehicle or helicopter.

2 Construction and Operation during 2017 to 2018

After the 1992 shutdown of the mine, it never reopened and no more tailings were deposited into the TMA. Information on the decommissioning of the mine is provided in Section 1.4.

Teck conducts on-going care and maintenance of the TMA and the water management infrastructure at the site including the access road from the Robert Campbell Highway. Any trees or vegetation on the downstream slope of North Dam that do not conform to the guidelines in the OMS manual are trimmed or removed. Seepage at the toe of the North Dam is monitored monthly with sampling of water quality and measurement of flow. During the monthly inspections by the sampling team, an inspection of the North Dam and the SRS spillway is made to check for any blockages or subsidence.

3 Climate Data and Water Balance during 2017 to 2018

3.1 Review and Summary of Climate Data

This section presents the current climate data for the site. As there is no weather station at the site, the data from selected local meteorological station was used to determine the mean annual precipitation and evaporation for the site. Below reference is made to a detailed climate characterization study that was carried out by SRK (SRK, 2017) to determine mean annual total precipitation for the Project site in absence of any site-specific data.

3.1.1 Mean Annual Precipitation

A regional and regression analysis were performed using the nearby meteorological stations from Environment Climate Change Canada (ECCC). The data were compiled in R Studio Software, generating the mean annual precipitation (MAP) for each station. Table 3-1 presents the station locations relative to the site, as well as their respective MAP estimate. Correction for under-catch

in the precipitation measurements is prepared daily by Environment Canada for many, but not all meteorological stations, as noted in Table 3-2.

Table 3-1: Selected Meteorological Stations Associated with the Project Site (1960 to 2016)

Station ID	Station Name	Longitude [deg]	Latitude [deg]	Elevation [m]	Dist. from Site [km]	MAP [mm]	Years of Info [yrs]	Under-Catch Factor Available
2101200	Watson Lake A	-128.82	60.12	687.4	46.66	424.0	74	YES
2101135	Tuchitua	-129.22	60.93	723.9	47.90	493.6	40	YES
2100FCG	Hour Lake	-129.13	61.18	890.0	72.93	544.8	28	NO
2101081	Swift River	-131.18	60.00	891.2	141.74	564.7	37	YES
1191440	Cassiar	-129.83	59.28	1077.5	150.35	728.2	36	YES
1197530	Smith River A	-126.43	59.90	673.0	151.68	466.9	25	NO
2203922	Tungsten	-128.25	61.95	1143.0	160.38	637.0	22	NO
2101100	Teslin A	-132.74	60.17	705.0	217.87	332.9	56	YES
1192340	Dease Lake	-130.01	58.43	806.6	243.67	419.9	61	YES
1195250	Muncho Lake	-125.77	58.93	836.5	248.96	508.1	40	NO
2100200	Carcross	-134.70	60.17	660.0	324.42	248.4	60	NO
1208202	Todagin Ranch	-130.07	57.60	899.0	334.45	419.4	18	NO
2100460	Drury Creek	-134.39	62.20	609.0	348.27	372.9	35	YES

Source:
file ///Z:\01_SITES\Sa_Dena_Hes\1CT008 061_2016_DSR_Studies\Task%20100_Hydrology\R_Analysis\Hydrology\Precipitation_Hydrology_at_Sa_Dena_Hes.docx

The regression analysis predicted a MAP for the site of 646 mm based on an elevation of 1080 masl. Monthly average precipitation for the site is summarized in Table 3-2 based on the site MAP of 646 mm and the monthly distribution from the Cassiar station (SRK 2017).

Table 3-2: Monthly Average Precipitation for the Site

Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Site	58.1	49.1	39.4	23.9	33.6	47.8	60.7	63.3	71.7	75.6	58.8	64.6	646

3.1.2 2017 Analysis

An estimate of the 2017 MAP for the site was computed and used to estimate the 2017 Water Discharge Volumes at the SRS spillway.

The Watson Lake A station was used as the reference station as it is the most representative station close to the site that is currently active. Total precipitation recorded at Watson Lake A in 2017 was reported as 313.8 mm by ECCC. Using the undercatch correction factor of 1.13 (SRK 2017), total corrected annual precipitation for 2017 at Watson Lake was 354 mm.

A ratio of Watson Lake MAP vs. calculated Site MAP was applied to convert the 2017 Watson Lake precipitation to a representative MAP for the Site. Based on the corrected undercatch MAP for Watson Lake of 479.3 mm, the adjustment factor for the site is 1.42, which equates to an approximate annual precipitation of 503 mm in 2017 at the site as shown in Table 3-3.

Table 3-3: Monthly Precipitation for the Site (based on 2017 Watson Lake Data)

Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	2017/Annual
Site	15.1	10.2	51.3	3.7	45.10	87.6	124	29.5	24.2	37.9	52.8	20.7	503

3.1.3 Evaporation

The network of evaporation stations is sparse in the Yukon and northern British Columbia. Potential evapotranspiration was calculated using the Morton (1983) methodology, utilising meteorological parameters measured at the nearby Watson Lake weather station, with solar radiation data obtained from the Whitehorse Airport station. Using this method, the annual lake evaporation rate was estimated to be 483 mm as shown in Table 3-4. Due to the limited variability of lake evaporation from year to year, the average annual values are applied in the annual water balance.

Table 3-4: Mean Monthly Lake Evaporation

	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Morton-Shallow Lake [mm]	10.4	8.4	18.2	41.4	75.5	96.9	99.5	71.6	33.4	11.0	7.2	9.7	483.2

Source: //Z:\01_SITES\Sa_Dena_Hes\1CT008 057_2016_Geotech_Inspection\!080_Deliverables\1CT008 057_Report\010_Text\2016_SDH_GeotInsp_Report_1CT008-057_20170404_pmh.docx

3.2 Review and Summary of Water Balance

The TMA at Sä Dena Hes has been decommissioned and there are no active ponds other than the small sediment pond at the SRS. The SRS pond has a maximum surface area of about 1600 m^2 during the freshet high flow period. An emergency overflow spillway was also built through the SRS to accommodate the 1 in 1000-year flood event. The catchment area for the SRS spillway is 1.33 km^2 as shown on Figure 10.

A simplified mean annual average water balance calculation for the catchment above the SRS dyke is summarized below, based on data compiled for the recent SRK hydrological study (SRK 2017) and the following assumptions:

- Inflow from the surrounding hillside catchment (1.17 km^2) based on 60% of the MAP
- Inflow from the tailings till cover (0.16 km^2) based on 50% of the MAP
- Direct precipitation input to the SRS pond based on 100% of the MAP
- Outflow from the SRS pond based on annual pond evaporation (483 mm) and seepage losses (estimated at 0.5 l/s)

Average annual water balance from the SRS Pond:

- MAR from the hillside catchment above the SRS = 453,500 m^3
- MAP on the sediment pond surface = 1034 m^3
- MAR on the tailings cover material = 50,388 m^3

- Total Annual Inflow: 504,900 m^3
- Total Outflow (seepage and pond evaporation): 16,540 m^3
- Net Annual Volume (over spillway): 488,370 m^3

Using the estimated 2017 MAP for the site, the 2017 annual water balance is summarized below:

- MAR from the hillside catchment above the SRS = 353,106 m^3
- MAP on the sediment pond surface = 805 m^3
- MAR on the tailings cover material = 39,234 m^3
- Total Annual Inflow: 393,145 m^3
- Total Outflow (seepage and pond evaporation): 16,540 m^3
- Net Annual Discharge Volume (over spillway): 376,604 m^3

3.3 Freeboard and Storage

3.3.1 North Dam

There is currently very little freeboard above the tailings cover and crest of the North Dam. The 2016 hydrological studies completed by SRK (SRK 2016a) concluded that there is no risk of overtopping of the North Dam even in an “extreme worst case” Probable Maximum Precipitation (PMP) event with none of the existing drainage features such as water diversions functioning. In this study a nominal freeboard above the tailings cover to the crest of the North Dam of 15 to 18 cm was estimated. The TMA has no tailings storage capability.

3.3.2 SRS

The SRS dyke has a 1m freeboard above the 1 in 1000 year flood event to the crest of the Dyke.

3.4 Water Discharge Volumes

The current water licence does not have provision for regulating the volume of water discharging over the SRS spillway. However, with reference to the above water balance the estimated annual water discharge volume through the SRS spillway for 2017 is 376,600 cubic metres.

3.5 Water Discharge Quality

The surface water quality discharging from the TMA is currently monitored annually under the Yukon Water Licence QZ16-051. The groundwater quality is currently monitored under the same licence. The results of the surface and groundwater quality sampling for 2018 were not available at the time this report was prepared. However, a review of the 2017 results compiled in the 2017 Annual report was carried out by the EoR of the SDH mine site. In 2017, samples from all the required water quality monitoring stations were collected and analysed. The results demonstrated that all the surface and groundwater stations met the standards provided in the

water licence QZ16-051. It is the opinion of the EoR that the current site water quality does not impact the structural integrity or factors of safety associated with stability of the North Dam or the SRS dyke. Furthermore, it is the opinion of the EoR that the water quality does not impact the performance of the water management structures.

4 Site Observations

4.1 Visual Observations

The weather during the DSI on June 24, 2018 was sunny and warm. Routine inspections of the TMA are made by Jeff Basarich twice a year in the spring (June 8, 2018) and the fall (October 6, 2018). Observations made by Mr. Basarich are included in his inspection reports and are provided in Appendix C of this report.

No additional concerns were identified during review of the photos and reports prepared by the Mr Basarich. The minor freeze/thaw cracking in the fill material behind the riprap along the north side of the Camp Creek Diversion are typical for this climate and do not present a stability concern.

4.1.1 North Dam

A site plan and a section of the North Dam are presented on Figures 3 and 4.

The crest of the North Dam looking west is shown in Photo 1, The dam is in good condition and t shows no signs of deformation or abnormal settling. The downstream slope of the dam (Photo 2) shows no signs of surficial movement or erosion nor is there any sign of bulging at the downstream toe.

The piezometers and settlement gauges (Photos 3, 4, 5 and 6) on the North Dam are in good condition and continue to function as designed. Orange coloured piezometer caps provide visible identification for the monitoring team. However, it was noted that two of the piezometers (PVC pipes) namely NDW-2B and NDW-1A do not have plastic caps and are not labelled.

Along the downstream toe of the North Dam there is an 80 m long seepage zone (Photo 7). Seepage from this zone is collected at a monitoring station referred to as MH-02 and is a combination of groundwater discharge from the surrounding hillsides to the west and minimal seepage flow from the impoundment. The monitoring station consists of a 6-inch diameter steel pipe (Photo 8) embedded in sandbags.

4.1.2 Till Tailings Cover

The till tailings cover has an overall gentle downslope gradient away from the North Dam. Photo 9 shows a view looking north of the drainage swale located down the middle of the tailings cover at the north end of the TMA. This swale was constructed to assist in directing runoff away from the crest of the North Dam. The swale was clear of any debris or vegetation and although there was evidence that water has flowed in the swale, at the time of the inspection it was dry except for one pool of water. Photo 10 shows a view of the swale looking south.

Vegetation is slowly developing over the entire area of the cover as shown in Photo 11.

4.1.3 North Creek

A riprapped channel conveys the North Creek over the original location of the decommissioned North Creek Dyke. It was noted at the inlet of the channel that beavers had again built a dam which was restricting flow (Photo 12). The dam raises the water level of the pond behind the structure and increases the risk of a rapid release of water that could result in erosion of the riprap protection in the channel. The dam was removed in 2018. Best Practice dictates that beaver dams be removed when identified during the routine inspections. Photo 13 shows a view looking upstream of the channel. At the outlet of the channel (Photo 14) some of the riprap had previously been dislodged by the flow, exposing a small area of the underlying filter fabric. There has been no noticeable change to this area since it was observed last year. The channel remains stable and no remediation is required.

About 150 metres east downstream of the above channel is a second riprapped channel that was reclaimed following the removal of two culverts as part of the site reclamation in 2015 (Photo 15 and 16). The channel is stable and requires no remediation.

4.1.4 Sediment Retaining Structure

The Sediment Retaining Structure (SRS) was built during the decommissioning of the South Dam between 2014 and 2015. Figures 5 and 6 provide a site plan and sections of the SRS.

The spillway (Photo 17) remains in stable condition with no noticeable subsidences.

The GeoJute erosion protection and the riprap buttress along the downstream toe of the SRS that Teck installed in 2016 are functioning well.

The sedimentation pond was clear at the time of our inspection and there was no evidence of any silt buildup (Photo 18).

Seepage from the hillside area to the east of the structure is still evident along the downstream toe of the SRS (Photo 19). A small active boil that has been noted in previous inspections was still present. This boil is a remnant of pore pressures that were evident during and after the construction of the South Dam which prompted the construction of a toe buttress. The pore pressures were a result of the hydraulic gradient across the dam due to the stored water in behind the embankment. The pore pressures were accentuated by the sand and gravel zones in the foundation soils below the dam. Since the removal of the South Dam, the pore pressures have significantly reduced but the small head of water due to the retained pond behind the SRS dyke is the likely source of the boil.

4.1.5 Drainage Channels

The riprapped drainage channels (the North Channel, the Camp Creek channel and the South Channel) were constructed during the TMA decommissioning in 2014. Figure 7 provides a plan

view of the three channels. SRK inspected each of the channels for any signs of subsidence and movement of the riprap erosion protection.

Photo 20 shows the South Channel looking south. Photos 21, 22 and 23 show the North, Camp Creek and South channels. No movement of the riprap or subsidence was evident in any of these channels.

4.1.6 Burnick and Jewelbox Waste Rock Dumps

SRK inspected the resloped Main Zone and Jewelbox waste dumps (Photo 24 and Figure 12). It was noted that at the northeast end of the JewelBox dump, there was evidence of some erosion (Photos 25 and 26). Following the 2017 DSI, monitoring pins were installed at the base of the erosion gully to monitor any deepening of the gully over time. It was noted that the gully had not deepened but there was evidence of some minor sideway erosion. This erosion does not impact the stability of the dump.

SRK also inspected the Burnick waste dumps at the locations of the reclaimed 1200 and 1300 portals respectively as shown in Figure 11. During the site decommissioning in 2014, the dumps were recontoured to provide added long-term stability. No further subsidence of the slopes was noted.

Minor settlement of the fill that was placed over the 1200 portal was noted during the 2017 inspection. The settled area was inspected this year (Photo 27) and no further settlement was noted.

4.2 Instrumentation Review

4.2.1 Water Levels

The water levels in the North Dam piezometers are recorded monthly and the results are reviewed by the EoR after each monitoring session. Figure B1 in Appendix B provides a plot of seasonal water levels from 2011 for Piezometers NDW-1A, 2A, 3A and 4A compared to the maximum safe levels established for the North Dam (as listed in the OMS Manual). The seasonal fluctuations recorded this year in the piezometers are consistent with those in previous years and are within acceptable tolerance limits.

The peak levels recorded in June 2018 are plotted on the dam section shown on Figure 4.

In the new water license, which was issued April 2017, piezometer levels are required to be measured bi-monthly.

4.2.2 Deformation/Settlement

Teck has been surveying the settlement gauges on the North Dam since 1993. Results are shown on Table 4-1. The results are elevations taken from the top of the steel pins that were set within the crest of the dam during construction. The last set of readings taken using the 1990 datum was completed in 2010. A recent set of readings was completed in 2017 based on the 2012 datum. The readings are consistent with those observed in previous years, with settlement

readings varying to a maximum of 51 mm (or less than 1% of the total height of the dam) from the initial readings taken in 1993. The recorded settlements are considered acceptable for a small earthen dam and would not compromise the structural integrity of the dam. In the last 3 years, the settlement changes have been less than 1 mm.

Table 4-1: Summary of Elevations taken at the top of the North Dam Settlement Gauges

Date	NDS3 (m)	NDS1 (m)	NDS2 (m)
August/93	1098.639	1098.501	1098.613
July/94	1098.637	1098.502	1098.589
August/95	1098.690	1098.545	1098.663
July/96	1098.637	1098.493	1098.609
August/97	1098.637	1098.496	1098.618
October/98	1098.627	1098.482	NA
October/02	1098.619	1098.481	1098.607
June/05	1098.637	1098.479	1098.587
June/06	1098.63	1098.45	1098.57
August/07	1098.786	1098.454	1098.489
June/08	1098.626	1098.482	1098.597
June/09	1098.625	1098.469	1098.587
June/10	1098.59	1098.47	1098.60
August/14	1100.572	1100.412	1100.524
September/15	1100.548	1100.391	1100.512
2016	1100.572	1100.425	1100.547
2017	1100.573	1100.427	1100.547
2018	1100.571	1100.426	1100.546

Note: 2014 to 2018 readings are based on the 2012 datum.

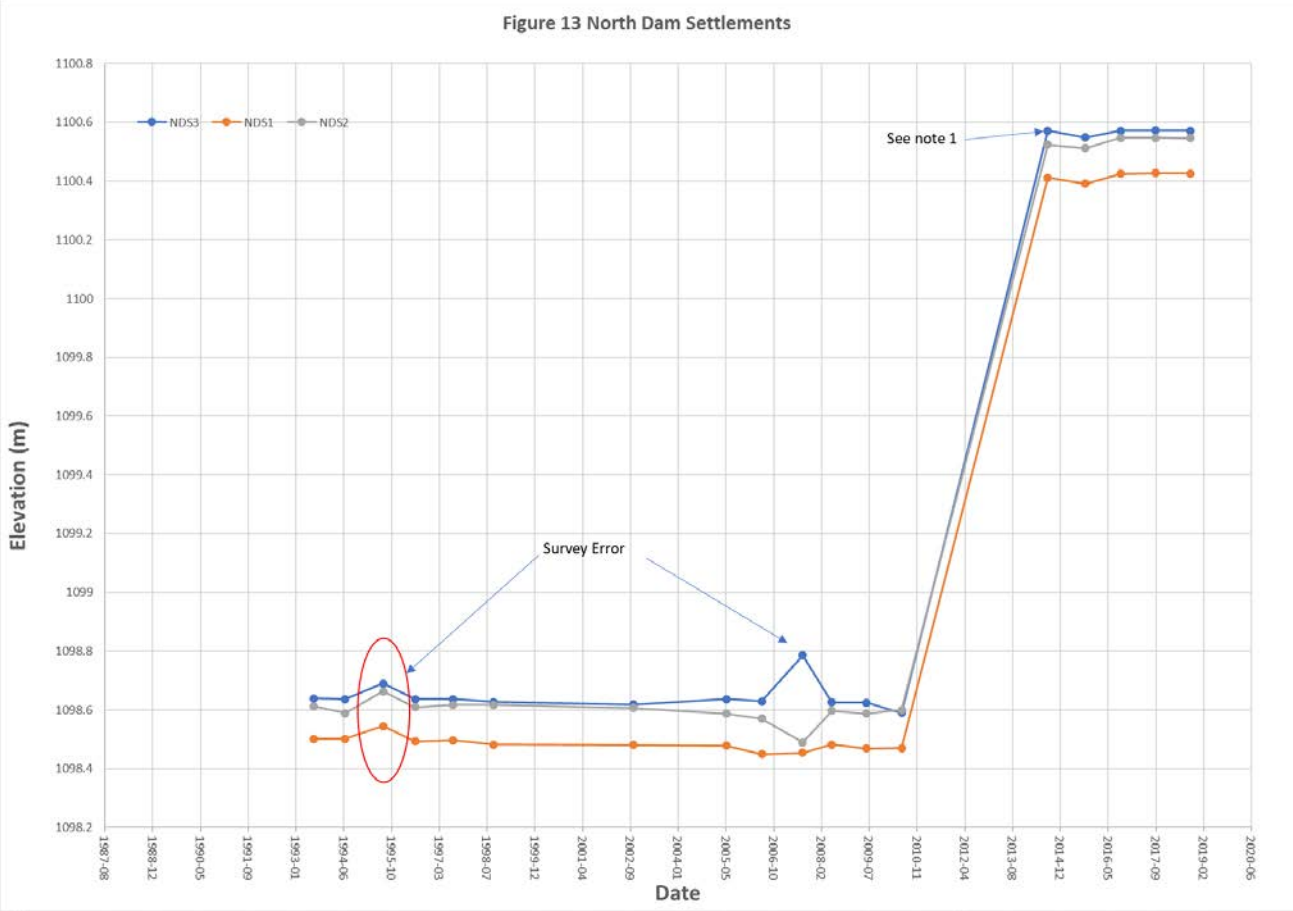


Figure 13: North Dam Settlements

Note 1: Survey Datum was changed in 2012

Figure 13 presents a graphical depiction of the settlement of the crest of the dam over time. The readings taken from 1992 to 2010 were based on the 1990 datum. The 2014 to 2018 readings were based on the 2012 datum. The results shown for 1995 and 2008 are erroneous due to survey error. Furthermore, some of the results indicate an increase in elevation. Those numbers were attributed to the inaccuracy of the survey equipment used and were consequently ignored. In general, as shown by Figure 13 above, settlement of the North Dam is performing as expected.

Given the above results and the long-term trend, settlement readings would continue to 2020 with no further readings taken beyond that point.

4.3 Photographs

A photographic log was taken during the site inspection. Photos are provided in Appendix A and are referenced in Section 4.1.

4.4 Pond and Discharge Water Quality

The Sediment pond at the SRS is the only pond associated with the TMA. Water quality in the pond was monitored as MH-01 under previous Water Licence QZ16-080 which expired on

March 31, 2017. Under the current water licence QZ016-051, water quality in the sediment pond is not monitored. However, the results of the water sampling carried out for the pond under the QZ16-080 water licence met the standards in the water licence. It is the opinion of the EoR that the results would not impact the structural integrity of the North Dam or the SRS dyke.

4.5 Site Inspection Forms

Every year, in accordance with the site Water Licence, the OMS manual and the EPRP, a routine inspection of the TMA is completed twice a year in the spring and the fall by Jeff Basarich. The reports prepared by Mr. Basarich are provided in Appendix C.

4.6 Facility Data Sheets

The facility data sheets for the North Dam and the SRS dyke are provided in Appendix D.

5 Dam Safety Assessment

5.1 Design Basis Review

5.1.1 North Dam

The original design of the starter dam for the North Dam required a crest elevation of 1,100 m with an ultimate dam design crest elevation of 1,106 m. However, this ultimate design crest elevation was modified in subsequent revisions to the mine plan to El. 1,104 m. A summary of the design criteria for the North Dam is provided in Table 5-1. The design criteria were also updated to reflect changes in the CDA 2014 Technical Bulletin, Dam Consequence Classification.

Table 5-1: Design Criteria of the North Dam (Updated)

Design Crest Elevation (Ultimate)	Not applicable
Starter Dam Crest (Existing)	1,100 m
Top of Till Core Elevation (Ultimate)	Not applicable
Maximum Operating Tailings Level (ultimate)	Not applicable
Maximum Operating Pond Level (Ultimate)	Not applicable
Spillway Invert Elevation	No emergency spillway in dam
Design Operating Freeboard	Not applicable
Design Seepage (SRK/AMCL, 2000)	35-50 L/min
Tailings Storage Capacity (Ultimate)	Not applicable
Dam Consequence Classification (2015 DSR)	Significant
Target Earthquake Level (CDA, 2014) (Passive care) Seismic Event	1 in 2475 year (PGA = 0.203g)
Target FOS (CDA, 2014)	1.5 (static); 1.0 (pseudo-static)
Target Flood Levels (CDA, 2014)	1/3 between the 1,000-year event and the PMF

Source: //Z:\01_SITES\Sa_Dena_Hes\1CT008 057_2016_Geotech_Inspection\!080_Deliverables\1CT008 057_Report\010_Text\2016_SDH_GeotInsp_Report_1CT008-057_20170404_pmh.docx

5.1.2 Sediment Retaining Structure

The SRS spillway was designed to accommodate the 1 in 1000-year design flood. The SRS currently has a "Low" Consequence Classification. CDA (2014) recommends that the inflow design flood (IDF) for a low consequence dam class that is expected to remain in Construction, Operation & Transition Phase would be the 1 in 100-year event as referenced in Table 3-2 of the CDA 2014 Technical Bulletin. However, as the SRS will be in a "Closure-Passive Care Phase" for an extended period under infrequent surveillance, the IDF for the spillway was raised to the next highest dam classification level, the 1 in 1000-year event as referenced in Table 4-1 of the CDA 2014 Technical Bulletin.

Similarly, the target PGA for the SRS is 0.146 g.

A summary of the design criteria for the SRS is provided in Table 5-2 below.

Table 5-2: Design Criteria for the SRS

Original Design Crest Elevation	El. 1086.7 m
As Built Crest Elevation	El. 1087.7 m
Original Design Spillway Invert Elevation	El. 1085.0 m
As Built Spillway Invert Elevation	El. 1085.7 m
Crest Length	80 m
Design Operating Freeboard	1 m
As Built Operating Freeboard	1 m
Dam Consequence Classification	Low
Operating Pond Level	El. 1085 m
Target Earthquake Level (CDA, 2014) (Passive Care)	1 in 1000 years (PGA = 0.146g)
Target FOS (CDA 2014)	1.5 (static); 1.0 (pseudo-static)
Target Flood Levels (CDA 2014) (Passive Care)	1 in 1000 years

5.2 Hazards and Failure Modes Review

As a permanently closed site, structures at Sä Dena Hes mine site that have the potential to endanger human life or create environmental damage were either removed or upgraded to enhance long-term physical stability. This section of the DSI reviews the hazards that have been identified for the North Dam and the SRS and provides an assessment of the safety of these structures relative to the potential failure modes listed in the CDA (2014) Technical Bulletin.

Key hazards identified for the North Dam and SRS include runoff from extreme precipitation events, seismic events, ice buildup and debris in the SRS spillway, potential for liquefaction of the tailings and flow capacity of the SRS spillway. The following sections assess the potential failure modes for each structure.

5.2.1 Dam Overtopping

The recent hydrological studies completed by SRK (SRK 2016a) concluded that there is no risk of overtopping of the North Dam even in an “extreme worst case” Probable Maximum Precipitation (PMP) event with none of the existing drainage features such as water diversions functioning.

The spillway in the SRS is designed to accommodate the 1 in 1000 year IDF which meets the CDA 2014 target levels for flood hazards for “low” Dam Consequence Classification dams in the closure-passive care phase.

5.2.2 Piping

North Dam

The North Dam was built as a tailings retaining structure designed to allow seepage through the dam. The dam has three zones: an upstream low permeability compacted zone of silty till, a semi pervious compacted central zone of sandy till and a compacted outer downstream shell of pervious sand and gravel. Underlying the dam is a native sandy, gravelly silt (till). There are no indicators of fines being washed through to dam, although there is some seepage evident at the downstream toe. This seepage is mixed in with historical spring activity that was noted during the construction of the dam and the annual dam inspections. The tailings placed up against the upstream face of the dam have significantly reduced the seepage loss since initial construction. Piezometric levels in the dam and in the foundation have varied seasonally since the mine shut down in 1992 and lower levels are expected over time as the till cap consolidates.

Given the lower hydraulic gradient now that the pond has been removed, the risk of piping is negligible.

SRS

The pond behind the SRS has a maximum depth of about 1.5 m and the overall hydraulic gradient through the structure is low and corresponds to no piping potential. The seepage through the dyke is barely measurable. There is one small boil that has been noted at the downstream toe of the SRS dyke, but no loss of fines detected.

5.2.3 Slope Stability

Table 5-3 outlines the minimum FoS values for mining dams based on the guidelines in the CDA 2014 technical Bulletin.

Table 5-3: Target Levels for Earthquake Hazards/Factor of Safety, 2014 CDA Guidelines

Dam Rating	Care Type[1]	Event	AEP	Minimum Static FoS	Minimum Pseudo-Static FoS
Low	Transition	1 in 100 year	0.01	1.5	1.0
Low	Passive Care	1 in 1000 year	0.001	1.5	1.0
Significant	Transition	1 in 1000 year	0.001	1.5	1.0
Significant	Passive Care	1 in 2475 year	0.0004	1.5	1.0

Notes:
1. Active care assumes regular dam safety reviews, continual dam performance monitoring and the ability to respond to emergencies immediately. Passive care assumes no maintenance or monitoring occurs post-closure.

As the site is expected to remain in the Closure Passive Care phase for an extended period and as there is infrequent surveillance, the passive care targets have been adopted.

North Dam

As discussed above, the North Dam is composed of compacted fill with a pervious downstream shell. The downstream slope is 2.5H:1V. Several stability analyses have been performed on this dam in the last 2 years.

In 2015, SRK completed a stability analysis of the North Dam to supplement a third-party review of the Dam Consequence Category for the dam.

The results of the stability analyses completed on the North Dam, which are shown in Table 5-4, show that the structure exceeds minimum FoS requirements for long-term static and pseudo-static stability for closed dams under passive care classified as having a “Significant” consequence of failure.

Table 5-4: Stability Analysis Results

Case	FoS
Long Term Static	1.6
Pseudo-Static (1 in 100 year)	1.5
Pseudo-Static (1 in 1000 year)	1.3
Pseudo-Static (1 in 2475 year)	1.2

In the above slope stability analysis, the seismic acceleration used in the calculation was one-half of the full Peak Ground Acceleration (PGA) or 0.20 g. The application of the entire PGA value in the direction of failure is extremely conservative and represents the absolute worst-case scenario.

In 2016, SRK completed an updated post-liquefaction stability analysis of the North Dam. The stability analysis was completed to assess the stability of the North Dam following an earthquake event and assuming liquefaction of the tailings impounded by the dam during the seismic event.

The stability analysis concluded that tailings play no role in dam stability as the critical failure surface runs through the dam, which is constructed of engineered and not tailings material.

Based on the above analyses, the North Dam is stable under both static and seismic assessments.

SRS

SRK also completed a stability analysis of the current configuration of the dyke under both static and pseudo-static conditions. The dyke has a maximum height of about 5 m and upstream and downstream slopes of 2H:1V slope and 2.5H:1V respectively. The maximum depth of the pond behind the dyke is about 1.7 m.

The seismic calculation was completed using a full horizontal loading of 0.15 g which was based on the target level for earthquake hazards suggested by CDA 2014 guidelines for a low consequence class dam in the passive care phase. The results of the analysis indicated both static and pseudo static FOS that exceeded the target values in Table 5-3 above.

5.2.4 Surface Erosion

North Dam

SRK completed a recent study to assess the erosion potential of the material on the downstream face. The study concluded that existing sand and gravel material exposed on the downstream face is adequate to withstand the runoff from the 200-year, 24-hour rainfall event without any significant erosion.

SRS

GeoJute fabric protection on the downstream face of the SRS is in good condition and provides adequate protection against surface erosion.

5.3 Review of Downstream and Upstream Conditions

5.3.1 Downstream Conditions (South)

No changes were noted downstream or south of the TMA. The original exit chute shows no sign of increased seepage since Camp Creek was redirected back into the original Camp Creek channel. The vegetation is slowly taking hold. There were no new dwellings or change in land use noted.

5.3.2 Upstream Conditions (North)

The North Dam is located near an original catchment divide so all conditions are predominantly downstream. An inspection of the conditions north of the North Dam was carried out and no changes were noted. Similarly to the area south of the TMA, no new dwellings or changes to land use were noted.

5.4 Dam Classification Review

The first assessment of the Dam Consequence Classification (DCC) of potential failure of the dams and spillways associated with the TMA was completed by SRK for the 2000 Detailed Decommissioning Reclamation Plan (DDRP). The assessment was completed in accordance with the guidelines presented in the “Mine Reclamation in the Northwest Territory and the Yukon” (INAC 1992) and focused on the failure of the South Dam spillway and the failure of the North Dam. The failure of South Dam and the Reclaim Dam was not considered since they would be removed upon closure. The study concluded that the failure of the North Dam and the South Dam spillway would not pose a significant risk to public health and safety; there would be no loss of life expected, no damage to buildings and no loss to roads. The design criteria established for the design of the South Dam spillway and the stability of the North Dam was therefore based on the 1 in 1000 year IDF and the PGA for the 1 in 1000 seismic event respectively. No dam breach or inundation studies were carried out.

As part of the 2003 Dam Safety Review (DSR) completed by Klohn Crippen Berger (KCB), a screening level assessment of the DCC for the TMA was carried out so that the appropriate

design criteria could be established for the DSR. The assessment was carried out in accordance with the 1999 CDA Dam Safety Guidelines and included a dam breach inundation analysis. The study concluded that all three dams (North, South and Reclaim) would be classified as Low Consequence facilities.

In 2010, a second DSR was carried out by Golder Associates, who also completed a screening level assessment so that a design criteria could be established for the 2010 DSR. The assessment was completed in accordance with the CDA 2007 Dam Safety Guidelines and included a conceptual dam breach and inundation study. Overall the assessment concluded that all three dams would be in the “significant” consequence class due to the potentially significant incremental losses on False Creek and Frances River.

Given the 2014 decommissioning activities associated with the TMA, SRK completed a dam breach and inundation study for the SRS dyke and the North Dam. The assessment concluded that by applying the CDA (2014) generalized guidelines shown in Table 5-5, incremental losses from a breach of the North Dam and SRS dyke would place the structures in the “Low” Consequence class. The attribution of that class to the North Dam and the SRS is based on the following consequence criteria:

- There is no population at risk downstream of the facility or near the dam or in the expected path of any water releases;
- No loss of human life would be expected from the failure;
- No local or regional infrastructure or services would be impacted by a failure; and
- There would be minimal short term loss and no long-term loss.

Table 5-5: CDA (2014) Dam Classification in Terms of Consequences of Failure

Dam Class	Population at Risk [note 1]	Incremental Losses		
		Loss of Life [note 2]	Environmental and Cultural Values	Infrastructure and Economics
Low	None	0	Minimal short-term loss No long-term loss	Low economic losses; area contains limited infrastructure or services
Significant	Temporary only	Unspecified	No significant loss or deterioration of fish or wildlife habitat Loss or marginal habitat only Restoration or compensation in kind highly possible	Losses to recreational facilities, seasonal workplaces, and infrequently used transportation routes
High	Permanent	10 or fewer	Significant loss or deterioration of i*mportant* fish or wildlife habitat. Restoration or compensation in kind highly possible	High economic losses affecting infrastructure, public transportation, and commercial facilities
Very high	Permanent	100 or fewer	Significant loss or deterioration or *critical* fish or wildlife habitat Restoration or compensation in kind possible but impractical	Very high economic losses affecting important infrastructure or services (e.g., highway, industrial facility, storage facilities for dangerous substances)
Extreme	Permanent	More than 100	Major loss of *critical* fish or wildlife habitat Restoration or compensation in kind impossible	Extreme losses affection critical infrastructure or services (e.g., hospital, major industrial complex, major storage facilities for dangerous substances)

Note 1. Definitions for population at risk:

None – There is no identifiable population at risk, so there is no possibility of loss of life other than through unforeseeable misadventure.

Temporary- People are only temporarily in the dam-breach inundation zone (e.g. seasonal cottage use, passing though on transportation routes, participating in recreational activities).

Permanent- The population at risk is ordinarily located in the dam-breach inundation zone (e.g., as permanent residents); three consequence classes (high, very high, extreme) are proposed to allow for more detailed estimates of potential loss of life (to assist in decision-making if the appropriate analysis is carried out).

Note 2. Definitions for population at risk:

Unspecified- The appropriate level of safety required at a dam where people are temporarily at risk depends on the number of people, the exposure time, the nature of their activity, and other conditions. A higher class could be appropriate, depending on the requirements. However, the design flood requirement, for example might not be higher if the temporary population is not l kely to be present during the flood season.

The last DSR was carried out by AMECFW in 2015 and based on this review, the CDA Dam Consequence Classification of the North Dam was changed from “Low” to “Significant”. The change was based on an issue raised by AMECFW that there was a potential for liquefaction of the tailings if the dam were to fail and that during a flood event there was a potential for overtopping of the dam. Because of this classification change, the IDF for the North Dam under passive care was changed to 1/3 between the 1,000-year event and the PMF and the design earthquake event was changed from the 1 in 1,000-year event to the 1 in 2,475-year event, respectively (based on passive care guidelines in CDA 2014).

As discussed in Section 5.2, there is no risk of overtopping of the North Dam even in an “extreme worst case” Probable Maximum Precipitation (PMP) event (SRK 2016a) and the recent stability analysis completed by SRK concluded liquefied tailings play no role in dam stability as the critical failure surface runs through the dam, which is constructed of engineered and not the tailings material.

As stated in the last DSI report, the next DSR is scheduled for 2020 or 5 years from the last DSR. In the CDA 2014 guidelines, the suggested frequency for DSR's ranges from 5 to 10 years, depending on the consequences of failure and changes in the dams. A risk assessment for the site is scheduled for December 2018 and a review of the Dam Consequence Category for the North Dam and the frequency of DSR's for the site should be reviewed at that time.

In the event that the dam classification for the North Dam is changed to Low after the risk assessment is completed, the design earthquake and the design flood events would revert to the 1 in 1000 year events respectively.

5.5 Physical and Operational Performance

As the mine is currently closed in passive care, operational performance is not applicable. The North Dam is currently stable and does not retain any water. There are no signs of any instability on the crest or the downstream slope. The SRS dyke is also stable with no indication of cracks along the crest or sloughing on the upstream and downstream slopes.

The spillway shows no sign of movement of the riprap or instability. It is functioning in accordance with the design parameters.

5.6 Operations, Maintenance and Surveillance (OMS) Manual Review

The current OMS Manual was prepared by SRK in 2015. The manual was reviewed as part of this 2018 DSI.

A list of changes to the OMS manual are provided below:

1. Section 1.1 *The SRS and the North Dam are in a "passive" care phase of closure with some surveillance and monitoring. Design criteria for both structures are governed by the target levels for flood and earthquake hazards based on the passive care phase of closure*.

2. Section 2.1 *Details in the Key Roles and Responsibility Table 1 have been updated including key contact information.*

3. Section 2.2 *Org Chart Figure 6 has been updated*.

4. Section 3.3.4 *Dam Consequence Category. Added discussion on the DCC for the North Dam and added reference to a scheduled Risk Assessment in Dec 2018. Frequency of DSR's for the SDH TMA.*

5. Section 5.2 *Added comment about a review of the Dam Consequence Category for the North Dam and the frequency of DSR's for the site*

6. Section 5.3.2 *Added comment about Piezometer caps and labels*

7. Section 6.1 *Added comment about the frequency of Routine maintenance inspections (Fall and Spring)*

8. Section 6.5.2 *Added requirement to remove Beaver dams as soon as they are identified during routine inspections.*

9. Section 6.5.6 *Added comments about erosion monitoring pins at the toe of the Jewelbox Waste Rock dump*

5.7 Emergency Preparedness and Response Plan (EPRP) Review

The current EPRP was prepared by SRK in 2015. The manual was reviewed as part of this 2018 DSI.

A list of changes to the EPRP is provided below:

1. Section 2.1 *Details in the Key Roles and Responsibility Table 1 have been updated including key contact information.*

2. Section 2.2 *Org Chart Figure 6 has been updated*.

6 Summary and Recommendations

6.1 Summary of Construction and Operations Activities

The site is current closed and there are no construction or operation activities.

6.2 Summary of Climate and Water Balance

The MAP for the site is 646mm based on a recent regional and regression analysis performed by SRK using the nearby meteorological stations from Environment Climate Change Canada (ECCC). An estimate of the 2017 MAP was estimated to be 503 mm based on the annual precipitation recorded at the Watson airport.

The mean annual lake evaporation for the site is estimated at 483 mm.

6.3 Summary of Performance

The North Dam is currently stable and does not retain any water. There are no signs of any instability on the crest or the downstream slope. The vegetation on the till cover is slowly taking hold and the drainage channel in the middle of the cover is functioning as designed.

The SRS dyke is also stable with no indication of cracks along the crest or sloughing on the upstream and downstream slopes.

The spillway shows not signs of movement of the riprap or instability. It is functioning in accordance with the design parameters

6.4 Summary of Changes to Facility or Upstream or Downstream Conditions

There were no significant changes noted of the North Dam or the SRS dyke. Similarly, there were no changes to the upstream and downstream conditions to the north and south of the North Dam.

6.5 Consequence Classification

The consequence of failure category for North Dam and the SRS Dyke is currently “significant” and “low” respectively. As stated in the last DSI report, the next DSR is scheduled for 2020 or 5 years from the last DSR. In the CDA 2014 guidelines, the suggested frequency for DSR’s ranges from 5 to 10 years, depending on the consequences of failure and changes in the dams. A risk assessment for the site is scheduled for December 2018 and a review of the Dam Consequence Category for the North Dam and the frequency of DSR’s for the site would be reviewed at that time.

6.6 Table of Deficiencies and Non Conformances

SRK has completed the 2018 DSI of Sä Dena Hes mine, TMA and water management infrastructure and concluded that the North Dam, the SRS, the diversion channels and the waste rock dumps are in good condition, and there was no evidence of any dam safety issues or concerns.

Table 6-1 provides a summary of deficiencies and non conformances noted during the 2018 dam safety inspection (DSI). There are no outstanding deficiencies or non-conformances from the 2017 or earlier DSI’s.

Table 6-1: Summary of Deficiencies and Non-Conformances

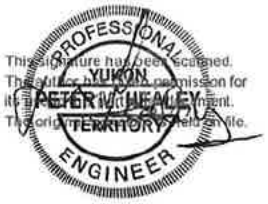
Structure	ID No.	Deficiency or Non Conformance	Applicable Regulatory or OMS Reference	Recommended Action	Priority (Teck 2014)	Recommended Deadline/ Status
North Dam	2018-1	NDW-2B and 1A missing caps	OMS 5.3.2	Install plastic caps and label	3	Before end of 2018 Completed Oct 18, 2018 Closed
North Creek Channel	2018-2	Beaver Dam at inlet to channel	OMS 5.6.3	Remove beaver dam in channel	3	Before End of 2018 / Completed July 26 2018 Closed
Jewelbox Waste Rock Dump	2018-3	Erosion Gully in North east corner	OMS 6.5.6 and 5.3.1	Install additional Monitoring pins	3	Before End of 2018 / Completed Sept 19 2018 Closed

General Description of Priority Rankings[2]

Priority	Description
1	A high probability or actual dam safety issue considered immediately dangerous to life, health or the environment, or a significant regulatory concern.
2	If not corrected, could likely result in dam safety issues leading to injury, environmental impact or significant regulatory action; or, a repetitive deficiency that demonstrates a systematic breakdown of procedures.
3	Single occurrences of deficiencies or non-conformances that alone would not be expected to result in dam safety issues.
4	Best Management Practice as a suggestion for continuous improvement towards industry best practices that could further reduce potential risks. This typically includes ongoing construction items within the appropriate construction cycle.

[2] Based on the Health, Safety and Reclamation Code (HSRC) for Mines in British Columbia (2016 revision).

This final report, 2018 Sä Dena Hes Annual Dam Safety Inspection, was prepared by SRK Consulting (Canada) Inc.



Peter Healey, PEng
Associate

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.

Disclaimer—SRK Consulting (Canada) Inc. has prepared this document for Teck Resources Limited. Any use or decisions by which a third party makes of this document are the responsibility of such third parties. In no circumstance does SRK accept any consequential liability arising from commercial decisions or actions resulting from the use of this report by a third party.

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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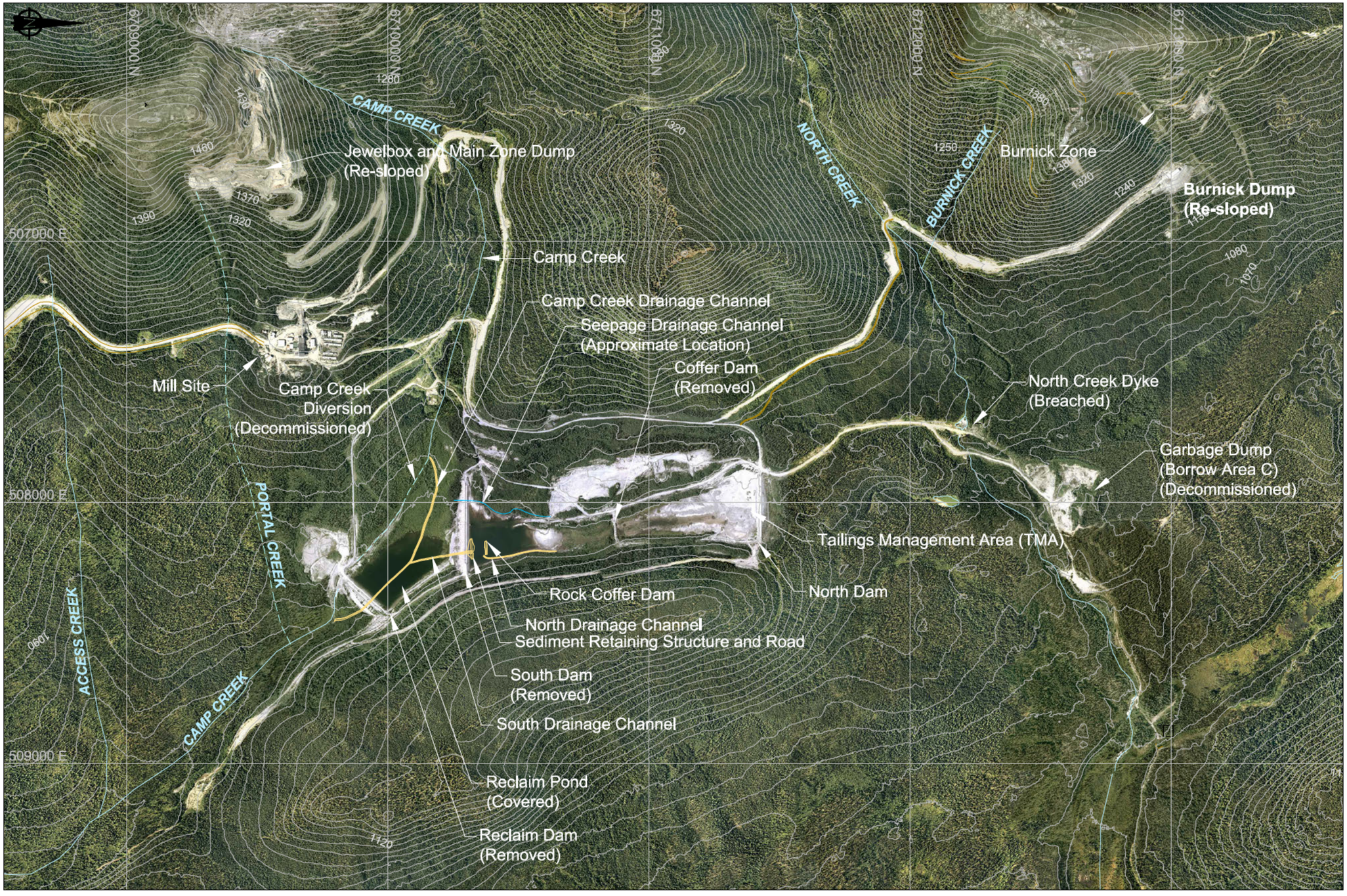
Yukon Territory Water Board Water License QZ99-045 for SDH mine (YTWB 2002), and its amendments (YTWB 2005 and YTWB 2010)

Figures



NOTES

1. Topographic contour data and aerial photos were obtained from McElhanney and are based on August 15, 2012 LiDAR survey. Coordinate system is UTM NAD 83CSRS zone 9V.
2. Orthographic photo depicts pre-decommissioned surface.

0 100 200 300 400 500
Scale in Metres
CONTOUR INTERVAL=10m

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SRK JOB NO. 1CT008.068
FILE NAME 1CT008_068_fig_01 - Vicinity Map.dwg

Teck

Sä Dena Hes Project

2018 Dam Safety Inspection

Vicinity Map

DATE	APPROVED	FIGURE
September 2018	PH	1

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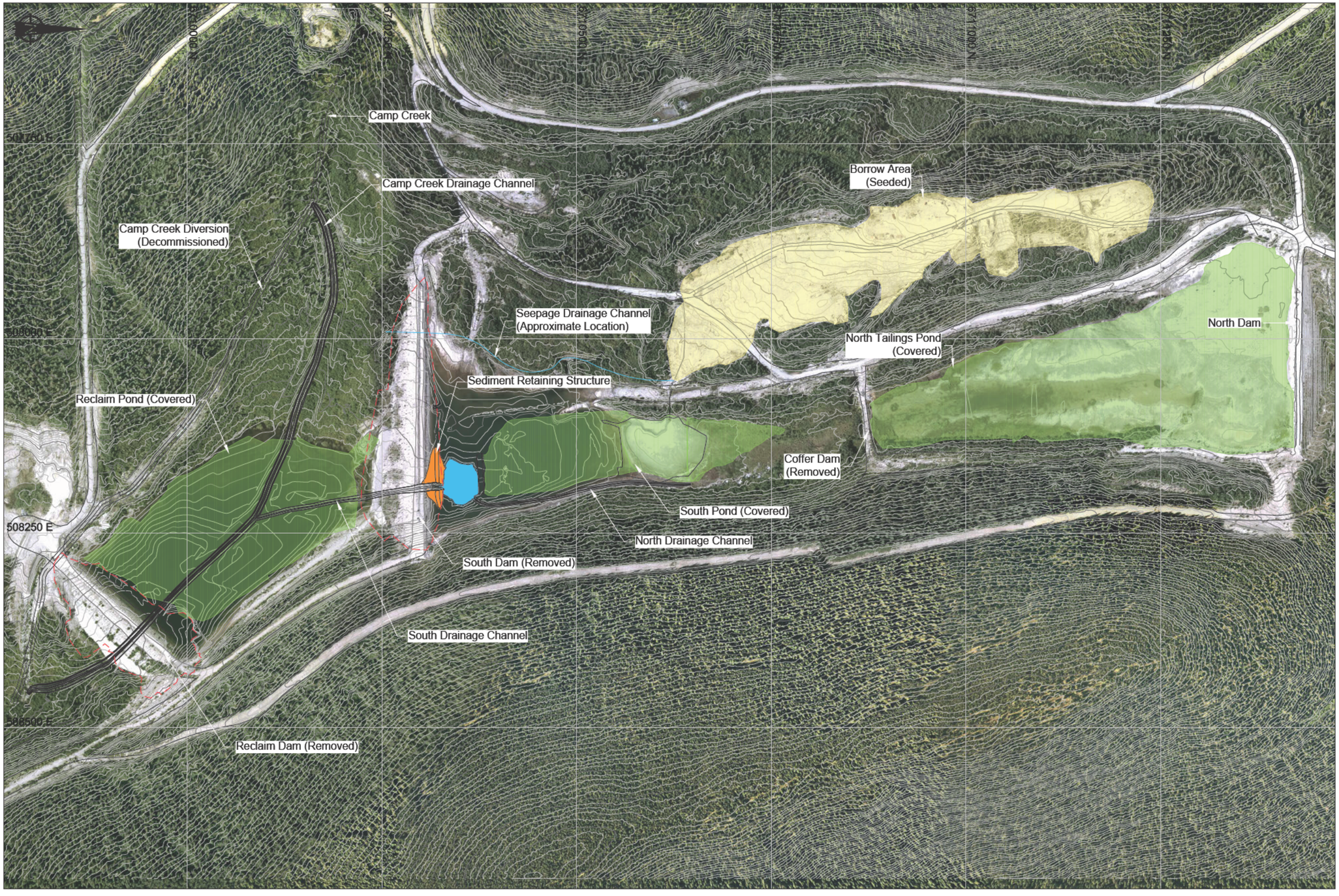

LEGEND

- Major Contour (5m interval)
- Minor Contour (1m interval)
- Edge of Road
- Design Edge of Road
- Camp Creek Drainage Channel
- Dam Excavation Extent
- Sedimentation Pond
- Capped Areas
- Seeded Area

NOTES

1. Preconstruction topographical contour data was obtained from McElhanney and is based on August 15, 2012 LiDAR Survey.
2. As-built survey data was collected by Yukon Engineering Services and Amec Foster Wheeler.
3. Coordinate system is UTM NAD 83 CSRS Zone 9V.
4. Tailings characterization work conducted by Golder and Associates determined the location of capping at the South Pond and Reclaim Pond areas.

0m 50 100 150 200

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2018 Dam Safety Inspection

TMA General Arrangement Map

SRK JOB NO.	1CT008.068
FILE NAME	1CT008_068_fig_02 - General Arrangement.dwg

Sä Dena Hes Project

DATE	APPROVED	FIGURE
September 2018	PMH	2

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MONITOR NG STATION
(MH-02)
(100 mm P PE WEIR)

LOWER
POND

UPPER
POND

NDW-4A

DOWNSTREAM TOE OF DAM

Well Decommissioned
October 2014

NDW-3A
NDW-3B

NDW-1A
NDW-1B

NDW-2A
NDW-2B

NDS-3

DAM CREST ELEV. 1099.8 m -1100 m.

WELL
TH 14-91

NDS-1

10 m.

NDS-2

℄ DAM

WEST
ABUTMENT

EAST
ABUTMENT

2.5:1

2:1

UPSTREAM TOE OF DAM

508,000 E

508,100 E

508,200 E

KEY

NDW-1 — PIEZOMETERS NSTALLED (NOV., 1991)

NDS-1 — SETTLEMENT GAUGE NSTALLED (NOV., 1991)

SEEPAGE

NOTES:

1. Topographic contour data and aerial photos were obtained from McElhanney and are based on August 15, 2012 LiDAR survey and October 2013 YES Survey. Coordinate system is UTM NAD 83CSRS zone 9V.

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SRK JOB NO.: 1CT008.068

FILE NAME: 1CT008_068_fig_03 – North Dam–plan.dwg

Teck

Sa Dena Hes Project

2018 Dam Safety Inspection

North Dam
Site Plan

DATE:	APPROVED:	FIGURE:
September 2018	P.M.H.	3

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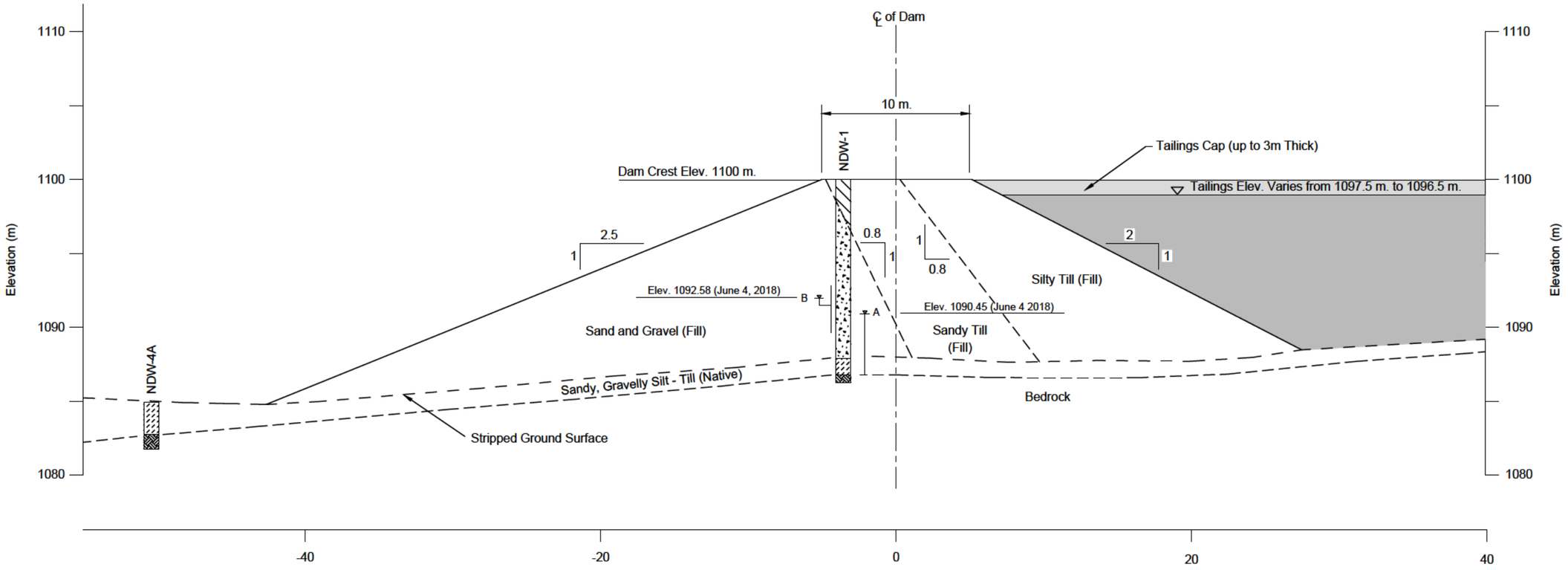

	DATE	T.O.P.	READING	ELEV.
NDW-1B	June 4, 2018	1100.57	7.99	1092.58
NDW-1A	June 4, 2018	1100.74	10.288	1090.45

LEGEND

- Sandy Till (Fill)
- Silty Till (Fill)
- Sand & Gravel(Fill)
- Silty Sand (Till)
- Gravelly Silty Sand (Till)
- Sand & Gravel (Native)
- Bedrock
- Piezometric Head for Filter Zone Indicated
- Tailings
- Tailings Cap

0m 3 6 9 12

NOTES

1. Topographic contour data and aerial photos were obtained from McElhanney and are based on August 15, 2012 LiDAR survey. Coordinate system is UTM NAD 83CSRS zone 9V.

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SRK JOB NO. 1CT008 068

FILE NAME 1CT008_068_fig_04 - North Dam-XS dwg

Teck

Sä Dena Hes Project

2018 Dam Safety Inspection

North Dam
Section 0+400

DATE	APPROVED	FIGURE
September 2018	PMH	4

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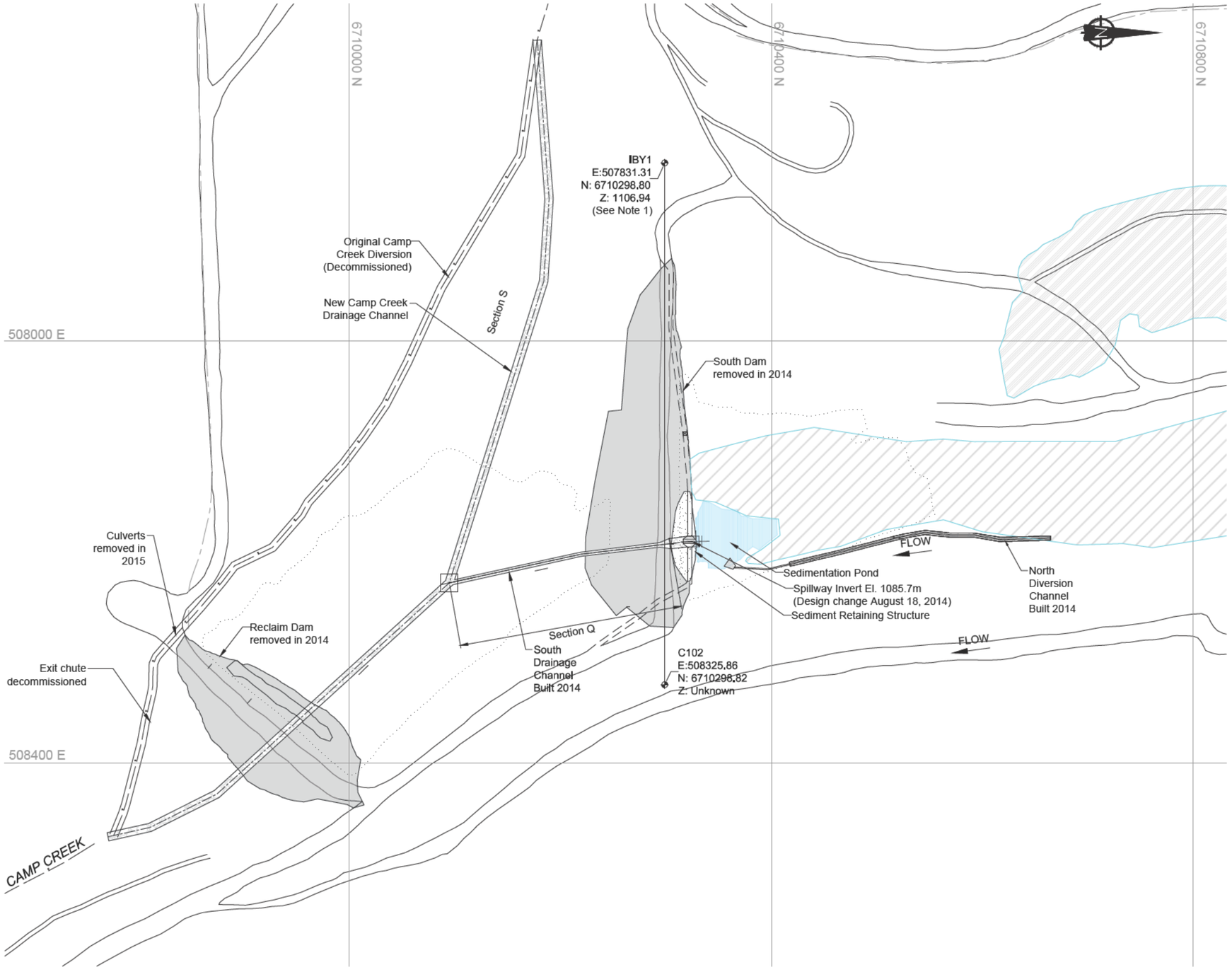

LEGEND

- Covered Tailings
- Removed Dams
- Sedimentation Pond
- Minor Contours (1m interval)
- Major Contours (5m interval)
- Camp Creek
- Drainage Channel

NOTES

1. This Benchmark datum is currently used to monitor settlement gauges on the dam and was used as the benchmark in construction of the dam. The elevation has been adjusted from 1103.54m to the current LiDAR Survey elevation.

0 20 40 60 80 100
Scale in Metres

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SRK JOB NO.: 1CT008.068
FILE NAME: 1CT008_068_fig_05 – TMF.dwg

Teck

Sä Dena Hes Project

2018 Dam Safety Inspection

Sediment Retaining Structure Location Map

DATE:	APPROVED:	FIGURE:
September 2018	PMH	5

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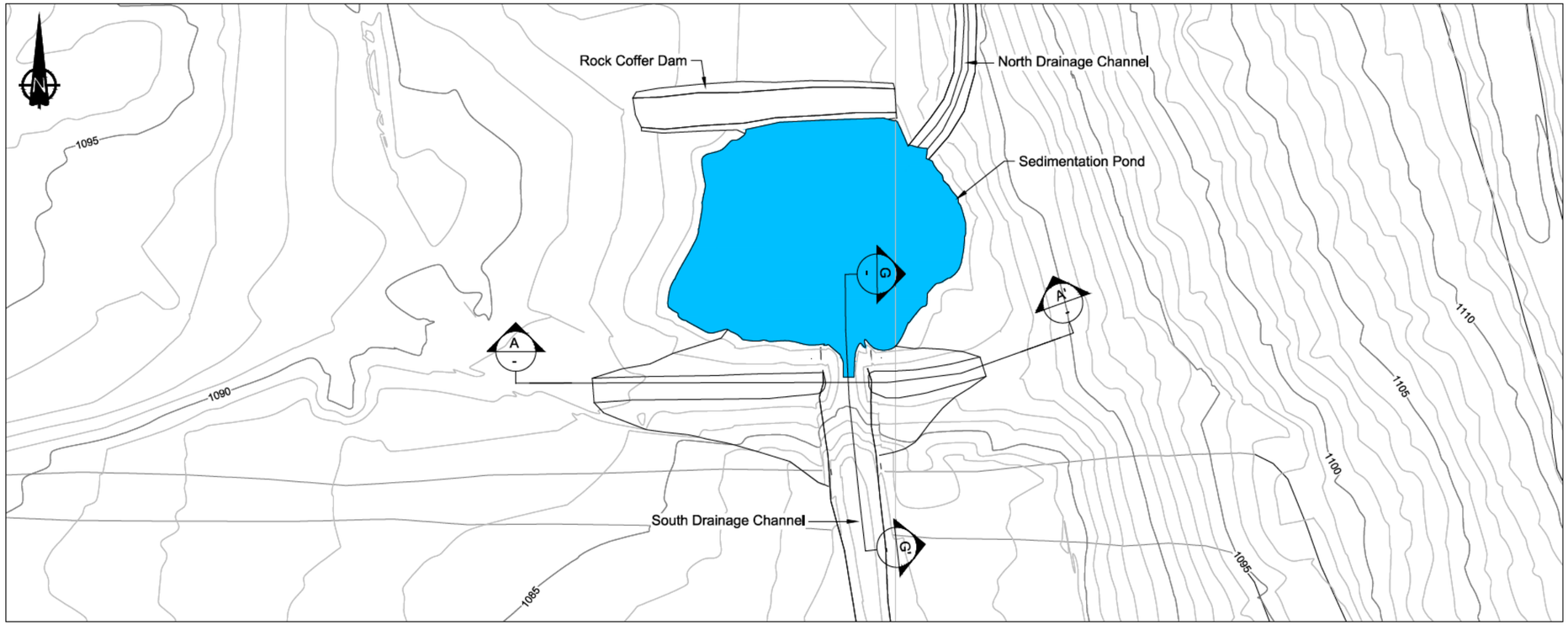


Plan

0m 10 20 30 40

LEGEND

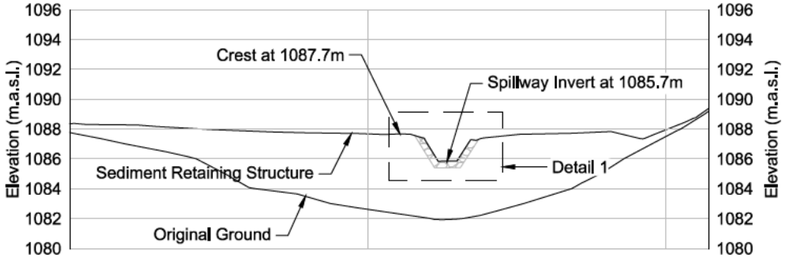
- Major Contour (5m)
- Minor Contour (1m)
- Dam Crest
- Dam Toe
- Edge of Road
- Sediment Pond

PROFILE AND DETAIL LEGEND

- Original Ground
- Non-woven Geotextile
- Riprap

NOTES

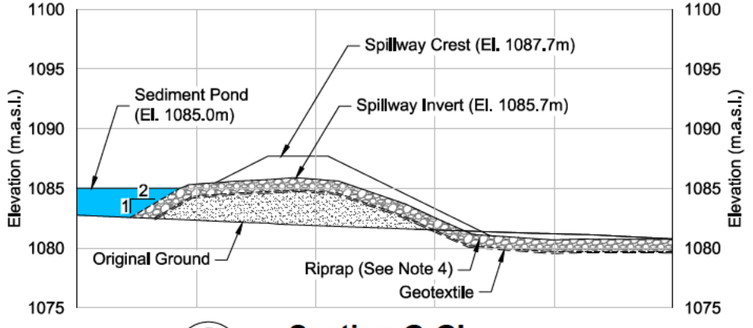
1. Excavated dam fill material was used to cap tailings. The final excavated surface was graded to promote drainage and blended topography into adjacent natural topography.
2. Rip rap from downstream toe buttress was salvaged and reused during channel construction.
3. The decant tower was demolished down to the foundation. Steel reinforced concrete was deposited in the onsite landfill located in Borrow Area C. The remaining concrete foundation was covered with dam fill material and graded to blend into topography.
4. Design extents of rip rap and geotextile, as no as-built survey.



A - **Profile A-A'**

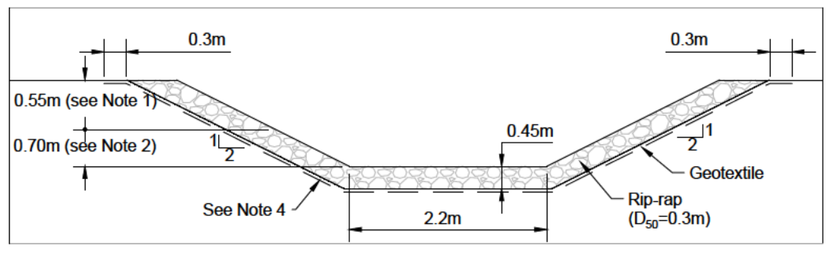
0m 10 20 30 40 Horizontal

0m 4 8 12 16 Vertical



G - **Section G-G'**

0m 5 10 15 20



1 - **Detail 1 - Design Spillway Typical Section**

N.T.S.

srk consulting	Teck	2018 Dam Safety Investigation	
SRK JOB NO. 1CT008.068		Sediment Retaining Structure Plan and Profile	
FILE NAME 1CT008_068_fig_06 - Sediment Retaining Struct.dwg	Sä Dena Hes Project	DATE September 2018	APPROVED PMH	DRAWING 6

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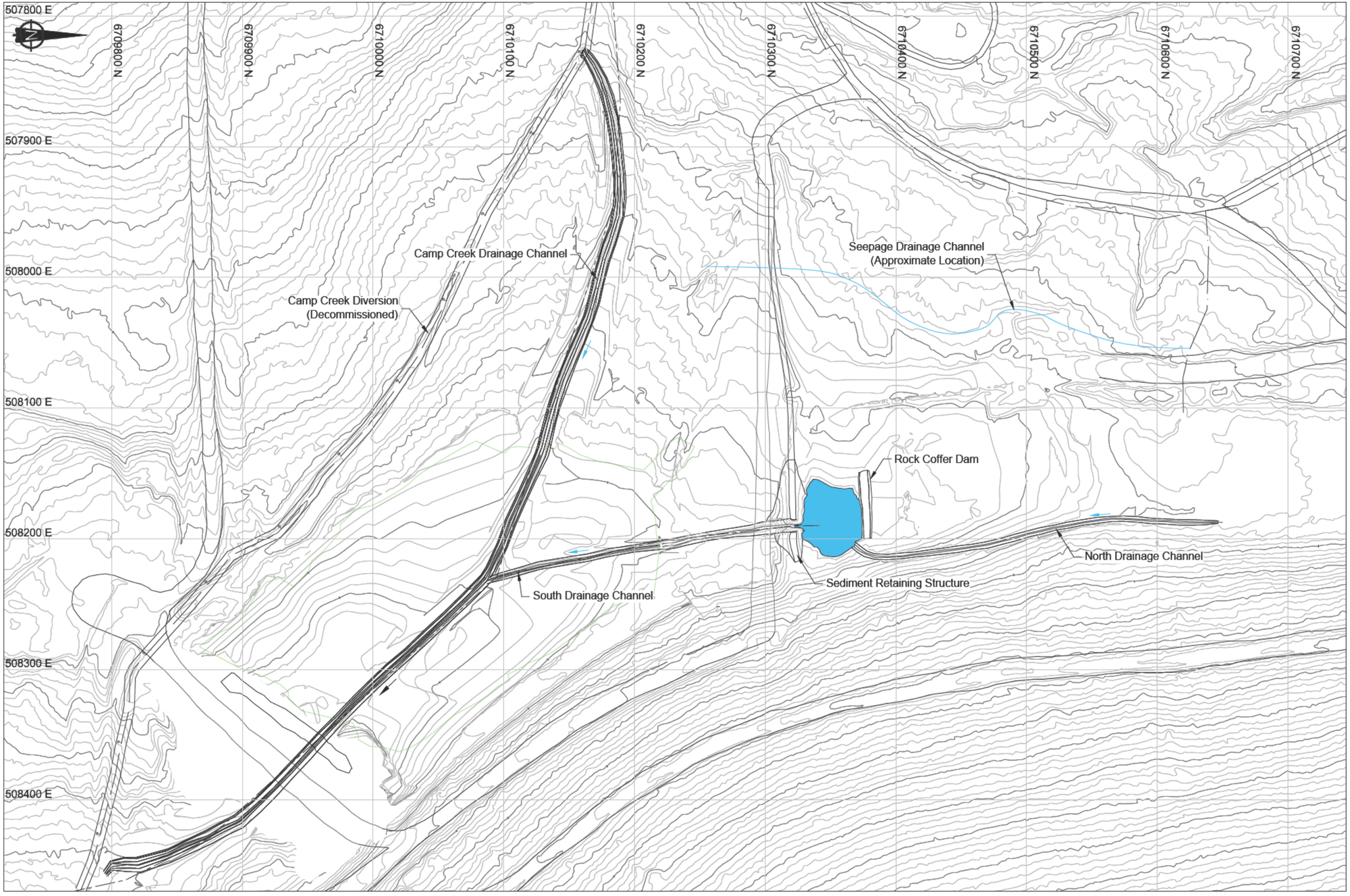

LEGEND

- Major Contour (5m)
- Minor Contour (1m)
- Dam Crest
- Dam Toe
- Edge of Road
- Direction of Flow
- Sediment Pond

NOTES

1. As-built Camp Creek Drainage Channel upstream and downstream tie-in locations and North Drainage Channel alignments were modified from the design by Amec foster wheeler, with consultation from SRK and Teck, based on field conditions.

0m 30 60 90 120

srk consulting

SRK JOB NO. 1CT008.068

FILE NAME 1CT008_068_fig_07 - Drainage Channel.dwg

Teck

Sä Dena Hes Project

2018 Dam Safety Investigation

Drainage Channel Plan

DATE September 2018 | APPROVED PMH | DRAWING 7

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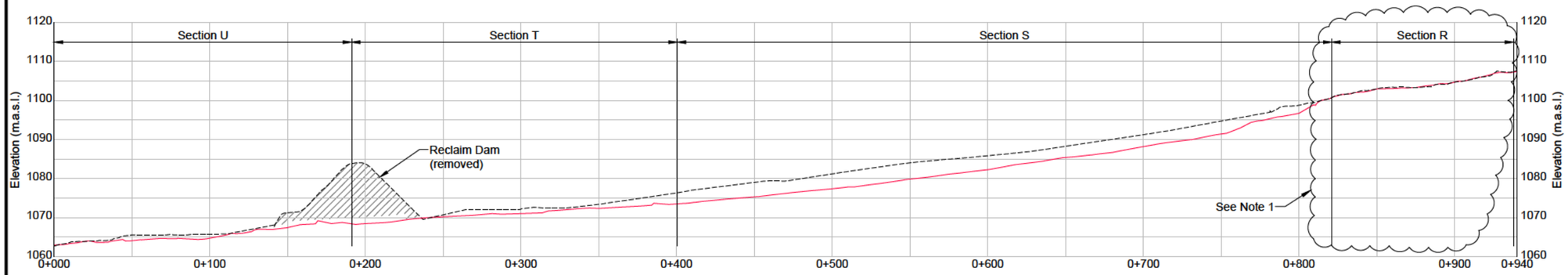


W 09 **Profile W - W'**
Camp Creek Channel

Horizontal: 0 10 20 30 40 50 Scale in Metres

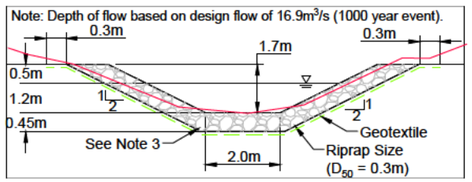
Vertical: 0 5 10 15 20 25 Scale in Metres

LEGEND

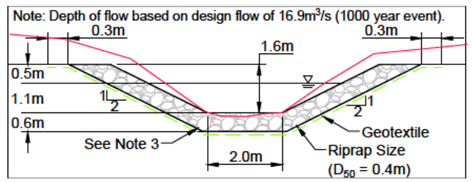
- Top of Drainage Channel Profile
- Pre-existing Ground
- Pre-Construction Ground
- Sediment Retaining Structure
- Non-woven Geotextile
- Material to be removed
- Rip Rap
- Till (left in place from Original Dam)
- As-built Surface

NOTES

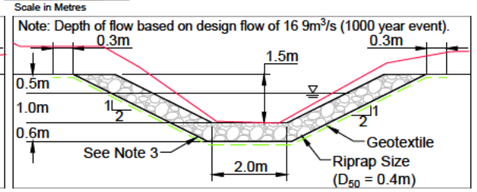
1. Based on field conditions Section R was removed from the design and the upstream tie-in location was modified.
2. Design extents of rip rap and geotextile, as no as-built survey.



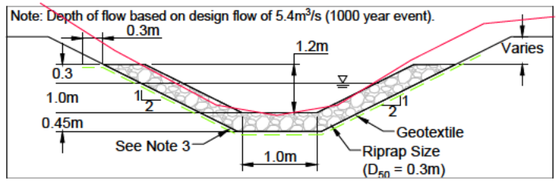
U 09 **DESIGN SECTION U- U'**
Camp Creek Drainage Channel
N.T.S.



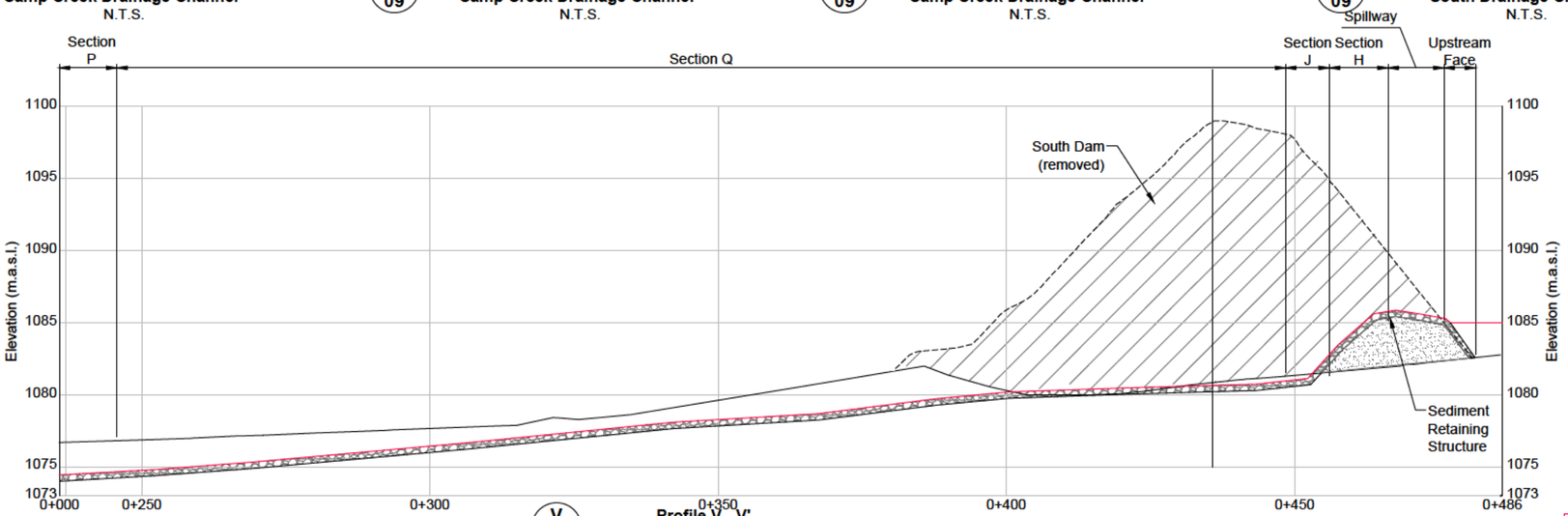
T 09 **DESIGN SECTION T- T'**
Camp Creek Drainage Channel
N.T.S.



S 09 **DESIGN SECTION S - S'**
Camp Creek Drainage Channel
N.T.S.



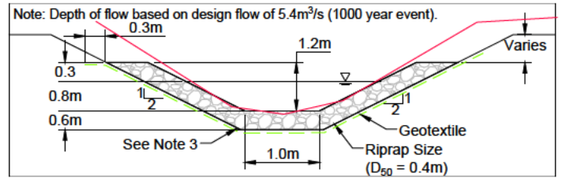
Q 09 **DESIGN SECTION Q - Q'**
South Drainage Channel
N.T.S.



V 09 **Profile V - V'**
South Drainage Channel

Horizontal: 0 5 10 15 20 25 Scale in Metres

Vertical: 0 2 4 6 8 10 Scale in Metres



P 09 **DESIGN SECTION P - P'**
South Dam Drainage Channel
N.T.S.

Design Drainage Channel
Riprap Volume Summary Table

Location	D_{50} (m)	Armoring Depth (m)	Volume (m^3)
Section U	0.3	0.45	993
Section T	0.4	0.6	1409
Section S	0.4	0.6	2875
Section P	0.4	0.6	52

AS-BUILT EXCAVATED RIPRAP QUANTITIES USED FOR CHANNEL CONSTRUCTION

Material	Units	Quantity	Notes
Riprap developed from the Quarry	m^3	5,492	Volume tracked by Amec Foster Wheeler
Riprap salvaged from Toe Buttresses	m^3	3,592	Volume tracked by Amec Foster Wheeler

srk consulting

SRK JOB NO: 1CT008.068

FILE NAME: 1CT008_068_fig_08-09-AB_Asbuilt.dwg

Teck

Sä Dena Hes Project

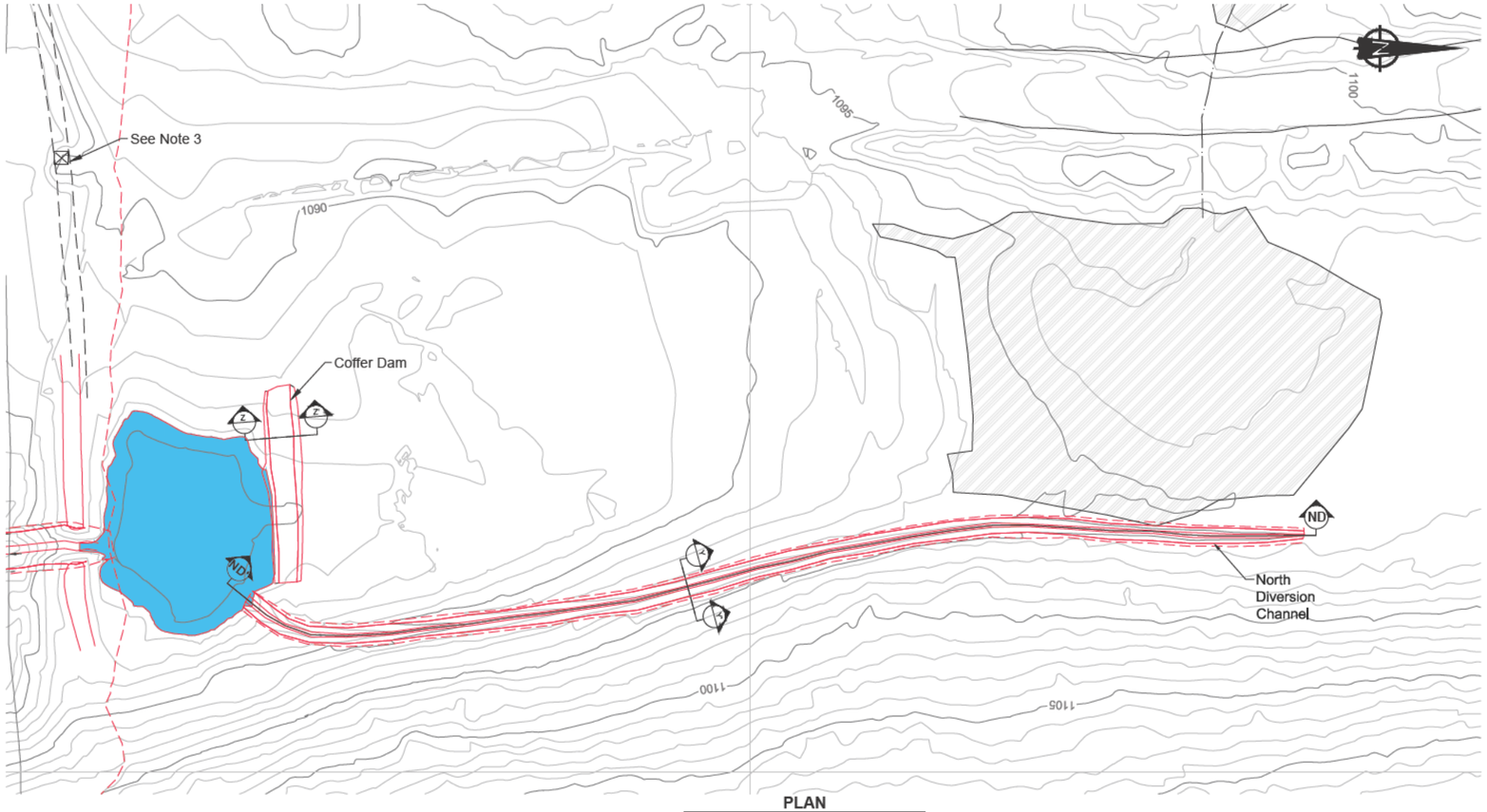
2018 Dam Safety Inspection

DRAWING TITLE:

Drainage Channel Sections

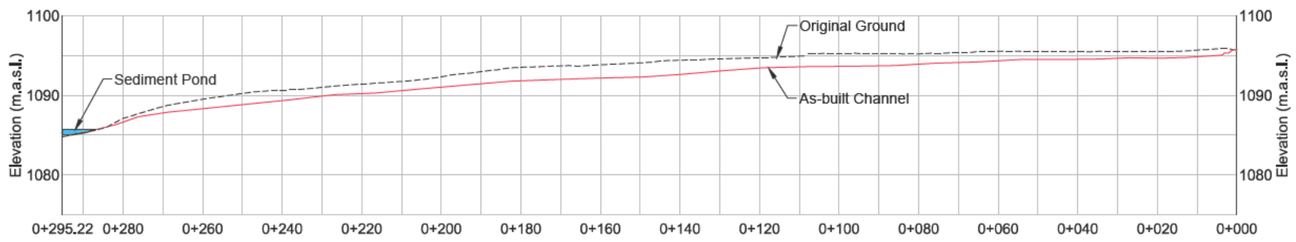
DATE:	APPROVED:	FIGURE NO.
September 2018	PMH	8

\\srk.ad\dfs\vas\wk\Projects\01 SITES\Sä Dena Hes\1CT008.068 2018 Dam Safety Inspection\040 Aute\CAD\1CT008_068_fig_08-09-AB Asbuilt.dwg



PLAN

0 5 10 15 20 25
Scale in Metres



ND - Profile ND - ND'

2x Vertical Exaggeration

Horizontal: 0 5 10 15 20 25 Scale in Metres

Vertical: 0 2.5 5 7.5 10 12.5 Scale in Metres

NOTES

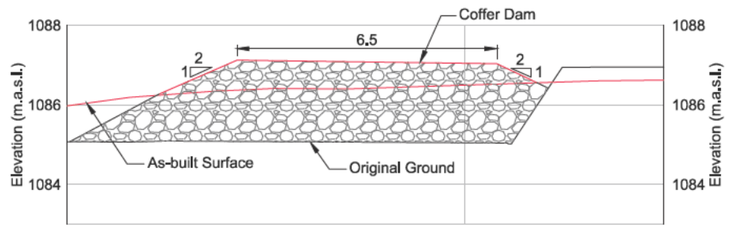
1. Based on field conditions the North Drainage Channel was realigned to avoid constructing the channel through deposited tailings.
2. Based on field conditions a Rock Cofferdam was constructed to retain soft tailings from sliding into the sediment retention pond during cover construction.
3. The decant tower was demolished down to the foundation. Steel reinforced concrete was deposited in the onsite landfill located in Borrow Area C. The remaining concrete foundation was covered with dam fill material and graded to blend into topography.
4. Design extents of rip rap and geotextile, as no as-built survey.

Design North Tailings Drainage Channel Riprap Volume Summary Table:

Location	D_{50} (m)	Armoring Depth (m)	Volume (m^3)
Y	0.3	0.45	638
Discharge Area	0.3	0.45	25

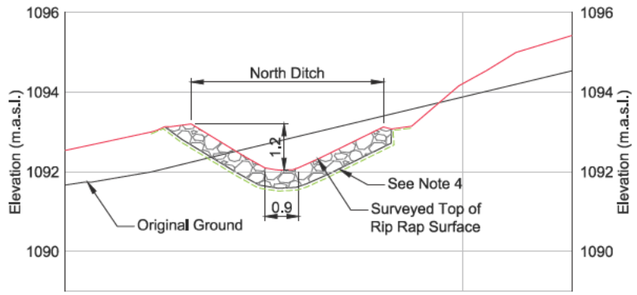
LEGEND

- Major Contours (5m)
- Minor Contours (1m)
- Edge of Road
- Tailings Pipeline
- Exis ing Ground (Profile)
- Non-woven Geotextile
- Covered Tailings (Proposed in Design)
- Rip Rap
- Sediment Pond (As-built)
- As-built Toe
- As-built Crest
- As-built Extent of Excavation / Fill



Z - Section Z - Z'

0 1 2 3 4 5
Scale in Metres



Y - Section Y - Y'

0 1 2 3 4 5
Scale in Metres

srk consulting

SRK JOB NO: 1CT008.068

FILE NAME: 1CT008_068_fig_08-09-AB_Asbuilt.dwg

Teck

Sä Dena Hes Project

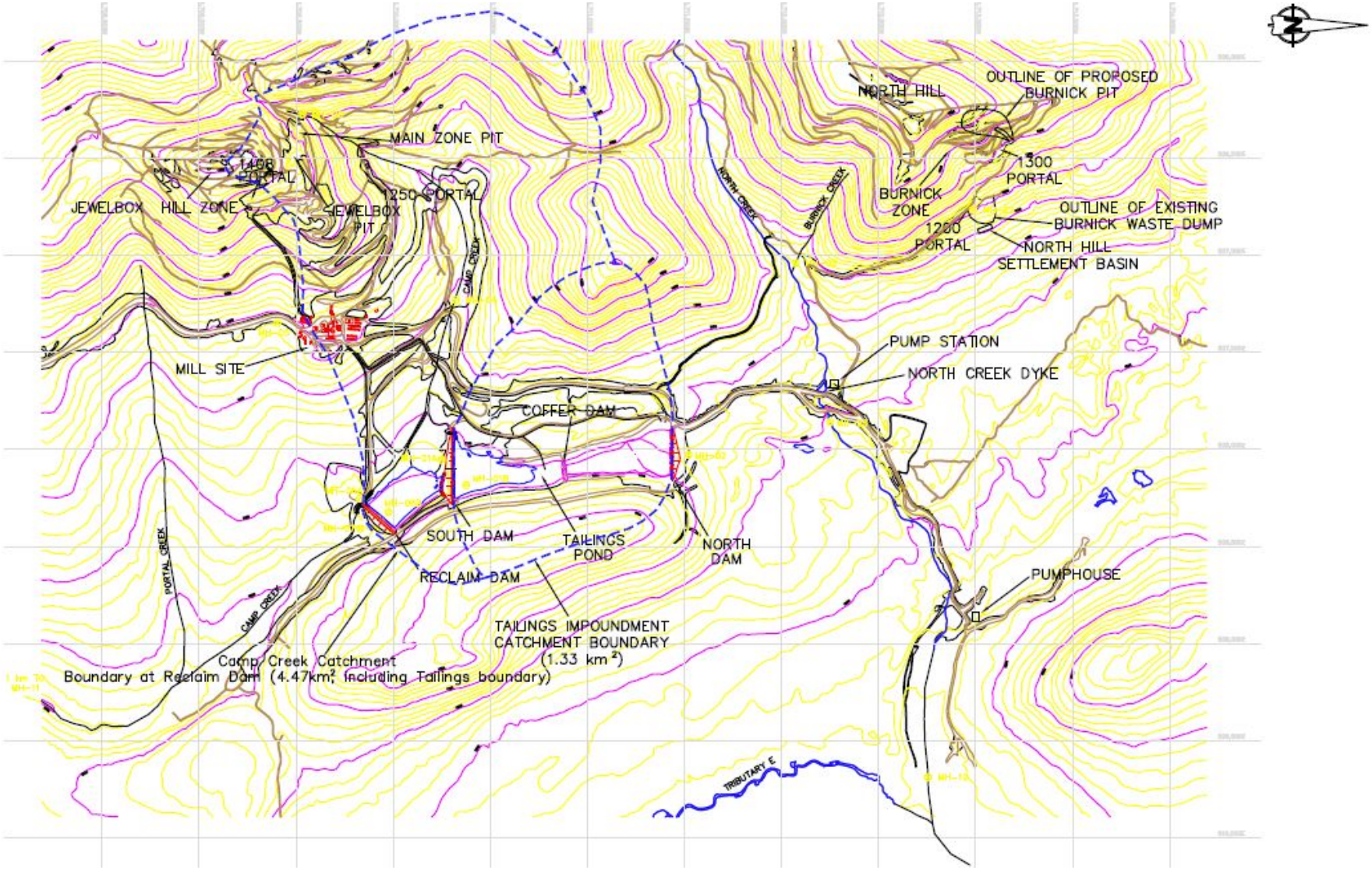
2018 Dam Safety Inspection

DRAWING TITLE:

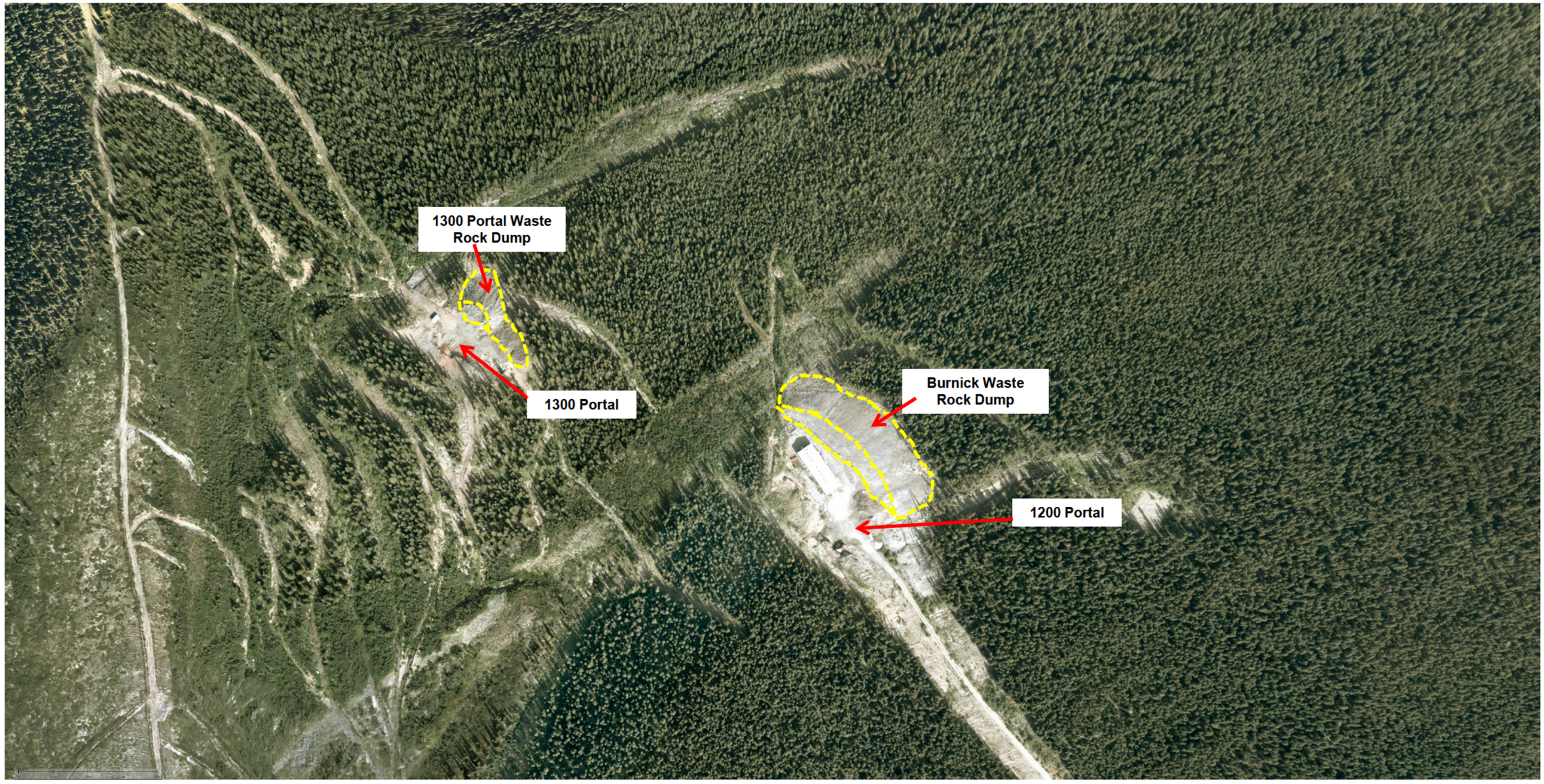
North Drainage Channel
Plan, Profile and Section

DATE:	APPROVED:	FIGURE NO.
September 2018	PMH	9

\\srk.srkdfs\srkwatak\Projects\01 SITES\Sä Dena Hes\1CT008.068 2018 Dam Safety Inspection\040 AutoCAD\1CT008 068 fig 08-09-AB Asbuilt.dwg



srk consulting	Teck	2018 Dam Safety Inspection
		Catchment Areas
Job No: 1CT008 068 Filename: 1CT008_068_fig_10 - CatchmentMap.pptx	Sä Dena Hes Project	Date: September 2018 / Approved: PH / Figure: **13**



srk consulting	Teck	2018 Dam Safety Inspection
Job No: 1CT008.068 Filename: 1CT008_068_fig_11 - Burnick Zone.pptx	Sä Dena Hes	**Burnick Zone Plan View** Date: September 2018 · Approved: PMH · Figure: 8

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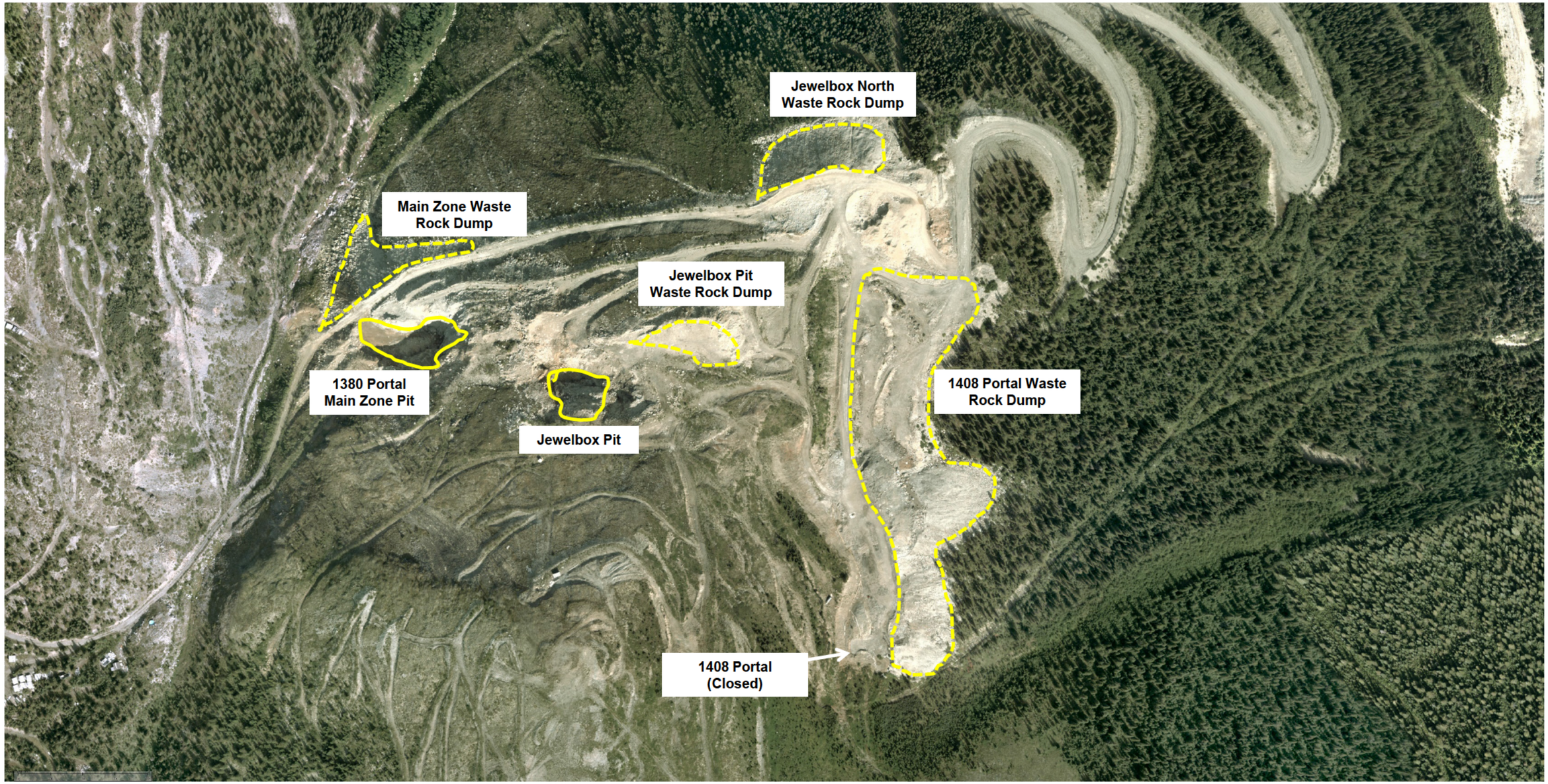

srk consulting	Teck	2018 Dam Safety Inspection
Job No: 1CT008.053 Filename: 1CT008_068_fig_12 - Main Zone and JB Zone.pptx	Sä Dena Hes	**Main Zone and Jewelbox Zone Plan View**
		Date: September 2018 / Approved: PMH / Figure: 9

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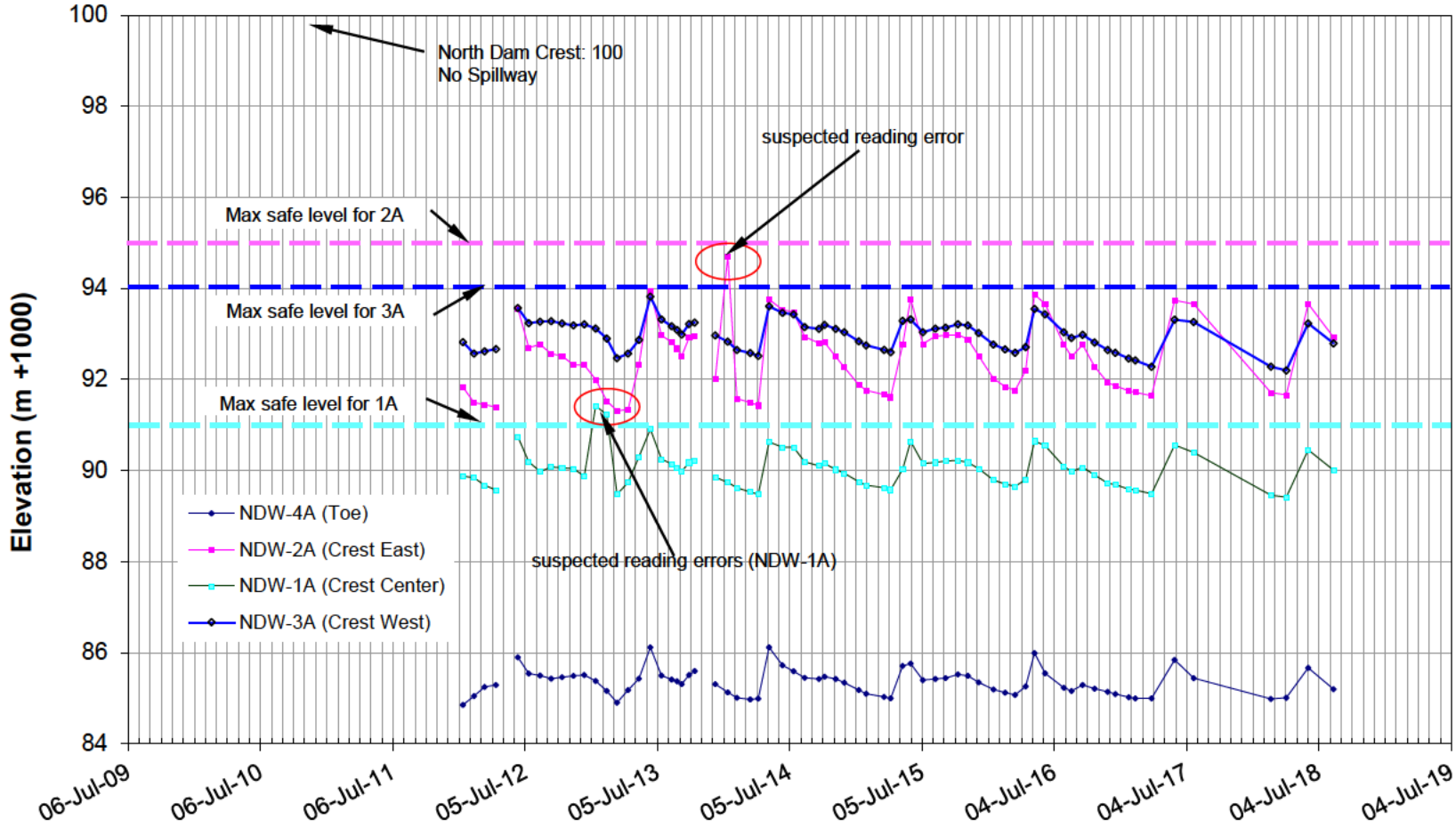
Appendix A – Piezometric Levels



srk consulting	Teck	2018 Dam Safety Inspection
Job No: 1CT008.068 Filename: FigB2 2017PiezoLevels_1CT008.065_rev1.pptx	Sa Dena Hes	**2011-2018 Piezometric Levels in North Dam**
		Date: September 2018 / Approved: PMH / Figure: **B1**

Appendix B – Photo Log

Photo 1: North Dam Crest looking west

Photo 2: Downstream slope of the North Dam looking east

Photo 3: North Dam Piezometers NDW-3A and 3B, NDS-3

Photo 4: Missing cap on Piezo NDW 1A.

Photo 5: Settlement Gauge NDS-1

Photo 6: Missing cap on Piezometer NDW-2B

Photo 7: Seepage at toe of North Dam, mainly due to hillside seepage from the west

Photo 8: Sampling location at Pipe Weir MW-02

Photo 9: View looking north of drainage swale on tailings till cover

Photo 10: View looking south of drainage swale draining south

Photo 11: Vegetation on tailings cover

Photo 12: Beaver dam at inlet to North Creek crossing

Photo 13: North Creek Crossing

Photo 14: Outlet of North Creek crossing

Photo 15: Outlet of Second crossing on North Creek

Photo 16: Second Crossing of North Creek

Photo 17: View looking north of the spillway at the SRS

Photo 18: Sediment collection pond upstream of SRS

Photo 19: View of the eastern end of the riprap buttress along the D/S toe of the SRS dyke

Photo 20: View of the south channel looking south from the SRS Dyke

Photo 21: View south of the North Diversion Channel

Photo 22: View upstream of the Camp Creek channel

Photo 23: View north along the South Diversion drainage channel

Photo 24: Regraded slopes of Jewelbox waste rock dump

Photo 25: Erosion gully at toe of Jewelbox Waste rock dump

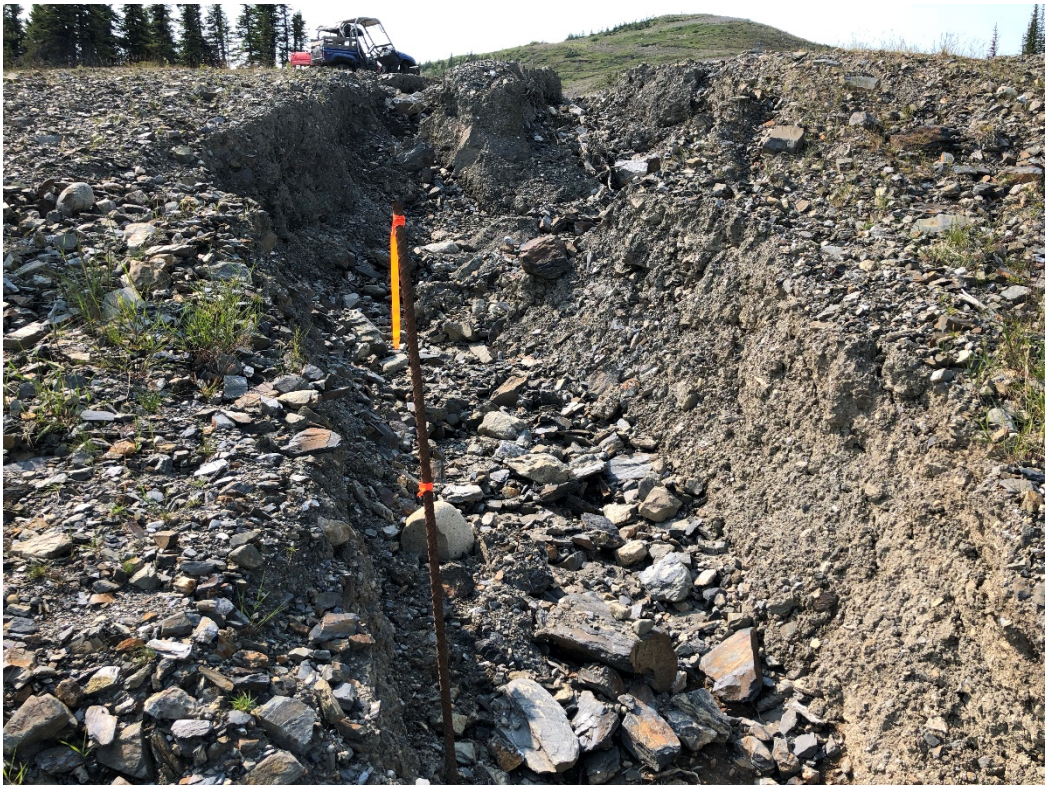


Photo 26: erosion gully at toe of Jewelbox waste rock dump with monitoring pin

Photo 27 minor subsidence on the slope of the backfill at Portal 1200 on Burnick

Appendix C – 2018 Routine Inspection Forms

Teck
Teck Resources Limited

Sä Dena Hes Mine Site
Geotechnical Inspection Form

North Dam

Date: June 10/18	Inspected By: Jeff Basarich	
Weather: sun/cloud +15°		
Inspection Check List (✓ =checked and no problems; x=not checked)		
Check: Upstream Slope, Crest, and Downstream Slope		
Area	**✓ / x**	**Comment**
North Dam		
Ponded Water	✓	
Erosion	✓	
Settlement/Depressions	✓	very slight depression (marked/Flag)
Cracks/Movement	✓	
Vegetation	✓	
Downstream Toe Seepage	✓	seep at toe (no change)
Other - (Photos)	✓	
Notes:		

Teck Resources Limited

Sä Dena Hes Mine Site
Geotechnical Inspection Form

TMA Water Conveyance Structures

Date: June 10/18	Inspected By: Jeff Basarich	
Weather: sun/cloud +15°		
Inspection Check List (✓ =checked and no problems; x=not checked)		
Area	**✓ / x**	**Comment**
South Drainage Channel		
Sideslopes	✓	
Riprap	✓	
Debris	✓	
Other - (Photos)	✓	
Notes:		
Camp Creek Drainage Channel		
Sideslopes	✓	cracking, middle, top of rip-rap
Riprap	✓	
Debris	✓	
Other - (Photos)	✓	
Notes:		
North Diversion Channel		
Sideslopes	✓	
Riprap	✓	
Debris	✓	
Discharge apron rip rap	✓	
Other - (Photos)	✓	
Notes:		

Teck Resources Limited

Sä Dena Hes Mine Site
Geotechnical Inspection Form

Sediment Retaining Structure (SRS)

Date: June 10/18	Inspected By: Jeff Basarich	
Weather: +15° sun/cloud		
Inspection Check List (✓ =checked and no problems; x=not checked)		
Check: Upstream Slope, Crest, and Downstream Slope		
Area	**✓ / x**	**Comment**
Sediment Retaining Structure (SRS)		
Depth of water at spillway	✓	
Sloughing of spillway slopes	✓	
Spillway riprap	✓	
Debris at spillway inlet	✓	
Erosion	✓	
Settlement/Depressions	✓	
Sinkholes	✓	
Cracks/Movement	✓	
Debris	✓	
Vegetation	✓	
Downstream Toe Seepage	✓	spring still at toe (no change)
East Hillside Seepage	✓	upper east side seepage
Other - (Photos)	✓	
Notes:		

Updated 2016-04-08

Teck Resources Limited

Sä Dena Hes Mine Site
Geotechnical Inspection Form

South Pond / Reclaim Pond Soil Caps

Date: June 10/18	Inspected By: Jeff Basarich	
Weather: sun/cloud +15°		
Inspection Check List (✓ =checked and no problems; x=not checked)		
Area	**✓ /x**	**Comment**
South Pond Soil Cap		
General Appearance	✓	
Erosion	✓	
Settlement/Depressions	✓	
Standing Water	✓	
Evaporite Salts	✓	
Vegetation	✓	
Other - (Photos)	✓	
Notes:		
Reclaim Pond Soil Cap		
General Appearance	✓	
Erosion	✓	
Settlement/Depressions	✓	
Standing Water	✓	
Vegetation	✓	
Other - (Photos)	✓	
Notes:		

Teck Resources Limited

Sä Dena Hes Mine Site Geotechnical Inspection Form

North Pond / Jewelbox Soil Caps

Date: June 8/18 Inspected By: Jeff Basarich

Weather: Sun/cloud/rain +15°C

Inspection Check List (✓ =checked and no problems; x=not checked)

Area	✓ / x	Comment
North Pond Soil Cap		
General Appearance	✓	
Erosion	✓	
Settlement/Depressions	✓	
Standing Water	✓	Some ponding along East side (minor)
Evaporite Salts	✓	
Vegetation	✓	re-veg doing well
Drainage Swale	✓	
Other - (Photos)	✓	
Notes:		
Jewelbox Soil Cap		
General Appearance	✓	
Erosion	✓	rills,
Settlement/Depressions	✓	settlement @ Portal, some small depressions previous sitting in
Standing Water	✓	
Vegetation	✓	
Other - (Photos)	✓	
Notes:		

Updated 2016-04-08

Teck Resources Limited

Sä Dena Hes Mine Site
Geotechnical Inspection Form

Decommissioned Water Diversions

Date: June 8/18	Inspected By: Jeff Basarich	
Weather: Sun/cloud/rain +15°C		
Inspection Check List (✓ =checked and no problems; x=not checked)		
Area	**✓ / x**	**Comment**
North Creek Dyke Breach		
Sideslopes	✓	
Riprap	✓	
Settlement/Depressions	✓	
Debris at Inlet	✓	
Discharge	✓	
Vegetation	✓	
Other - (Photos)	✓	
Notes: unnamed crossings all good		
North Creek Second Crossing		
Sideslopes	✓	
Riprap	✓	
Settlement/Depressions	✓	
Debris at Inlet	✓	
Discharge	✓	
Vegetation	✓	
Other - (Photos)	✓	
Notes:		

Teck resources Limited

Sä Dena Hes Mine Site Geotechnical Inspection Form

Waste Dumps

Weather: Sun/cloud/rain +15 — Jeff Basarich

Inspection Check List (✓ =checked and no problems; x=not checked)

Area	✓ / x	Comment
Burnick 1200 Waste Rock Dump		
Cracks / Scarps	✓	some cracking by perfect some cracks silting in
Subsidence	✓	
Erosion	✓	
Seeps	✓	
Other - (Photos)	✓	
Notes: drain pipes dry		
Burnick 1300 Waste Rock Dump		
Cracks / Scarps	✓	
Subsidence	✓	
Erosion	✓	
Seeps	✓	
Other - (Photos)	✓	
Notes: Noise from pipe still present - crossings all good		
Jewelbox Waste Rock Dumps		
Cracks / Scarps	✓	
Subsidence	✓	some subsidence (minor)
Erosion	✓	rills
Seeps	✓	
Other - (Photos)	✓	
Notes:		

Updated 2016-04-08

Teck resources Limited

Sä Dena Hes Mine Site
Geotechnical Inspection Form

Waste Dumps

Weather: Light snow -2		
Inspection Check List (✓ =checked and no problems; x=not checked)		
Area	**✓ / x**	**Comment**
Burnick 1200 Waste Rock Dump		
Cracks / Scarps	✓	cracks sitting in around portal area
Subsidence	✓	
Erosion	✓	
Seeps	✓	
Other - (Photos)		
Notes:		
Burnick 1300 Waste Rock Dump		
Cracks / Scarps	✓	
Subsidence	✓	
Erosion	✓	
Seeps	✓	
Other - (Photos)		
Notes:		
Jewelbox Waste Rock Dumps		
Cracks / Scarps	✓	
Subsidence	✓	minor subsidence
Erosion	✓	rills
Seeps	✓	
Other - (Photos)		
Notes:		

Teck Resources Limited

Sä Dena Hes Mine Site
Geotechnical Inspection Form

Decommissioned Water Diversions

Date: Oct 5 2018	Inspected By: Jeff Basarich/Marie Basarich	
Weather: light snow -2		
Inspection Check List (✓ =checked and no problems; x=not checked)		
Area	**✓ / x**	**Comment**
North Creek Dyke Breach		
Sideslopes	✓	
Riprap	✓	
Settlement/Depressions	✓	
Debris at Inlet	✓	
Discharge	✓	
Vegetation	✓	
Other - (Photos)		
Notes: crossings all in good shape		
North Creek Second Crossing		
Sideslopes	✓	
Riprap	✓	
Settlement/Depressions	✓	
Debris at Inlet	✓	
Discharge	✓	
Vegetation	✓	
Other - (Photos)		
Notes:		

Teck Resources Limited

Sä Dena Hes Mine Site
Geotechnical Inspection Form

North Pond / Jewelbox Soil Caps

Date: Oct 5/2018	Inspected By: JEFF BASARICH	
Weather:		
Inspection Check List (✓ =checked and no problems; x=not checked)		
Area	**✓ / x**	**Comment**
North Pond Soil Cap		
General Appearance	✓	
Erosion	✓	
Settlement/Depressions	✓	
Standing Water	✓	
Evaporite Salts	✓	
Vegetation	✓	growing well
Drainage Swale	✓	
Other - (Photos)		
Notes:		
Jewelbox Soil Cap		
General Appearance	✓	
Erosion	✓	rills
Settlement/Depressions	✓	
Standing Water	✓	
Vegetation	✓	
Other - (Photos)		
Notes:		

Teck Resources Limited

Sä Dena Hes Mine Site
Geotechnical Inspection Form

South Pond / Reclaim Pond Soil Caps

Date: Oct 6/2018 Inspected By: Jeff Basarick/Marie Basarick		
Weather: sun/cloud -3		
Inspection Check List (✓ =checked and no problems; x=not checked)		
Area	**✓ /x**	**Comment**
South Pond Soil Cap		
General Appearance	✓	
Erosion	✓	minor rills
Settlement/Depressions	✓	some settling throughout
Standing Water	✓	
Evaporite Salts	✓	
Vegetation	✓	
Other - (Photos)		
Notes: Reclaim Soil Cap		
~~**Jewelbox Soil Cap**~~		
General Appearance	✓	
Erosion	✓	
Settlement/Depressions	✓	
Standing Water	✓	
Vegetation	✓	
Other - (Photos)		
Notes:		ospreys still in nest

Teck Resources Limited

Sä Dena Hes Mine Site
Geotechnical Inspection Form

Sediment Retaining Structure (SRS)

Date: Oct 6/2018	Inspected By: Jeff Basarich/Marie Basarich	
Weather: sun/cloud -3		
Inspection Check List (✓ =checked and no problems; x=not checked)		
Check: Upstream Slope, Crest, and Downstream Slope		
Area	**✓ /x**	**Comment**
Sediment Retaining Structure (SRS)		
Depth of water at spillway	✓	below rip-rap level
Sloughing of spillway slopes	✓	
Spillway riprap	✓	
Debris at spillway inlet	✓	
Erosion	✓	
Settlement/Depressions	✓	
Sinkholes	✓	
Cracks/Movement	✓	
Debris	✓	
Vegetation	✓	
Downstream Toe Seepage	✓	spring still same@downstream toe
East Hillside Seepage	✓	seepage present
Other - (Photos)		
Notes: SRS Depth approx 1 meter		

Teck Resources Limited

Sä Dena Hes Mine Site
Geotechnical Inspection Form

TMA Water Conveyance Structures

Date: Oct 6/2018	Inspected By: JEFF BASARICH, MARLE BASARICH	
Weather:		
Inspection Check List (✓ =checked and no problems; x=not checked)		
Area	**✓ / x**	**Comment**
South Drainage Channel		
Sideslopes	✓	
Riprap	✓	
Debris	✓	
Other - (Photos)		
Notes: water flowing at bottom end of channel near convergence		
Camp Creek Drainage Channel		
Sideslopes	✓	
Riprap	✓	
Debris	✓	
Other - (Photos)		
Notes: slight cracking along upper North side above rip-rap		
North Diversion Channel		
Sideslopes	✓	
Riprap	✓	
Debris	✓	
Discharge apron rip rap	✓	
Other - (Photos)		
Notes:		

Teck Resources Limited

Sä Dena Hes Mine Site
Geotechnical Inspection Form

North Dam

Date: Oct 5 2018	Inspected By: Jeff Basarich/Marie Basarick	
Weather: -2 light snow/cloudy		
Inspection Check List (✓ =checked and no problems; x=not checked)		
Check: Upstream Slope, Crest, and Downstream Slope		
Area	**✓ / x**	**Comment**
North Dam		
Ponded Water	✓	
Erosion	✓	
Settlement/Depressions	✓	No change in minor depression
Cracks/Movement	✓	
Vegetation	✓	
Downstream Toe Seepage	✓	no seepage presently @ toe
Other - (Photos)		
Notes:		

Appendix D – Facility Data Sheet

Appendix D

Facility Data Sheet

North Dam and SRS Dyke

Physical Description

North Dam	
Dam Type	Earth Dam, Single Stage, three zones
Maximum Dam Height	15m
Dam Crest Width	10m
Impoundment Area	0.16 km^2
Volume of Tailings	400,000 m^3
Reservoir Capacity	NA
Consequence Classification	Significant, Passive care
Inflow Design Flood (IDF)	1/3 between the 1,000-year event and the PMF
Design Earthquake	1: 2475- year event
Spillway Capacity	NA
Catchment Area	NA till cover slopes (drains) to south towards SRS
Access to Dam	Vehicles via roads or helicopter in winter
SRS Dyke	
Dam Type	Earth Dam, Single Stage, one zone
Maximum Dam Height	5m
Dam Crest Width	4m
Impoundment Area	Pond area is 1600m^2
Volume of Tailings	400,000 m^3
Reservoir Capacity	800 m^3
Consequence Classification	Low, Passive care
Inflow Design Flood (IDF)	1,000-year event
Design Earthquake	1,000-year event
Spillway Capacity	5.4m^3/s
Catchment Area	1.33 sq km
Access to Dam	Vehicles via roads or helicopter in winter

APPENDIX H

2018 ENVIRONMENTAL EFFECTS MONITORING

ENVIRONMENTAL MONITORING

AT

SÄ DENA HES MINE SITE, 2018

For

Teck Resources Ltd

Sä Dena Hes Operating Corporation,

Submitted by

Laberge Environmental Services
&
Can-Nic-A-Nick Environmental Sciences

January 2019

Laberge
ENVIRONMENTAL SERVICES
P.O. Box 21072
Whitehorse, Y.T.
Y1A 6P7

Office Phone: 867-668-6838
Cell Phone: 867-668-1043
Fax: 867-667-6956

LETTER OF TRANSMITTAL

Michelle Unger
Manager,
Teck Resources Limited
Bag 2000,
Kimberley, BC
V1A 3E1

Dear Michelle:

Re: **Environmental Monitoring at Sä Dena Hes Mine Site, 2018**

We are pleased to submit herewith, the above report covering the environmental monitoring programs completed in 2018 at the Sä Dena Hes property.

This is the first year that the environmental monitoring programs have been undertaken under the new license, number QZ16-051, issued in April 2017. Site locations and methodology differ significantly from the previous license and long term comparisons are not achievable.

Should you have any questions or comments on the report, please do not hesitate to contact the undersigned.

Sincerely,

Bonnie Burns
Laberge Environmental Services

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1.0 INTRODUCTION

The Sä Dena Hes Mining Corporation is a joint venture comprised of Teck Resources Limited (Teck) at 50 percent and 50 percent Pan-Pacific Metal Mining Corp., a wholly-owned subsidiary of Korea Zinc. The Joint Venture purchased the Sä Dena Hes lead/zinc property north of Watson Lake, Yukon, in March 1994. Teck is the operator under the joint venture agreement.

Active mining and milling occurred from July 1991 until temporary shut down on December 2, 1992. There had been no production at Sä Dena Hes since operations were suspended in 1992 and the property was in care and maintenance until 2013. On behalf of Sä Dena Hes Mining Corporation, Teck initiated permanent closure of the Sä Dena Hes Mine in September of 2013. Decommissioning and reclamation activities were undertaken in 2013, 2014 and 2015. Sä Dena Hes Mining Corporation was issued a new water licence, QZ16-051, effective in April 2017, for continued monitoring to ensure the closure activities are successful over the short and long term. The site also has a Yukon Quartz Mining Production Licence QML-0004 issued pursuant to the Yukon Quartz Mining Act and Regulations.

Teck engaged Laberge Environmental Services (LES) and Can-Nic-A-Nick Environmental Sciences to conduct the environmental effects monitoring (EEM) programs required for 2018. Sample sites and methodology have changed since the previous licenses to comply with the Environmental Monitoring, Surveillance and Reporting Plan (EMSRP) which accompanies the License (Teck, 2017).

2.0 STUDY AREA

The study area is located in the upper part of the Liard River basin, 40 air kilometres, and 70 road kilometres north of Watson Lake.

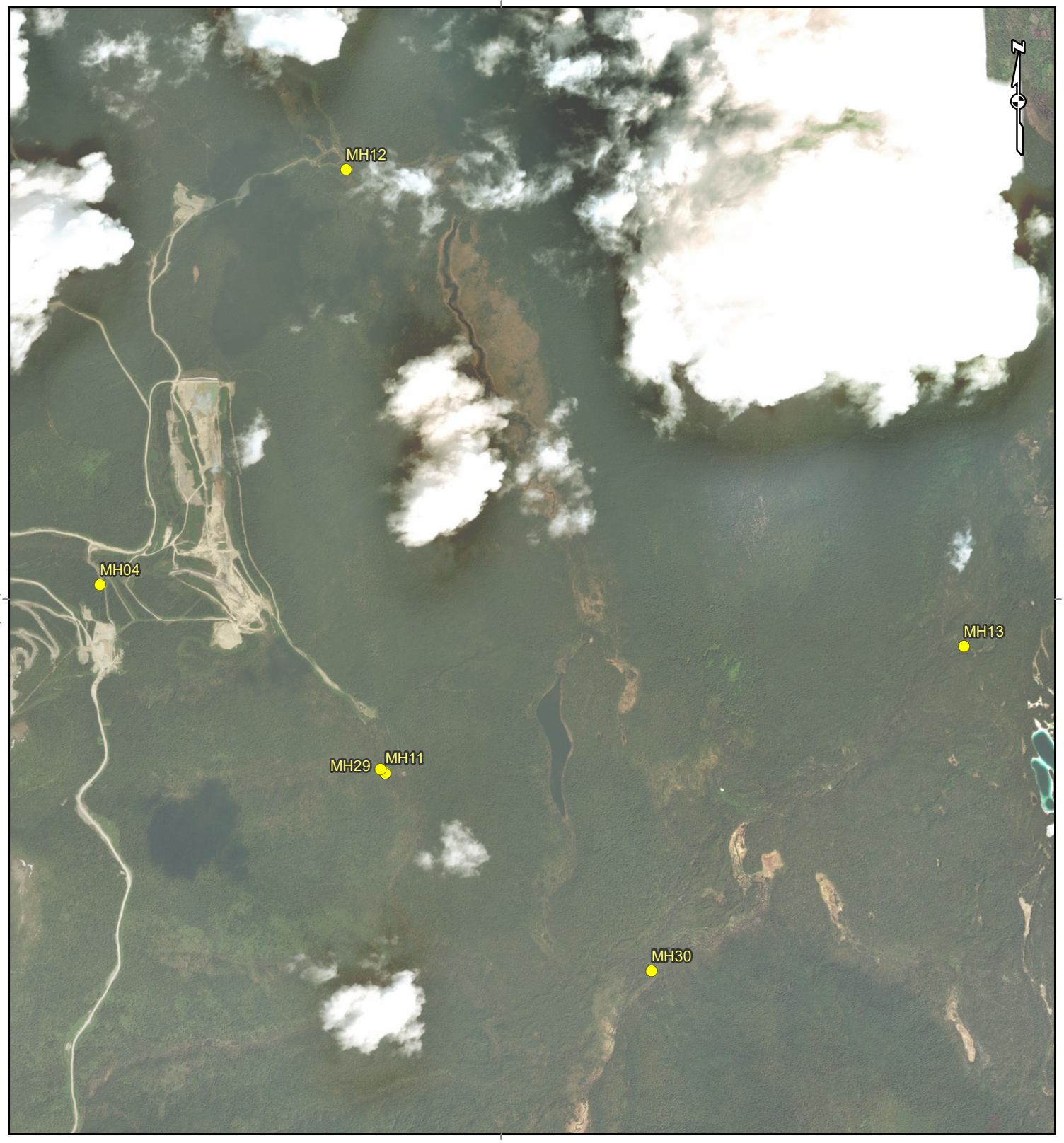
The Sä Dena Hes property lies within the ecoregion known as Liard Basin. This ecoregion is characterized by low hills separated by broad plains and surrounded by mountains and plateaus. The low elevation, moderate precipitation and relatively long, warm summers results in vigorous forest growth, most notably in the floodplains of the major rivers of the area (Ecoregion Working Group, 2004).

The tailings management area was dewatered, contoured, covered and revegetated. The mill site and waste dumps were also re-contoured and revegetated. All revegetated areas were completed with local native shrubs and grasses. Receiving water sites will be monitored over time. The applicable sites pertinent to this study are described in Table 1 and depicted on Figure 1.

TABLE 1 SAMPLE SITE DESCRIPTIONS AND LOCATIONS

Site #	NAD 83, Zone 9V		Site Description	Sample Type	Site Type
	Easting	Northing			
MH04	507374	6710097	Upper Camp Cr u/s former culvert	WQ, BI, SS	exposed
MH11	509241	6708863	Camp Creek	WQ, BI, SS	exposed
MH12	508988	6712814	East Fork of Tributary E	WQ, BI, SS	exposed
MH13	513030	6709693	False Canyon Cr approx 10 km d/s site	F, WQ, BI, SS	exposed
MH29	509213	6708888	Access Creek u/s Camp Cr	WQ, BI, SS	reference
MH30	510985	6707568	False Canyon cCr u/s Camp Cr	F, WQ, BI, SS	reference

F = fish, WQ = water quality, BI = benthic invertebrates, SS = stream sediments



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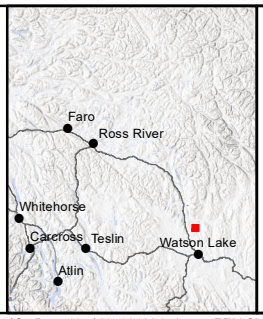

Figure 1
EEM Site Locations

0 500 1,000 Meters

1:35,000

NAD 1983 UTM Zone 9N

DRAWING NUMBER	FIGURE 1
PROPERTY / SITE	SA DENA HES
DATE	2019/01/09
DRAWN BY	GO
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3.0 METHODS

The environmental monitoring programs described below were completed on September 13th to 15th, 2018. All sites were accessed by helicopter.

3.1 Benthic Invertebrate Monitoring and Water Quality

The benthic invertebrate monitoring program is outlined in Sections 52 to 56 of License QZ16-051 with detailed protocols provided in Appendix B of the EMSRP.

The biennial monitoring of benthic invertebrates under the previous licenses required using a Surber Sampler. A specific area of substrate was sampled and triplicates were collected. The Canadian Aquatic Biomonitoring Network (CABIN) protocol is to be used commencing in 2018. This involves the kick and sweep method. A D-net equipped with a 400 µm mesh size was used to capture disturbed invertebrates while kicking the substrate in each stream for a duration of three minutes while moving upstream in a zigzag pattern for approximately 10 m. The captured detritus and benthic invertebrates were placed in a one litre nalgene bottle and preserved with 10% buffered formalin. Samples were stored and shipped in coolers.

Quality assurance and quality control (QA/QC) procedures for the field component consisted of; ensuring all personnel were adequately trained, sampling methods per site and between sites were consistent, samples were correctly collected, labeled and preserved, equipment was properly maintained, detailed field notes were kept, chain-of-custody forms were used and safe shipping and storage methods were followed. The samples were shipped by ground transport to Cordillera Consulting in Summerland, B.C. for sorting, enumeration and identification following CABIN protocols. The methods and quality control report from Cordillera Consulting is appended in Appendix B.

CABIN habitat forms were completed at each site. The collected data was entered into the CABIN database as per the statement of work. Brief CABIN reports are presented in Appendix B.

Section 55 of the License indicates that water quality sampling be conducted at each of the benthic invertebrate sites. The samples were collected in a fast flowing section of the stream, prior to any other sampling activity. In-situ measurements (temperature, conductivity, dissolved oxygen and pH) were taken at each site using a Hanna multi-probe.

All sample bottles were supplied by Maxxam Analytics Inc from their depot in Whitehorse, Yukon. At each site, samples were collected in 500 mL plastic bottles for sulphates, alkalinity and total suspended solids. Samples for nutrients were collected in 120 mL amber glass bottles and preserved with sulfuric acid. Ammonia samples were collected in pre-charged (with sulphuric acid) 120 mL plastic bottles. Samples to be analyzed for total metals were collected in 50 mL Falcon Tubes. The dissolved metals samples were filtered in the field using disposable sterile syringes and in-line filters (filter pore size 0.45 microns) and the filtrate placed into 50 mL Falcon Tubes. Dissolved and total metals samples were preserved with nitric acid. Samples for mercury analysis were collected in 40 mL glass vial and preserved with hydrochloric acid. Dissolved mercury samples were filtered using the same methodology as for dissolved metals, prior to preservation. All samples were kept cool until delivered to the Maxxam depot in Whitehorse, Yukon.

3.2 Stream Sediment Sampling

The stream sediment monitoring program is outlined in Sections 57 to 59 of License QZ16-051 with detailed protocols provided in Appendix B of the EMSRP.

In keeping with the directives of the EMSRP, different protocols have also been devised for stream sediment sampling. Whereas in the past, triplicate stream sediment samples were collected with a stainless steel trowel from depositional areas throughout the stream, the "Guzzler" method will be employed for future sampling, commencing in 2018. This entails the use of a hand-held bilge pump to apply suction to pump fine sediments from interstitial spaces within the gravel/cobble substrate of the stream, generally from mid-stream. Sampling is commenced where fines are expected to occur and pumping from various stream bottom locations is done until a distance of 10 to 15 m is typically covered. The collected material is pumped into a 20L bucket which now must be allowed to settle for up to 24 hours. At the end of the settling period, as much of the overlying water as possible is carefully poured off and discarded. The remaining sediment that has settled at the bottom of the bucket is spooned into a stainless steel bowl, well mixed and then placed into two 250 mL glass jars. The samples were kept cool and shipped on ice to Maxxam in B.C.

At the lab the samples were analyzed for particle size and total organic carbon (TOC). Total metals were analyzed on the portion of sediment that was less than 2mm.

3.3.1 Fish Monitoring

The fish monitoring program is outlined in Sections 49 to 51 of License QZ16-051 and the methodology remains unchanged from past monitoring programs.

The current water license (QZ16-051) requires biennial monitoring of two sites (MH13 and MH30) on False Canyon Creek for the presence of fish. The mine has not been active since the early 1990s and is currently in a state of permanent closure. The reclamation and closure activities were completed in 2015. Sites MH16 and MH20, that were assessed in all previous monitoring programs, were not assessed during this project as no requirement is specified in the current water license. The field program in 2018 was completed during the second week of September. The methodology and timing of the assessment was consistent with all previous monitoring programs. Monitoring programs have been conducted biennially since 1994 (LES 1995).

A Smith Route model LR24 battery powered electrofisher was used as the primary method for establishing fish presence and relative density. The shocking time (seconds) and settings (voltage, frequency and duty cycle) were noted for each sampling episode. Six Gee type baited minnow traps were also set overnight at each of the sampling sites using methods described by the Yukon River Panel (2007). All captured fish were identified and measured for a length (± 1mm) and weight (± 0.1gm). Weight was determined using an Ohaus Scout II digital scale. All fish were live released at site of capture.

4.0 RESULTS AND DISCUSSION

4.1 Benthic Invertebrates and Water Quality

Benthic invertebrate samples were to be collected from six sites; MH4, MH11, MH12, MH13, MH29 and MH30. Increased beaver activity and associated flooding prevented safe landing at MH30. Attempts were made on each day of the survey and sections upstream of MH30 were flown slowly

at a low altitude in attempts at finding a more suitable location, but all areas upstream were also marshy. When conducting the bimonthly water program in August, the contractor Alexco had a difficult time landing at MH30 but managed closer to the trees. However, they were only able to collect water samples as the flooded condition was not suitable for a discharge measurement. During the September monitoring, the flooded area had completely immersed the confluence of Camp and False Canyon Creeks with saturated conditions up to treeline. The geomorphology of the site during the September visit was not appropriate for the monitoring of benthic invertebrates and fish due to the backed-up waters creating ponded areas with no velocity. Additionally, the water would be too deep to collect sediment samples or to conduct electroshocking if access had been possible. See photos in Appendix A illustrating how this confluence has changed since 2014.

Four phyla were found in the study area: Arthropoda, Annelida, Nemata, and Platyhelminthes. Of these, Cordillera Consulting does not consider Nemata or Platyhelminthes to be benthic organisms. In addition, crustaceans within the phylum Arthropoda were not considered as benthos. The numbers for these taxa indicated in Appendix B reflect presence, not total numbers of individuals in the sample. Samples were subsampled as necessary and the portion that was sorted and identified is indicated in Appendix B, in the row under the date each sample was collected.

Of the organisms that were enumerated, a total of 23,828 invertebrates, representing 85 different taxonomic groups were identified in the study area. The following sections pertain to these taxa.

4.1.1 Abundance and Taxonomic Richness

The total number of organisms per site represents the corrected abundance and ranged from 686 individuals at MH13 to 9,020 individuals at MH11 (Table 2).

The simplest method for determining diversity for each site is by enumerating all the taxonomic groups identified from species to phylum. High taxa richness is assumed to indicate high biotic integrity because many species are adapted to the conditions present in the habitat. The most diverse community occurred at MH12 with 43 different taxa identified. The least diverse communities were documented at MH11 and MH13, each with 30 different taxa identified. The Simpson's Diversity Index is another measure of diversity which takes into account the number of species present, as well as the abundance of each species. The Index ranges from 0 to 1, with numbers approaching 1 indicating greater diversity. After applying the calculation to the 2018 data, the diversity ranged from a low of 0.67 at MH11 to a high of 0.94 at MH12, similar to the results using the simple richness method. The diversity at MH13 however, is greater when the Simpson Index is applied. These data are also included in Table 2.

TABLE 2 GENERAL STATISTICS ON THE BENTHIC COMMUNITIES

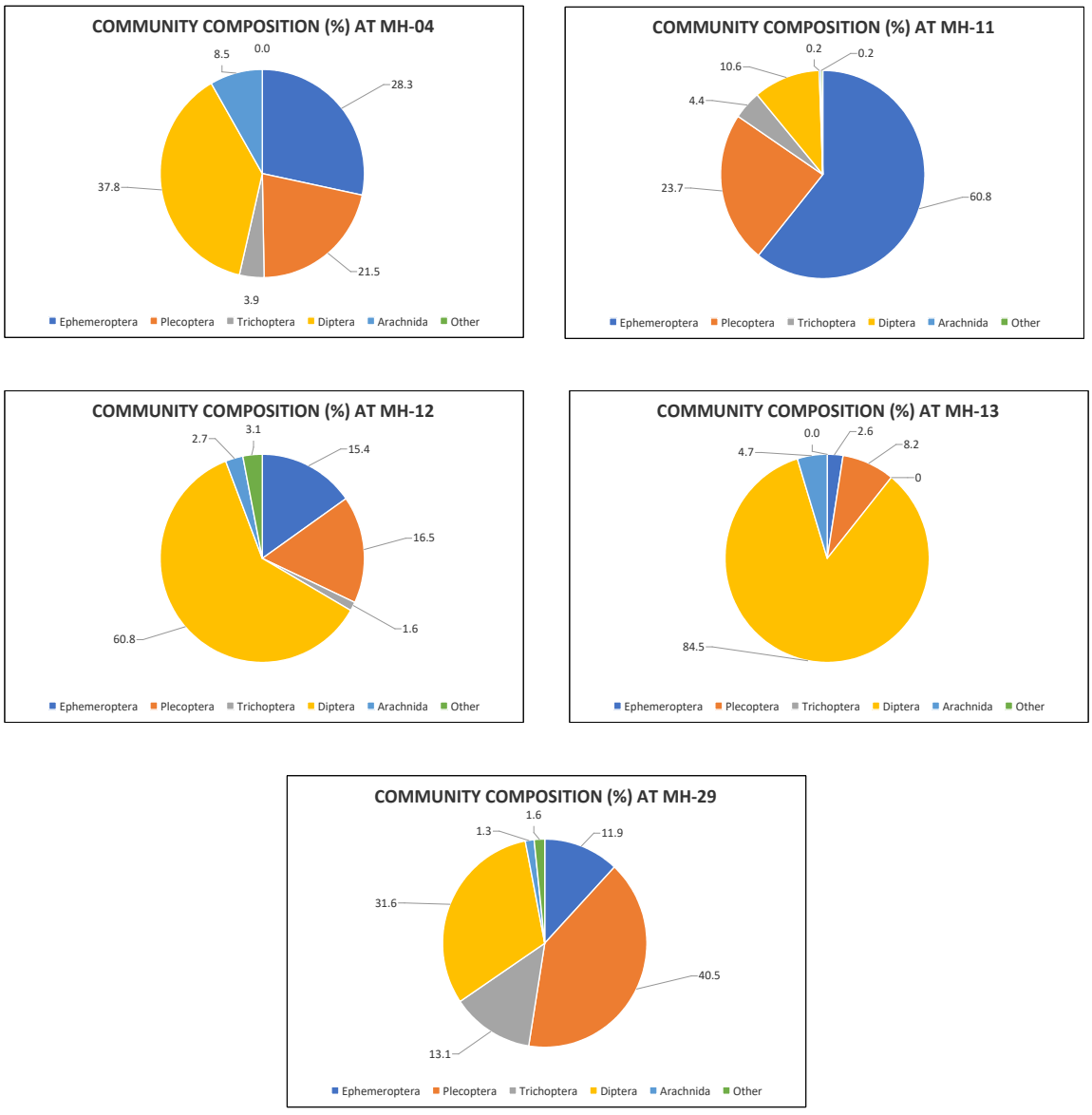
Site	Abundance	Taxonomic Richness	Simpson's Index of Diversity (1 - D)
MH04	3070	40	0.92
MH11	9020	30	0.67
MH12	8980	47	0.94
MH13	686	30	0.86
MH29	2072	43	0.93

4.1.2 Community Composition

The composition of the benthos communities was calculated as a percentage of the major taxonomic orders present, with pie charts generated for each site (Figure 2). The grouping "Other" consists of invertebrates from Collembola, Thysanoptera and Oligochaeta.

The group Diptera (trueflies) dominated the communities at MH04 (37.8%), MH12 (60.8%) and MH13 (84.5%). Ephemeroptera (mayflies) dominated the population at MH11 (60.8%) and Plecoptera (stoneflies) was the dominant order at MH29 (40.5%).

FIGURE 2 COMPOSITION OF THE BENTHIC COMMUNITIES AT SÄ DENA HES, SEPTEMBER 2018



4.1.3 EPT (Ephemeroptera, Plecoptera, Trichoptera)

Many aquatic insects require good water quality to thrive. Larvae of mayflies (Ephemeroptera), stoneflies (Plecoptera) and caddisflies (Trichoptera) require clear, clean, well oxygenated water, clean gravel substrate, and have very low tolerance to pollution (Rosenberg and Resh, 1993). Analyzing the combined EPT at a site, gives an indication of the overall health of the stream. Table 3 summarizes the number of EPT found per site, the proportion of EPT in each community and the number of EPT taxa (richness) present.

TABLE 3 EPT ABUNDANCE, PROPORTION AND RICHNESS

Site	# EPT	% EPT	EPT Richness
MH04	1650	53.7	24
MH11	8020	88.9	19
MH12	3000	33.4	19
MH13	74	10.8	7
MH29	1357	65.5	23

The community at MH11 had the highest abundance and proportion with a richness of 19. The greatest taxa richness occurred at MH04 with 24 different EPT present followed by 23 at MH29. Over half of the populations at these two sites are members of EPT.

EPT abundance, richness and proportion was lowest at MH13. The habitat here is not of a quality conducive to EPT productivity due to the lack of clean washed gravels. Due to decades of beaver activity in the False Canyon Creek region, the physical habitat at MH13 has been modified considerably over the years since monitoring was initiated. Dams have created ponding resulting in a large beaver complex. The initial creek channel is no longer present making it difficult to find suitable sampling sites. The physical habitat structure of streams is a major determinant of the potential aquatic communities. Substrate types (fines vs gravels/cobbles), velocity (pools/back eddies vs riffles/cascades), riparian growth, canopy cover, etc, all play a role in the benthic invertebrate community structure. The flow at MH13 is sluggish with a mobile muddy/fine sand substrate, which favours invertebrates such as chironomids. Invertebrates within the family Chironomidae (order Diptera) formed 83.4% of the total population at MH13 (Appendix B).

The stream habitat at MH13 is markedly different from the other sites. The substrate is composed mainly of fines and easily mobilized. The stream is wide at the sampling site with an open canopy and the flow has a very low velocity. All of the other sites were narrow streams with gravel/cobble substrates and riffle habitats. Habitat descriptions for each site are provided in Appendix B.

Another method to determine the health of a stream is to calculate the Hilsenholf Biotic Index (Hauer and Lamberti, 2006). Due to differences in their tolerance to pollution, the presence or absence of certain invertebrates can provide valuable information on stream water quality. The HBI ranges from 0 to 10, where lower numbers indicate the presence of pollution sensitive organisms and the higher numbers represent a greater presence of pollution tolerant families. Therefore, sites with excellent water quality would contain benthic communities with a high number of pollution sensitive families. Table 4 gives the listing of the categories for the condition of the water and Table 5 summarizes the data for the Sä Dena Hes.

TABLE 4 WATER QUALITY BASED ON HBI

Hilsenhoff Biotic Index	Water Quality Category
0.00 - 3.75	Excellent
3.76 - 4.25	Very Good
4.26 - 5.00	Good
5.01 - 5.75	Fair
5.76 - 6.50	Fairly Poor
6.51 - 7.25	Poor
7.26 - 10.00	Very Poor

TABLE 5 WATER QUALITY BASED ON HBI FOR SÄ DENA HES SITES

Site	Hilsenhoff Biotic Index	Water Quality Category
MH04	3.86	Very good
MH11	3.33	Excellent
MH12	4.36	Good
MH13	5.56	Fair
MH29	2.88	Excellent

Based on this index, the water quality at MH11 and MH29 is excellent, very good at MH04, good at MH12 and fair at MH13.

4.1.4 Comparisons with Past Benthic Invertebrate Data

The CABIN kick net method was used to capture benthic invertebrates from sites MH04, MH11, MH12 and MH29 in 2016 as an initial baseline assessment (Laberge, memo 2017). In June 2014, Azimuth collected benthic invertebrates using CABIN protocols at MH04, MH11 and MH29 during the aquatic ecological risk assessment (Azimuth, 2015). Various metrics have been tabulated and compared to the 2018 data for these sites in Table 6.

Although the 2014 data was collected at a different season than the 2016 and 2018 data; early summer vs fall, there are no conspicuous differences in the metrics. Abundance is variable and depends on many factors; timing of sampling, weather conditions, hydrological influences, invertebrate cycles (emergence, drift, etc). All communities appear diverse with good representation from sensitive species (EPT).

TABLE 6 VARIOUS METRICS FOR EACH OF THE BENTHIC INVERTEBRATE COMMUNITIES, 2014, 2016 & 2018

Metric	Year	MH04	MH11	MH12	MH29
Abundance	2014	4,895	1,929		4,500
	2016	7,480	4,710	12,140	3,562
	2018	3,070	9,020	8,980	2,072
Taxa richness	2014	37	40		42
	2016	30	31	48	36
	2018	40	30	47	43
EPT Abundance	2014	2,747	1,803		3,156
	2016	5,820	4,280	4,700	2,143
	2018	1,650	8,020	3,000	1,357
EPT Percent	2014	56.1	93.5		70.1
	2016	77.8	90.9	38.7	60.2
	2018	53.7	88.9	33.4	65.5
EPT taxa richness	2014	14	26		18
	2016	17	16	20	15
	2018	24	19	19	23
Simpson's Index of Diversity (1 - D)	2016	0.81	0.77	0.93	0.86
	2018	0.92	0.67	0.94	0.93
Dominant Order	2014	Diptera	Plecoptera		Ephemeroptera
	2016	Ephemeroptera	Ephemeroptera	Diptera	Plecoptera
	2018	Diptera	Ephemeroptera	Diptera	Plecoptera
1st Dominant Taxon	2016	Baetis	Baetis	Micropsectra	Zapada
	2018	Oreogeton	Baetidae	Tvetenia	Zapada
% 1 Dominant Taxon	2016	36.6%	44.9%	15.0%	26.5%
	2018	19.5%	55.2%	11.6%	15.1%
2nd Dominant Taxon	2016	Zapada columbiana	Zapada	Pagastia	Heleniella
	2018	Baetis	Zapada	Tanytarsini	Paraphaenocladius
% 2 Dominant Taxa	2016	21.1%	12.5%	11.7%	20.3%
	2018	13.0%	14.4%	10.0%	12.5%
Hilsenhoff Biotic Index	2016	3.77	3.34	3.92	3.29
	2018	3.86	3.33	4.36	2.88
WQ based on HBI	2016	very good	excellent	very good	excellent
	2018	very good	excellent	good	excellent

4.1.5 Water Quality

Water quality samples were collected from each of the five sites during the 2018 study. All analytical data are presented in Appendix C. Of the 36 metals analyzed, 11 were below detection at each site in both the total and dissolved states (beryllium, bismuth, boron, cobalt, mercury, nickel, phosphorus, silver, titanium, thallium, and zirconium).

The results for the field data and selected parameters are presented in Table 7. Concentrations of the various water quality parameters were compared to the most recent Canadian Council of Ministers of the Environment guidelines for the protection of freshwater aquatic life and these are also included in Table 7. Any guidelines that were exceeded are displayed in bold and highlighted.

The waters of the study area were clear, seasonally cool and slightly alkaline. Conductivity is generally a measure of dissolved ions in water. Conductivity at all sites was relatively high, predominately due to the concentrations of calcium and magnesium ions.

The streams were generally well aerated although the dissolved oxygen content at MH13 is lower reflecting the sluggish nature of the ponded water at this site.

Alkalinity is a measure of water's ability to neutralize acid. The creeks sampled in this study had high alkalinity values and the waters were hard to very hard, providing this region with a relatively good buffering capacity. Hardness is an important modifying factor in water quality as it can significantly influence the form and hence toxicity of numerous heavy metals. In general terms, the toxicity of certain metals is lowered with an increase in hardness.

Ammonia and nitrate were not detected in any samples. Nitrate levels ranged from undetected at MH13 to 0.216 mg/L at MH04, and all concentrations met the guideline.

Sulphate levels were low at all sites ranging from 4.5 to 18.7 mg/L. Natural sulphate concentrations in surface waters have been found to vary from 3 to 80 mg/L (CCREM, 1987). Sulphate can contribute to changes in pH in water systems. The alkaline waters of the study area are a reflection of naturally high carbonate/bicarbonate and low sulphate concentrations.

Metal concentrations were low throughout the study area and met the applicable recommended guidelines with the exception of cadmium. The toxicity of cadmium is related to the hardness of the water and the equation $10^{\{0.83(log[hardness])-2.46\}}$ can be used to generate the site-specific guideline (http://st-ts.ccme.ca/en/index.html?lang=en&factsheet=20#aql_fresh_concentration, accessed Dec 27, 2018). Generally, an increase in hardness decreases the toxicity of cadmium to freshwater aquatic life. Although all sampled waters were hard (greater than 120 mg/L CaCO3), the guideline for cadmium was slightly exceeded at MH04. Water quality samples have been collected from MH04 since 1991 and the concentration documented in September 2018 is fairly typical. Of 179 samples where total cadmium was detected at MH04, over half (104) have exceeded the CCME guideline.

The clear water and the low concentrations of reported metals throughout the study area indicate good water quality for the support of freshwater aquatic life.

As measures of QA/QC for the water quality survey, a duplicate water sample was collected at MH04 and a field blank was prepared. The data for the duplicate were very similar to that of MH04 (Appendix C). Relative percent difference (RPD) was performed on each parameter, with a difference of 20% or more indicating a sampling or analytical bias. The RPD was calculated according to the following formula:

RPD = (value in sample – value in duplicate)/((value in sample + value in duplicate)/2) *100

Of the 83 constituents tested, total lead had the greatest RPD of 21.1% which slightly exceeded the 20% threshold (Table 8, Appendix C). The concentration of lead in MH04 was 0.000348 mg/L and in the duplicate it was 0.000281 mg/L. As all the remaining RPDs were low, there were no concerns with sampling or analytical techniques and the reported data can be considerable reliable.

There were no detected parameters in the field blank, with the exception of pH, indicating that no contamination was introduced during preparation and filtering.

TABLE 7 WATER QUALITY SUMMARY, SEPTEMBER 2018								
Site #	**MDL**	**Units**	**MH04**	**MH11**	**MH12**	**MH13**	**MH29**	**CCME Guideline for the protection of aquatic life**
Date Sampled			14-Sep-2018	14-Sep-2018	13-Sep-2018	13-Sep-2018	14-Sep-2018	
Time Sampled			9:15	12:40	18:00	15:50	13:50	
Field Data								
Water Temperature		°C	1.5	2.1	2.3	3.2	2.0	
Conductivity		uS/cm	350	420	350	410	380	
pH		pH	8.5	8.6	8.8	8.5	8.6	
Dissolved Oxygen		mg/L	12.3	12.4	11.8	12.5	11.6	
Analytical Data								
Hardness (as CaCO3)	0.50	mg/L	164	202	176	211	188	
Total Suspended Solids	1.0	mg/L	<1.0	<1.0	1.2	<1.0	2.5	
Alkalinity, Total (as CaCO3)	1.0	mg/L	150	194	168	201	189	
Ammonia, Total (as N)	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.749
Nitrate (as N)	0.0050	mg/L	0.216	0.0773	0.0154	<0.0050	0.0330	13
Nitrite (as N)	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	60
Sulfate (SO4)	0.30	mg/L	18.7	15.5	11.1	9.17	4.50	
Arsenic (As)-Total	0.00010	mg/L	0.00042	0.00054	0.00082	0.00051	0.00092	0.005
Cadmium (Cd)-Total	0.0000050	mg/L	**0.000283**	0.0000376	0.0000434	0.0000122	0.000152	calculatation
Cadmium - calculated		mg/L	*0.000240*	*0.0002800*	*0.0002500*	*0.0002900*	*0.000270*	
Chromium (Cr)-Total	0.00010	mg/L	0.00021	<0.00010	0.00018	0.00020	0.00027	0.001
Copper (Cu)-Total	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	0.00070	0.002
Iron (Fe)-Total	0.010	mg/L	0.010	0.058	0.017	0.179	0.196	0.3
Lead (Pb)-Total	0.000050	mg/L	0.000348	0.000167	0.000336	<0.000050	0.000870	0.001
Mercury (Hg)-Total	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000026
Molybdenum (Mo)-Total	0.000050	mg/L	0.000712	0.000836	0.00127	0.00105	0.000414	0.073
Nickel (Ni)-Total	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.025
Selenium (Se)-Total	0.000050	mg/L	0.000859	0.000514	0.000681	0.000478	0.000419	0.001
Silver (Ag)-Total	0.000010	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.00025
Uranium (U)-Total	0.000010	mg/L	0.000828	0.00104	0.000897	0.00136	0.000655	0.015
Zinc (Zn)-Total	0.0030	mg/L	0.0061	0.0035	<0.0030	<0.0030	0.0061	0.030

4.2 Sediments

Composite stream sediment samples were collected from the five sites using the “guzzler” method. The stream sediment samples were sieved and based on the distribution of grain sizes less than 2mm, texture was determined (Table 9). The texture was sandy loam at MH04, sand at MH11 and MH29, loamy sand at MH12 and silt at MH13.

TABLE 9 PARTICLE SIZE AND TEXTURE					
Sample Site	**MH04**	**MH11**	**MH12**	**MH13**	**MH29**
Date Sampled	14-Sep-2018	14-Sep-2018	13-Sep-2018	13-Sep-2018	14-Sep-2018
% Gravel (>2mm)	16.9	11.8	13.2	<1.0	14.0
% Sand (2.0mm - 0.063mm)	60.7	85.0	70.3	12.0	79.4
% Silt (0.063mm - 4µm)	16.9	1.8	13.9	79.8	4.9
% Clay (<4µm)	5.6	1.4	2.6	8.2	1.7
Texture	Sandy loam	Sand	Loamy sand	Silt	Sand

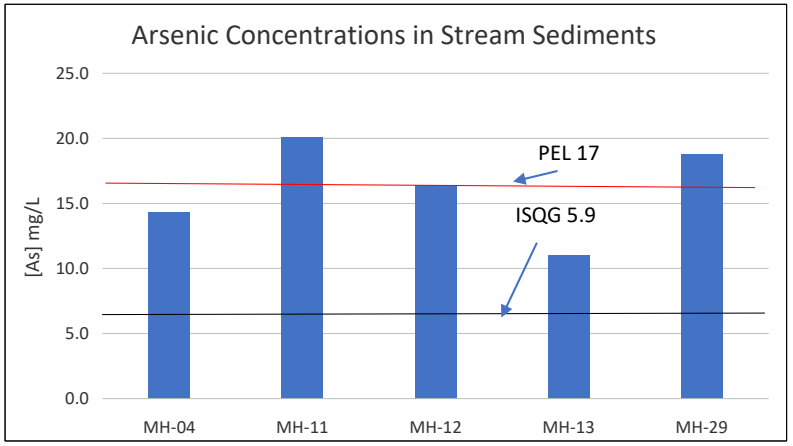
The stream sediment samples were also analyzed for pH, total organic carbon (TOC) and 35 metals. The complete analytical report can be found in Appendix C. Metals that are known to have toxic effects to aquatic biota and/or were present in the waste rock or tailings were examined. Data for arsenic, cadmium, chromium, copper, lead, mercury and zinc are tabulated below in Table 9. The CCME guidelines for the protection of freshwater aquatic life are also included where applicable; Interim Freshwater Sediment Quality (ISQG) and Probable Effects Levels (PEL). Values in bold indicate that the ISQG has been exceeded and the cells that are highlighted represent where the PEL is also exceeded. These guidelines are used to help to evaluate the degree to which adverse biological effects are likely to occur as a result of exposure to metals in the sediments.

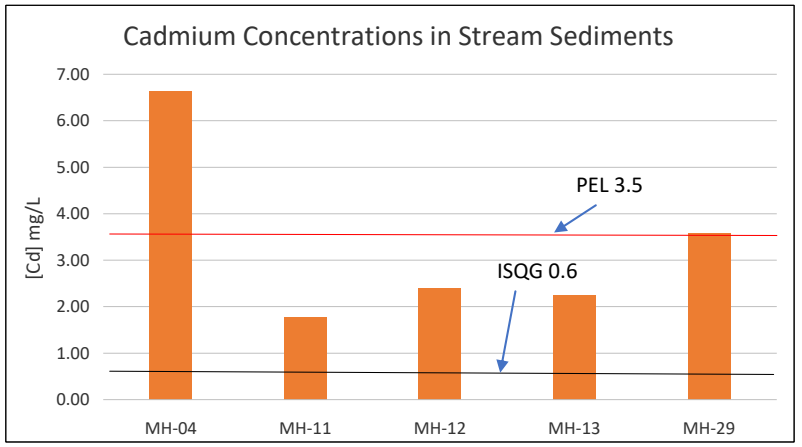
TABLE 10 SUMMARY OF METAL & TOC CONCENTRATIONS (mg/kg) IN THE STREAM SEDIMENTS, 2018							
Site #	**MH04**	**MH11**	**MH12**	**MH13**	**MH29**	**ISQG**	**PEL**
pH	7.74	8.37	7.94	7.59	8.13		
Total Organic Carbon	3.74	0.463	1.51	7.84	1.08		
Arsenic (As)	**14.3**	**20.1**	**16.4**	**11.0**	**18.8**	5.9	17
Cadmium (Cd)	**6.63**	**1.78**	**2.40**	**2.25**	**3.59**	0.6	3.5
Chromium (Cr)	23.2	19.5	19.3	17.5	19.5	37.3	90
Copper (Cu)	20.3	13.6	21.0	23.7	13.7	35.7	197
Lead (Pb)	**199**	**140**	**150**	34.0	**43.7**	35	91.3
Mercury (Hg)	0.0255	0.0120	0.0329	0.0953	0.0244	0.170	0.486
Zinc (Zn)	**376**	**346**	**322**	**208**	**203**	123	315

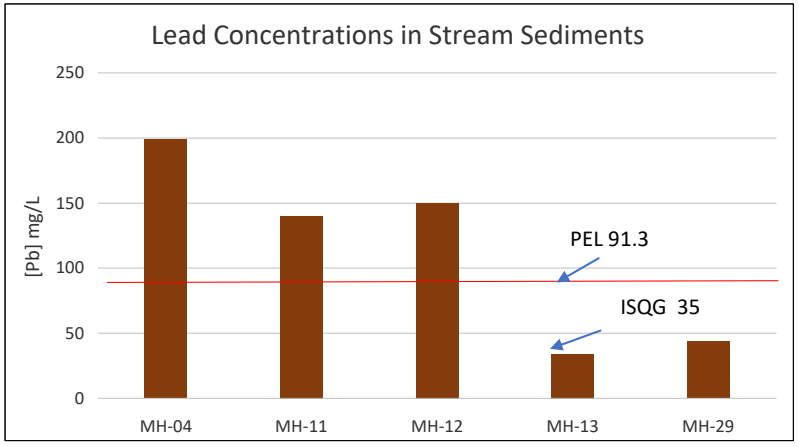
The stream sediments were near neutral to slightly alkaline. Total organic carbon concentrations ranged from 0.463 (MH11) to 7.84 (MH13). Although the substrate was very fine and silty at MH13, the beaver activity has created organic debris throughout the area.

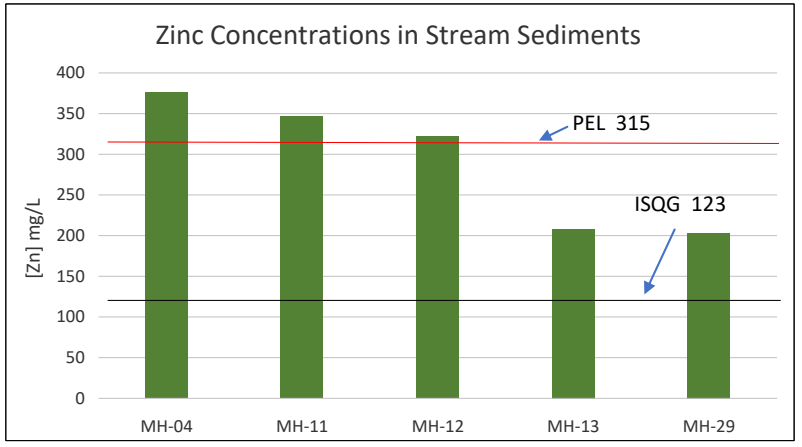
Arsenic concentrations in the stream sediments exceeded the recommended ISQG guideline at all sites, and the PEL was exceeded at MH11 and at MH29. Note that MH29 is a reference site and the high levels here likely reflect the natural mineralization in the area. The ISQG for cadmium was exceeded at all sites and the PEL was exceeded at MH04 and MH29.

FIGURE 3 CONCENTRATIONS OF SELECTED METALS IN THE STREAM SEDIMENTS, SDH 2018









Concentrations of lead exceeded the ISQG at all sites except at MH13. The PEL for lead was exceeded at MH04, MH11 and MH12. All sites exceeded the ISQG recommended guideline for zinc, with concentrations at MH04, MH11 and MH12 also exceeding the PEL.

Concentrations of chromium, copper and mercury met the guidelines at all sites.

The metal concentrations of arsenic, cadmium, lead and zinc have been graphed in Figure 3.

Although MH13 has many years of stream sediment data, comparisons have not been made due to the change in methodology. Stream sediments were collected at the remaining sites in 2016 however the guzzler method was not used. Examination of the mean concentrations of the triplicate grab samples, show they were similar for most parameters to the 2018 data (Laberge, 2016). In June 2014, Azimuth Consulting Group Partnership (Azimuth), collected stream sediments using the guzzler method from sites MH04, MH11 and MH29. Their data also shows guideline exceedances similar to the 2018 study (Azimuth, 2015). The data suggests that the reference site MH29, is within the mineralized zone of Sä Dena Hes and often has greater concentrations of some metals than at the exposed sites. Of the two sites on Camp Creek, MH04, upstream of the tailings management area frequently has higher concentrations of metals than at MH11, downstream of the tailings management area.

4.3 Fish

4.3.1 Fish Distribution and Abundance

Site MH13 was the only location assessed for the presence of fish during the 2018 field program. Access to the other monitoring site (MH30) was not possible as extensive beaver activity and wide spread flooding prohibited the helicopter from landing. With only a single monitoring location, little can be said about the fish distribution in the drainage. Nonetheless the biennial monitoring program, which has been conducted at site MH13 since 1994, does provide a long term and consistent data set.

Slimy sculpin (*Cottus cognatus*) has been represented in the catch of all previous monitoring programs and is the only fish species inhabiting site MH13. Other species such as Arctic grayling and burbot have been consistently captured and documented at other downstream monitoring sites in False Canyon Creek. It is believed that obstructions in the headwaters, primarily in the form of large beaver dams, are barriers to movement of species found in the lower reaches of the watershed. Table 11 summarizes the fish capture results at site MH13 using the two capture gear types. Individual fish length and weight data is provided in Appendix D. A length frequency that includes all sculpin that were historically captured at this site is presented in Figure 4.

The capture of only three sculpins is once again indicative of generally low densities inhabiting site MH13 in 2018. They were captured exclusively with the electrofisher and collected in still waters of a beaver pond. Their differing sizes is thought to represent at least two different year classes and perhaps two life history stages (i.e. juvenile/adult). Slimy sculpin fry, that are typically too small for the nets but can readily be observed while electrofishing, were visibly absent at site MH13. The catch is well below an overall average of ~ 17 sculpin derived from previous monitoring episodes (Table 12). Low inferred densities based on poor catches have also been reported in 1992, 2000, 2002, 2014 and 2016.

TABLE 11

SUMMARY OF SAMPLING EFFORT AND TOTAL CATCH AT EACH SAMPLING LOCATION, SEPTEMBER 2018.

SAMPLE SITE	CAPTURE METHOD	SAMPLE EFFORT	CATCH				OBSERVATIONS
			Arctic Grayling	Longnose Sucker	Slimy Sculpin	Whitefish	
MH13	MNT	24.0 hrs	0	0	0	0	
MH13	Electro	611sec	0	0	3	0	none observed

Legend: MNT = Minnow trap (6 traps)
Electro = Electrofisher

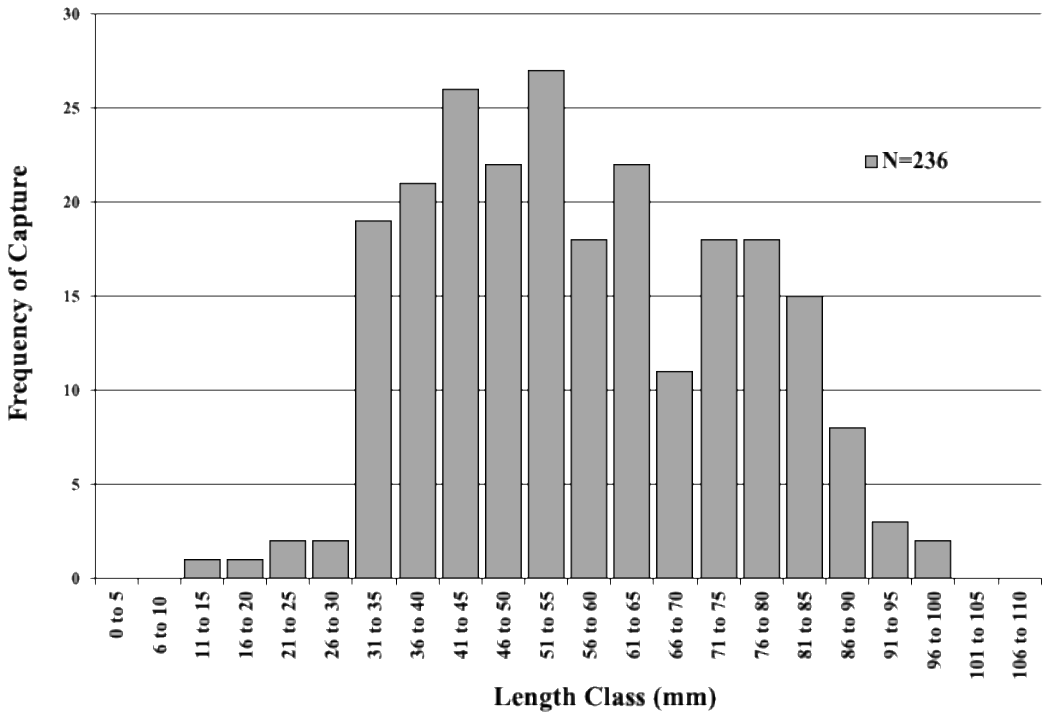


FIGURE 4 LENGTH FREQUENCY HISTOGRAM OF SLIMY SCULPIN CAPTURED AT SITE MH13 IN FALSE CANYON CREEK, 1994 TO 2018.

TABLE 12

COMPARISON OF SLIMY SCULPIN CATCH AT SITE MH13 OVER A 26 YEAR PERIOD (BIENNIAL SAMPLING)

YEAR	CATCH (number of fish)		
	ELECTROFISHING	MINNOW TRAPPING	TOTAL
1992	-	-	9
1994	19	0	19
1996	6	12	18
1998	1	14	15
2000	4	2	6
2002	8	0	8
2004	18	7	25
2006	20	1	21
2008	32	46	78
2010	19	0	19
2012	20	1	21
2014	1	0	1
2016	0	1	1
2018	3	0	3
Average	**11.6**	**6.5**	**17.4**

4.3.2 Fish Habitat

Beaver continue to be a major influence to the biophysical attributes of the aquatic habitat of site MH13. The numerous ponds trap sediment and many areas have no discernable flow or obvious channel. While concentrations of metals in sediment have fluctuated with time, the benthic invertebrate community at MH13 continues to be diverse and have reasonable representation of sensitive EPT taxa. With the exception of slimy sculpin, the many barriers in the form of active and abandoned beaver dams are believed to limit the upstream movement of fish from downstream areas. These dams also affect flow patterns that change regularly by water diversions while beaver activity in general can affect the water quality of this site.

5.0 SUMMARY

No anomalies were apparent in the water quality during the 2018 study. The clear, alkaline waters of the drainage were hard to very hard and concentrations of metals were low where detected. Only

cadmium concentrations at MH04 exceeded applicable CCME guidelines for the protection of freshwater aquatic life life and is consistent with historical concentrations. MH04 is monitored within the routine water quality of the water license and EMSRP.

The biological monitoring of only one site, MH13, is consistent with the previous license. The monitoring program conducted in 2018 represents the first time that licensed requirements for stream sediment and benthic invertebrate monitoring were completed at the additional sites. Although the stream sediment data indicates that there could be negative effects on the aquatic biota, the benthic invertebrate communities were diverse and had good representation from the major groups of organisms that are usually present in lotic waters. The presence of EPT at all sites suggests that the metals documented in the sediments are likely not in a bioavailable form.

Slimy sculpin continues to be the only fish species captured at MH13. Numbers have been low at this site during the last three sampling events. While the absolute number of captured fish varies over time, the species composition continues to be consistent and indicative of a stable fish community. The other licensed fish monitoring site, MH30, could not be sampled due to flooded conditions as a result of increased beaver activity throughout this reach.

6.0 REFERENCES

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APPENDIX A

PHOTOGRAPHS

Photo #1: MH04, September 14, 2018

Photo #2: MH12, September 13, 2018

Photo #3: MH11, September 14, 2018

Photo #4: MH29, September 14, 2018.

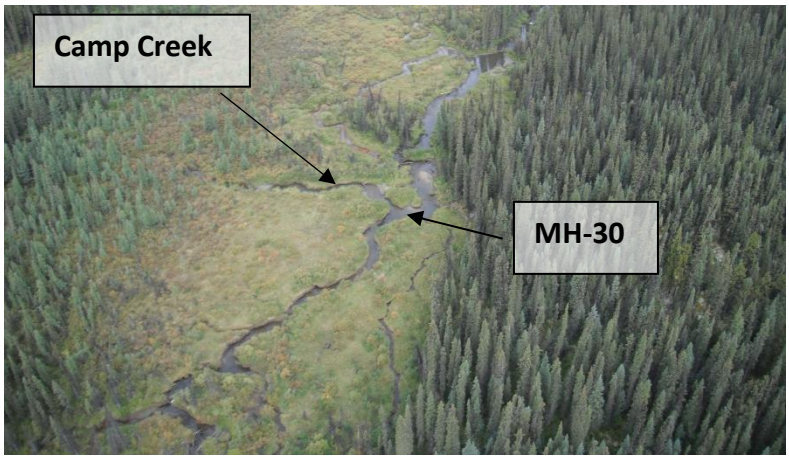

Photo #5: Confluence of Camp and False Canyon Creeks, August 2014.

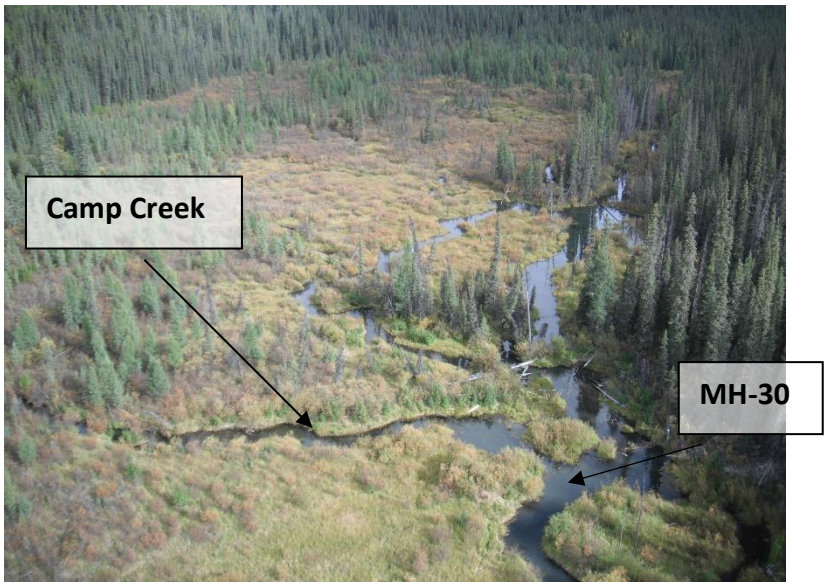

Photo #6: Confluence of Camp and False Canyon Creeks, August 2016.

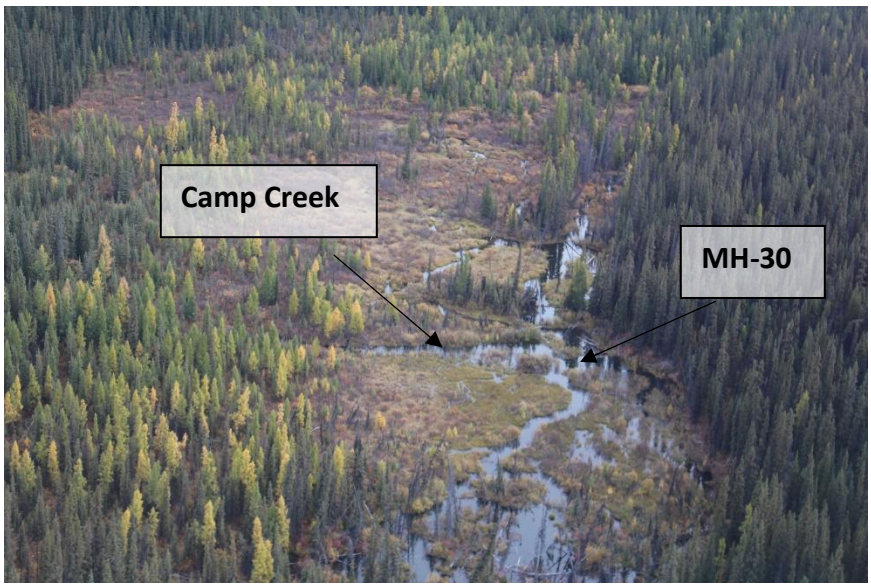

Photo #7: Confluence of Camp and False Canyon Creeks, September 2018.

APPENDIX B

- **BENTHIC INVERTEBRATE DATA, 2018**
- **CABIN HABITAT FORMS**

APPENDIX B

BENTHIC INVERTEBRATE DATA, SEPTEMBER 2018

Site:	MH-04	MH-11	MH-12	MH-13	MH-29	Totals	%
Sample Collection Date:	14-Sep-18	14-Sep-18	13-Sep-18	13-Sep-18	14-Sep-18		
SubSample %:	10	5	5	50	15		
Phylum: Arthropoda							
| Order: Collembola		20			13	33	0.14
Subphylum: Hexapoda							
| Class: Insecta							
| Order: Ephemeroptera	10					10	0.04
| Family: Ameletidae							
Ameletus	150		300	2	60	512	2.15
| Family: Baetidae	30	4980	460	2	53	5525	23.19
Baetis	400	100	20			520	2.18
Baetis rhodani group	50					50	0.21
| Family: Ephemerellidae			80	14		94	0.39
Drunella doddsii	10					10	0.04
| Family: Heptageniidae	210	240	520		100	1070	4.49
Cinygmula	10	20				30	0.13
Epeorus		100			33	133	0.56
| Family: Leptophlebiidae		40				40	0.17
| Order: Plecoptera		80	40			120	0.50
| Family: Capniidae	40	20	200	40	87	387	1.62
| Family: Chloroperlidae	30		60		20	110	0.46
Paraperla	90		40		13	143	0.60
Sweltsa	60	160	60	10	60	350	1.47
| Family: Leuctridae	30				20	50	0.21
Paraleuctra					20	20	0.08
| Family: Nemouridae			160		113	273	1.15
Visoka cataractae	60				27	87	0.37
Zapada	80	1300	780	4	313	2477	10.40
Zapada oregonensis group		60		2	13	75	0.31
Zapada cinctipes		40			7	47	0.20
Zapada columbiana	250	460	80		120	910	3.82
| Family: Perlodidae	0	20	20		13	53	0.22
Megarcys	10		40			50	0.21
| Family: Taeniopterygidae	10				13	23	0.10
| Order: Trichoptera							
| Family: Apataniidae							
Allomyia	80				13	93	0.39
| Family: Glossosomatidae							
Glossosoma		40				40	0.17
| Family: Hydropsychidae		60	20			80	0.34
Parapsyche elsis		20				20	0.08
| Family: Limnephilidae	10		20		80	110	0.46
Ecclisomyia	10		40			50	0.21
Homophylax	10				13	23	0.10
| Family: Rhyacophilidae							
Rhyacophila	10	240			133	383	1.61
Rhyacophila vobara subgroup					33	33	0.14
Rhyacophila vofixa group		40	60		0	100	0.42
| Order: Diptera							
| Family: Chironomidae			880		7	887	3.72
| Subfamily: Chironominae							
| Tribe: Chironomini							
Polypedilum				2		2	0.01

APPENDIX B

BENTHIC INVERTEBRATE DATA, SEPTEMBER 2018

Site:	MH-04	MH-11	MH-12	MH-13	MH-29	Totals	%
Sample Collection Date:	14-Sep-18	14-Sep-18	13-Sep-18	13-Sep-18	14-Sep-18		
SubSample %:	10	5	5	50	15		
| Tribe: Tanytarsini			900	94	53	1047	4.39
Micropsectra	100	100	160	30	13	403	1.69
Stempellina				4		4	0.02
| Subfamily: Diamesinae							
| Tribe: Diamesini							
Diamesa			40			40	0.17
Pagastia	110	120	320		20	570	2.39
Pseudodiamesa	20		300			320	1.34
| Subfamily: Orthocladiinae	30		240		27	297	1.25
Brillia		20		4		24	0.10
Eukiefferiella	20		140	2		162	0.68
Heleniella				2	7	9	0.04
Heterotrissocladius				46		46	0.19
Hydrobaenus	10		80			90	0.38
Orthocladiinae 004 (Like Heleniella)				2		2	0.01
Orthocladius complex		20	80			100	0.42
Paraphaenocladius		540		2	260	802	3.37
Parorthocladius			40			40	0.17
Rheocricotopus			40	2		42	0.18
Tvetenia	180	60	1040			1280	5.37
| Subfamily: Tanypodinae				54		54	0.23
Zavrelimyia				138		138	0.58
| Tribe: Pentaneurini							
Thienemannimyia group				174		174	0.73
| Family: Empididae			20	2		22	0.09
Chelifera/ Metachela			20	2	7	29	0.12
Clinocera	10					10	0.04
Oreogeton	600	20			140	760	3.19
Trichoclinocera				4		4	0.02
Wiedemannia	30				20	50	0.21
| Family: Psychodidae							
Pericoma/Telmatoscopus			820		13	833	3.50
| Family: Simuliidae							
Helodon			40			40	0.17
Prosimulium			40			40	0.17
Prosimulium/Helodon	20	20	120		87	247	1.04
| Family: Tipulidae							
Dicranota	30	60	140	16		246	1.03
| Order: Thysanoptera					7	7	0.03
Subphylum: Chelicerata							
| Class: Arachnida							
| Order: Trombidiformes	40	20	20			80	0.34
| Family: Aturidae							
Aturus				2		2	0.01
| Family: Feltriidae							
Feltria			60			60	0.25
| Family: Hydryphantidae							
Albertathyas	70				7	77	0.32
| Family: Hygrobatidae							
Hygrobates				14		14	0.06
| Family: Lebertiidae							
Lebertia	70		60	12	7	149	0.63
| Family: Oxidae							

APPENDIX B

BENTHIC INVERTEBRATE DATA, SEPTEMBER 2018

Site:	MH-04	MH-11	MH-12	MH-13	MH-29	Totals	%
Sample Collection Date:	14-Sep-18	14-Sep-18	13-Sep-18	13-Sep-18	14-Sep-18		
SubSample %:	10	5	5	50	15		
Oxus				2		2	0.01
| Family: Sperchontidae							
Sperchon	80		40	2		122	0.51
| Order: Sarcoptiformes							
| Order: Oribatida			20			20	0.08
| Family: Hydrozetidae			40		13	53	0.22
Phylum: Annelida							
Subphylum: Clitellata							
| Class: Oligochaeta							
| Order: Tubificida							
| Family: Enchytraeidae							
Enchytraeus			200		7	207	0.87
| Family: Naididae							
| Subfamily: Tubificinae without hair chaetae			80		7	87	0.37
Totals:	**3070**	**9020**	**8980**	**686**	**2072**	**23828**	**100**
# of Taxa:	40	30	47	30	43	85	

Taxa present but not included:

Phylum: Arthropoda					
Subphylum: Crustacea					
| Class: Ostracoda	10	20		2	7
| Class: Copepoda				2	
Phylum: Nemata	10		20		7
Phylum: Platyhelminthes					
| Class: Turbellaria	10	20	0	2	7
Totals:	**30**	**40**	**20**	**6**	**21**

Site Description

Study Name	YK-Aquatic Resource Monitoring-Can-nik-a-nick
Site	MH4
Sampling Date	Sep 14 2018
Know Your Watershed Basin	Upper Liard
Province / Territory	Yukon Territories
Terrestrial Ecological Classification	Boreal Cordillera EcoZone Liard Basin EcoRegion
Coordinates (decimal degrees)	60.52868 N, 128.86742 W
Altitude	1129
Local Basin Name	False Canyon (Camp) Creek
	Frances River Basin
Stream Order	1

Down Stream

Up Stream

Sample Information

Sampling Device	Kick Net
Mesh Size	400
Sampling Time	3
Taxonomist	Scott Finlayson, Cordillera Consulting
Date Taxonomy Completed	November 30, 2018
	Marchant Box
Sub-Sample Proportion	10/100

Site Description

Study Name	YK-Aquatic Resource Monitoring-Can-nik-a-nick
Site	MH11
Sampling Date	Sep 14 2018
Know Your Watershed Basin	Upper Liard
Province / Territory	Yukon Territories
Terrestrial Ecological Classification	Boreal Cordillera EcoZone Liard Basin EcoRegion
Coordinates (decimal degrees)	60.51575 N, 128.83171 W
Altitude	1013
Local Basin Name	False Canyon (Camp) Creek
	Frances River Basin
Stream Order	2

Down Stream

Up Stream

Sample Information

Sampling Device	Kick Net
Mesh Size	400
Sampling Time	3
Taxonomist	Scott Finlayson, Cordillera Consulting
Date Taxonomy Completed	November 30, 2018
	Marchant Box
Sub-Sample Proportion	5/100

Site Description

Study Name	YK-Aquatic Resource Monitoring-Can-nik-a-nick
Site	MH12
Sampling Date	Sep 14 2018
Know Your Watershed Basin	Upper Liard
Province / Territory	Yukon Territories
Terrestrial Ecological Classification	Boreal Cordillera EcoZone Liard Basin EcoRegion
Coordinates (decimal degrees)	60.55105 N, 128.83574 W
Altitude	960
Local Basin Name	False Canyon (North) Creek
	Frances River Basin
Stream Order	2

Down Stream

Up Stream

Sample Information

Sampling Device	Kick Net
Mesh Size	400
Sampling Time	3
Taxonomist	Scott Finlayson, Cordillera Consulting
Date Taxonomy Completed	November 30, 2018
	Marchant Box
Sub-Sample Proportion	5/100

Site Description

Study Name	YK-Aquatic Resource Monitoring-Can-nik-a-nick
Site	MH13
Sampling Date	Sep 14 2018
Know Your Watershed Basin	Upper Liard
Province / Territory	Yukon Territories
Terrestrial Ecological Classification	Boreal Cordillera EcoZone Liard Basin EcoRegion
Coordinates (decimal degrees)	60.52319 N, 128.76262 W
Altitude	860
Local Basin Name	False Canyon Creek
	Frances River Basin
Stream Order	3

Down Stream

Up Stream

Sample Information

Sampling Device	Kick Net
Mesh Size	400
Sampling Time	3
Taxonomist	Scott Finlayson, Cordillera Consulting
Date Taxonomy Completed	December 03, 2018
	Marchant Box
Sub-Sample Proportion	50/100

Site Description

Study Name	YK-Aquatic Resource Monitoring-Can-nik-a-nick
Site	MH29
Sampling Date	Sep 14 2018
Know Your Watershed Basin	Upper Liard
Province / Territory	Yukon Territories
Terrestrial Ecological Classification	Boreal Cordillera EcoZone Liard Basin EcoRegion
Coordinates (decimal degrees)	60.51597 N, 128.83220 W
Altitude	1033
Local Basin Name	False Canyon (Camp) Creek
	Frances River Basin
Stream Order	1

Down Stream

Up Stream

Sample Information

Sampling Device	Kick Net
Mesh Size	400
Sampling Time	3
Taxonomist	Scott Finlayson, Cordillera Consulting
Date Taxonomy Completed	December 03, 2018
	Marchant Box
Sub-Sample Proportion	15/100

APPENDIX C

WATER QUALITY AND SEDIMENT DATA, 2018

- **TABLE 8**
- **ANALYTICAL REPORT, SEPTEMBER 2018**

TABLE 8 RPD% VALUES FOR DUPLICATE SAMPLING

	MDL	Units	MH-04	DUP	RPD%
Physical Tests (Water)					
Conductivity	2.0	uS/cm	312	310	0.6
Hardness (as CaCO3)	0.50	mg/L	164	166	1.2
pH	0.10	pH	8.29	8.32	0.4
Total Suspended Solids	1.0	mg/L	<1.0	<1.0	ND
Total Dissolved Solids	10	mg/L	199	207	3.9
Anions and Nutrients (Water)					
Alkalinity, Total (as CaCO3)	1.0	mg/L	150	151	0.7
Ammonia, Total (as N)	0.0050	mg/L	<0.0050	<0.0050	ND
Nitrate (as N)	0.0050	mg/L	0.216	0.217	0.5
Nitrite (as N)	0.0010	mg/L	<0.0010	<0.0010	ND
Sulfate (SO4)	0.30	mg/L	18.7	18.9	1.1
Total Metals (Water)					
Aluminum (Al)-Total	0.0030	mg/L	0.0068	0.0065	4.5
Antimony (Sb)-Total	0.00010	mg/L	0.00013	0.00013	0.0
Arsenic (As)-Total	0.00010	mg/L	0.00042	0.00039	7.4
Barium (Ba)-Total	0.00010	mg/L	0.0218	0.0212	2.8
Beryllium (Be)-Total	0.000020	mg/L	<0.000020	<0.000020	ND
Bismuth (Bi)-Total	0.000050	mg/L	<0.000050	<0.000050	ND
Boron (B)-Total	0.010	mg/L	<0.010	<0.010	ND
Cadmium (Cd)-Total	0.0000050	mg/L	0.000283	0.000272	4.0
Calcium (Ca)-Total	0.050	mg/L	58.2	57.6	1.0
Chromium (Cr)-Total	0.00010	mg/L	0.00021	0.00022	4.7
Cobalt (Co)-Total	0.00010	mg/L	<0.00010	<0.00010	ND
Copper (Cu)-Total	0.00050	mg/L	<0.00050	<0.00050	ND
Iron (Fe)-Total	0.010	mg/L	0.010	<0.010	ND
Lead (Pb)-Total	0.000050	mg/L	0.000348	0.000281	21.3
Lithium (Li)-Total	0.0010	mg/L	0.0016	0.0015	6.5
Magnesium (Mg)-Total	0.10	mg/L	3.16	3.08	2.6
Manganese (Mn)-Total	0.00010	mg/L	0.00084	0.00080	4.9
Mercury (Hg)-Total	0.0000050	mg/L	<0.0000050	<0.0000050	ND
Molybdenum (Mo)-Total	0.000050	mg/L	0.000712	0.000691	3.0
Nickel (Ni)-Total	0.00050	mg/L	<0.00050	<0.00050	ND
Phosphorus (P)-Total	0.050	mg/L	<0.050	<0.050	ND
Potassium (K)-Total	0.10	mg/L	0.39	0.38	2.6
Selenium (Se)-Total	0.000050	mg/L	0.000859	0.000784	9.1
Silicon (Si)-Total	0.10	mg/L	3.14	3.08	1.9
Silver (Ag)-Total	0.000010	mg/L	<0.000010	<0.000010	ND
Sodium (Na)-Total	0.050	mg/L	0.816	0.806	1.2
Strontium (Sr)-Total	0.00020	mg/L	0.203	0.203	0.0
Sulfur (S)-Total	0.50	mg/L	6.38	6.29	1.4
Thallium (Tl)-Total	0.000010	mg/L	<0.000010	<0.000010	ND
Tin (Sn)-Total	0.00010	mg/L	<0.00010	<0.00010	ND
Titanium (Ti)-Total	0.00030	mg/L	<0.00030	<0.00030	ND
Uranium (U)-Total	0.000010	mg/L	0.000828	0.000829	0.1
Vanadium (V)-Total	0.00050	mg/L	<0.00050	<0.00050	ND
Zinc (Zn)-Total	0.0030	mg/L	0.0061	0.0053	14.0
Zirconium (Zr)-Total	0.00030	mg/L	<0.00030	<0.00030	ND
Dissolved Metals (Water)					
Aluminum (Al)-Dissolved	0.0010	mg/L	0.0016	0.0014	13.3
Antimony (Sb)-Dissolved	0.00010	mg/L	0.00012	0.00012	0.0
Arsenic (As)-Dissolved	0.00010	mg/L	0.00036	0.00039	8.0
Barium (Ba)-Dissolved	0.00010	mg/L	0.0229	0.0222	3.1
Beryllium (Be)-Dissolved	0.000020	mg/L	<0.000020	<0.000020	ND
Bismuth (Bi)-Dissolved	0.000050	mg/L	<0.000050	<0.000050	ND
Boron (B)-Dissolved	0.010	mg/L	<0.010	<0.010	ND
Cadmium (Cd)-Dissolved	0.0000050	mg/L	0.000264	0.000264	0.0
Calcium (Ca)-Dissolved	0.050	mg/L	60.5	61.2	1.2
Chromium (Cr)-Dissolved	0.00010	mg/L	0.00014	0.00013	7.4
Cobalt (Co)-Dissolved	0.00010	mg/L	<0.00010	<0.00010	ND
Copper (Cu)-Dissolved	0.00020	mg/L	<0.00020	<0.00020	ND
Iron (Fe)-Dissolved	0.010	mg/L	<0.010	<0.010	ND
Lead (Pb)-Dissolved	0.000050	mg/L	0.000100	0.000108	7.7
Lithium (Li)-Dissolved	0.0010	mg/L	0.0015	0.0015	0.0
Magnesium (Mg)-Dissolved	0.10	mg/L	3.21	3.17	1.3
Manganese (Mn)-Dissolved	0.00010	mg/L	0.00044	0.00042	4.7
Mercury (Hg)-Dissolved	0.0000050	mg/L	<0.0000050	<0.0000050	ND
Molybdenum (Mo)-Dissolved	0.000050	mg/L	0.000747	0.000720	3.7
Nickel (Ni)-Dissolved	0.00050	mg/L	<0.00050	<0.00050	ND
Phosphorus (P)-Dissolved	0.050	mg/L	<0.050	<0.050	ND
Potassium (K)-Dissolved	0.10	mg/L	0.41	0.40	2.5
Selenium (Se)-Dissolved	0.000050	mg/L	0.000930	0.00101	8.2
Silicon (Si)-Dissolved	0.050	mg/L	3.23	3.14	2.8
Silver (Ag)-Dissolved	0.000010	mg/L	<0.000010	<0.000010	ND
Sodium (Na)-Dissolved	0.050	mg/L	0.836	0.824	1.4
Strontium (Sr)-Dissolved	0.00020	mg/L	0.211	0.204	3.4
Sulfur (S)-Dissolved	0.50	mg/L	6.57	6.54	0.5
Thallium (Tl)-Dissolved	0.000010	mg/L	<0.000010	<0.000010	ND
Tin (Sn)-Dissolved	0.00010	mg/L	<0.00010	<0.00010	ND
Titanium (Ti)-Dissolved	0.00030	mg/L	<0.00030	<0.00030	ND
Uranium (U)-Dissolved	0.000010	mg/L	0.000873	0.000858	1.7
Vanadium (V)-Dissolved	0.00050	mg/L	<0.00050	<0.00050	ND
Zinc (Zn)-Dissolved	0.0010	mg/L	0.0051	0.0054	5.7
Zirconium (Zr)-Dissolved	0.00030	mg/L	<0.00030	<0.00030	ND

TECK METALS LTD.
ATTN: Michelle Unger
601 Knightton Road
KIMBERLEY BC V1A 3E1

Date Received: 17-SEP-18
Report Date: 26-OCT-18 17:31 (MT)
Version: FINAL

Client Phone: 250-427-8404

Certificate of Analysis

Lab Work Order #: L2165391

Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers: 17-653852
Legal Site Desc:

Can Dang
Senior Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2165391-8	L2165391-9	L2165391-10	L2165391-11	L2165391-12
Description	Sediment	Sediment	Sediment	Sediment	Sediment
Sampled Date	14-SEP-18	14-SEP-18	13-SEP-18	13-SEP-18	14-SEP-18
Sampled Time					
Client ID	MH-04	MH-11	MH-12	MH-13	MH-29
Grouping / **Analyte**					
SOIL					
Physical Tests pH (1:2 soil:water) (pH)	7.74	8.37	7.94	7.59	8.13
Particle Size % Gravel (>2mm) (%)	16.9	11.8	13.2	<1.0	14.0
% Sand (2.0mm - 0.063mm) (%)	60.7	85.0	70.3	12.0	79.4
% Silt (0.063mm - 4um) (%)	16.9	1.8	13.9	79.8	4.9
% Clay (<4um) (%)	5.6	1.4	2.6	8.2	1.7
Texture	Sandy loam	Sand	Loamy sand	Silt	Sand
Organic / Inorganic Carbon Total Organic Carbon (%)	3.74	0.463	1.51	7.84	1.08
Metals Aluminum (Al) (mg/kg)	13900	12400	10300	10000	13100
Antimony (Sb) (mg/kg)	1.44	1.35	1.78	1.11	0.95
Arsenic (As) (mg/kg)	14.3	20.1	16.4	11.0	18.8
Barium (Ba) (mg/kg)	76.2	111	151	325	136
Beryllium (Be) (mg/kg)	0.58	0.39	0.44	0.45	0.41
Bismuth (Bi) (mg/kg)	0.20	<0.20	<0.20	<0.20	<0.20
Boron (B) (mg/kg)	<5.0	<5.0	<5.0	<5.0	<5.0
Cadmium (Cd) (mg/kg)	6.63	1.78	2.40	2.25	3.59
Calcium (Ca) (mg/kg)	8320	10600	10900	10500	11000
Chromium (Cr) (mg/kg)	23.2	19.5	19.3	17.5	19.5
Cobalt (Co) (mg/kg)	10.3	9.26	8.00	8.66	9.33
Copper (Cu) (mg/kg)	20.3	13.6	21.0	23.7	13.7
Iron (Fe) (mg/kg)	23400	26600	20500	21600	25200
Lead (Pb) (mg/kg)	199	140	150	34.0	43.7
Lithium (Li) (mg/kg)	30.0	25.3	21.6	15.3	27.7
Magnesium (Mg) (mg/kg)	8740	9400	7170	5050	9660
Manganese (Mn) (mg/kg)	586	1240	530	500	1180
Mercury (Hg) (mg/kg)	0.0255	0.0120	0.0329	0.0953	0.0244
Molybdenum (Mo) (mg/kg)	0.99	1.50	2.28	0.95	0.82
Nickel (Ni) (mg/kg)	25.3	24.4	27.3	27.8	23.3
Phosphorus (P) (mg/kg)	606	855	1050	962	667
Potassium (K) (mg/kg)	570	470	560	810	480
Selenium (Se) (mg/kg)	1.09	0.38	1.44	2.38	0.95
Silver (Ag) (mg/kg)	0.25	0.14	0.33	0.41	0.19
Sodium (Na) (mg/kg)	<50	<50	63	62	53
Strontium (Sr) (mg/kg)	38.0	44.1	39.9	47.2	42.0
Sulfur (S) (mg/kg)	<1000	<1000	<1000	<1000	<1000
Thallium (Tl) (mg/kg)	0.115	0.069	0.102	0.127	0.076
Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium (Ti) (mg/kg)	483	312	305	131	253

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2165391-8 Sediment 14-SEP-18 MH-04	L2165391-9 Sediment 14-SEP-18 MH-11	L2165391-10 Sediment 13-SEP-18 MH-12	L2165391-11 Sediment 13-SEP-18 MH-13	L2165391-12 Sediment 14-SEP-18 MH-29
Sample ID						
Description						
Sampled Date						
Sampled Time						
Client ID						
SOIL						
Metals	Tungsten (W) (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
	Uranium (U) (mg/kg)	0.976	0.632	0.896	1.12	0.523
	Vanadium (V) (mg/kg)	29.7	27.5	32.5	29.2	24.0
	Zinc (Zn) (mg/kg)	376	346	322	208	203
	Zirconium (Zr) (mg/kg)	1.1	3.3	1.3	1.8	1.0

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2165391-1 H2O 14-SEP-18 09:15 MH-04	L2165391-2 H2O 14-SEP-18 12:40 MH-11	L2165391-3 H2O 13-SEP-18 18:00 MH-12	L2165391-4 H2O 13-SEP-18 15:50 MH-13	L2165391-5 H2O 14-SEP-18 13:50 MH-29
WATER						
Physical Tests	Conductivity (uS/cm)	312	377	322	371	344
	Hardness (as CaCO3) (mg/L)	164	202	176	211	188
	pH (pH)	8.29	8.36	8.38	8.38	8.36
	Total Suspended Solids (mg/L)	<1.0	<1.0	1.2	<1.0	2.5
	Total Dissolved Solids (mg/L)	199	245	209	232	215
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	150	194	168	201	189
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Nitrate (as N) (mg/L)	0.216	0.0773	0.0154	<0.0050	0.0330
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sulfate (SO4) (mg/L)	18.7	15.5	11.1	9.17	4.50
Total Metals	Aluminum (Al)-Total (mg/L)	0.0068	0.0068	0.0098	0.0039	0.106
	Antimony (Sb)-Total (mg/L)	0.00013	0.00015	0.00021	0.00011	0.00016
	Arsenic (As)-Total (mg/L)	0.00042	0.00054	0.00082	0.00051	0.00092
	Barium (Ba)-Total (mg/L)	0.0218	0.0603	0.0714	0.143	0.0486
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.000283	0.0000376	0.0000434	0.0000122	0.000152
	Calcium (Ca)-Total (mg/L)	58.2	66.4	57.1	57.3	64.9
	Chromium (Cr)-Total (mg/L)	0.00021	<0.00010	0.00018	0.00020	0.00027
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	0.00070
	Iron (Fe)-Total (mg/L)	0.010	0.058	0.017	0.179	0.196
	Lead (Pb)-Total (mg/L)	0.000348	0.000167	0.000336	<0.000050	0.000870
	Lithium (Li)-Total (mg/L)	0.0016	0.0016	0.0014	0.0012	0.0016
	Magnesium (Mg)-Total (mg/L)	3.16	7.48	5.72	13.3	5.49
	Manganese (Mn)-Total (mg/L)	0.00084	0.00935	0.00176	0.0109	0.0326
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000712	0.000836	0.00127	0.00105	0.000414
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.39	0.42	0.43	0.37	0.30
	Selenium (Se)-Total (mg/L)	0.000859	0.000514	0.000681	0.000478	0.000419
	Silicon (Si)-Total (mg/L)	3.14	3.40	3.77	2.91	3.77
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.816	1.11	0.996	0.930	0.915
	Strontium (Sr)-Total (mg/L)	0.203	0.258	0.216	0.205	0.227

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2165391-6	L2165391-7			
	Description	H2O	H2O			
	Sampled Date					
	Sampled Time					
	Client ID	DUP	FIELD BLANK: FB			
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	310	<2.0			
	Hardness (as CaCO3) (mg/L)	166	<0.50			
	pH (pH)	8.32	5.56			
	Total Suspended Solids (mg/L)	<1.0	<1.0			
	Total Dissolved Solids (mg/L)	207	<10			
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	151	<1.0			
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050			
	Nitrate (as N) (mg/L)	0.217	<0.0050			
	Nitrite (as N) (mg/L)	<0.0010	<0.0010			
	Sulfate (SO4) (mg/L)	18.9	<0.30			
Total Metals	Aluminum (Al)-Total (mg/L)	0.0065	<0.0030			
	Antimony (Sb)-Total (mg/L)	0.00013	<0.00010			
	Arsenic (As)-Total (mg/L)	0.00039	<0.00010			
	Barium (Ba)-Total (mg/L)	0.0212	<0.00010			
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020			
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050			
	Boron (B)-Total (mg/L)	<0.010	<0.010			
	Cadmium (Cd)-Total (mg/L)	0.000272	<0.0000050			
	Calcium (Ca)-Total (mg/L)	57.6	<0.050			
	Chromium (Cr)-Total (mg/L)	0.00022	<0.00010			
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010			
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050			
	Iron (Fe)-Total (mg/L)	<0.010	<0.010			
	Lead (Pb)-Total (mg/L)	0.000281	<0.000050			
	Lithium (Li)-Total (mg/L)	0.0015	<0.0010			
	Magnesium (Mg)-Total (mg/L)	3.08	<0.10			
	Manganese (Mn)-Total (mg/L)	0.00080	<0.00010			
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Total (mg/L)	0.000691	<0.000050			
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050			
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050			
	Potassium (K)-Total (mg/L)	0.38	<0.10			
	Selenium (Se)-Total (mg/L)	0.000784	<0.000050			
	Silicon (Si)-Total (mg/L)	3.08	<0.10			
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Total (mg/L)	0.806	<0.050			
	Strontium (Sr)-Total (mg/L)	0.203	<0.00020			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2165391-1	L2165391-2	L2165391-3	L2165391-4	L2165391-5
Description	H2O	H2O	H2O	H2O	H2O
Sampled Date	14-SEP-18	14-SEP-18	13-SEP-18	13-SEP-18	14-SEP-18
Sampled Time	09:15	12:40	18:00	15:50	13:50
Client ID	MH-04	MH-11	MH-12	MH-13	MH-29
Grouping / **Analyte**					
WATER					
Total Metals Sulfur (S)-Total (mg/L)	6.38	5.30	3.58	3.12	1.53
Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	0.00245
Uranium (U)-Total (mg/L)	0.000828	0.00104	0.000897	0.00136	0.000655
Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	0.00061
Zinc (Zn)-Total (mg/L)	0.0061	0.0035	<0.0030	<0.0030	0.0061
Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved (mg/L)	0.0016	0.0020	0.0015	0.0016	0.0022
Antimony (Sb)-Dissolved (mg/L)	0.00012	0.00014	0.00020	<0.00010	0.00017
Arsenic (As)-Dissolved (mg/L)	0.00036	0.00048	0.00080	0.00041	0.00068
Barium (Ba)-Dissolved (mg/L)	0.0229	0.0633	0.0747	0.147	0.0467
Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved (mg/L)	0.000264	0.0000334	0.0000430	0.0000100	0.0000409
Calcium (Ca)-Dissolved (mg/L)	60.5	68.6	60.8	62.3	66.4
Chromium (Cr)-Dissolved (mg/L)	0.00014	0.00016	0.00014	<0.00010	<0.00010
Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved (mg/L)	<0.00020	0.00025	0.00024	0.00027	0.00032
Iron (Fe)-Dissolved (mg/L)	<0.010	0.027	<0.010	0.059	<0.010
Lead (Pb)-Dissolved (mg/L)	0.000100	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Dissolved (mg/L)	0.0015	0.0016	0.0015	0.0012	0.0013
Magnesium (Mg)-Dissolved (mg/L)	3.21	7.50	5.90	13.5	5.35
Manganese (Mn)-Dissolved (mg/L)	0.00044	0.00729	0.00053	0.0112	0.00247
Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)	0.000747	0.000872	0.00124	0.00108	0.000643 DTMF
Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved (mg/L)	0.41	0.43	0.44	0.38	0.27
Selenium (Se)-Dissolved (mg/L)	0.000930	0.000673	0.000746	0.000582	0.000488
Silicon (Si)-Dissolved (mg/L)	3.23	3.54	3.98	3.07	3.69
Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved (mg/L)	0.836	1.11	1.03	0.959	0.915
Strontium (Sr)-Dissolved (mg/L)	0.211	0.265	0.212	0.217	0.231

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2165391-6	L2165391-7			
	Description	H2O	H2O			
	Sampled Date					
	Sampled Time					
	Client ID	DUP	FIELD BLANK: FB			
Grouping	**Analyte**					
WATER						
Total Metals	Sulfur (S)-Total (mg/L)	6.29	<0.50			
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010			
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030			
	Uranium (U)-Total (mg/L)	0.000829	<0.000010			
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Total (mg/L)	0.0053	<0.0030			
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030			
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD			
	Dissolved Metals Filtration Location	FIELD	FIELD			
	Aluminum (Al)-Dissolved (mg/L)	0.0014	<0.0010			
	Antimony (Sb)-Dissolved (mg/L)	0.00012	<0.00010			
	Arsenic (As)-Dissolved (mg/L)	0.00039	<0.00010			
	Barium (Ba)-Dissolved (mg/L)	0.0222	<0.00010			
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020			
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050			
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010			
	Cadmium (Cd)-Dissolved (mg/L)	0.000264	<0.0000050			
	Calcium (Ca)-Dissolved (mg/L)	61.2	<0.050			
	Chromium (Cr)-Dissolved (mg/L)	0.00013	<0.00010			
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010			
	Copper (Cu)-Dissolved (mg/L)	<0.00020	<0.00020			
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010			
	Lead (Pb)-Dissolved (mg/L)	0.000108	<0.000050			
	Lithium (Li)-Dissolved (mg/L)	0.0015	<0.0010			
	Magnesium (Mg)-Dissolved (mg/L)	3.17	<0.10			
	Manganese (Mn)-Dissolved (mg/L)	0.00042	<0.00010			
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Dissolved (mg/L)	0.000720	<0.000050			
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050			
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050			
	Potassium (K)-Dissolved (mg/L)	0.40	<0.10			
	Selenium (Se)-Dissolved (mg/L)	0.00101	<0.000050			
	Silicon (Si)-Dissolved (mg/L)	3.14	<0.050			
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Dissolved (mg/L)	0.824	<0.050			
	Strontium (Sr)-Dissolved (mg/L)	0.204	<0.00020			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2165391-1	L2165391-2	L2165391-3	L2165391-4	L2165391-5
Description	H2O	H2O	H2O	H2O	H2O
Sampled Date	14-SEP-18	14-SEP-18	13-SEP-18	13-SEP-18	14-SEP-18
Sampled Time	09:15	12:40	18:00	15:50	13:50
Client ID	MH-04	MH-11	MH-12	MH-13	MH-29
Grouping / Analyte					
WATER					
Dissolved Metals Sulfur (S)-Dissolved (mg/L)	6.57	5.67	3.75	3.15	1.81
Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Uranium (U)-Dissolved (mg/L)	0.000873	0.00108	0.000929	0.00139	0.000693
Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved (mg/L)	0.0051	0.0029	0.0017	<0.0010	<0.0010
Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2165391-6	L2165391-7			
	Description	H2O	H2O			
	Sampled Date					
	Sampled Time					
	Client ID	DUP	FIELD BLANK: FB			
Grouping	**Analyte**					
WATER						
Dissolved Metals	Sulfur (S)-Dissolved (mg/L)	6.54	<0.50			
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010			
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030			
	Uranium (U)-Dissolved (mg/L)	0.000858	<0.000010			
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Dissolved (mg/L)	0.0054	<0.0010			
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030			

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Silver (Ag)-Total	B	L2165391-2
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2165391-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2165391-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2165391-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2165391-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Barium (Ba)-Total	MS-B	L2165391-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Calcium (Ca)-Total	MS-B	L2165391-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2165391-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Strontium (Sr)-Total	MS-B	L2165391-1, -2, -3, -4, -5, -6, -7

Qualifiers for Individual Parameters Listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
DTMF	Dissolved concentration exceeds total for field-filtered metals sample. Metallic contaminants may have been introduced to dissolved sample during field filtration.
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**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". 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.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

C-TIC-PCT-SK	Soil	Total Inorganic Carbon in Soil	CSSS (2008) P216-217

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.

C-TOC-CALC-SK	Soil	Total Organic Carbon Calculation	CSSS (2008) 21.2

Total Organic Carbon (TOC) is calculated by the difference between total carbon (TC) and total inorganic carbon. (TIC)

C-TOT-LECO-SK	Soil	Total Carbon by combustion method	CSSS (2008) 21.2

The sample is ignited in a combustion analyzer where carbon in the reduced CO2 gas is determined using a thermal conductivity detector.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-200.2-CVAF-VA	Soil	Mercury in Soil by CVAAS	EPA 200.2/1631E (mod)

Soil samples are digested with hot nitric and hydrochloric acids, followed by CVAAS analysis. This method is fully compliant with the BC SALM strong acid leachable metals digestion method.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

Reference Information

IC-CACO3-CALC-SK	Soil	Inorganic Carbon as CaCO3 Equivalent	Calculation
MET-200.2-CCMS-VA	Soil	Metals in Soil by CRC ICPMS	EPA 200.2/6020A (mod)

Soil/sediment is dried, disaggregated, and sieved (2 mm). Strong Acid Leachable Metals in the <2mm fraction are solubilized by heated digestion with nitric and hydrochloric acids. Instrumental analysis is by Collision / Reaction Cell ICPMS.

Limitations: This method is intended to liberate environmentally available metals. Silicate minerals are not solubilized. Some metals may be only partially recovered (matrix dependent), including Al, Ba, Be, Cr, S, Sr, Ti, Tl, V, W, and Zr. Elemental Sulfur may be poorly recovered by this method. Volatile forms of sulfur (e.g. sulfide, H2S) may be excluded if lost during sampling, storage, or digestion.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water 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-WR	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-WR	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.

PH-1:2-VA	Soil	pH in Soil (1:2 Soil:Water Extraction)	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL

This analysis is carried out in accordance with procedures described in the pH, Electrometric in Soil and Sediment method - Section B Physical/Inorganic and Misc. Constituents, BC Environmental Laboratory Manual 2007. 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. The pH of the solution is then measured using a standard pH probe.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PSA-PIPET+GRAVEL-SK	Soil	Particle size - Sieve and Pipette	SSIR-51 METHOD 3.2.1

Particle size distribution is determined by a combination of techniques. Dry sieving is performed for coarse particles, wet sieving for sand particles and the pipette sedimentation method for clay particles.

Reference:

Burt, R. (2009). Soil Survey Field and Laboratory Methods Manual. Soil Survey Investigations Report No. 5. Method 3.2.1.2.2. United States Department of Agriculture Natural Resources Conservation Service.

SO4-IC-WR	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
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.

Reference Information

** 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
WR	ALS ENVIRONMENTAL - WHITEHORSE, YUKON, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

17-653852

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 Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2165391-COFC

COC Number: 17 - 653852

Page 1 of 1

Report To	Contact and company name below will appear on the final report
Company:	TECK RESOURCES
Contact:	MICHELLE UNGER
Phone:	250-432-5264
	Company address below will appear on the final report
Street:	
City/Province:	
Postal Code:	

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	bonnieburns@northwestel.net
Email 2	michelle.unger@teck.com
Email 3	

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)	
Regular [R]	☑ Standard TAT if received by 3 pm - business days - no surcharges apply
PRIORITY (Business Days) 4 day [P4-20%]	☐
PRIORITY (Business Days) 3 day [P3-25%]	☐
PRIORITY (Business Days) 2 day [P2-50%]	☐
EMERGENCY 1 Business day [E-100%]	☐
EMERGENCY Same Day, Weekend or Statutory holiday [E2-200%] (Laboratory opening fees may apply)]	☐
Date and Time Required for all E&P TATs:	dd-mmm-yy hh:mm
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:		
Contact:		

Invoice Distribution	
Select Invoice Distribution:	☐ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	
Email 2	

Project Information	
ALS Account # / Quote #:	Sa Dena Hes
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: Bonnie Burns

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, alkalinity	Specific conductance	TSS, TDS,	Total metals	Dissolved metals	total ammonia	nitrate, nitrite,	dissolved SO4	hardness		TOC	Particle Size	Metals on portion that <2mm	SAMPLES ON HOLD	Sample is hazardous (please provide further details	NUMBER OF CONTAINERS
	MH-04	14/9/18	09:15	H2O																7
	MH-11	14/9/18	12:40	"																7
	MH-12	13/9/18	18:00	"																7
	MH-13	13/9/18	15:50	"																7
	MH-29	14/9/18	13:50	"																7
	DUP	-	-	"																7
	Field Blank: FB	-	-	"																7
	MH-04	14/9/18		Sediment																2
	MH-11	14/9/18		"																2
	MH-12	13/9/18		"																2
	MH-13	13/9/18		"																2
	MH-29	14/9/18		"																2

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	WQ - analyze metals to low MDLs. to compare to CCME Sr protection of Freshwater Aquatic Life
Are samples for human consumption/ 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
2°C	9

SHIPMENT RELEASE (client use)		
Released by:	Date:	Time:

INITIAL SHIPMENT RECEPTION (lab use only)		
Received by:	Date: Sept 17/18	Time: 11:15

FINAL SHIPMENT RECEPTION (lab use only)		
Received by: HA	Date: 9/18	Time: 2:37

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

JULY 2017 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 D

FISH DATA, 2018

APPENDIX D:

LENGTH DATA COLLECTED FROM FISH CAPTURED DURING SAMPLING OF FALSE CANYON CREEK, SEPTEMBER 2018.

Species	Sample Site	Length (mm)	Weight (gms)
Slimy Sculpin	MH13	37	0.7
Slimy Sculpin	MH13	41	0.8
Slimy Sculpin	MH13	65	2.9

REVEGETATION MONITORING AT THE RECLAIMED SÄ DENA HES MINE SITE, 2018

For

Teck Resources Ltd
Sä Dena Hes Operating Corporation

Submitted by

Laberge Environmental Services

October 2018

Laberge
ENVIRONMENTAL SERVICES
P.O. Box 21072
Whitehorse, Y.T.
Y1A 6P7

Office Phone: 867-668-6838
Cell Phone: 867-668-1043
Fax: 867-667-6956

LETTER OF TRANSMITTAL

Michelle Unger
Manager, Environmental Compliance
Teck Resources Limited
Bag 2000,
Kimberley, BC
V1A 3E1

Dear Michelle:

Re: **Revegetation Monitoring at the Reclaimed Sä Dena Hes Mine Site, 2018**

This report provides the results for Year Three monitoring of the grass seeded areas and the tree planted areas at the reclaimed Sä Dena Hes mine site. Overall to date, the revegetation programs are proving very successful. Soil sampling was undertaken to delineate a contaminated area at the mill site indicating that approximately 1,400 m^2 requires recapping. An invasive plant assessment of the site was also undertaken.

Should you have any questions or comments on the report, please do not hesitate to contact the undersigned.

Sincerely,

Original signed by:

Bonnie Burns
Laberge Environmental Services

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APPENDICES

Appendix A Photographs

Appendix B Analytical Report for Soil Samples

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1.0 BACKGROUND

On behalf of Sä Dena Hes Mining Corporation, Teck Resources Limited (Teck) initiated permanent closure of the Sä Dena Hes Mine in September of 2013. Decommissioning and reclamation activities were undertaken in 2013, 2014 and 2015.

Willow, poplar and alder tree seeds were collected from the Sä Dena Hes area in 2014.Plugs were grown off-site over winter and were planted on the tailings management area (TMA), mill site and the landfill site. The waste rock zones at Jewel Box and Burnick were contoured and then seeded with various grass species in 2015. The TMA was seeded in September 2016. Seeding was delayed in the TMA to give the 2015 tree plantings one year with less grass competition.

Teck retained Laberge Environmental Services (Laberge) to monitor these revegetated areas in the summer of 2018 and to conduct an invasive plant assessment while on site.

2.0 REVEGETATION MONITORING

2.1 Tree Planted Areas

Details on the methodology of the seed collections, planting of plugs and plot establishment are provided in a previously submitted report by Laberge (2015). The purpose of the willow and poplar planting was to provide some biodiversity over the tailings management area, but not create a major attractant for moose browse. Approximately 27,000 plugs consisting of *Salix alaxensis, S. bebbiana, S. barclayi, S. planifolia* and *Populus balsamifera* were installed in several discrete areas throughout the reclaim, south pond, north pond and mill areas. The remaining open areas of these sites were planted with approximately 70,000 alder (*Alnus viridis crispa*) plugs. The alder were planted at a much lower density than the other tree species.

Fourteen permanent monitoring plots, eight planted with willows and poplar and six planted with alder, were established in 2015 (Table 1, Figure 1). Plots VMP-1 to VMP-8 were planted at a higher density than the alder plots, VMP-9 to VMP-14. The plots represented each of the areas planted except for the boneyard. Only a small area was planted with alder here as the majority of the boneyard has naturally revegetated over the years with willows, poplar, some alder and forbs. The growth in this planted area was also assessed in 2018.

The fourteen plots were monitored from July 24th to 27th, 2018. Table 2 summarizes the assessment of the third year of growth of the planted tree plugs at each of the plots. Photographs were taken of each site and selected photos are presented in Appendix A. All photos will be archived and maintained for comparison purposes over time.

As the willows were too immature to produce catkins, they could not positively be identified to species. A total of four willow species were initially planted; *Salix alaxensis, S. bebbiana, S. barclayi and S. planifolia*. The presence of non-planted species within the plots was also noted.

Similar to 2017, the willows and alders exhibited the most robust and vigorous growth in 2018. Generally, the poplars had less vigorous growth, however, some plots had very healthy poplar plants with increased height and branching (Photo #7).

TABLE 1 LOCATION OF TREE MONITORING PLOTS

Plot #	Easting NAD 83	Northing Zone 9V	Elevation (m)	Tree Type	General Location
VMP-1	508182	6710456	1072	willow/poplar	south pond area
VMP-2	508117	6710587	1084.2	willow/poplar	south pond area
VMP-3	507999	6710278	1085.4	willow/poplar	south pond area
VMP-4	508062	6710865	1090.9	willow/poplar	north pond area
VMP-5	508171	6710130	1072.9	willow/poplar	reclaim pond area
VMP-6	507992	6711385	1072.3	willow/poplar	north dam area
VMP-7	508283	6709879	1075.3	willow/poplar	reclaim pond area
VMP-8	507406	6709627	1149.4	willow/poplar	mill site
VMP-9	508027	6712609	1009.2	alder	landfill
VMP 10	508195	6709820	1078.1	alder	Borrow pit G
VMP 11	508288	6710068	1070.2	alder	reclaim pond area
VMP-12	508106	6710513	1069	alder	south pond area
VMP 13	508088	6711391	1088.4	alder	north pond area
VMP-14	507423	6709674	1186.9	alder	mill site

General observations were made in the planted area of the boneyard on July 24th, 2018. The planted alder were healthy and robust. Many other species were growing in the assessed area: Salix spp, poplar, grasses, (including fescue, alpine bluegrass, spike trisetum, Bluejoint, alpine timothy and tickle grass,) fleabane, currant, cinquefoil, sandwort, elegant hawksbeard, dandelion, dwarf fireweed, rock cress, alsike clover, conifer seedlings and mustards. The invasive plants sweet clover and narrowleaf hawksbeard were also growing in the boneyard and were all removed.

To further assess the progress, heights of randomly selected trees, (which covered the range of plants per plot) were measured (Table 3).

Review of these tables shows that growth and biodiversity has increased in the majority of the plots since last assessed in July 2017. Most of the trees have grown considerably taller over the past year. The tallest tree measured in any of the plots occurred at VMP-7 with a height of 1.53 m (See Photo #7 and cover). Biodiversity has increased due to the encroachment of several more native species into the plots. Overall, tree growth appeared healthy and robust. Conversely, plants continued to do poorly at VMP-8 where mortality increased, and growth was stressed.

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Plot	Easting	Northing
VMP-1	508182	6710460
VMP-2	508117	6710590
VMP-3	507999	6710280
VMP-4	508062	6710870
VMP-5	508171	6710130
VMP-6	507992	6711390
VMP-7	508283	6709880
VMP-8	507406	6709630
VMP-9	508027	6712610
VMP-10	508195	6709820
VMP-12	508103	6710510
VMP-11	508288	6710070
VMP-13	508088	6711390
VMP-14	507423	6709670
GP 1	506599	6709490
GP 2	506731	6709520
GP 3	506743	6709290
GP 4	506468	6713120
GP 5	506474	6713130
GP 6	506750	6712990
GP 7	508293	6712640

GP 4 GP 5 GP 6 VMP-9 GP 7 VMP-6 VMP-13 VMP-4 VMP-2 VMP-12 VMP-1 VMP-3 VMP-5 VMP-11 VMP-7 VMP-10 VMP-14 VMP-8 GP 1 GP 2 GP 3

N

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Sa Dena Hes Vegetation Monitoring Plots

Veg Monitoring
Reclaimed Areas

*** Aerial photography was obtained from McElhanney from August 15, 2012 LiDAR survey and represents the site prior to reclamation.

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DATE:	MINE OPERATION:
3/14/2017	Sa Dena Hes
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goulton	NAD 1983 UTM Zone 11N

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TABLE 2 YEAR THREE MONITORING OF TREE PLOTS, JULY 2018

	Site	Date Established	# of plugs planted	Date Assessed	# of live trees	Survival Rate (%)	Tree Species	Other Species	Comments	Invasive Species
Willow / Poplar	VMP-1	6/24/2015	42	7/25/2018	40	95.2	Salix	Lupine, Alpine bluegrass,violet wheatgrass,fescue, equisetum, spruce seedling	very healthy growth, fescue dominant, lots of leaf litter, alsike clover in plot, many hawksbeard plants across creek, yellow butterfly in plot	alsike clover
	VMP-2	6/26/2015	59	7/25/2018	41	69.5	36 Poplar and 5 Salix	Alpine bluegrass, violet wheatgrass, ticklegrass, and fescue	health has improved since last year, some volunteer willows and poplars	nil
	VMP-3	6/27/2015	60	7/25/2018	61	101.7	6 poplar, 55 Salix - appear to be lots of *S. alaxensis* .	Dwarf fireweed, fescue, ticklegrass and violet wheatgrass, spruce seedlings, moss, unknown forb (pink family),foxtail, alpine bluegrass, equisetum, spruce seedlings,	volunteer alder very healthy growth, good soil moisture, not too compact,	nil
	VMP-4	6/29/2015	24	7/24/2018	27	112.5	26 Salix sp 1 poplar	19 volunteer alder, Alpine bluegrass, fescue, wheatgrass, alfalfa, equisetum, fireweed, *Epilobium ciliatum,* spruce seedlings	all plants look healthy, none appear stressed this year.	several small alfalfa in plot, 1 hawksbeard outside of plot - removed
	VMP-5	6/29/2015	24	7/25/2018	27	112.5	10 poplar 17 Salix	Volunteer willows and poplar, spruce seedlings, Alpine bluegrass, violet wheatgrass, dwarf fireweed, mustard, fleabane, *Festuca alpica* , glaucous wheatgrass, *Epilobium ciliatum* , mushrooms, Calamagrostis	very healthy growth, high biodiversity, moist soil conditions, 6 volunteer willows	
	VMP-6	6/30/2015	50	7/24/2018	54	100.0	29 poplar 25 Salix	lupine, violet wheatgrass, Apline bluegrass, *Festuca alpica* , crepis, fireweed, spruce seedling	healthy growth of all plants, majority of willows appear to be *Salix alaxensis*	1 hawksbeard growing outside of plot - removed
	VMP-7	7/1/2015	67	7/25/2018	60	89.6	60 poplar	Volunteer willow and alder, fescue, violet wheatgrass, carex, sandwort, spruce seedling, Epilobium, moss	healthy growth, some large poplars, osprey nest still occupied outside of plot	alsike clover near plot
	VMP-8*	8/27/2015	37	7/26/2018	24	64.9	22 poplar 2 Salix	alpine bluegrass, fescue, wheatgrass, 1 spruce seedling	trees are unhealthy, some barely alive, some only have growth at base of stems	nil
Alder	VMP-9	8/23/2015	12	7/25/2018	12	100.0	alder	Alpine bluegrass,violet wheatgrass, fescue, fireweed, wheatgrass, lupine, spike trisetum, cinquefoil, *Astragalus alpinus* , volunteer willow, poplar and alder, spruce seedling, wild rhubarb, alsike clover, very small raspberry, strawberry	robust and healthy growth, lots of grasses are mature, high biodiversity	Hawksbeard in plot, plus previous population has expanded, alsike clover in plot
	VMP-10	8/25/2015	15	7/25/2018	9	60.0	alder	2 volunteer alder, volunteer willows and very small spruce and fir seedlings, dwarf willow, Epilobium ciliatum, crepis, alpine bluegrass, unidentified aster, moss	trees appear healthy, good recovery, osprey on nearby nest, significant increase in biodiversity, dragonflies and horseflies in and near plot	nil
	VMP-11	8/25/2015	12	7/25/2018	12	100.0	alder	Alpine bluegrass, dwarf fireweed, crepis, volunteer willow, spruce seedling	healthy growth, mammal scat in plot - lynx?, spider in plot	nil
	VMP-12	8/27/2015	15	7/25/2018	13	86.7	alder	Alpine bluegrass, violet wheatgrass, spruce seedlings,	all alder appear healthy	
	VMP-13	8/27/2015	7	7/24/2018	7	100.0	alder	Alpine bluegrass, violet wheatgrass, spike trisetum, aribis, *Minuartia sp,* conifer seedlings, approx 15 volunteer willow	healthy growth, increased biodiversity	2 alsike clover and 2 alfalfa removed
	VMP-14	8/27/2015	10	7/26/2018	5	50.0	alder	volunteer willow, fescue, alpine bluegrass, bluegrass, spruce seedlings, wild rhubarb, dwarf fireweed, *Oxytropis sp* , ticklegrass, equisetum, fireweed, raspberry - very small, strawberry	all trees are healthy and growing, signficant increase in biodiversity	alsike clover

* The original Plot VMP 8 that was planted on June 30, 2015, was inadvertently removed during site prep for alders and reestablished on August 27, 2015

TABLE 3 HEIGHTS OF PLANTED TREE SPECIES, JULY 2018		
Site	**Species Planted**	**Random Heights (cm)**
VMP-1	Willow	33, 16, 33, 28, 12.5
VMP-2	Poplar	59, 42, 29, 41, 16
	Willow	11, 27, 4.5, 6
VMP-3	Poplar	91, 40, 7, 14, 22
	Willow	19, 33, 27.5, 20, 59
VMP-4	Poplar	17
	Willow	29, 23.5, 21, 18, 30
VMP-5	Poplar	58.5, 52, 76, 43, 35
	Willow	115, 78, 92, 31, 151
VMP-6	Poplar	79.5, 70, 48, 40.5, 62
	Willow	18.5, 46, 47.5, 22, 30
VMP-7	Poplar	153, 120, 89.5, 65, 32
VMP-8	Poplar	27, 9.5, 23, 11, 12
	Willow	14, 6.5
VMP-9	Alder	90, 37, 81, 60, 91.5
VMP-10	Alder	66, 43, 45, 42, 45
VMP-11	Alder	75.5, 72, 45, 52, 33
VMP-12	Alder	24, 49, 52, 24, 88.5
VMP-13	Alder	54, 53, 24, 49, 48
VMP-14	Alder	57, 45, 36, 51, 21.5

2.2 Grass Seeded Areas

Grass was hand seeded at an application rate of 44 kg/ha, in various areas throughout the mine site in 2015. The low elevation seed mix (Table 4) was used on the reclaimed roads and the lower borrow pit. The high elevation seed mix (Table 5) was used at the Burnick and Jewel Box waste rock zones.

TABLE 4 LOW ELEVATION SEED MIX AND AMOUNTS			
Common Name	**Scientific Name**	**Weight %**	**Composition %**
Violet Wheatgrass	*Agropyron violaceum*	47	13
Northern Fescue	*Festuca altaica*	24	18
Glacier Alpine Bluegrass	*Poa alpina*	11	37
Sheep fescue	*Festuca ovina*	18	32

TABLE 5 HIGH ELEVATION SEED MIX AND AMOUNTS			
Common Name	**Scientific Name**	**Weight %**	**Composition %**
Violet Wheatgrass	*Agropyron violaceum*	45	12
Rocky Mountain Fescue	*Festuca saximontana*	15	17

TABLE 5	**HIGH ELEVATION SEED MIX AND AMOUNTS**		
Chariot Hard Fescue	*Festuca brevipila*	15	21
Tufted Hairgrass	*Deschampsia caespitosa*	14	14
Glacier Alpine Bluegrass	*Poa alpina*	10	23
Spike Trisetum	*Trisetum spicatum*	1	13

No plots were established on the reclaimed roads but general observations were made. It appears that some sections were seeded at a high application rate. This may impede the natural colonization of local species from the seed sources of the nearby forest.

The methodology of the establishment of the seven grass plots is detailed in a previously submitted report by Laberge (2017). Table 6 below describes the location of each of these plots.

TABLE 6 LOCATIONS OF GRASS MONITORING PLOTS

Plot #	NAD 83, Zone 9V		Elevation (m)	General Location
	Easting	Northing		
GP-1	506599	6709489	1416.4	Jewel Box waste rock zone
GP-2	506731	6709521	1388.7	Jewel Box waste rock zone
GP-3	506743	6709291	1409.7	Jewel Box waste rock zone
GP-4	506468	6713116	1287.2	Burnick 1300 waste rock zone
GP-5	506474	6713125	1288.4	Burnick 1300 waste rock zone
GP-6	506750	6712985	1211.6	Burnick 1200 waste rock zone
GP-7	508293	6712639	1002.2	Gravel Pit area past Landfill

Grass growth had visibly increased at all plots on Jewel Box and many were in inflorescence (Photos #19 to 21). However, similar to 2016, no grasses were present in plot GP-4 and it appears that the upper section of Burnick 1300 was missed during the seeding process. The lower portion did contain some grass and Plot GP-5 was assessed (Photo #22).

Mature grasses were growing in most plots and were identified to genus or species. The results of the monitoring of the grass plots are presented in Table 7.

The high elevation sites are steep sloped and evidence of erosion in the form of minor rilling was observed at the plots on Jewel Box, however there were no signs of increased erosion. No signs of erosion were present at the other plots. There was only one plot in a low elevation site, GP-7, in an old borrow pit area near the landfill area. Of the grass plots, this was the only one with the presence of an invasive species, Hawksbeard.

Grasses within the plots were measured to assess growth (Table 7). Density, height and the number of mature grasses increased in 2018 with the exception of the plots on Burnick 1300.

TABLE 7 YEAR THREE DATA FOR THE GRASS MONITORING PLOTS, JULY 25 and 26, 2018							
Grass Plot #	**% Cover**	**Planted Grass Species**	**Random Heights (cm)**	**Other Species Present**	**Invasive Species**	**Signs of Erosion**	**Comments**
GP-1	25 - 30	Fescue, Wheatgrass, Alpine Bluegrass	Fescue: 38, 25.5, 32, 35, 24.5. Alpine Bluegrass: 25, 22, 23, 29, 18. Wheatgrass: 15.5, 13, 7, 10, 11	none	none	some very minor rilling	even coverage of grass growth, obvious increase over last year.
GP-2	10 - 15	Alpine Bluegrass, Wheatgrass, Fescue, probably Rocky Mtn.	Fescue: 27.5, 44.5, 25, 32.5 17. Alpine Bluegrass:24, 21, 30.5, 30, 25.5. Wheatgrass: 17, 9, 24, 11, 10	none	none	very minor rilling	obvious increase in growth from last year, many grasses in inflorescence, some bare areas.
GP-3	10	Fescue, Wheatgrass, Alpine Bluegrass	Fescue: 26, 25.5, 43, 32, 40. Alpine Bluegrass: 26.5, 16, 26, 17, 26.5. Wheatgrass: 12, 18, 7, 16	none	none	some rilling, depths: 5, 13, 10, 10, 16 cm.	Fescue is dominant grass altho alpine bluegrass is abundant. Coverage has increased since 2017.
GP-4	0	none	none	fir seedling	none	none	
GP-5	<1	Fescue	Fescue: 2, 1, 2, 1.5	conifer seedling	none	none	few blades of stressed grass
GP-6	1	Fescue, Alpine Bluegrass	Fescue: 8, 4, 8.5, 34, 6. Alpine Bluegrass: 3, 2, 19, 22, 3	conifer seedlings	none	none	a few plants in flower, some leaf litter
GP-7	10	2 species of fescue, Alpine Bluegrass	Fescue: 53, 31, 28, 6, 5. Alpine Bluegrass: 17.5, 28.5, 4, 2.5, 25.	Spike trisetum, tickle grass, fleabane, potentilla, yarrow, willow, aribis, fireweed, spruce and poplar seedling	several Hawksbeard, removed from plot	none	Fescue dominant, no wheatgrass

2.3 Transect

In July 2017, a line transect (TP-1) was set up in the north pond area as a method to determine the success, growth and community structure of the tree planted area where grass had been seeded the following year. The methodology, adapted from EMAN Terrestrial Vegetation Monitoring Protocols Section III (Environment Canada, 1999), is detailed in the report submitted by Laberge (2018). The locations and observations within each 1 m^2 plot were noted (Table 8).

Plant coverage had increased, albeit slightly in some plots. Leaf litter from previous years' growth was evident in a few of the plots. Volunteer tree seedlings were documented in several of the plots.

TABLE 8 LINE TRANSECT IN NORTH POND AREA, TP-1, JULY 24, 2018					
Plot #	Zone 9V, NAD 83		% Cover	Species	Comments
	Easting	Northing			
Base stake	508119	6711103			
Q-1	508110	6711102	10 - live, 13 incl litter	Fescue, Alpine Bluegrass	none mature
Q-2	508102	6711100	11	1 alder; 27 cm, wheatgrass, fescue, alpine bluegrass, volunteer willow	small plants but healthy
Q-3	508099	6711102	7 - live, 8 to 10 incl litter	Alpine bluegrass, fescue, wheatgrass, spruce seedling	
Q-4	508092	6711101	1	tickle grass, unknown grass, 2 volunteer willow, 2 species of Epilobium, 1 spruce seedling, moss	
Q-5	508088	6711101	1	5 volunteer willow-2 species, fireweed, different species of bluegrass, moss	1 willow - quite large
Q-6	508082	6711101	12	Alpine Bluegrass, Fescue, Wheatgrass, 1 small mustard, spruce seedling	coverage is spreading throughout plot
Q-7	508077	6711100	4	Alpine bluegrass, spruce seedling, tiny mustard plants, volunteer willow,1 alder; 15 cm.	Several mature Alpine Bluegrass
Q-8	508069	6711100	8	Alpine bluegrass, fescue, 1 alder - 55cm, 1 volunteer feltleaf willow and several very small willows,	Several mature Alpine Bluegrass
Q-9	508060	6711099	2	1 alder - dead, 1 spruce seedling, several alpine bluegrass, fescue, wheatgrass, moss	Several mature Alpine Bluegrass and many small immature plants
Q-10	508054	6711099	3 - live, 4 incl litter	Alpine bluegrass, fescue - dominant, wheatgrass, 1 spruce seedling	appear somewhat stressed
End stake	508049	6711098			

3.0 SOIL CHARACTERIZATION

Following up on the high metal concentrations documented in the soil assessment at the mill site plots in 2017, and observations of the stressed and dying trees, a step-out soil sampling program was conducted in 2018 to determine the extent of contamination. Once in the field it was decided that only sampling radiating from VMP-8 was necessary as growth of the trees appeared healthy and improved at VMP-14 and in the adjacent surrounding area.

Four transects were set up at VMP-8. Samples were collected at 10 m intervals from depths 0 to 10 cm. One sample was collected from a nearby forested disturbed site for comparison. Samples were placed in ziplock bags and kept cool until delivery to the ALS laboratory in Whitehorse, Yukon. The visible boundary between healthy and stressed/dead vegetation was tracked with a GPS. The area of contamination was calculated as 1,384 m^2. The sample sites are described in Table 9 and displayed in Figure 2.

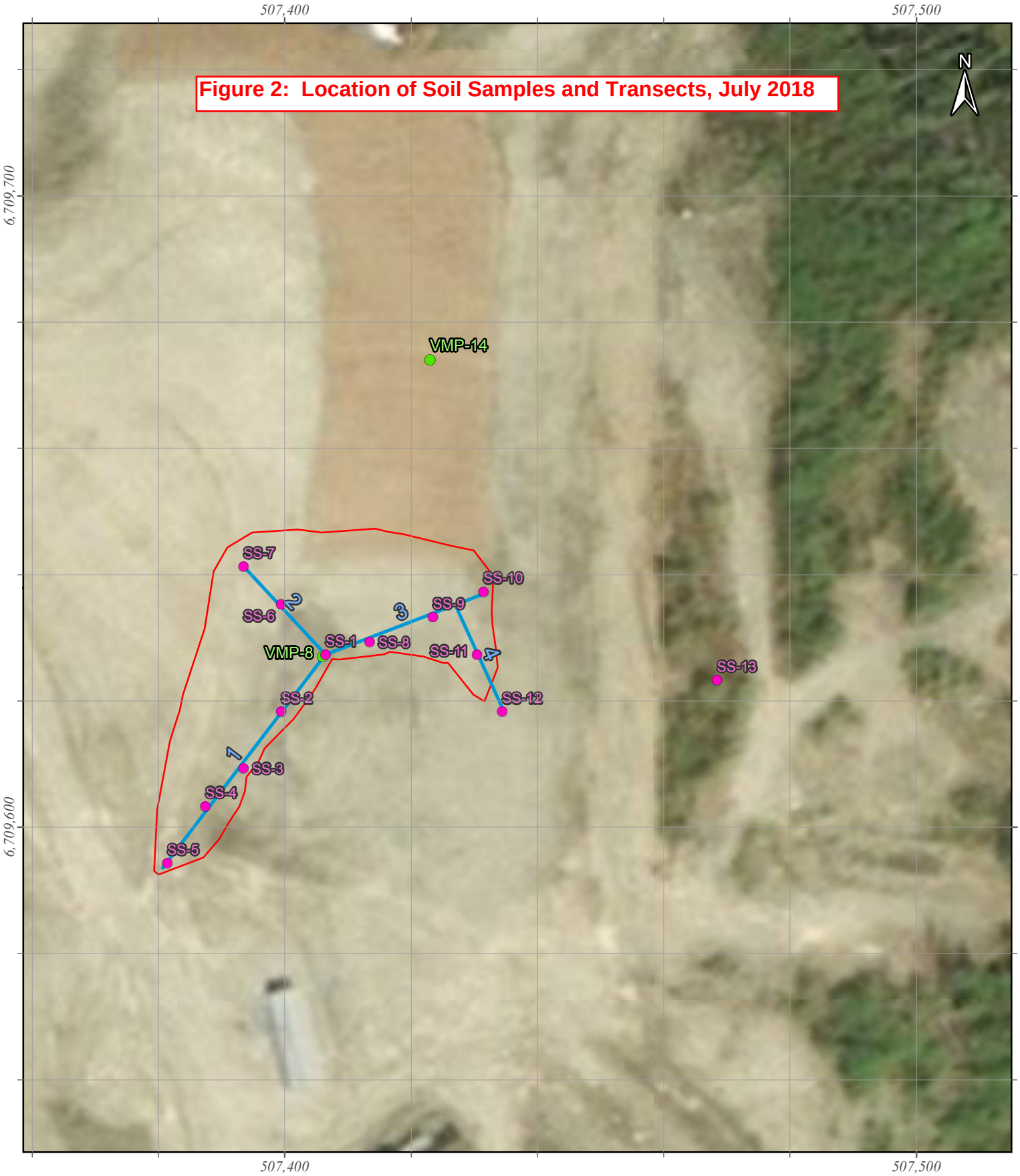
TABLE 9 LOCATIONS OF THE SOIL SAMPLES

	Soil Sample #	Zone 9V NAD 27		Description
		Easting	Northing	
Transect #1	**SS-1**	507512	6709432	Center stake of Plot VMP-8
	SS-2	507505	6709423	10m 200° S of center stake
	SS-3	507499	6709414	20m 200° S of center stake
	SS-4	507493	6709408	30m 200° S of center stake
	SS-5	507487	6709399	40m 200° S of center stake
Transect #2	**SS-6**	507505	6709440	10m 325° NW of center stake
	SS-7	507499	6709446	20m 325° NW of center stake
Transect #3	**SS-8**	507519	6709434	10m 13° N of center stake
	SS-9	507529	6709438	20m 13° N of center stake
	SS-10	507537	6709442	30m 13° N of center stake
Transect #4	**SS-11**	507536	6709432	10 m 147° SE of the 25m point on Transect #3
	SS-12	507540	6709423	20 m 147° SE of the 25m point on Transect #3
	SS-13	507574	6709428	Control sample from nearby disturbed forest

Azimuth (2016) identified lead and zinc as Contaminants of Potential Concern (COPC) at the mill site. Secondary COPCs were listed as cadmium, molybdenum and selenium. The results for these metals have been tabulated and compared to the Yukon Contaminated Sites Regulations for agriculture, parkland and residential standards (Table 10).

All soils were neutral to slightly alkaline ranging from 7.00 at SS-13 to 8.03 at SS-8. The highest concentrations of most of the examined metals were located at sample site SS-2, and all of the standards were exceeded here. The highest concentration of molybdenum was documented at SS-12. The concentrations of lead and zinc far exceeded the standards in the majority of the soil samples. The standards for lead were met at SS-7, SS-8 and SS-13, and for zinc at SS-8 only.

Figure 2: Location of Soil Samples and Transects, July 2018



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Sa Dena Hes - Mill Site

- Soil Sample Locations
- Plots
- Transects
- Contaminated Area (1384 sq. meters)

0 5 10 20 Meters

Date: 10/12/2018	Property: Sa Dena Hes
Scale: 1:800	Coordinate System: NAD 1983 UTM Zone 9N

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TABLE 10 METAL CONCENTRATIONS (mg/kg) IN SOILS NEAR VMP-8						
Sample #	**pH**	**Cadmium**	**Lead**	**Molybdenum**	**Selenium**	**Zinc**
SS-1	7.86	85.2	7180	13.3	5.99	14500
SS-2	7.52	266	25000	14.7	18.6	42200
SS-3	7.94	60.2	5760	12.7	4.39	10200
SS-4	7.79	64.3	8060	10.1	6.02	11100
SS-5	7.73	70.1	7130	9.09	6.34	11800
SS-6	7.76	86.5	9650	12.0	7.82	14500
SS-7	7.91	6.28	515	8.86	1.09	949
SS-8	8.03	3.46	120	11.2	1.09	422
SS-9	8.01	15.1	4810	8.12	3.89	2360
SS-10	7.83	28.3	1790	17.1	2.98	4800
SS-11	7.79	23.3	2080	13.8	3.05	3860
SS-12	7.84	11.9	1430	24.1	2.92	1900
SS-13	7.00	3.57	657	2.03	0.61	602
YCSR Standards	Agricultural	70	1000	5	2	450
	Park	70	1000	10	3	450
	Residential	70	1000	10	3	450
266	All standards have been exceeded					
2.98	Agricultural standard only has been exceeded					

Figure 3 shows a schematic of the distribution of lead and zinc concentrations along each of the transects. The highest values for these two metals were located along Transect 1 and at SS-6.

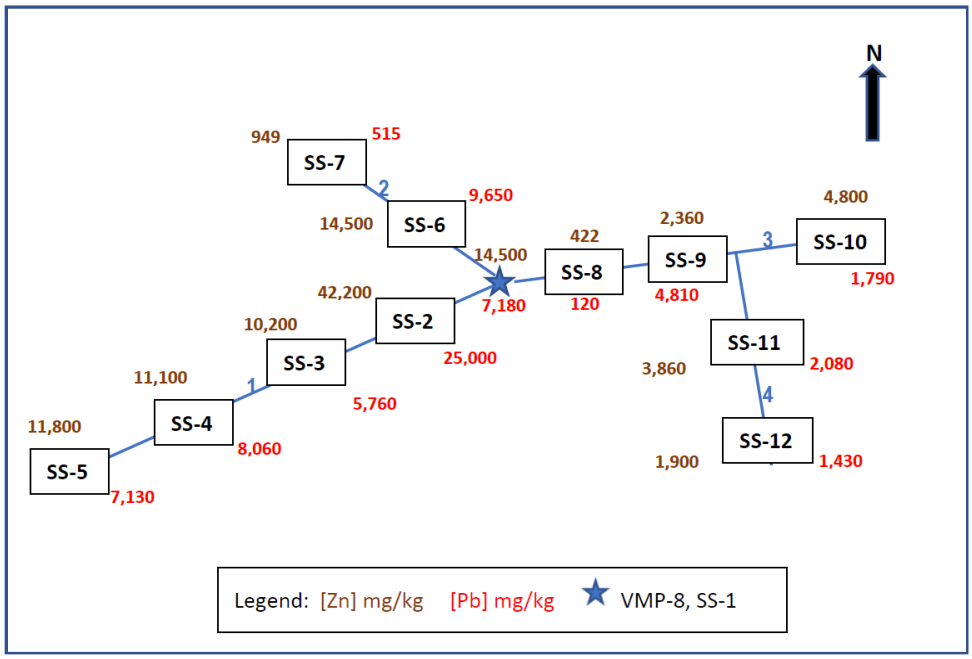

Figure 3: Schematic of the Distribution of Lead and Zinc around VMP-8

The control sample, SS-13 was collected from a disturbed forested area to the east of Transect #3. This area would be more indicative of conditions to be expected over time at the reclaimed mill site area rather than a sample from the undisturbed native forest. Metal concentrations were generally low here although the standard for zinc was exceeded.

4.0 INVASIVE SPECIES ASSESSMENT

Observations regarding the presence of invasive plants were conducted throughout the monitoring program. Invasive species were noted and locations of larger populations were documented with a hand-held GPS.

The population of Oxeye Daisy (*Leucanthemum vulgare*) that was observed south of the gate at Kilometer 23 in 2016 was eradicated when this area was prepared and seeded with the low elevation grass mixture in the fall of 2016. No Oxeye Daisy was observed in 2018.

Similar to the past assessments, the most common invasive species was *Crepis tectorum*, (narrowleaf hawksbeard) and was generally found sporadically along the road sides within the study area. Hawksbeard is an annual plant of the sunflower family and was introduced from Europe as a contaminant in seed mixes. Hawksbeard is commonly found in cultivated fields and disturbed areas. The population that was documented near the monitoring plot VMP-9 at the landfill site, had increased in 2018 (Photo #26). Due to the shade intolerance characteristic of this plant, it will gradually die out when the alder trees increase in size. The small population of Hawksbeard that was previously documented at WP#96 had decreased in size in 2018. Hawksbeard was also observed within some of the monitoring plots (see Tables 2 and 7). Although another in-depth roadside survey was not completed on the access road in 2018, it a small population of tall hawkweed (*Hieracium piloselloides*) was observed near Km 12.

Small white sweetclover plants (*Melilotus alba)* were identified near the boneyard site where the two plants had been removed in 2017. These were again immediately removed from the site and disposed of appropriately. Table 11 summarizes all observations.

TABLE 11 OBSERVATIONS OF INVASIVE PLANTS IN THE STUDY AREA, 2018

Waypoint or Plot #	NAD 83 Zone 9V		General Location	Invasive Species	Action
	Easting	Northing			
VMP-1	508182	6710456	south pond area	1 alsike clover	
VMP-4	508062	6710865	outside of plot, north pond area	1 hawsksbeard	removed
WP#22	507848	6711377	Boneyard	several small white clover plants and hawksbeard	removed
VMP-6	507992	6711385	outside of plot, north pond area	1 hawskbeard	removed
VMP-7	508283	6709879	reclaim pond area - outside of plot	alsike clover	
VMP-9	508027	6712609	landfill	hawksbeard and alsike clover	
VMP-13	508088	6711391	north pond area	alsike clover and alfalfa	removed
VMP-14	507423	6709674	north pond area	alsike clover	
GP-7	508293	6712639	small borrow pit	several hawksbeard	removed
WP #96	507894	6710305	by access route to south pond	hawksbeard	
WP #114	508016	6712629	near VMP-9, near forest	hawksbeard	

5.0 SUMMARY

The third year of monitoring the planted tree plugs showed that willow and alder were the most successful species in terms of vigor and growth. Poplar were not as productive on the date of assessment but generally appeared healthy. The overall survival rate continues to be high; greater than 85% in 10 of the 14 plots. The survival rate at the other plots ranged from 50% to 70%.

Grass growth had significantly increased at the plots on Jewel Box.

The soil data at the mill site indicates that an approximate area of 1,384 m^2 should be capped with till.

Crepis tectorum (narrowleaf hawksbeard) was the most common invasive species at the site. This species is widespread in the Yukon and readily invades disturbed areas.

6.0 RECOMMENDATIONS

It is recommended that annual monitoring of all plots, and observations on growth throughout the site in general, continue for 2019.

To increase successful revegetation at the mill site area in the region located near VMP-8, it is recommended that a layer of till, minimal depth of 30 cm, be applied to the 1,384 m^2 of contaminated soil as indicated in Figure 2.

7.0 REFERENCES

Azimuth Consulting Group. 2016. Technical Memo: Sä Dena Hes Mine Site Long Term Monitoring Plan for the Terrestrial Environment Related to Human Health and Ecological Risks. Submitted to Michelle Unger, Teck Resources Ltd.

Environment Canada. 1999. EMAN Terrestrial Vegetation Monitoring Protocols, Report #9, Section III Ground Vegetation Biodiversity Monitoring Protocols.

Laberge Environmental Services. 2015. Tree Planting at the Reclaimed Sä Dena Hes Mining Site, 2015. Prepared for Teck Resources Ltd.

Laberge Environmental Services. 2017. Revegetation Monitoring at the Reclaimed Sä Dena Hes Mining Site, 2016. Prepared for Teck Resources Ltd.

Laberge Environmental Services. 2018. Revegetation Monitoring at the Reclaimed Sä Dena Hes Mining Site, 2017. Prepared for Teck Resources Ltd.

Yukon Government, Department of Environment, Environment Act - Contaminated Sites Regulations, OIC2002/171.

APPENDIX A

PHOTOGRAPHS, JULY 2018

Photo #1: VMP-1

Photo #4: Recovered growth at VMP-4

Photo #2: VMP-2

Photo #5: Trees have significantly increased in size at VMP-5

Photo #3: VMP-3

Photo #6: VMP-6, increased tree growth

Photo #7: Increased poplars growth at VMP-7

Photo #10: Healthy alder growth at VMP-10

Photo #8: Willows are continuing to struggle at VMP-8

Photo #11: VMP-11

Photo #9: Robust alder growth at VMP-9

Photo #12: VMP-12

Photo #13: VMP-13

Photo #16: Aerial view of north pond area, Sept 14/18

Photo #14: Alders appear healthy at VMP-14

Photo #17: Aerial view of second pond area, Sept 14/18

Photo #15: Alder and volunteer growth at Boneyard site

Photo #18: Aerial view of second and reclaim pond area

Photo #19: GP-1

Photo #22: Stressed grasses at GP-5

Photo #20: Mature grasses growing within plot GP-2

Photo #23: Healthier grasses at GP-6

Photo #21: Mature grasses at GP-3 and throughout area

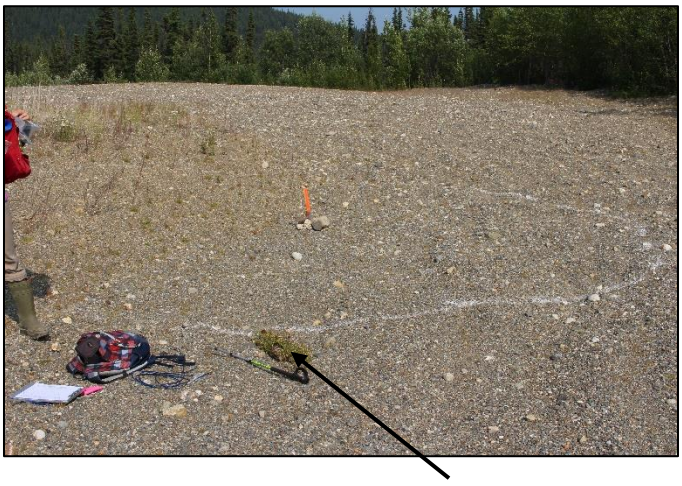

Photo #24: GP-7, hawksbeard have been removed

Photo #25: Hawksbeard growing east of VMP-1

Photo # 26: Hawksbeard growing north of VMP9 near forest edge

Photo #27: Overview of soil transects from end of Transect #2, Krystal standing at SS-1.

Photo #28: “Control” site in nearby disturbed forest.

Photo #29: Transect #1

Photo #30: Transect #2

Photo #31: Transect #4

APPENDIX B

ANALYTICAL REPORT - SOIL SAMPLING

TECK METALS LTD.
ATTN: Michelle Unger
601 Knighton Road
Kimberley BC V1A 3E1

Date Received: 30-JUL-18
Report Date: 10-AUG-18 13:13 (MT)
Version: FINAL

Client Phone: 250-427-8404

Certificate of Analysis

Lab Work Order #: L2138278

Project P.O. #: 9179
Job Reference: SDH-VEG PROGRAM
C of C Numbers: 1 of 1
Legal Site Desc:

Can Dang
Senior Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2138278-1	L2138278-2	L2138278-3	L2138278-4	L2138278-5
Description	Soil	Soil	Soil	Soil	Soil
Sampled Date	26-JUL-18	26-JUL-18	26-JUL-18	26-JUL-18	26-JUL-18
Sampled Time					
Client ID	SS-1	SS-2	SS-3	SS-4	SS-5
Grouping / **Analyte**					
SOIL					
Physical Tests pH (1:2 soil:water) (pH)	7.86	7.52	7.94	7.79	7.73
Metals Aluminum (Al) (mg/kg)	12700	14200	15200	13300	13000
Antimony (Sb) (mg/kg)	10.3	14.7	8.34	8.50	8.14
Arsenic (As) (mg/kg)	47.8	58.0	50.8	41.3	39.7
Barium (Ba) (mg/kg)	143	157	130	164	192
Beryllium (Be) (mg/kg)	0.70	0.95	0.66	0.74	0.66
Bismuth (Bi) (mg/kg)	4.97	18.3	2.90	4.40	4.82
Boron (B) (mg/kg)	6.2	6.9	<5.0	5.3	<5.0
Cadmium (Cd) (mg/kg)	85.2	266	60.2	64.3	70.1
Calcium (Ca) (mg/kg)	23700	29000	23800	17800	18500
Chromium (Cr) (mg/kg)	21.6	26.1	26.4	23.9	21.8
Cobalt (Co) (mg/kg)	14.8	25.2	16.0	13.2	12.9
Copper (Cu) (mg/kg)	51.7	59.4	44.5	66.1	43.2
Iron (Fe) (mg/kg)	26100	30000	26600	25500	24000
Lead (Pb) (mg/kg)	7180	25000	5760	8060	7130
Lithium (Li) (mg/kg)	25.3	28.4	34.2	26.2	24.5
Magnesium (Mg) (mg/kg)	12300	12600	14100	11400	12900
Manganese (Mn) (mg/kg)	642	1420	518	599	612
Mercury (Hg) (mg/kg)	0.0864	0.0485	0.0241	0.0356	0.0307
Molybdenum (Mo) (mg/kg)	13.3	14.7	12.7	10.1	9.09
Nickel (Ni) (mg/kg)	48.8	53.2	44.3	42.4	38.8
Phosphorus (P) (mg/kg)	742	885	747	884	1130
Potassium (K) (mg/kg)	1430	1620	1500	1410	1350
Selenium (Se) (mg/kg)	5.99	18.6	4.39	6.02	6.34
Silver (Ag) (mg/kg)	6.96	24.1	5.10	6.64	6.55
Sodium (Na) (mg/kg)	74	70	54	70	74
Strontium (Sr) (mg/kg)	71.3	78.6	85.1	63.9	58.3
Sulfur (S) (mg/kg)	5200	15400	4000	4400	4600
Thallium (Tl) (mg/kg)	0.325	0.332	0.289	0.272	0.241
Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium (Ti) (mg/kg)	855	883	1110	920	838
Tungsten (W) (mg/kg)	1.30	2.10	0.54	1.28	0.75
Uranium (U) (mg/kg)	1.96	2.84	1.79	2.02	1.94
Vanadium (V) (mg/kg)	99.0	114	98.2	113	112
Zinc (Zn) (mg/kg)	14500	42200	10200	11100	11800
Zirconium (Zr) (mg/kg)	9.7	9.7	10.1	9.5	8.0

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2138278-6	L2138278-7	L2138278-8	L2138278-9	L2138278-10
Description	Soil	Soil	Soil	Soil	Soil
Sampled Date	26-JUL-18	26-JUL-18	26-JUL-18	26-JUL-18	26-JUL-18
Sampled Time					
Client ID	SS-6	SS-7	SS-8	SS-9	SS-10
Grouping / **Analyte**					
SOIL					
Physical Tests pH (1:2 soil:water) (pH)	7.76	7.91	8.03	8.01	7.83
Metals Aluminum (Al) (mg/kg)	16700	14400	14400	15700	14000
Antimony (Sb) (mg/kg)	9.52	6.05	7.75	7.40	11.1
Arsenic (As) (mg/kg)	49.6	37.8	43.2	37.1	61.0
Barium (Ba) (mg/kg)	169	202	202	148	184
Beryllium (Be) (mg/kg)	0.79	0.64	0.73	0.64	0.75
Bismuth (Bi) (mg/kg)	5.13	0.67	0.26	2.58	1.46
Boron (B) (mg/kg)	6.7	<5.0	<5.0	<5.0	<5.0
Cadmium (Cd) (mg/kg)	86.5	6.28	3.46	15.1	28.3
Calcium (Ca) (mg/kg)	23900	6320	6940	9990	9800
Chromium (Cr) (mg/kg)	28.2	25.0	25.5	26.5	25.5
Cobalt (Co) (mg/kg)	16.7	10.2	10.4	10.9	12.3
Copper (Cu) (mg/kg)	46.4	41.6	50.2	41.7	57.7
Iron (Fe) (mg/kg)	28100	23700	23200	25100	25600
Lead (Pb) (mg/kg)	9650	515	120	4810	1790
Lithium (Li) (mg/kg)	34.6	25.1	24.9	33.1	26.8
Magnesium (Mg) (mg/kg)	14200	10400	12000	13400	13000
Manganese (Mn) (mg/kg)	707	368	333	421	410
Mercury (Hg) (mg/kg)	0.0332	0.0386	0.0512	0.0287	0.0460
Molybdenum (Mo) (mg/kg)	12.0	8.86	11.2	8.12	17.1
Nickel (Ni) (mg/kg)	46.3	41.8	48.5	43.7	54.5
Phosphorus (P) (mg/kg)	832	1020	807	894	888
Potassium (K) (mg/kg)	1860	1350	1390	1270	1420
Selenium (Se) (mg/kg)	7.82	1.09	1.09	3.89	2.98
Silver (Ag) (mg/kg)	8.20	1.06	0.72	4.06	2.43
Sodium (Na) (mg/kg)	82	79	73	57	61
Strontium (Sr) (mg/kg)	91.2	44.7	39.9	46.5	48.9
Sulfur (S) (mg/kg)	5700	<1000	<1000	1100	1100
Thallium (Tl) (mg/kg)	0.320	0.263	0.324	0.262	0.370
Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium (Ti) (mg/kg)	1160	792	894	958	904
Tungsten (W) (mg/kg)	0.78	<0.50	<0.50	<0.50	<0.50
Uranium (U) (mg/kg)	2.02	1.90	2.60	1.78	2.73
Vanadium (V) (mg/kg)	128	125	162	114	163
Zinc (Zn) (mg/kg)	14500	949	422	2360	4800
Zirconium (Zr) (mg/kg)	12.2	6.5	8.1	7.3	10.4

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2138278-11	L2138278-12	L2138278-13		
Description	Soil	Soil	Soil		
Sampled Date	26-JUL-18	26-JUL-18	26-JUL-18		
Sampled Time					
Client ID	SS-11	SS-12	SS-13		
Grouping / **Analyte**					
SOIL					
Physical Tests pH (1:2 soil:water) (pH)	7.79	7.84	7.00		
Metals Aluminum (Al) (mg/kg)	13300	13500	19200		
Antimony (Sb) (mg/kg)	9.72	13.3	1.74		
Arsenic (As) (mg/kg)	52.3	69.8	14.3		
Barium (Ba) (mg/kg)	175	188	96.7		
Beryllium (Be) (mg/kg)	0.70	0.73	0.51		
Bismuth (Bi) (mg/kg)	2.07	0.91	0.66		
Boron (B) (mg/kg)	<5.0	5.0	<5.0		
Cadmium (Cd) (mg/kg)	23.3	11.9	3.57		
Calcium (Ca) (mg/kg)	10700	14600	6910		
Chromium (Cr) (mg/kg)	24.3	24.7	34.6		
Cobalt (Co) (mg/kg)	11.0	10.9	10.8		
Copper (Cu) (mg/kg)	55.3	61.6	18.8		
Iron (Fe) (mg/kg)	23200	24500	30600		
Lead (Pb) (mg/kg)	2080	1430	657		
Lithium (Li) (mg/kg)	25.3	24.4	37.1		
Magnesium (Mg) (mg/kg)	12100	13000	11600		
Manganese (Mn) (mg/kg)	432	366	368		
Mercury (Hg) (mg/kg)	0.0442	0.0923	0.0269		
Molybdenum (Mo) (mg/kg)	13.8	24.1	2.03		
Nickel (Ni) (mg/kg)	49.1	56.2	34.1		
Phosphorus (P) (mg/kg)	815	857	689		
Potassium (K) (mg/kg)	1360	1590	750		
Selenium (Se) (mg/kg)	3.05	2.92	0.61		
Silver (Ag) (mg/kg)	2.62	1.85	0.89		
Sodium (Na) (mg/kg)	58	53	61		
Strontium (Sr) (mg/kg)	53.2	69.8	39.1		
Sulfur (S) (mg/kg)	1100	<1000	<1000		
Thallium (Tl) (mg/kg)	0.320	0.401	0.130		
Tin (Sn) (mg/kg)	<2.0	<2.0	<2.0		
Titanium (Ti) (mg/kg)	918	1020	508		
Tungsten (W) (mg/kg)	0.52	<0.50	<0.50		
Uranium (U) (mg/kg)	2.54	3.21	0.663		
Vanadium (V) (mg/kg)	149	181	44.2		
Zinc (Zn) (mg/kg)	3860	1900	602		
Zirconium (Zr) (mg/kg)	9.9	12.0	1.3		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Arsenic (As)	DUP-H	L2138278-2

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
HG-200.2-CVAF-VA	Soil	Mercury in Soil by CVAAS	EPA 200.2/1631E (mod)

Soil samples are digested with hot nitric and hydrochloric acids, followed by CVAAS analysis. This method is fully compliant with the BC SALM strong acid leachable metals digestion method.

MET-200.2-CCMS-VA	Soil	Metals in Soil by CRC ICPMS	EPA 200.2/6020A (mod)

This method uses a heated strong acid digestion with HNO3 and HCl and 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.

PH-1:2-VA	Soil	pH in Soil (1:2 Soil:Water Extraction)	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL

This analysis is carried out in accordance with procedures described in the pH, Electrometric in Soil and Sediment method - Section B Physical/Inorganic and Misc. Constituents, BC Environmental Laboratory Manual 2007. 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. The pH of the solution is then measured using a standard pH probe.

** 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
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, 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.

ALS Environmental

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L2138278-COFC

COC #

Page 1 of 1

Report To		Report Format / Distribution		Service Requested (Rush for routine analysis subject to availability)
Company:	Teck Resources Ltd	☑ Standard ☐ Other		● Regular (Standard Turnaround Times - Business Days)
Contact:	Michelle Unger	☑ PDF ☑ Excel ☑ Digital ☐ Fax		○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	Bag 2000 601 Knighton Road	Email 1:	bonnieburns@northwestel.net	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Kimberley, BC V1A 3E1	Email 2:	michelle.unger@teck.com	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	250-427-8409 Fax: 250-427-8451	Email 3:		**Analysis Request**
Invoice To	Same as Report ? ☑ Yes ☐ No	**Client / Project Information**		Please indicate below Filtered, Preserved or both (F, P, F/P)
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	SDH - Veg Program	
Company:		PO / AFE:		
Contact:		LSD:		
Address:				
Phone:	Fax:	Quote #:		
Lab Work Order # (lab use only)		ALS Contact:	Sampler: Bonnie Burns & Krystal Isbister	

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	pH	Metals, CSR, CCME	Number of Containers
	SS-1	26-07-18		Soil	X	X	1
	SS-2	26-07-18		Soil	X	X	1
	SS-3	26-07-18		Soil	X	X	1
	SS-4	26-07-18		Soil	X	X	1
	SS-5	26-07-18		Soil	X	X	1
	SS-6	26-07-18		Soil	X	X	1
	SS-7	26-07-18		Soil	X	X	1
	SS-8	26-07-18		Soil	X	X	1
	SS-9	26-07-18		Soil	X	X	1
	SS-10	26-07-18		Soil	X	X	1
	SS-11	26-07-18		Soil	X	X	1
	SS-12	26-07-18		Soil	X	X	1
	SS-13	26-07-18		Soil	X	X	1

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:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Bonnie Burns				July 30/18	15:15	15 °C				

JC 31 Jul 18 1545 13

GENF 20.00 Front