2016 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 Metals Ltd.**

Prepared by: Michelle Unger, (250) 427-8422

March 31, 2017

Teck

EXECUTIVE SUMMARY

The Annual Reclamation Report for 2016 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 2016.

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 2016, post-reclamation monitoring programs included surface water, groundwater, re-vegetation monitoring, physical/geotechnical inspections, and maintenance of constructed/engineered structures. The surface water monitoring was conducted as per the Water Use License QZ15-082. In summary, parameter concentrations were less than the Water Use License standards with the exception of turbidity for one occurrence at MH-02 (North Dam Seepage) and MH-05 (Portal Creek), and true color for one occurrence at MH-01 (South Tailings Outflow) and MH-14 (20 km downstream False Canyon Creek). Total zinc concentrations exceeded at MH-22 (Burnick 1200 Portal) but do not discharge directly to the receiving environment and the concentrations are within historic ranges. The fish, benthic invertebrate and sediment monitoring was also conducted and there are no differences relative to reference locations.

Additional surface water and groundwater monitoring was also conducted as per the *Environmental Monitoring, Surveillance and Reporting Plan* (EMSRP) dated June 30, 2016 (Teck Metals Ltd., 2016) in anticipation of receiving a new post closure Water License in 2016. The EMSRP was revised during the Water License application process and will be submitted once the new License is finalized.

Revegetation monitoring was conducted and the overall survival rate was high with greater than 88% in 11 of the 14 plots.

Physical work conducted at the site was limited to maintenance of culverts along the main access road, removing and burning old exploration shacks on the back side of Jewelbox, and regrading the drainage channel in the North tailings management area as per the recommendation of the geotechnical engineer.

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1. Sä Dena Hes – 2016 Annual Report Yukon Water Licence QZ15-082 dated March 2016, prepared by SRK
2. Revegetation Monitoring at the Reclaimed Sä Dena Hes Mining Site, 2016 dated March 2017, prepared by Laberge Environmental Services
3. Supplementary Memo: 2016 Surface Water and Groundwater Monitoring Data, Sä Dena Hes Mine, dated March 30, 2017, prepared by SRK Consulting.

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 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 QZ15-082 came into effect on January 1, 2016 and expired December 31, 2016. In December 2016, an extension was granted for three months (QZ16-080), as a new water licence addressing permanent closure of the site is anticipated in April 2017.

2.0 2016 DECOMMISSIONING AND RECLAMATION ACTIVITIES

Post-reclamation environmental monitoring, physical/geotechnical inspections, and maintenance of constructed/engineered structures were undertaken in 2016 as described in the *Environmental Monitoring, Surveillance and Reporting Plan* (EMSRP) dated June 30, 2016 (Teck Metals Ltd., 2016). Note that the EMSRP was updated in December 2016 to reflect comments and revisions received during the Water Licence renewal application process and will be re-submitted to Yukon Energy, Mines and Resources (EMR) once the new Water Licence is finalized.

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

- Surface Water Quality Monitoring
  - Ongoing monthly/quarterly water surface water sampling conducted using a helicopter in the winter months and an all-terrain vehicle in the snow free months as per the 2015 Water Use Licence QZ15-082. Note that additional locations were monitored as per the EMSRP.
- Groundwater Quality Monitoring
  - Quarterly monitoring of the groundwater wells within the landfill was conducted. Groundwater monitoring/sampling of other wells as per the EMSRP was conducted in the spring and/or fall.
- Aquatic Resources Monitoring
  - The Environmental Effects Monitoring program as per the QZ15-082 was completed in 2016.
- Terrestrial Monitoring
  - The 2016 re-vegetation assessment was completed in July to assess the 2015 site planting program.
  - The South Pond and North Pond were seeded. The delay in seeding the pond covers were to give the 2015 plantings one year with less grass competition.
- Physical/geotechnical inspections
  - Spring routine site inspection of physical/geotechnical features was completed by Teck and the fall routine site inspection was conducted by a local contractor whom has been trained by Teck and the Engineer of Record.
  - The annual 2016 Dam Safety Inspection (DSI) was completed by the engineer of record in July.
  - Survey completed on the North Dam settlement gauges.
- Maintenance of constructed/engineered structures or access road
  - Main culvert at 16.9km was cleared of beaver dams. This work involved the use of heavy equipment as the culvert was under approximately 6.4 meters of water. The access road has been narrowed in this location.
  - Old exploration shacks on the back side of Jewelbox were removed and burnt as requested by Justin Hooper, Natural Resource Officer, Yukon Department and Energy, Mines and Resources.

- A section of the main culvert at 13.6km collapsed and was removed and the roadway was narrowed, culvert repairs and/or replacement is scheduled for summer 2017.
- Regrading of the drainage channel in the North tailings management area to reduce ponding in the channel was completed as per the recommendation of the geotechnical engineer.

3.0 2017 DECOMMISSIONING AND RECLAMATION ACTIVITIES

There are no planned physical activities in 2017 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 Adaptive Management Plan and Environmental Surveillance, Monitoring and Reporting plan will be conducted as per the Water Licence issued in 2017.

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 2016 there are no updated maps included within this report.

6.0 INSPECTION OF ENGINEERED STRUCTURES

The 2016 geotechnical inspection of the structures and features associated with the Tailings Management Area at SDH was completed by SRK on July 19, 2016. The inspection report *2016 Geotechnical Inspection Tailings Management Facility, Sä Dena Hes, Yukon Territory, dated November 2015* was submitted to EMR on October 13, 2016.

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; and
- 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 were required.

Other than the ongoing surveillance program which forms part of the OMS manual, SRK has recommended that the central drainage channel in the TMA Till Cover be regraded to reduce ponding in the channel. This work was conducted in 2016.

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 QZ15-082 (replaces QZ99-045) which came into effect on January 1, 2016 and it expires on December 31, 2016. In December 2016, an extension was granted for three months (QZ16-080 replaces QZ15-082), as a new water licence addressing permanent closure of the site is anticipated in spring 2017 (QZ16-051). A requirement of licence QZ15-082 is that annual reports addressing the terms of the licence be submitted to the Water Board.

The licence describes the water quality monitoring program for temporary closure, 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 QZ15-082, water quality data is reported monthly to the Yukon Territory Water Board. In addition, the biennual biological effects monitoring was conducted. The 2016 monitoring results are discussed in the report prepared by SRK Consulting entitled *Sä Dena Hes – 2016 Annual Report Yukon Water Licence QZ15-082 dated March 2016.* The report is included as Attachment 1.

In summary, samples from all of the required water quality monitoring stations met the standards in licence QZ15-082 for pH, TSS, ammonia, dissolved arsenic, total cadmium, total copper, cyanide, total lead, total selenium, and total silver. The licence standards for true colour, turbidity, and total zinc were exceeded at some stations (Table 1). Turbidity and TSS levels at

all stations have decreased since 2015 suggesting that sediments are beginning to stabilize following the completion of decommissioning activities. Although the Burnick 1200 portal discharge (MH-22) is compared to the licence standards, it is important to note that it does not discharge directly to surface water.

Table 1: Summary of Licence QZ15-082 Exceedances in 2016

Station		Parameter	Standard	Exceedances
South Tailings Outflow	MH-01	True Colour	20 Col. Units	1 of 4 samples (25%)
North Dam Seepage	MH-02	Turbidity	15 NTU	1 of 12 samples (8%)
Portal Creek	MH-05	Turbidity	15 NTU	1 of 1 sample (100%)
False Canyon Creek (20 km downstream)	MH-14	True Colour	20 Col. Units	1 of 4 samples (25%)
Burnick 1200 Portal	MH-22	Total Zinc	0.5 mg/L	7 of 8 samples (88%)

Laberge Environmental Services and Can-Nic-A-Nick Environmental Sciences was retained to conduct the fish, benthic invertebrate, and sediment monitoring programs required for 2016. The results are provided in the 2016 Annual Water Licence report in Attachment 1. The results of the fish, benthic invertebrate and sediment monitoring program indicated that the False Canyon Creek drainage continues to show no differences in freshwater aquatic community relative to reference locations.

7.2. Surface Water and Groundwater Monitoring

Additional surface water and groundwater sampling was conducted as per the EMSRP dated June 2016. The results are discussed in the attached memorandum *Supplementary Memo: 2016 Surface Water and Groundwater Monitoring Data, Sä Dena Hes Mine*, dated March 30, 2017, prepared by SRK Consulting.

The surface water and mine discharge samples were compared to the approved and working BC Water Quality Guidelines (BC WQG) (BC Ministry of Environment, 2017) for the protection of aquatic life. The comparison to the BC WQG was completed for screening purposes only as the site specific standards will be outlined in the new Water Licence in 2017. In summary, parameter concentrations were less than the BC WQGs with the exception of select parameters at MH-04, MH-22 and SDH-02 including cadmium, lead, selenium and zinc. These parameters are known to commonly exceed at the site.

Groundwater quality was compared to the Yukon Contaminated Site Regulation (CSR) standards (Environment Yukon, 2002). Concentrations in all the monitoring wells were less than the CSR standards, with the exception of the mine source groundwater wells of dissolved cadmium downgradient of the 1380 portal in MW13-01 and MW13-13. These concentrations are similar to 2014 and 2015 sampling events.

Laberge Environmental Services and Can-Nic-A-Nick Environmental Sciences was retained to conduct the fish, benthic invertebrate, and sediment monitoring programs required for 2016. Additional locations were completed in 2016 in anticipation of the new water licence. The reporting is currently in progress.

7.3. 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 700,000 alder (*Alnus viridis crispa*) plugs. The alder were planted at a much lower density than the other tree species.

Revegetation monitoring was conducted in 2016 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, 2016"* dated March 2017. In summary, fourteen permanent tree monitoring plots were established and monitored from July 18th to July 20th. Overall the survival rate was high with greater than 88% in 11 of the 14 plots. These include all the willow/poplar plots and three of the six alder plots. The remainder 3 alder plots ranged from 50% to 73% survival but the number of plants within the plots were less than 15.

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 nd 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 is sparse in all the plots due to the short amount of growing time since seeding (October 2015).

Photograph 1: Grass growing in 2015 seeded area

8.0 INVASIVE PLANTS

In 2016, a survey of invasive plants was conducted during the revegetation monitoring by Laberge Environmental Services. The most common invasive species identified was the Hawksbeard and was generally found along the road sides within the study area.

9.0 SPILLS AND ACCIDENTS

There were no reportable spills or accidents in 2016.

10.0 WILDLIFE INCIDENTS AND OTHER ACCIDENTS

There were no direct wildlife incidents or other accidents reported in 2016 other than notable activity of beavers plugging road culverts along the main access road.

11.0 SITE IMPROVEMENTS TO ADDRESS SEDIMENT AND EROSION

There were no signs of major erosion in any the capped areas in 2016. 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 2017 to determine if any remedial action is required.

Additional seeding was conducted on the South Pond and North Pond. The delay in seeding the pond covers were to give the 2015 seedlings one year of growth prior to competing with any grasses.

12.0 REFERENCES

BC Ministry of Environment. (2017). *British Columbia Approved Water Quality Guidelines; updated January 2017.*

Environment Yukon. (2002). *Schedule 3, Generic Numerical Water Standards, O.I.C. 2002/171, Environment Act.*

Teck Metals Ltd. (2016). *Sa Dena Hes Environmental, Surveillance, and Reporting Plan, dated June 30, 2016.*

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Sä Dena Hes – 2016 Annual Report
Yukon Water Licence QZ15-082

Prepared for

Sa Dena Hes Operating Corp. c/o Teck Resources Limited

Prepared by

srk consulting

SRK Consulting (Canada) Inc.
1CT008.063
March 2017

Sä Dena Hes – 2016 Annual Report
Yukon Water Licence QZ15-082

March 2017

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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 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 Territory Water Board regulates water management of mine sites within the Territory through the use of site specific Water Use Licences. Water Use Licence QZ15-082 (Appendix 1) came into effect on January 1, 2016 and it expires on December 31, 2016. In December 2016, an extension was granted for three months (QZ16-080 replaces QZ15-082), as a new water licence addressing permanent closure of the site is anticipated in spring 2017 (QZ16-051). A requirement of licence QZ15-082 is that annual reports addressing the terms of the licence be submitted to the Water Board. SRK Consulting (Canada) Inc. was retained by Teck to prepare the 2016 annual report.

2 Water Usage and Discharge

Water usage regulations are presented in Part C – OPERATING CONDITIONS of licence QZ15-082 (Appendix 1). No water was withdrawn from the domestic water supply well in 2016.

Volume regulations for water discharge from SDH are also presented in Part C – OPERATING CONDITIONS of licence QZ15-082 (Appendix 1). The discharge volume allowed by the licence is less than 490,000 m^3/yr in less than 90 cumulative days, and discharge can only occur between April 15 and October 15. The Reclaim Dam and the South Dam were both decommissioned in 2014. Decommissioning activities involved constructing a spillway and installation of a Sediment Retaining Structure (SRS) at the South Dam and complete removal of the Reclaim Dam. As a result, water is no longer discharged from these locations. Water ponded within the SRS overflows the spillway when water levels reach the invert of the spillway.

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 License (QML-0004), which expires on December 31, 2040. The current status of the site is Permanent Closure and Reclamation.

Teck was required to submit decommissioning and reclamation status reports to the Yukon Territory Water Board twice yearly for the duration of Permanent Closure and Reclamation as required by Part F – DECOMISSIONING AND RECLAMATION of licence QZ15-082 (Appendix 1). The first report was submitted in November 2013, two additional reports were submitted in March and November 2014 and the last submissions were in March and November 2015. Reclamation activities at SDH were completed in 2015 and all reclamation activities have been documented in the aforementioned submissions.

4 Water Quality Monitoring

Water quality standards and monitoring requirements are presented in Part D – EFFLUENT QUALITY STANDARDS and Part E – MONITORING AND SURVEILLANCE of licence QZ15-082 (Appendix 1). The licence describes the water quality monitoring program for temporary closure, 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 (Appendices A and C of licence QZ15-082). Figure 4-1 shows the locations of all temporary closure water monitoring stations and their sampling frequency. Figure 4-2 shows a close-up view of the monitoring stations within the mine lease boundary.

As required by licence QZ15-082, water quality data is reported monthly to the Yukon Territory Water Board. All water quality results from 2016 are presented in Appendix 2A (stations sampled monthly) and 2B (stations sampled quarterly). The 2016 monitoring results are discussed in Section 4.1. Section 4.2 compares the 2016 results to historical trends.

504700 509700 514700

6720000 6715000 6710000

MH-20
MH-16
MH-14
MH-13
MH-11
MH-10
MH-09
MH-22
MH-08
MH-02
MH-01
MH-07
MH-06B
MH-06A
MH-04
MH-03
MH-25
MH-05

False Canyon Creek
Tributary B
Tributary D
West Fork of Tributary E
East Fork of Tributary E
Canyon Creek
False Creek
Burnick Ck.
North Creek
Camp Creek
Portal Access Creek

BURNICK ZONE
BURNICK WASTE ROCK DUMP
NORTH CREEK DYKE
MILL SITE
MAIN ZONE PIT
JEWELBOX PIT

See Figure 4-2

Legend

- Monthly Sampling Frequency
- Quarterly Sampling Frequency
- Creeks
- Ephemeral Stream
- Claim Boundary
- Lease Boundary

NOTE

Aerial photos were obtained from McElhanney and are based on August 15, 2012 LiDAR survey.
Aerial photo represents the site prior to reclamation.
Coordinate system is UTM NAD 83CSRS zone 9V.

0 1 2 Kilometers

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Teck

Sa Dena Hes Mine

Yukon Water Licence QZ15-082 Annual Report

All Temporary Closure Water Monitoring Stations

Date:	Approved:	Figure:
March 2016	KNK	4-1

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509700

6710000

N

MH-10

MH-09

MH-22

BURNICK WASTE ROCK DUMP

MH-08

NORTH CREEK DYKE

MH-02

SEDIMENT RETAINING STRUCTURE

SOUTH DRAINAGE CHANNEL

MH-01

MH-04

CAMP CREEK DRAINAGE CHANNEL

MH-07

MH-06B

MH-06A

MILL SITE

MH-03

MH-25

MH-05

MAIN ZONE PIT

JEWELBOX PIT

Camp Creek

Portal Creek

Access Creek

Legend

- Monthly Sampling Frequency
- Quarterly Sampling Frequency
- Creeks
- Ephemeral Stream
- Claim Boundary
- Lease Boundary
- TMF Covered Area

NOTE

Aerial photo was obtained from McElhanney and are based on August 15, 2012 LiDAR survey.
Aerial photos represent the site prior to reclamation.
Coordinate system is UTM NAD 83CSRS zone 9V.
The green shaded regions indicate ponded water areas in the TMF that have been decommissioned and are shown in this figure for illustration purposes only.

0 0.25 0.5 Kilometers

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Sa Dena Hes Mine

Yukon Water Licence QZ15-082 Annual Report

Mine Site
Water Monitoring Stations

Date:	Approved:	Figure:
March 2016	KNK	4-2

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4.1 2016 Water Quality Monitoring Results

There are two groupings of water quality monitoring stations at SDH: stations at the mine site (within the mine lease boundary, Figure 4-2) and stations downstream of the mine site (see Figure 4-1). Mine site stations include seeps, portal discharges, pond outflows, and creeks within the mine lease boundary. Sampling stations downstream of the mine site are located on False Canyon Creek.

4.1.1 Stations Located within the Mine Site

In previous years, ten monitoring stations were sampled monthly. Decommissioning activities removed a number of sampling locations in 2014 and 2015, including Camp Creek Pond Outflow (MH-03), Reclaim Pond/Reclaim Pond Outflow (MH-06), Reclaim Pond Seepage (MH-07) and Main Zone 1380 Portal (MH-25). Stations MH-09 and MH-10 were also not sampled in 2016 because there was no flow.

Samples were collected at the following monthly stations in 2016 (although not necessarily in each month due to lack of flow): North Dam Seepage (MH-02), Portal Creek (MH-05), Burnick Creek (MH-08), and Burnick 1200 Portal Discharge (MH-22).

Two stations were sampled quarterly: the South Tailings Outflow (MH-01) and Lower Camp Creek (MH-04). Quarterly sampling at the South Tailings Outflow is a requirement of the licence. Since the installation of the sediment retaining structure at the South Dam, MH-01 is now monitored at the spillway outfall (when flow occurs) and within the pond when water is not discharging. Quarterly sampling at Lower Camp Creek is a requirement when MH-03 cannot be sampled. As with previous years, MH-03 was not sampled because it was capped and there is no ponded water.

All monitoring samples collected at Burnick Creek (MH-08) and Lower Camp Creek (MH-04) were in compliance with the water quality limits in licence QZ15-082. The other stations met the water quality limits in licence QZ15-082 for pH (6.0), ammonia as nitrogen (3.5 milligrams per liter [mg/L]), total suspended solids (50 mg/L), total arsenic (0.05 mg/L), total cadmium (0.02 mg/l), total copper (0.2 mg/L), total lead (0.2 mg/L), total cyanide (0.5 mg/L), total selenium (0.05 mg/L), and total silver (0.1 mg/L). True colour, turbidity, and total zinc were exceeded at selected stations as discussed in the following subsections.

South Tailings Outflow (MH-01)

The following exceedances of the licence standards occurred at MH-01 in 2016:

- True Color: 42.5 Col. Units (September), which exceeded the standard of 20 Col Units;

North Dam Seepage (MH-02)

The following exceedances of the licence standards occurred at MH-02 in 2016:

- Turbidity: 24.0 NTU (May), which exceeded the standard of 15 NTU.

MH-02 is downstream of the North Dam and tailings impoundment. The north tailings were covered in 2015. The high turbidity is likely associated with entrainment of sediment during freshet.

Portal Creek (MH-05)

In 2015, Portal Creek (MH-05) was sampled only in May. The station was dry during all other months owing to the fact that Portal Creek is an ephemeral stream that flows during freshet (specifically, in the month of May and less frequently June). Only one parameter exceeded the guidelines in May 2015:

- Turbidity: 53.6 NTU, which exceeded the standard of 15 NTU.

MH-05 is within the catchment of the Jewelbox Portal and also receives flow from the mill area. The turbidity has decreased since 2015. This decrease may be due to the re-establishment of vegetation following previous construction activities.

Burnick 1200 Portal Discharge (MH-22)

Burnick 1200 Portal discharge was sampled from May through to December in 2016. The following exceedances of the licence limits occurred in 2015:

- Total zinc: concentrations exceeded the licence standard (0.5 mg/l) in seven of the eight 2016 samples. The licence limit was not exceeded in June. The values that exceeded the guidelines ranged from 0.617 mg/l (July) to 1.79 mg/l (May).

Although the Burnick 1200 Portal discharge (MH-22) is compared to the licence limits, it is important to note that it does not discharge directly to the receiving water.

4.1.2 Stations Downstream of the Mine Site

Water quality was monitored monthly downstream of the mine site at one location: Upper False Canyon Creek (MH-11). Samples were also taken on a quarterly basis at the following sites: False Canyon Creek – 10 km downstream of the former reclaim pond (MH-13), False Canyon Creek – 20 km downstream of the reclaim pond (MH-14), and False Canyon Creek – approximately 22 km downstream of the former reclaim pond (MH-16).

All monitoring samples collected at MH-11, MH-13, and MH-16 were in compliance with all water quality standard in licence QZ15-082. True colour was exceeded at one station as discussed in the following subsection.

False Canyon Creek – 20 km Downstream (MH-14)

There was one exceedance in 2016:

- True Colour: 21.7 Col. Units (September), which exceeded the standard of 20 Col. Units.

4.2 Water Quality Trends

Clause 12 of licence QZ15-082 states that any variances from baseline conditions or from previous year's data should be discussed (Appendix 1). This section of the report compares the 2016 data to the long term trends for selected parameters and stations.

The discussed stations include:

- Stations with parameters above permit limits in 2016: South Tailings outflow (MH-01), North Dam seepage (MH-02), Portal Creek (MH-05), and Burnick 1200 Portal discharge (MH-22); and
- The water quality monitoring stations downstream of the Burnick 1200 Portal (MH-22) and Main Zone 1380 Portal (MH-25), and that are relevant to the water and load balance prepared for closure planning: MH-04, MH-11, MH-13, and MH-16.

The Main Zone 1380 Portal (MH-25) is not presented because it was not sampled in 2016. Station False Canyon Creek – 20 km Downstream (MH-14) was also not included because the only parameter that was elevated was true colour, which is not clearly indicative of mining or reclamation activities.

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 because it is used to calculate certain Canadian Council of Ministers of the Environment (CCME) guidelines for the protection of aquatic life for selected metals (e.g. cadmium and lead);
- Parameters with levels above licence standards in 2016 (turbidity, and total zinc); and
- Total cadmium because it consistently exceeded the licence standard at MH-25 between 2001 and when it was decommissioned in 2014. MH-25 can no longer be monitored.

Each parameter is discussed within the following subsections.

4.2.1 pH

Long term pH levels for the seven stations and the licence standard of 6.0 are presented in Figure 4-3.

With two exceptions, the pH levels was at or just above 8 in 2016 samples at all stations. The pH levels have been relatively stable since 1996 at the South Tailings Outflow (MH-01), Lower Camp Creek and False Canyon Creek stations (MH-04, MH-11, MH-13, and MH-16) and since 2007 for the Burnick 1200 Portal discharge (MH-22). Prior to these dates, pH was similar to current levels but occasionally was as low as 7, particularly at MH-01.

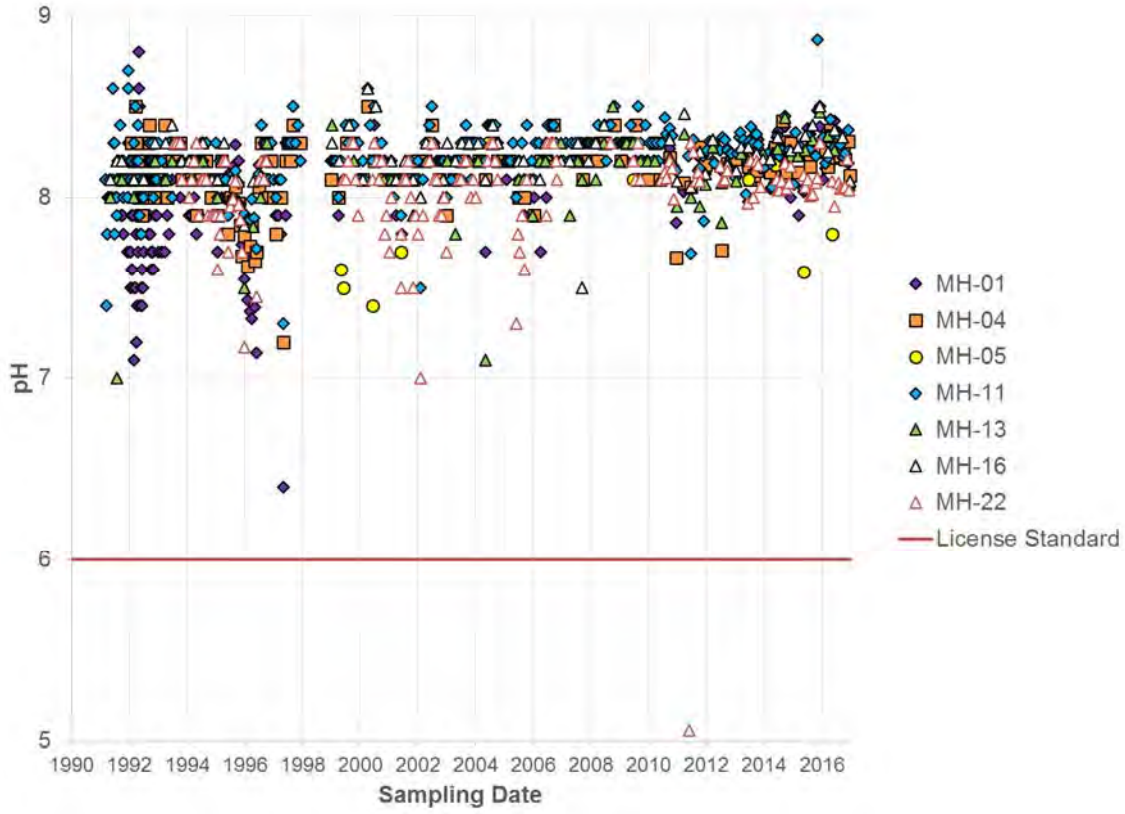

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Figure 4-3: Sä Dena Hes Long Term pH Levels

4.2.2 Total Alkalinity

Long term total alkalinity concentrations are presented in Figure 4-4.

Total alkalinity concentrations have generally been greater than 150 mg/L at all three False Canyon Creek stations (MH-11, MH-13, and MH-16). In Lower Camp Creek (MH-04) and Portal Creek (MH-05) concentrations have generally ranged between 100 and 175 mg/L. Five samples for Portal Creek (MH-05) from 1999 and 2000 and from 2015 to 2016 were lower, below 35 mg/L. Alkalinity in the Burnick 1200 Portal discharge (MH-22) has consistently been around 100 mg/L. Total alkalinity concentrations were within historical ranges in 2016 at these stations.

Historically, the South Tailings Outflow (MH-01) generally has had levels of alkalinity between 40 and 190 mg/L. Alkalinity concentrations were greater when the tailings were reclaimed in 2014 and 2015.

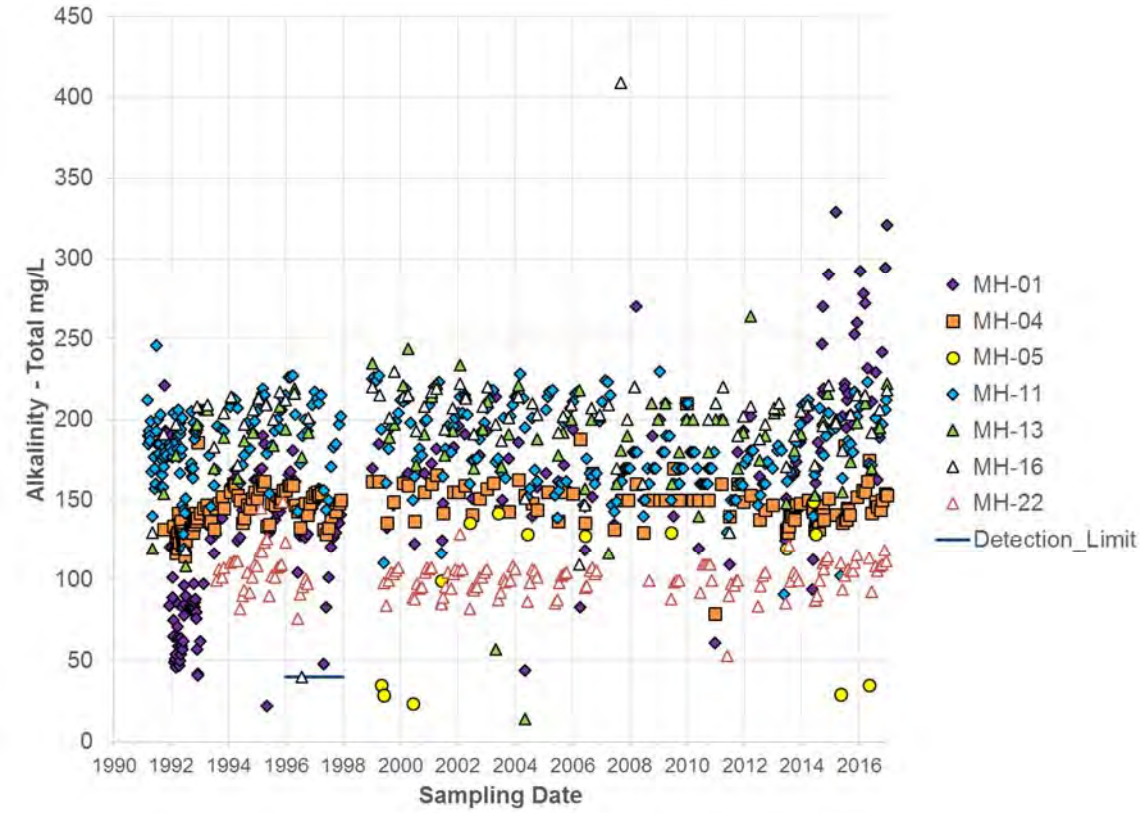

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Figure 4-4: Sä Dena Hes Long Term Total Alkalinity Concentrations

4.2.3 Sulphate

Long term sulphate concentrations are presented in Figure 4-5.

Sulphate levels were within historical ranges at the seven stations that were sampled in 2016. Concentrations generally decrease within increasing downstream distance from the SDH mine site. In 2016, concentrations were:

- South Tailings Outflow (MH-01): between 19 and 33 mg/L;
- Burnick 1200 Portal discharge (MH-22): between 28 and 108 mg/L;
- Lower Camp Creek (MH-04): between 11 and 27 mg/L;
- Portal Creek (MH-05): 28 mg/L (sampled once);
- Upper False Canyon Creek (MH-11): between 13 and 22 mg/L; and
- Further downstream on False Canyon Creek (MH-13 and MH-16): between 7 and 11 mg/L.

Sulphate concentrations were relatively higher in the South Tailings outflow (MH-01) during 2014, when the area was disturbed by reclamation activities.

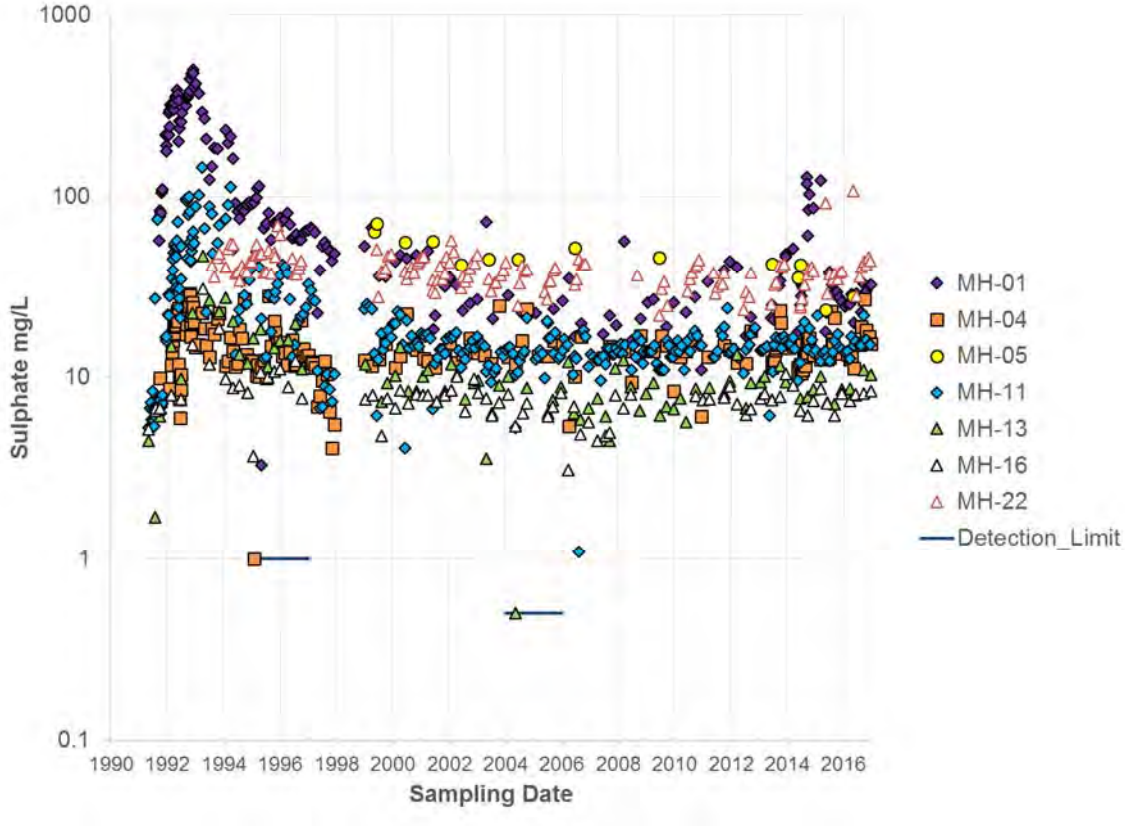

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Figure 4-5: Sä Dena Hes Long Term Sulphate Concentrations

4.2.4 Hardness

Long term hardness concentrations for all seven stations are presented in Figure 4-6.

Hardness levels exhibit long term stability at all seven stations. With the exception of MH-01 and MH-05, hardness generally ranged from 110 to 230 mg/L at all stations. These results are consistent with historical ranges. Hardness levels for the South Tailings Outflow (MH-01) periodically has had higher levels. The Burnick 1200 Portal (MH-22) has generally had the lowest levels of hardness. Consistent with 2015, the May sample at the Portal Creek station (MH-05) was substantially lower than the sample results from previous years. This may be related to the flow of turbid water from the mill area.

The hardness in the South Tailings outflow (MH-01) was elevated during 2014, when the area was disturbed by reclamation activities.

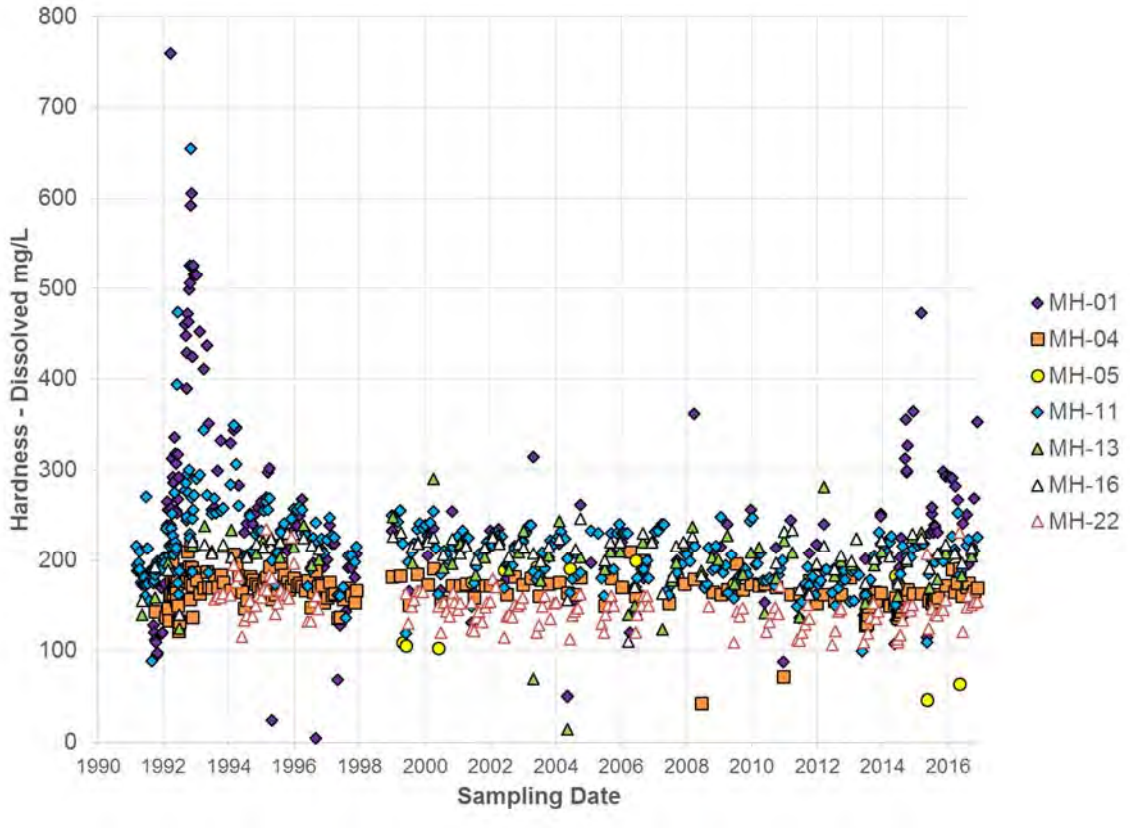

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Figure 4-6: Sä Dena Hes Long Term Hardness Concentrations

4.2.5 Total Suspended Solids

Long term TSS concentrations and the licence TSS limit of 50 mg/L are presented in Figure 4-7.

There were no exceedances of the 50 mg/L licence limit at any of the stations in 2016. The False Canyon Creek stations (MH-13 and MH-16), and the Burnick 1200 Portal discharge (MH-22) have not exceeded the licence standard since 2001. TSS concentrations have been higher in the South Tailings outflow (MH-01) during and after reclamation of tailings. Erosion of the tailings cover should decrease over time as the area becomes revegetated.

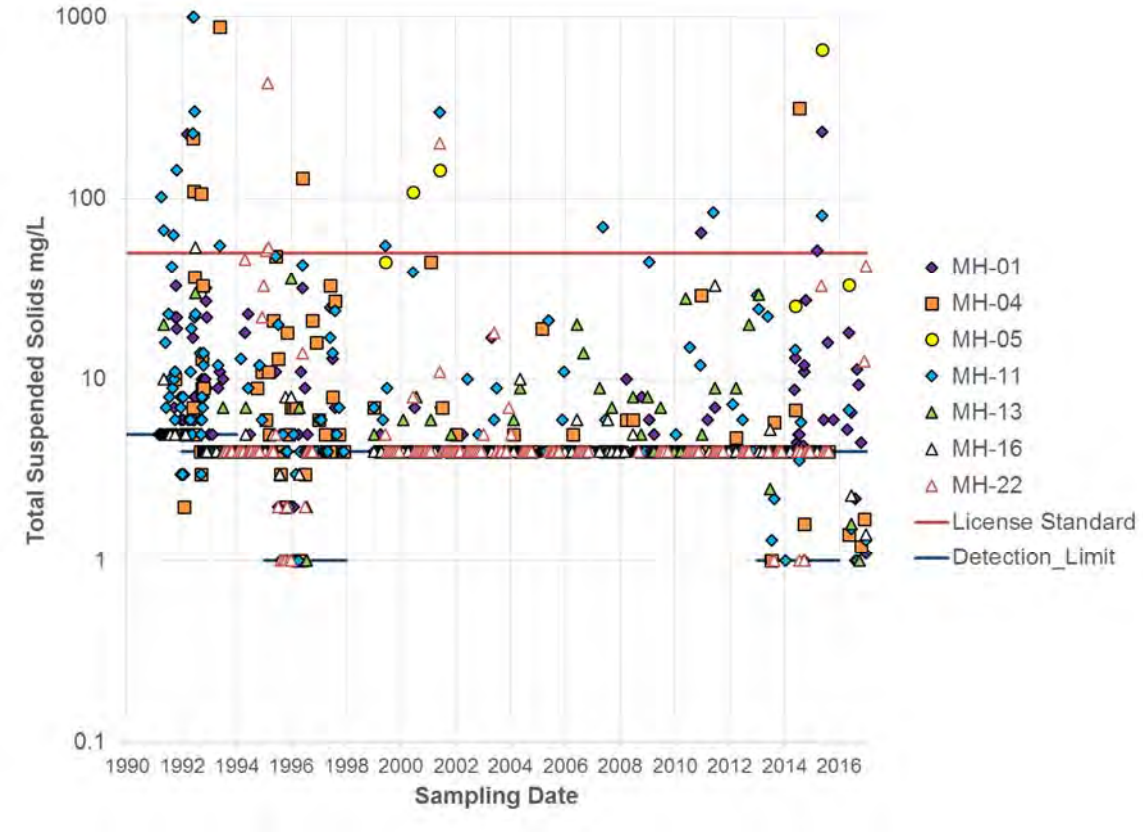

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Figure 4-7: Sä Dena Hes Long Term Total Suspended Solids Concentrations

4.2.6 Turbidity

Figure 4-8 shows long term turbidity levels and the licence turbidity standard of 15 NTU.

Turbidity levels exceeded the licence standard at MH-05 and MH-01 only. Overall, the 2016 samples from the South Tailings Outflow (MH-01), Portal Creek (MH-05), 1200 Burnick Portal (MH-22), and Upper False Canyon Creek (MH-11) stations have decreased from the levels observed in 2015. As with TSS, elevated turbidity coincided with reclamation of the tailings but have decreased since the reclamation was completed.

The turbidity readings at the remaining stations were approximately the same or lower than their respective historical trends.

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Figure 4-8: Sä Dena Hes Long Term Turbidity Levels

4.2.7 Total Cadmium

Long term total cadmium concentrations and the licence cadmium standard of 0.02 mg/L are presented in Figure 4-9.

Cadmium detection limits have decreased over time. Detection limits were higher and more variable before 2005. A number of 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 false positives (analytical accuracy is low at concentrations close to detection limit). 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 trends for stations that have lower cadmium levels (e.g. MH-04 and MH-11).

None of the samples from 2016 exceeded the licence standard. Total cadmium concentrations at the 1200 Burnick Portal (MH-22) ranged from 0.0023 and 0.0083 mg/L in 2016. Cadmium concentrations at MH-22 have slowly increased since the early 1990s and in more recent years the upward trend may have steepened. Additional monitoring data are required to confirm this trend. At the South Tailings Outflow (MH-01), total cadmium levels ranged from 0.000035 to 0.00041 mg/L and appear to be trending downward.

Total cadmium at the Portal Creek station (MH-05) has decreased since 2015 and is within the historical range. Lower Camp Creek (MH-04) concentrations were below 0.00032 mg/L and are consistent with historical data. In False Canyon Creek, concentrations progressively decreased downstream with MH-11, MH-13 and MH-16 having average 2016 concentrations of 0.000063 mg/L, 0.000021 mg/L and 0.000011 mg/L, respectively. For MH-16, the maximum concentration above the level of analytical detection was 0.000015 mg/L.

Similar to the TSS trend, total cadmium concentrations in the South Dam outflow (MH-01) temporarily increased during closure and reclamation of the South Tailings Dam, but have decreased since this work was completed.

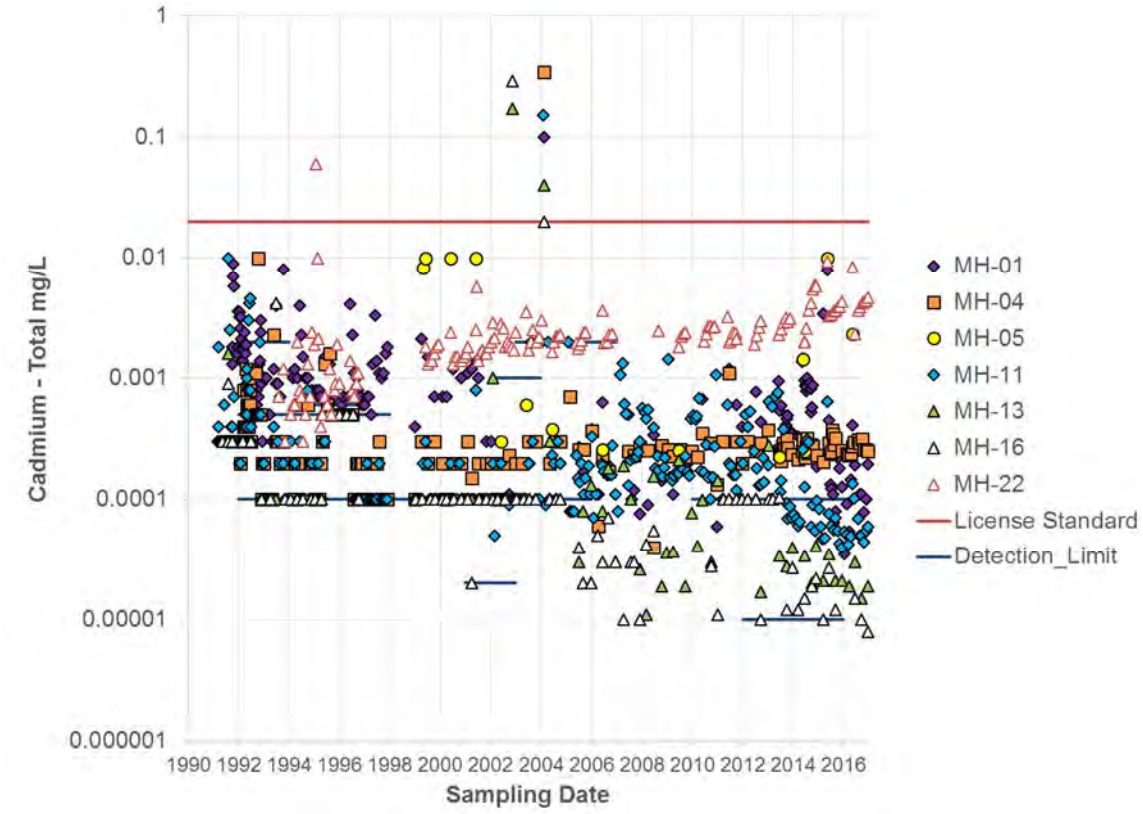

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Figure 4-9: Sä Dena Hes Long Term Total Cadmium Concentrations

4.2.8 Total Lead

Long term total lead concentrations and the lead licence standard of 0.2 mg/L are presented in Figure 4-10.

There were no samples collected in 2016 that exceeded the licence limits for total lead. In 2015, total lead levels at the South Tailings Outflow (MH-01) and in Portal Creek (MH-05) were above licence limits and have subsequently decreased. This coincides with reclamation and closure activities at the site. Since then total lead concentrations have decreased. Total lead concentrations in Portal Creek (MH-05) were 0.19 mg/L, which is just below the licence limit for total lead.

All samples from the Burnick 1200 Portal discharge (MH-22) were below licence limits. With the exception of two samples, MH-22 concentrations were below 0.0005 mg/L. The overall lead trend at MH-22 is decreasing levels since 1993 with stable levels since approximately 2004.

Lower Camp Creek (MH-04) concentrations in 2016 ranged from 0.00015 mg/L to 0.0012 mg/L and were on the lower end of historical ranges. Upper False Canyon Creek (MH-11) concentrations ranged more than an order of magnitude in 2016 reaching a maximum of 0.046 mg/L, which is consistent with the data since approximately 1994. Further downstream in False Canyon Creek (MH-13 and MH-16), concentrations of lead were near or below the analytical detection limit. Concentrations at MH-13 and MH-16 have been stable since approximately 2005. Prior to that, trends could not be assessed due to high detection limits.

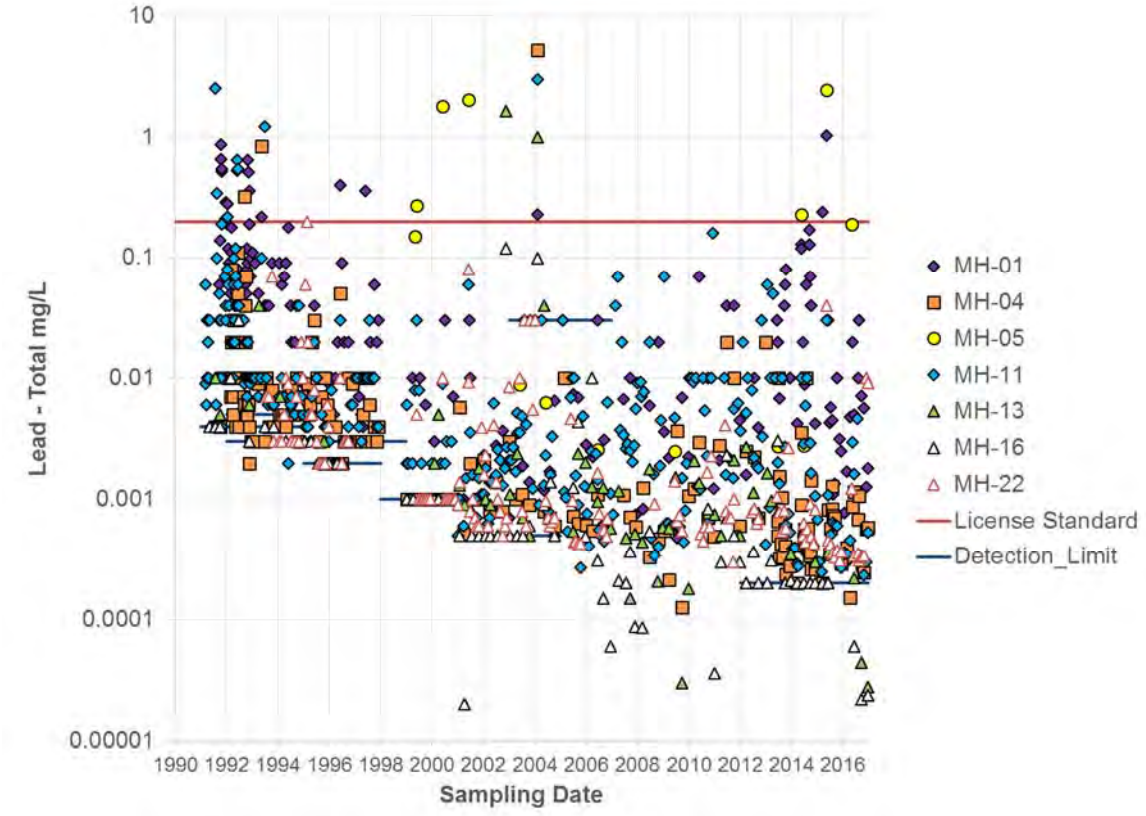

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Figure 4-10: Sä Dena Hes Long Term Total Lead Concentrations

4.2.9 Total Zinc

Long term total zinc concentrations at all seven stations and the licence limit for total zinc of 0.5 mg/L are presented in Figure 4-11.

Six of the seven Burnick 1200 Portal discharge (MH-22) samples in 2016 exceeded the licence standard. Since 2012, there appears to be an increasing trend in total zinc levels. Although the Burnick 1200 portal discharge (MH-22) is compared to the licence standards, it is important to note that it does not discharge directly to the receiving environment.

Total zinc concentrations in the South Tailings outflow (MH-01) were elevated during closure and reclamation of the tailings. Since the work was completed concentrations have decreased.

No other samples from 2016 exceeded the licence standard. Lower Camp Creek (MH-04) concentrations ranged from 0.0044 to 0.0064 mg/L. Upper False Canyon Creek (MH-11) had a maximum concentration of 0.013 mg/L. Further downstream in False Canyon Creek (MH-13 and MH-16), concentrations were all below the level of analytical detection (<0.005 mg/L).

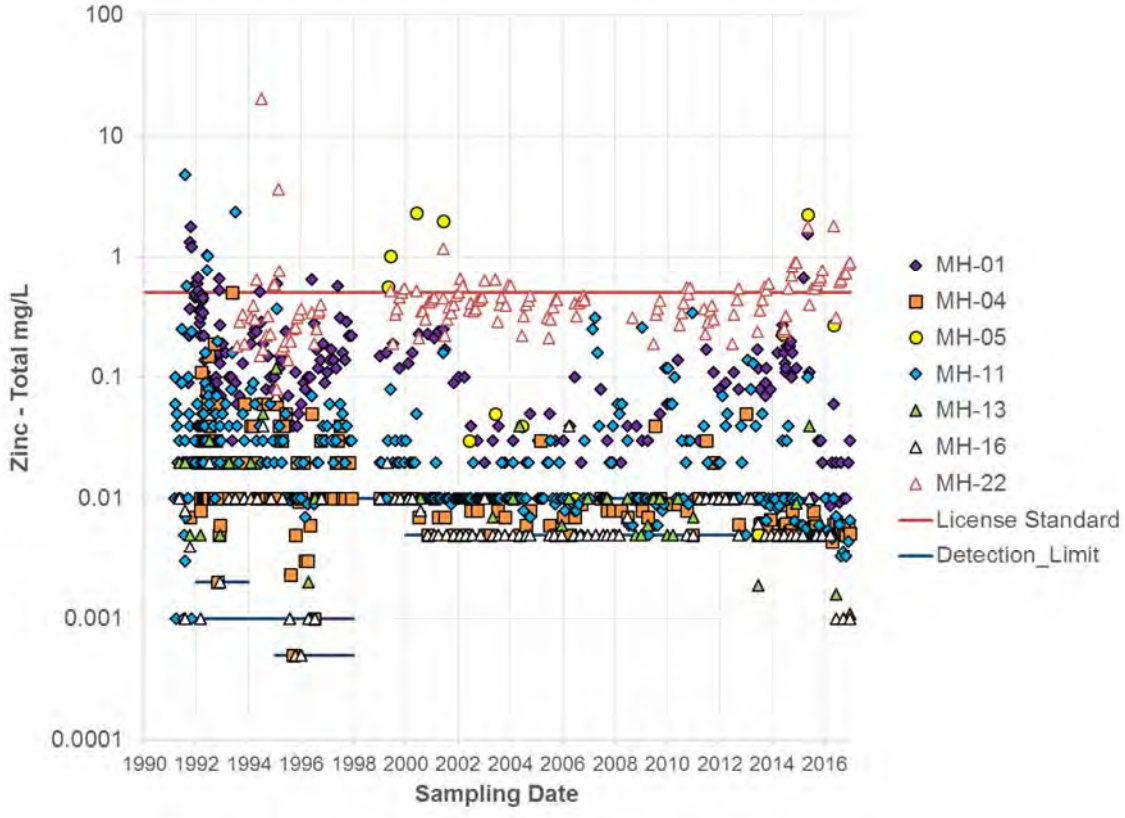

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Figure 4-11: Sä Dena Hes Long Term Total Zinc Concentrations

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 estimates were made for key water sampling stations. 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.

6 Geochemical Assessment

There were no additional waste rock, ore or tailings sampling programs completed in 2016.

7 Geotechnical Inspections

The 2016 geotechnical inspection of the structures and features associated with the Tailings Management Area (TMA) at SDH was completed by SRK on July 19, 2016. The inspection report is provided in Appendix 3.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; and
- The Jewelbox and Main Zone Waste Rock Dump 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 SRS is a temporary structure which will eventually be decommissioned.

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 were required.

Other than the ongoing surveillance program which forms part of the OMS manual, SRK has recommended that the central drainage channel in the TMA Till Cover be regraded to reduce ponding in the channel. SRK understands that this work was carried out in 2016.

8 2016 Monitoring and Maintenance of Dams, Diversion Ditches, and Waste Dumps

Monitoring of earthworks was conducted in 2016. 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 3. The seasonal fluctuations recorded in 2016 in the piezometers are generally consistent with those in previous years and below the maximum safe levels are within acceptable tolerance limits.

9 Biological Effects Monitoring

Water Use Licence QZ15-082 requires biological effects monitoring for multiple ecosystem components. Bioassays are required for discharge to False Canyon Creek as specified in Part D – EFFLUENT QUALITY STANDARDS of the licence. Results are presented in Section 9.1.

Fisheries, benthic invertebrates, and sediment monitoring programs must occur once every two years as indicated by Clauses 55, 58, and 63 of the licence. The last monitoring programs were conducted in 2014 so a monitoring program was required in 2016.

9.1 Bioassay Results

The 2016 quarterly rainbow trout bioassays were conducted at the South Tailings Outflow (MH-01). The bioassay results are presented in Table 9-1. All four tests had 100% survival rates.

Table 9-1: 2016 Quarterly Rainbow Trout Bioassay at MH-01

Parameter	Units	1st Quarter		2nd Quarter		3rd Quarter		4th Quarter	
		Mar 21, 2016		Jun 12, 2016		Sep 20, 2016		Dec 21, 2016	
Concentration	%vol/vol	0	100	0	100	0	100	0	100
Conductivity	µmho/cm	36	433	37	341	45	320	38	646
Initial Temp	°C	14.7	14.4	15.0	15	14.0	15	15	15
Final Temp	°C	14.8	14.8	15	15	14	14.0	15	15
Initial pH		8.1	8.0	7.4	8.0	7.7	8.4	7.9	7.5
Final pH		7.2	8.2	8.9	8.8	7.4	8.1	7.1	8.1
Initial D.O.	mg/L	10.1	10.3	10.2	9.9	10.1	10.4	10	7.1
Final D.O.	mg/L	9.8	9.9	10.1	10.4	9.8	9.7	10.1	9.6
Mortality (96 hr)	%	0	0	0	0	0	0	0	0

Source: \\van-svr0\Projects\01_SITES\Sa_Dena_Hes\1CT008.056_2016 Water License Support\Monthly_Water_License_Reports_2016\12_Dec\SDH_WL_Report_Dec2016_wjm_knk

9.2 Fish, Benthic Invertebrate and Sediment Monitoring

Teck engaged Laberge Environmental Services and Can-Nic-A-Nick Environmental Sciences to conduct the fish, benthic invertebrate, and sediment monitoring programs required for 2016. The results are provided in the report in Appendix 4.

In summary, the water and stream sediment chemistry in the False Canyon Creek drainage continue to be of good quality for the support of freshwater aquatic life. Robust communities of benthic invertebrates were present at all sites. Comparison to previous fish surveys revealed little change in the dominant fish types or their relative abundance for all sites sampled in 2016. Variation in the number of captured fish from year to year is considered to be typical population fluctuation within a stable fish community. Notable in 2016 was the capture of several longnose suckers at site MH-20. This species has not been previously documented in the watershed.

10 Summary

Decommissioning activities were completed in 2015 moving the site toward 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.

No freshwater from the on-site water wells was withdrawn for industrial or domestic purposes in 2016. The Reclaim Pond and South Tailings Pond dams have been decommissioned. 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 2016, samples from all of the required water quality monitoring stations met the standards in licence QZ15-082 for pH, TSS, ammonia, dissolved arsenic, total cadmium, total copper, cyanide, total lead, total selenium, and total silver. The licence standards for true colour, turbidity, and total zinc were exceeded at some stations (Table 10-1). Turbidity and TSS levels at all stations have decreased since 2015 suggesting that sediments are beginning to stabilize following the completion of decommissioning activities. Although the Burnick 1200 portal discharge (MH-22) is compared to the licence standards, it is important to note that it does not discharge directly to surface water.

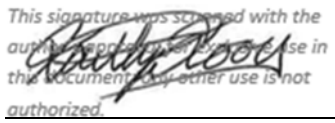
Table 10-1: Summary of Licence QZ15-082 Exceedances in 2015

Station		Parameter	Standard	Exceedances
South Tailings Outflow	MH-01	True Colour	20 Col. Units	1 of 4 samples (25%)
North Dam Seepage	MH-02	Turbidity	15 NTU	1 of 12 samples (8%)
Portal Creek	MH-05	Turbidity	15 NTU	1 of 1 sample (100%)
False Canyon Creek (20 km downstream)	MH-14	True Colour	20 Col. Units	1 of 4 samples (50%)
Burnick 1200 Portal	MH-22	Total Zinc	0.5 mg/L	7 of 8 samples (88%)

Work at SDH in 2016 included:

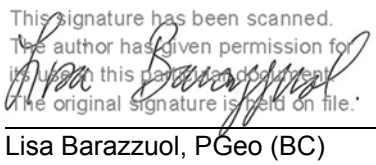
- The annual geotechnical inspection and associated earthworks monitoring, which did not uncover any unusual circumstances. It is recommended that the central drainage channel in the TMA Till Cover be regraded to reduce ponding in the channel (Appendix 3).
- Four rainbow trout bioassays, which all had 100% survival rates (Section 9.1).
- A fish, benthic invertebrate, and sediment monitoring program which indicated that the False Canyon Creek drainage continues to show no differences in freshwater aquatic community relative to reference locations.

This report, *Sä Dena Hes – 2016 Annual Report Yukon Water Licence QZ15-082*, was prepared by



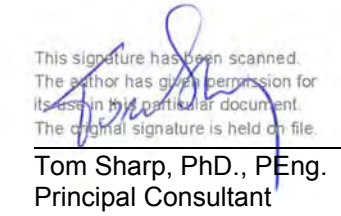
Kaitlyn Kooy, EIT
Staff Consultant

and reviewed by



Lisa Barazzuol, PGeo (BC)
Senior Consultant

and



Tom Sharp, PhD., PEng.
Principal Consultant

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.

11 References

SRK 2014a. Sä Dena Hes 2013 Annual Report Yukon 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.

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

Teck 2012. Sä Dena Hes Mine Detailed Decommissioning and Reclamation Plan 2012 Update. Report prepared by Teck Metals Limited. January 2012.

Teck 2013. Sä Dena Hes Mine Detailed Decommissioning and Reclamation Plan 2013 Update. Report prepared by Teck Metals Limited. March 2013.

Teck 2015. Sä Dena Hes Mine Detailed Decommissioning and Reclamation Plan 2015 Update. Report prepared by Teck Metals Limited. August 2015.

Appendix 1: Yukon Water Use Licence QZ15-082

YUKON WATER BOARD

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

Sa Dena Hes Operating Corp.
c/o Teck Metals Ltd.
3300-550 Burrard Street
Vancouver BC V6C 0B3

LICENCE NUMBER: QZ15-082

RENEWAL: This licence shall be deemed to be a renewal of licence number QZ99-045.

LICENCE TYPE: A **UNDERTAKING:** QUARTZ MINING

WATER MANAGEMENT AREA: 02 Yukon

LOCATION: Wells on the upper False Canyon Creek drainage area and from the North Creek Impoundment, Mount Hundere Area, Yukon

MAP CO-ORDINATES : Max Latitude: 60° 42' 21" N Max Longitude: 129° 11' 38" W
Min Latitude: 60° 18' 31" N Min Longitude: 128° 34' 08" W

PURPOSE: To obtain, store, divert, alter, and return a flow of water and to deposit a waste for a Quartz Mining Undertaking.

MAXIMUM QUANTITY: 4091.5 cubic metres of water per day

EFFECTIVE DATE: The effective date of this renewal licence shall be January 1, 2016.

EXPIRY DATE: December 31, 2016

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.

Approved this 18th day of December, 2015.

Witness

Minister, Executive Council Office
Government of Yukon

Issued this 21st day of December, 2015.

Witness

Vice-Chairperson
Yukon Water Board

PART A – GENERAL CONDITIONS

1. Definitions

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

"Application" means Water Use Application QZ15-082, QZ99-045, and QZ09-093 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.

"Decommissioning Plan" means the report entitled "Cominco Ltd., Sä Dena Hes Mine, Detailed Decommissioning and Reclamation Plan", dated February 2000 and prepared by Access Mining Consultants Ltd. and SRK Consulting, and any revision.

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

"SRK C104105" means the report entitled "C104105, Construction Report Remedial Work Sä Dena Hes Mine, Yukon Territory", dated November 1994 and prepared by Steffen, Robertson and Kirsten (Canada) Inc., which was submitted to the Board on December 28, 1994.

"SRK 60616" means the report entitled "Report 60616, Mt. Hundere Development Water Licence Application", dated July 1990 and prepared by Steffen Robertson and Kirsten (B.C.) Inc., which was submitted to the Board on July 27, 1990 as part of water use application IN90-002.

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

Other Laws

2. No term of this licence limits the application of any other Federal, Territorial, First Nation or Municipal Legislation.

3. All work authorized by this licence shall occur on property that the Licensee has the right to enter upon and use for that purpose.

Correspondence

4. 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, faxed or mailed by registered mail to the following address:

Sa Dena Hes Operating Corporation
c/o Teck Cominco Metals Ltd.
600-200 Burrard Street
Vancouver, B.C. V6C 3L7 Fax: (604) 685-3066

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

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

Yukon Water Board
Suite 106, 419 Range Road
Whitehorse, Yukon 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 seven (7) days after the day it was mailed, as the case may be.

Non-Compliance

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

Deleterious Substances

6. Subject to the provisions of this licence, deleterious substances shall be used, transported, stored and disposed of in such a manner that they are not deposited in, or allowed to be deposited in, any waters.

Term of Licence

7. The term of this licence is from the effective date to December 31, 2015.

Reports

8. All reports required to be submitted to the Board will be unbound and reproducible by standard photocopier, accompanied by one electronic copy on a CD/DVD.

9. The Licensee shall provide to the Board 5 additional copies of all reports. The additional copies may be either 5 bound paper copies or 5 electronic copies on individual CDs/DVDs.

10. Electronic copies shall be IBM compatible in one of the following formats: Word 97 - 2003, Excel 97 - 2003 workbooks, or Adobe .pdf format. Water quality results must be presented in Excel 97-2003 .xls format.

Annual Reports

11. Annual reports shall be submitted to the Board by the Licensee. Reports shall cover each calendar year and shall be submitted to the Board on or before March 31 of the next year. The first report shall cover the calendar year 2001 and shall include the reporting requirements for licence QZ97-025 for the year 2001.

12. Annual reports shall include the information required by this licence and by the Regulations, including, but not necessarily limited to:

    a) all water quantities used during the year with a summary and an interpretation of any trends or variations in the data; and

    b) summaries of all data generated as a result of the monitoring requirements of this licence, including analysis and interpretation of the summaries and a discussion of any variances from base line conditions or from previous years' data; and

    c) a detailed record of any major maintenance work carried out on the waste dumps, diversion works, water treatment plant or any other aspect of works on the property which may have an impact on water; and

    d) during temporary closure, a closure status report that includes a discussion of planned future operations, and

    e) during temporary closure, documentation of activities carried out under the requirements of Maintenance Activities During Temporary Closure, and

    f) an identification of any recommendations from the annual physical monitoring inspections, or from the most recent five year dam safety review, 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 recommendation was not implemented.

Spills and Unauthorized Discharges

13. The Licensee shall keep the spill contingency plan current. Any revisions to the plan shall be delivered to the Board within ten days of the revision.

14. The Licensee shall immediately contact the 24-hour Yukon Spill Report telephone number (867) 667-7244 and implement the most recent spill contingency plan that has been filed with the Board, should a spill or an unauthorized discharge occur. 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 delivered to the Board not later than ten days after its occurrence.

15. All personnel shall be trained in procedures to be followed and the equipment to be used in the containment of a spill.

Hazardous Materials Storage

16. A complete inventory of chemicals, fuels, oils, lubricants and other hazardous materials, including but not limited to mill process reagants, explosives and ore concentrates, and their locations, shall be maintained by the Licensee.

PART B - DESIGN AND CONSTRUCTION

Submissions

17. The Licensee shall submit to the Board final detailed design construction drawings, specifications and quality assurance/quality control procedures for the construction of any facilities or structures authorized by this licence, but shall not begin construction until such time as the Board has notified the Licensee to proceed. These facilities and structures shall include, but not be limited to:

    a) water supply systems;
    b) wastewater transportation, treatment and disposal systems;
    c) impoundments;
    d) drainage works;
    e) spillways;
    f) stream training works;
    g) diversions; and
    h) any works associated with the implementation of the Decommissioning Plan.

18. 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 licensed to practice in Yukon.

19. The final detailed design construction drawings, specifications and quality assurance/quality control procedures submitted to the Board shall be consistent with the preliminary designs in the Application. Each submission to the Board shall be accompanied by a design report prepared and sealed by the Professional Engineer responsible for the work. The report shall contain a statement by the Professional Engineer confirming that the designs are consistent with, or indicating where the designs differ from, the preliminary designs in the Application.

20. 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.

21. During construction, where site conditions require minor design modifications, the Licensee shall notify the Board, in advance of implementation, of the details of any modifications or variations from final detailed designs, specifications and quality assurance/quality control procedures previously submitted to the Board. The notice shall include an explanation of the reasons for the change and an assessment of the potential impact. The notice shall be sealed by a Professional Engineer licensed to practice in Yukon.

22. 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 licensed to practice in Yukon.

23. All instream earthworks, diversions, ditches, spillways and any other water-related structures shall be designed and constructed to accommodate the peak instantaneous 200-year return period flood.

24. During the term of this licence, including any period of temporary closure, the Licensee shall maintain all works in good order in accordance with sound engineering and environmental practices.

New Developments

25. The Licensee may develop and mine the Gribbler Ridge ore deposit and any other ore deposit which is found within the False Canyon Creek drainage upstream of stations MH-20 and MH-21 providing that:

    a) the method of mining does not substantially differ from the methods employed at the deposits included in the Application; and

    b) the nature of the deposit does not substantially differ from the nature of the deposits described in the Application; and

    c) at least six months prior to the commencement of any mining the Licensee submits to the Board:

        i) a detailed waste disposal plan and an assessment of the acid generating potential of the deposit which is to be developed, and

ii) final detailed design and construction drawings, specifications and quality assurance/quality control procedures for any new structures required for mining or waste disposal; and

iii) a plan for any additions to the surveillance network program.

26. If at any time during the term of the licence any deposits are to be developed for mining where associated works have any potential to affect water quality within any drainage except the False Canyon Creek drainage, then the Licensee shall not proceed with such mining without first applying for and receiving an amendment to this licence.

PART C - OPERATING CONDITIONS

Water Use

27. The Licensee is hereby authorised to:

a) withdraw water at a total maximum combined rate of 4091.5 m^3 per day from wells in the Upper False Canyon Creek drainage area, from the North Creek impoundment and from the reclaim pond; and

b) use said water for quartz mining purposes,

all as described in the Application and subject to the terms of this licence.

28. The maximum combined rate of water withdrawal from wells in the Upper False Canyon Creek drainage area and from the North Creek Impoundment shall not exceed 44 m^3 per hour.

Waste Deposit

29. Mill waste shall be discharged through a slurry pipeline into a tailings pond in the uppermost drainage of False Canyon Creek as outlined in SRK 60616.

30. Water from the tailings pond shall be released to the reclaim pond according to the plan described in SRK 60616, Section 5.2.5.3.

31. Effluent from the reclaim pond shall be discharged into Upper False Canyon Creek only during the periods of highest flow or runoff between April 15 and October 15 of each year. In no case shall the periods of discharge exceed a cumulative total of ninety days. In no case shall the discharge exceed a rate of 228 m^3 per hour or a quantity of 490,000 m^3 per year.

32. Waste dumps and other mine workings shall be constructed such that all water draining from them reports to the False Canyon Creek drainage and that no water draining from them reports to the Tom Creek drainage.

33. Collected runoff from the Jewelbox Hill dumps shall be discharged to Upper False Canyon Creek and collected run-off from the North Hill dumps shall discharge into tributaries of False Canyon Creek.

34. All sewage shall be directed to an onsite, in-ground sewage treatment and disposal system.

35. Excess water from the Burnick 1200 Portal shall be piped from the portal, over the waste dump and directly into the North Hill Settlement Basin.

PART D - EFFLUENT QUALITY STANDARDS

36. All waste discharges shall meet the following effluent quality standards:

PARAMETER	CONCENTRATION
Suspended Solids	50 mg/l
pH	not less than 6.0
Colour	20 PT-CO Units
Turbidity	15 Jackson Turbidity Units
Floating Solids	None
Floating oils or grease	None Visible

37. The results of grab sample analysis of any waste discharge shall meet the following standards:

PARAMETER	CONCENTRATION
Ammonia (as total N)	3.50 mg/L
Arsenic (dissolved)	0.05 mg/L
Cadmium (total)	0.02 mg/L
Copper (total)	0.20 mg/L
Cyanide (as total CN)	0.5 mg/L

PARAMETER	CONCENTRATION
Cyanide (as WAD CN)*	0.2 mg/L
Lead (total)	0.20 mg/L
Selenium (total	0.05 mg/L
Silver (total)	0.10 mg/L
Zinc (total)	0.50 mg/L

*Analysis for weak acid dissociable cyanide (WAD CN) is a requirement of this licence only in the event that results of analysis for total CN exceed a concentration of 0.2 mg/L. If total CN concentration exceeds 0.2 mg/L then analyses are required for both WAD CN and Total CN.

38. The effluent quality standards shall be met at all points of entry to all receiving waters.

39. Any discharge to False Canyon Creek shall meet a bioassay standard of a 96 hour LC_{50} of 100%.

PART E - MONITORING AND SURVEILLANCE

Implementation of Study Plans

40. Where this licence requires the Licensee to submit plans, the Licensee shall not implement the plan until notified by the Board to do so. This requirement also applies to the Operation, Maintenance and Surveillance Manual, to a quality assurance/quality control program for any internal testing laboratory.

Surveillance Network Program

41. The Licensee shall compile data relating to the surveillance network program into a monthly report. The report shall be submitted to the Board within thirty (30) days of the end of each month for which the report is compiled.

42. The Licensee shall comply with the Surveillance Network Program attached as Appendix A, Appendix B and Appendix C hereto, and shall comply with all provisions for sampling, sample preservation, reporting and analysis specified in this licence.

43. All data collection and analysis shall be conducted in accordance with the most current edition of Standard Methods for the Examination of Water and Waste Water, prepared and published jointly by the American Water Works Association and the Water Pollution

Control Federation.

44. The Licensee may use an internal testing laboratory providing that a quality assurance/quality control program for the laboratory has first been submitted to the Board.

45. During any period of temporary closure, the Licensee shall comply with the Surveillance Network Program contained in Appendix C of this licence.

Physical Monitoring Program

46. 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 July 31 of each year of this licence by a Professional Engineer licenced to practice in Yukon. 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 in September of each year.

47. The Licensee shall establish and implement an internal monitoring program for all earthworks. The program shall, at a minimum, incorporate the recommendations itemized in SRK C104105. The results of the internal monitoring program, including all problems identified, remedial measures proposed, and remedial measures implemented, shall be compiled and submitted to the Board as part of the Annual Report.

48. 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 five years, with the first review to be completed no later than 2003. The review shall be conducted in accordance with the Dam Safety Guidelines (Canadian Dam Association, 1999).

49. Prior to November 30 of the year in which a dam safety review is completed, the Licensee shall submit a report on the review to the Board. The report shall be prepared in accordance with the recommendations contained in the Dam Safety Guidelines and shall include at a minimum:

    a) documentation of the dam safety review process, procedures, activities and results;

    b) any recommendations for maintenance, operation, surveillance, reporting and/or emergency preparedness;

    c) documentation of actions taken on the recommendations of previous dam safety reviews and annual inspection reports; and

    d) the planned response to each recommendation in the dam safety review report, including schedules for completion.

50. 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.

Instrumentation and Monitoring of Dams

51. The tailings and reclaim dams shall be monitored by the use of instrumentation with piezometers, settlement markers and seepage collection as part of a program to ensure long term stability as set out in SRK 60616, Section 3.6.11. In addition, existing piezometers at the toe of the north dam, at the toe of the south dam, at the toe of the reclaim dam and downstream of the toe of the reclaim dam, shall be monitored.

52. Piezometer and seepage observations shall be made monthly. Settlement marker surveys shall be carried out annually in July to coincide with the Physical Monitoring Program.

53. The information collected as part of the Instrumentation and Monitoring of Dams shall be submitted to the Board in September of each year as part of the report on the Physical Monitoring Program.

Fisheries Monitoring Program

54. A fisheries monitoring program shall be conducted at sites MH-13; MH-18 and MH-20, MH-24. The sample locations shall be marked in the field in a manner that ensures that replicate surveys can be made.

55. The Licensee shall survey sites MH-13, MH-18, MH-20 and MH-24 once every two years in the month of September, beginning in 2002, to establish:

    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.

56. The results of the Fish Monitoring Program shall be included in the Annual Report.

Benthic Invertebrate Monitoring

57. Benthic invertebrate monitoring shall be conducted at sites MH-13, MH-14, MH-18, MH-19, and MH-24.

58. The Licensee shall collect three replicate samples in the month of August of every second year, beginning in 2002, from each of sites MH-13, MH-14, MH-18, MH-19, and MH-24 using the Surber sampling technique, and accepted preservation, enumerative and

identification procedures.

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

60. Water Sampling shall be conducted at each of the collection sites during the sample period. Analyses will include: pH; hardness; alkalinity; sulphate; total suspended solids; total ammonia; total and dissolved metals: copper, iron, lead and zinc; and water temperature.

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

Sediment Monitoring

62. Sediment Monitoring shall be conducted at sites MH-13, MH-14, MH-18, MH-19, and MH-24.

63. 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.

64. Each sample shall be passed through a 100 mesh (0.15 mm) stainless steel sieve and the portion passing through the sieve will be analysed for total metals (ICP scan). The results shall be included in the Annual Report.

Geochemical Assessment Program

65. a) Within four months of the effective date of this licence, the Licensee shall submit to the Board a plan for a Geochemical Assessment Program to evaluate and identify potential long-terms impacts and potential mitigation of:

    i) existing or potential discharges from the Main Zone 1380 Portal, the Jewelbox 1408 Portal, the Jewelbox 1250 Portal and the Burnick 1200 Portal, and an assessment of whether water that drains into the Jewelbox pit drains into the Main Zone 1380 Portal;

    ii) methods for maintaining unrestricted flow from the Burnick 1200 Portal and the Main Zone open pit after closure;

    iii) tailings pore water chemistry, including monitoring and assessment of flow paths and attenuation processes, and the potential use of location DP7 as a representative site for characterizing the tailings and their pore water chemistry; and

iv) the attenuation of zinc, lead and cadmium in the Main Zone 1380 Portal discharge by carbonates and/or other secondary mineral precipitates in Camp Creek soils and/or other attenuation processes contributing to the removal of metals along the flow path; and

b) The plan for the Geochemical Assessment Program shall include: methods and frequency of sampling; parameters to be analyzed; data evaluation methods; reporting methods; and any other details of the studies to be carried out.

66. The Licensee shall implement the Geochemical Assessment Program when notified by the Board to do so.

67. If potential for long term impacts are identified as a result of implementing the Geochemical Assessment Program, then the Licensee shall develop and implement an impact mitigation plan. The plan should include, but not necessarily be limited to, an expansion of the surveillance network program to include monitoring of the discharges and receiving waters immediately upstream and downstream of the likely reporting zones for the discharges. The implementation shall be reported in the Annual Report.

68. Based on an elevation survey, the Licensee shall submit as part of the Annual Report for the year 2002, data on piezometric elevations and potential flow patterns in the tailings management facility.

Surface Water Hydrology Program

69. Within six months of the effective date of this licence, the Licensee shall submit to the Board a plan to monitor surface water hydrology and verify design flood estimates for critical water conveyances and retaining structures, and shall implement the plan when instructed to do so by the Board. The plan shall include a schedule for reporting data and conclusions to the Board.

North Tailings Dam Seepage Monitoring

70. Within six months of the effective date of this licence, the Licensee shall submit to the Board a plan for a study program to assess, evaluate and report on seepage discharge conditions from the North Tailings Dam and shall implement the plan when instructed to do so by the Board.

Operation, Maintenance and Surveillance Manual

71. No later than April 30, 2004, the Licensee shall submit to the Board an operation, maintenance and surveillance manual ("OMS Manual") that documents procedures for safe operation, maintenance and surveillance of all dams and appurtenances. The Licensee shall prepare the OMS Manual in accordance with the Dam Safety Guidelines (Canadian Dam

Association, January 1999) and shall provide an updated manual when the results of the annual dam safety inspections and/or the five year dam safety reviews recommend that an update is necessary. The OMS Manual shall include, but not be limited to:

a) procedures for operation, maintenance and surveillance that are consistent with the recommendations contained in the Dam Safety Guidelines; and

b) a program for recording and reporting inspection and maintenance activities.

PART F - DECOMMISSIONING AND RECLAMATION

72. All waste discharges after the cessation of mining shall meet the effluent quality standards specified in this Licence.

Temporary Closure

73. Temporary Closure shall be the cessation of mining and/or discharge of waste from milling operations, for a period of four years or less.

74. On the effective date of this licence, the undertaking shall be deemed in continuation of temporary closure.

75. The Licensee shall notify the Board when mining and/or discharge of waste from milling begins, and at the beginning of any subsequent period of Temporary Closure.

Maintenance Activities During Temporary Closure

76. During Temporary Closure, the Licensee shall:

a) maintain the site under the care of a full-time, on-site caretaker;

b) maintain the main access road in a manner such that heavy equipment can be taken to the site on short notice;

c) maintain facilities and structures and undertake all monitoring in accordance with the requirements of this licence; and

d) maintain all major fixed equipment, including power generation, concentrator and camp facilities and ensure that these are intact and on-site.

77. On the third anniversary of the commencement of any period of temporary closure, the Licensee shall submit to the Board a temporary closure report that documents the status of

all facilities on the site, evaluates the effects of temporary closure on the receiving environment, examines any deviations from predicted performance of facilities, and evaluates the effectiveness of mitigation put in place.

Permanent Closure

78. If all of the requirements described in this licence in the section entitled "Maintenance Activities During Temporary Closure" are carried out, then Permanent Closure shall be deemed to commence January 29, 2013. If the mine resumes mining and discharge of waste prior to January 28, 2013, then Permanent Closure shall commence four years from the date of cessation of mining and/or discharge of waste from milling operations. If any of the requirements described in this licence in the section entitle "Maintenance Activities During Temporary Closure" are not carried out, then the undertaking shall be deemed to be in Permanent Closure.

79. Except as otherwise required by this licence, upon Permanent Closure the Licensee shall implement the Decommissioning Plan.

80. Except as otherwise required by this licence, the Licensee shall undertake the works and activities described in the Decommissioning Plan in accordance with the schedule described in the section of the Decommissioning Plan entitled "Closure Measures Implementation Plan, Table 4-2" or its subsequent updates.

81. For the first three years after the commencement of Permanent Closure, the Licensee shall submit twice yearly decommissioning and reclamation status reports to the Board that describe ongoing decommissioning and reclamation activities, including any deviation from the schedule described in the section of the Decommissioning Plan entitled "Closure Measures Implementation Plan, Table 4-2" or its subsequent updates. The reports shall be submitted on March 30 and November 30 of each year.

82. The Licensee shall submit final detailed designs, specifications and quality assurance/quality control procedures, sealed by a Professional Engineer licenced to practice in Yukon, for all of the structures described in the Decommissioning Plan and for each of the following facilities and works, but shall not begin construction until such time as the Board has notified the Licensee to proceed:

    a) upgrade work for the tailings dams and appurtenances including stability analyses to corroborate the likely physical integrity of the tailings dams upon decommissioning;

    b) the placement of erosion-resistant materials for surfacing of the south tailings dam;

    c) permanent spillways for the tailings facility, including the details of type and application of permanent material to be used for separation of rip-rap and sub-grade;

d) all spillways and diversions; and

e) the confluence of any spillway or channel with Camp Creek, including detailed designs for velocity control.

83. a) The Licensee shall submit an update to the Decommissioning Plan, to the Board, by January 28, 2010 and every two years thereafter, on or before January 28 of that year, unless mine operations resume.

b) The Licensee shall submit an update to the Decommissioning Plan to the Board within two years of the resumption of mine operations, and every two years thereafter.

c) The updated plan shall be consistent with the site decommissioning and reclamation goals described in the Decommissioning Plan, and shall also address the following:

i. relevant advances in technology;
ii. changes to the Canadian Environmental Quality Guidelines (CCME);
iii. any relevant additional information that has been acquired through site monitoring; and
iv. a review of the estimated costs of decommissioning.

d) The Licensee shall submit to the Board any reports prepared by third party consultants and any additional correspondence or reports received by the Licensee from the Yukon government, pertaining to the Decommissioning Plan and any material contained within that plan.

84. Any update to the Decommissioning Plan shall be deemed to be a revision of the plan when the Licensee is notified of that by the Board.

APPENDIX A

SURVEILLANCE NETWORK PROGRAM
SCHEDULE OF WATER QUALITY MONITORING SITES

MH-1: Tailings Pond Outflow - discharge from the tailings pond, through the decant tower, to the reclaim pond or if no discharge, the pond water.

MH-2: Tailings North Dam Seepage - water accumulating within the seepage collection system located immediately below the downstream face of the north tailings dam.

MH-3: Camp Creek Pond Outflow - discharge from a sedimentation pond developed on Camp Creek which drains the Jewelbox 1250 Portal and Main Zone Waste Dump.

MH-4: Alternate Site - Lower Camp Creek - on Camp Creek located immediately above the West Interceptor Ditch; this is an alternative site to be sampled only when there is no discharge from MH-3.

MH-5: Portal Creek - a small intermittent stream which drains the East face of Jewelbox Hill, immediately below the 1450 exploration portal, to False Canyon Creek; discharge from a sedimentation pond, located immediately above the mine access road servicing the portal, Jewelbox Waste Dump and mill site drainage located immediately above the mine access road.

MH-6a: Reclaim Pond Outflow - discharge from the reclaim pond through the overflow spillway.

MH-6b: Reclaim Pond - To be monitored as an alternative to MH-6a only when there is no discharge from the reclaim pond.

MH-7: Reclaim Pond Seepage - water accumulating within the seepage collection system located immediately below the downstream face of the reclaim dam.

MH-8: Burnick Creek - a small intermittent drainage south of the Burnick pit and portal sites which will consolidate drainage within a sediment pond from those sites as well as Burnick pit access road runoff; the drainage contributes to the upper end of Tributary E, east fork, of False Canyon Creek.

MH-9: Burnick West Pond Outflow - discharge from a small sediment pond, which collects drainage from the west and north faces of the Burnick Dump and drains to the upper end of Tributary E, west fork, of False Canyon Creek.

MH-10: Burnick East Pond Outflow - discharge from a small sediment pond, which collects drainage from the east face of the Burnick Dump, to a branch of Tributary E, west fork, of False Canyon Creek.

MH-11: An established station on upper False Canyon Creek within one kilometre of and downstream of the Portal Creek confluence.

MH-12: Tributary E, east fork - of False Canyon Creek, approximately 2 kilometres downstream of the north tailings dam, above the confluence with a small tributary flowing north from a small lake through a swamp which is located approximately 2 kilometres east of the tailings pond.

MH-13: The main channel of False Canyon Creek, approximately 10 kilometres downstream of the reclaim pond, upstream of the confluence of a tributary which flows north from a small lake.

MH-14: The main channel of False Canyon Creek, approximately 20 kilometres downstream of the reclaim pond just upstream of the confluence with Tributary E.

MH-15: Tributary E, west fork, upstream of the confluence with Tributary E, east fork, approximately six kilometres downstream of the North Hill development.

MH-16: The main channel of False Canyon Creek, downstream of the confluence of Tributary D, approximately 22 kilometres downstream of the reclaim pond.

MH-18: On the lower end of Tributary E, approximately one kilometre above the confluence with False Canyon Creek, some ten kilometres northeast of the mill site.

MH-19: On the main channel of False Canyon Creek, approximately four kilometres downstream of the Tributary D confluence.

MH-20: On the main channel of False Canyon Creek, approximately 13 kilometres upstream of the mouth and immediately above the Tributary B confluence.

MH-21 On Tributary B, above confluence with the main branch of False Canyon Creek.

MH-22: Burnick 1200 Portal discharge, the end of pipe discharge point into the North Hill Settlement Basin.

MH-23: North Creek immediately downstream of the impoundment.

MH-24: The east tributary that joins False Canyon Creek just downstream of MH-13.

MH-25: The Main Zone 1380 Portal discharge.

APPENDIX B

Surveillance Network Program During Normal Operations

Station / Parameter	MH-1	MH-2	MH-3	MH-4 *	MH-5	MH-6a	MH-6b **	MH-7	MH-8	MH-9	MH-10	MH-11	MH-12	MH-13 ****	MH-14 ****	MH-15	MH-16	MH-18 ****	MH-19 ****	MH-22	MH-23 ***	MH-24 ****	MH-25
pH (field)	W^	M	M	M	M	W	M	M	M	M	M	W	Q	Q	Q	Q	Q			M	M		M
Flow Rate	W^	M	M	M	M	C	C	M	M	M	M	C	Q	Q	Q	Q	Q			M	M		M
Temperature	W^	M	M	M	M	W	M	M	M	M	M	W	Q	Q	Q	Q	Q			M	M		M
Conductivity	W^	M	M	M	M	W	M	M	M	M	M	W	Q	Q	Q	Q	Q			M	M		M
Alkalinity	W^	M	M	M	M	W	M	M	M	M	M	W	Q	Q	Q	Q	Q			M	M		M
Turbidity			W+		W+				W+	W+	W+									W+			W+
pH (lab)	W^	M	M	M	M	W	M	M	M	M	M	W	Q	Q	Q	Q	Q			M	M		M
Total Suspended Solids	W^		M	M	M	W	M	M	M	M	M	W								M	M		M
Dissolved Solids	W^		M	M	M	W	M	M	M	M	M	W								M	M		M
Copper - total	W^		M	M	M	W	M	M	M	M	M	W								M	M		M
Lead - total	W^		M	M	M	W	M	M	M	M	M	W								M	M		M
Zinc - total	W^		M	M	M	W	M	M	M	M	M	W								M	M		M
Zinc - dissolved	W^		M	M	M	W	M	M	M	M	M	W								M	M		M
ICP scan - total	W^	M	M	M	M	M	M	M	M	M	M	W	Q	Q	Q	Q	Q			M	M		M
ICP scan - dissolved				M								W	Q	Q	Q	Q	Q						
Ammonia - total	W^	M	M	M	M	W	M	M	M	M	M	W				Q				M	M		M
Sulphate	W^		M	M	M	W	M	M	M	M	M	W								M	M		M
Hardness	W^	M	M	M	M	W	M	M	M	M	M	W	Q	Q	Q	Q	Q			M	M		M
Cyanide - total	W^	M				W	M	M				W	Q	Q	Q	Q	Q						
Bioassay - LC50						Q	Q																
Benthic Invertebrates														2A	2A			2A	2A			2A	
Sediments														2A	2A			2A	2A			2A	

NOTES TO APPENDIX B

Legend	
Q	Quarterly
M	Monthly
W	Weekly
C	Continuous
2A	Every two years, with three replicate samples in the month of August
^	Weekly while discharging, otherwise monthly. After 6 months of data during discharge has been accumulated, monitoring frequency will be as dictated by the "Metal Mine Liquid Effluent Regulations and Guidelines", April 1977.
+	When there is a discharge from the sedimentation pond.
*	To be monitored as an alternative site to MH-3 only when there is no discharge from the camp Creek Sediment Pond.
**	To be monitored as an alternative site to MH-6a only when there is no discharge from the reclaim pond.
***	To be monitored during the first year of operations only.
****	In addition to the monitoring specified in the table, sampling shall also be carried out for pH, hardness, alkalinity, sulphate, total suspended solids, total ammonia, total and dissolved metals (ICP scan: copper, iron, lead and zinc) and temperature at the same time as the Benthic Invertebrate monitoring.

APPENDIX C
Surveillance Network Program During Temporary Closure*

Station / Parameter	MH-1	MH-2	MH-3	MH-4 *	MH-5	MH-6a	MH-6b **	MH-7	MH-8	MH-9	MH-10	MH-11	MH-13 ****	MH-14 ****	MH-16	MH-22	MH-25
pH (field)	Q	M	M	Q	M	M	Q	M	M	M	M	M	Q	Q	Q	M	M
Flow Rate	Q	M	M	Q	M	M	Q	M	M	M	M	M/C	Q	Q	Q	M	M
Temperature	Q	M	M	Q	M	M	Q	M	M	M	M	M	Q	Q	Q	M	M
Conductivity	Q	M	M	Q	M	M	Q	M	M	M	M	M	Q	Q	Q	M	M
Alkalinity	Q	M	M	Q	M	M	Q	M	M	M	M	M	Q	Q	Q	M	M
pH (lab)	Q	M	M	Q	M	M	Q	M	M	M	M	M	Q	Q	Q	M	M
Total Suspended Solids	Q	M	M	Q	M	M	Q	M	M	M	M	M	Q	Q	Q	M	M
Dissolved Solids	Q	M	M	Q	M	M	Q	M	M	M	M	M	Q	Q	Q	M	M
ICP scan - total	Q	M	M	Q	M	M	Q	M	M	M	M	M	Q	Q	Q	M	M
Ammonia - total	Q	M	M	Q	M	M	Q	M	M	M	M	M	Q	Q	Q	M	M
Sulphate	Q	M	M	Q	M	M	Q	M	M	M	M	M	Q	Q	Q	M	M
Hardness	Q	M	M	Q	M	M	Q	M	M	M	M	M	Q	Q	Q	M	M
Cyanide - total	Q	M				M	Q	M				M	Q	Q	Q		
Bioassay - LC50						Q	Q										

NOTES TO APPENDIX C

Legend: Q = Quarterly M = Monthly M/C = Minimum monthly or continuous flow, year round

* = For the purposes of this surveillance program only, the mine will not be deemed to be in Temporary Closure until one year from the date that milling of ore ceases.

** = To be monitored as an alternative site to MH-3 only when there is no discharge from the Camp Creek Sediment Pond.

*** = To be monitored as an alternative site to MH-6a only when there is no discharge from the reclaim pond.

Appendix 2: 2016 Water Quality Monitoring Results

Appendix 2A: 2016 Monthly Water Quality Data

Sa Dena Hes Mine, Water Licence QZ15-082
2016 MONTHLY WATER QUALITY DATA

MH-02 - North Dam Seepage			18-Jan	21-Feb	18-Mar	16-Apr	10-May	08-Jun	30-Jul	20-Aug	20-Sep	22-Oct	28-Nov	18-Dec
General Parameters	**Units**	**Permit**												
Alkalinity - $CaCO_3$	mg/L		312	307	299	277	143	262	279	268	274	318	318	321
Ammonia Nitrogen	mg/L	3.5	0.041	0.046	0.055	0.11	0.057	0.07	0.061	0.046	<0.0050	0.017	0.15	0.04
Colour, True	Col. Units	20	<5.0	<5.0	<5.0	11.3	<5.0	<5.0	<5.0	7.6	7.3	<5.0	<5.0	<5.0`
Conductivity - Lab	uS/cm		1080	1110	1100	1040	422	922	978	995	965	1080	1130	1150
Conductivity - Field	uS/cm					1118	469	934	950	970	962	1196	1137	1246
Cyanide (total CN)	mg/L	0.5	0.00090	0.00098	0.00057	0.00087	0.00073	0.00085	0.00052	<0.00050	<0.00050	0.0006	0.00095	0.00092
Flow *	L/min		12	7.2	2.4	12	180	30	12	18	18	18	12	2.4
Hardness	mg/L		586	621	582	588	240	520	603	588	522	595	716	615
pH - Lab	pH	<6.0	8.17	7.96	8.19	8.30	8.26	8.13	8.2	8.18	8.23	7.94	8.04	7.8
pH - Field	pH	<6.0	8	7.6	7.6	7.8	7.9	7.9	7.9	7.9	8	7.6	7.6	7.6
Sulphate	mg/L		300	295	313	298	76.6	282	268	290	280	290	338	297
TDS	mg/L		762	742	740	754	252	628	660	724	666	786	838	818
TSS	mg/L	50	<4.0	<4.0	<4.0	<4.0	7.8	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	5
Temperature	°C		0.1	0.2	0.2	1.5	5.3	16.1	18.8	13.1	7	0.4	0.1	0.4
Turbidity - Lab	NTU	15	0.26	0.39	0.28	0.55	24.0	0.21	0.52	0.3	0.32	0.26	0.28	0.6
Turbidity - Field	NTU	15	0.25	0.35	0.4	0.63				0.29	0.27	0.18	0.38	0.17
Total Elements	**Units**	**Permit**												
Aluminum	mg/L		0.0367	0.0047	0.003	0.0016	0.191	0.003	0.0051	0.0035	0.0026	0.0029	0.0015	0.0129
Antimony	mg/L		<0.0005	<0.0005	<0.0005	0.000053	0.000142	0.00014	0.000111	0.000078	0.000052	0.00004	0.00005	0.000063
Arsenic	mg/L	0.05	0.00041	0.00041	0.00038	0.000396	0.000398	0.000421	0.000602	0.000543	0.000389	0.000356	0.000299	0.000747
Barium	mg/l		0.0588	0.0615	0.0664	0.068	0.0425	0.0709	0.0662	0.0562	0.0512	0.0571	0.0641	0.0761
Beryllium	mg/L		<0.0001	<0.0001	<0.0001	<0.00001	0.000011	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth	mg/L		<0.001	<0.001	<0.001	<0.000005	0.000015	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.00001
Boron	mg/L		<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	mg/L	0.02	0.000074	0.000052	0.000057	0.000062	0.000082	0.000022	0.000025	0.000014	0.000015	0.000072	0.000062	0.00
Calcium	mg/L		202	216	202	206	87.0	185	212	205	182	209	256	218.00
Chromium	mg/L		<0.001	<0.001	<0.0001	<0.0001	0.00023	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00
Cobalt	mg/L		0.00095	0.00084	0.00089	0.000815	0.000307	0.000439	0.00055	0.000525	0.000513	0.000621	0.000745	0.00
Copper	mg/L	0.2	<0.0005	<0.0005	<0.0005	<0.0002	0.0005	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	<0.0002	0.00
Iron	mg/L		0.116	0.1	0.068	0.105	0.189	0.034	0.0915	0.0594	0.0468	0.039	0.0665	0.43
Lead	mg/L	0.2	0.00123	<0.0002	0.00033	0.000259	0.0121	0.000422	0.0011	0.000285	0.000495	0.000145	0.000126	0.00
Magnesium	mg/L		19.6	19.6	19.0	17.8	5.60	13.9	17.7	18.4	16.2	17.9	19	17.40
Manganese	mg/L		0.697	0.808	0.632	0.7	0.0774	0.0711	0.22	0.15	0.124	0.43	0.556	1.35
Molybdenum	mg/L		<0.001	<0.001	<0.001	0.000314	0.00043	0.000485	0.000578	0.000514	0.000307	0.0002	0.0002	0.00
Nickel	mg/L		<0.001	<0.001	<0.001	0.00042	0.00038	0.0002	0.00027	0.00024	0.00022	0.0004	0.00035	0.00
Potassium	mg/L		1.37	1.42	1.58	1.64	1.02	1.69	1.86	2.55	2.11	1.33	1.31	1.24
Selenium	mg/L	0.05	<0.0001	<0.0001	<0.0001	0.000071	0.000378	0.000136	0.000098	0.00007	0.000077	0.00006	0.00008	0.00
Silver	mg/L	0.1	<0.00002	<0.00002	<0.00002	<0.000005	0.000008	0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.00001
Sodium	mg/L		10.4	11	11.1	9.74	3.58	8.8	11.5	11.4	9.55	9.57	10.7	9.47
Strontium	mg/L		0.678	0.717	0.763	0.795	0.267	0.631	0.783	0.722	0.658	0.763	0.771	0.73
Sulphur	mg/L		101	122	127	122	30.5	91.3	103	104	91.1	110	122	113.00
Thallium	mg/L		<0.00005	<0.00005	<0.00005	0.000002	0.000003	0.000002	0.000002	<0.000002	<0.000002	0.000002	0.000002	0.00
Tin	mg/L		<0.005	<0.005	<0.005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Titanium	mg/L		<0.005	<0.005	<0.005	<0.0005	0.00775	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.002
Vanadium	mg/L		<0.005	<0.005	<0.005	<0.0002	0.00029	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Zinc	mg/L	0.5	0.0476	0.0362	0.0363	0.0368	0.0341	0.0132	0.009	0.0058	0.0081	0.0508	0.0533	0.08
Zirconium	mg/L		<0.0005	<0.0005	<0.0005	<0.0001	0.00016	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Note: green highlight indicates parameter has a permit effluent quality standard

Note: yellow highlight indicates measurement exceeded the permit effluent quality standard

* N/A indicates site was not accessed or has been decommissioned, 0 indicates no flow

Sa Dena Hes Mine, Water Licence QZ15-082
2016 MONTHLY WATER QUALITY DATA

MH-05 - Portal Creek			Jan	Feb	Mar	Apr	10-May	08-Jun	Jul	Aug	Sep	Oct	Nov	Dec
General Parameters	**Units**	**Permit**												
Alkalinity - $CaCO_3$	mg/L						34.6							
Ammonia Nitrogen	mg/L	3.5					0.29							
Colour, True	Col. Units	20					<5.0							
Conductivity - Lab	uS/cm						143							
Conductivity - Field	uS/cm						155							
Flow *	L/min		0	0	0	0	30	0	0	0	0	0	0	0
Hardness	mg/L						69.6							
pH - Lab	pH	<6.0					7.80							
pH - Field	pH	<6.0					7.1							
Sulphate	mg/L						28.0							
TDS	mg/L						80							
TSS	mg/L	50					33.1							
Temperature	°C						0.7							
Turbidity - Lab	NTU	15					53.6							
Turbidity - Field	NTU	15												
Total Elements	**Units**	**Permit**												
Aluminum	mg/L						0.822							
Antimony	mg/L						0.00066							
Arsenic	mg/L	0.05					0.00258							
Barium	mg/l						0.0397							
Beryllium	mg/L						0.000069							
Bismuth	mg/L						0.000167							
Boron	mg/L						<0.05							
Cadmium	mg/L	0.02					0.00233							
Calcium	mg/L						23.8							
Chromium	mg/L						0.00156							
Cobalt	mg/L						0.00098							
Copper	mg/L	0.2					0.00481							
Iron	mg/L						1.45							
Lead	mg/L	0.2					0.193							
Magnesium	mg/L						2.48							
Manganese	mg/L						0.0457							
Molybdenum	mg/L						0.00109							
Nickel	mg/L						0.00362							
Potassium	mg/L						0.96							
Selenium	mg/L	0.05					0.000524							
Silver	mg/L	0.1					0.000149							
Sodium	mg/L						0.77							
Strontium	mg/L						0.068							
Sulphur	mg/L						<15							
Thallium	mg/L						0.00003							
Tin	mg/L						<0.0002							
Titanium	mg/L						0.0328							
Vanadium	mg/L						0.00759							
Zinc	mg/L	0.5					0.275							
Zirconium	mg/L						0.00031							

Note: green highlight indicates parameter has a permit effluent quality standard

Note: yellow highlight indicates measurement exceeded the permit effluent quality standard

* N/A indicates site was not accessed or has been decommissioned, 0 indicates no flow

Sa Dena Hes Mine, Water Licence QZ15-082
2016 MONTHLY WATER QUALITY DATA

MH-08 - Burnick Creek			18-Jan	21-Feb	18-Mar	16-Apr	10-May	12-Jun	31-Jul	21-Aug	25-Sep	22-Oct	26-Nov	18-Dec
General Parameters	**Units**	**Permit**												
Alkalinity - $CaCO_3$	mg/L		139	139	137	138	144	148	146	136	139	137	137	134
Ammonia Nitrogen	mg/L	3.5	0.016	0.0097	0.063	0.0085	0.028	0.02	0.03	0.035	0.019	0.048	0.062	0.031
Colour, True	Col. Units	20	<5.0	8.2	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Conductivity - Lab	uS/cm		270	267	262	266	276	282	272	273	270	265	257	255
Conductivity - Field	uS/cm					285	300	313	290	276	260	284	285	277
Flow *	L/min		12	2.4	6	6	36	48	18	18	12	6	6	3.6
Hardness	mg/L		134	145	140	148	157	150	161	154	141	136	141	133
pH - Lab	pH	<6.0	8.20	8.19	8.18	8.29	8.27	8.14	8.22	8.19	8.1	8.16	8.28	8.1
pH - Field	pH	<6.0	8.2	7.8	8	7.7	8	8	8.2	8.2	8.1	8.3	8.2	8
Sulphate	mg/L		5.73	5.8	5.47	5.68	6.10	5.33	6.1	6.2	6	5.53	5.75	6.31
TDS	mg/L		156	144	140	158	150	154	158	162	150	152	156	138
TSS	mg/L	50	<4.0	<4.0	<4.0	<4.0	<1.0	<1.0	<1.0	2	<1.0	<1.0	9.4	1.1
Temperature	°C		0.1	1.3	1.6	2	2	2.6	4.1	4	3.6	2.5	1.2	1.7
Turbidity - Lab	NTU	15	<0.10	0.11	<0.10	0.25	0.17	0.13	<0.10	0.1	0.17	0.1900	0.1600	0.1400
Turbidity - Field	NTU	15				0.18			0	0.19	0.02	0.0500	0.0900	0.0000
Total Elements	**Units**	**Permit**												
Aluminum	mg/L		0.0362	0.0056	<0.003	0.0072	0.011	0.0018	0.003	0.0044	0.002	0.0027	0.0126	0.0036
Antimony	mg/L		<0.0005	<0.0005	<0.0005	0.000376	0.000366	0.000386	0.000411	0.000391	0.000381	0.00038	0.00038	0.0004
Arsenic	mg/L	0.05	0.00219	0.00211	0.00234	0.00241	0.00202	0.00159	0.00205	0.00206	0.00204	0.00206	0.00215	0.00225
Barium	mg/l		0.0354	0.0363	0.0368	0.0377	0.0402	0.0502	0.0451	0.0413	0.0396	0.0388	0.0367	0.0357
Beryllium	mg/L		<0.0001	<0.0001	<0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth	mg/L		<0.001	<0.001	<0.001	<0.000005	<0.00002	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Boron	mg/L		<0.05	<0.05	<0.05	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	mg/L	0.02	0.000062	0.000073	0.000068	0.000072	0.0001	0.000082	0.000076	0.000081	0.000071	0.000071	0.000061	0.000058
Calcium	mg/L		45.8	49.6	47.7	50.9	53.7	50.8	55.5	53	48.5	46.8	48.6	45
Chromium	mg/L		<0.001	<0.001	0.00063	0.00062	0.0006	0.00054	0.00059	0.00061	0.0006	0.0006	0.0006	0.0006
Cobalt	mg/L		<0.0005	<0.0005	<0.0005	0.000007	0.000012	0.000008	0.000006	0.000006	0.000006	0.000007	0.000013	0.0000
Copper	mg/L	0.2	<0.0005	<0.0005	<0.0005	<0.0002	0.00035	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	<0.0002
Iron	mg/L		<0.01	<0.01	<0.01	0.0098	0.0128	0.0013	0.0023	0.0036	0.0012	<0.001	0.0087	0.0017
Lead	mg/L	0.2	<0.0002	<0.0002	<0.0002	0.000063	0.00008	<0.00002	<0.00002	0.000026	<0.00002	<0.00002	0.000058	<0.00002
Magnesium	mg/L		4.78	5.2	5.08	4.98	5.63	5.55	5.51	5.3	4.79	4.74	4.69	4.73
Manganese	mg/L		<0.001	<0.001	<0.001	0.00043	0.00104	<0.0002	<0.0002	0.00031	<0.0002	<0.0002	0.000730	<0.0002
Molybdenum	mg/L		<0.001	<0.001	<0.001	0.000743	0.000639	0.000666	0.00074	0.000707	0.000729	0.0007	0.0007	0.0007
Nickel	mg/L		<0.001	<0.001	<0.001	<0.0002	<0.0001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Potassium	mg/L		0.421	0.448	0.461	0.461	0.48	0.455	0.442	0.45	0.455	0.442	0.424	0.439
Selenium	mg/L	0.05	0.00196	0.0018	0.00189	0.00182	0.00177	0.00157	0.00185	0.00179	0.00182	0.00179	0.00192	0.0019
Silver	mg/L	0.1	<0.00002	<0.00002	<0.00002	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Sodium	mg/L		0.840	0.788	0.845	0.852	0.87	0.779	0.838	0.85	0.768	0.852	0.799	0.739
Strontium	mg/L		0.168	0.167	0.164	0.177	0.174	0.164	0.167	0.16	0.16	0.169	0.151	0.152
Sulphur	mg/L		<3.0	<3	<3.0	<3.0	<15	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Thallium	mg/L		<0.00005	<0.00005	<0.00005	<0.000002	<0.000002	0.000002	<0.000002	<0.000002	0.000002	<0.000002	0.000002	<0.000002
Tin	mg/L		<0.005	<0.005	<0.005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Titanium	mg/L		<0.005	<0.005	<0.005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L		<0.005	<0.005	<0.005	0.00043	<0.0005	0.00023	0.00044	0.00043	0.00039	<0.0002	0.0004	0.0004
Zinc	mg/L	0.5	<0.005	0.0251	<0.005	0.0019	0.0033	0.0022	0.002	0.002	0.002	0.00180	0.00260	0.0021
Zirconium	mg/L		<0.0005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Note: green highlight indicates parameter has a permit effluent quality standard

Note: yellow highlight indicates measurement exceeded the permit effluent quality standard

* N/A indicates site was not accessed or has been decommissioned, 0 indicates no flow

Sa Dena Hes Mine, Water Licence QZ15-082
2016 MONTHLY WATER QUALITY DATA

MH-11 - Upper False Canyon Creek			19-Jan	22-Feb	19-Mar	17-Apr	11-May	08-Jun	30-Jul	20-Aug	20-Sep	22-Oct	27-Nov	17-Dec
General Parameters	**Units**	**Permit**												
Alkalinity - $CaCO_3$	mg/L		208	213	211	223	173	172	201	193	192	197	206	212
Ammonia Nitrogen	mg/L	3.5	0.0091	0.010	0.16	0.043	0.039	0.021	0.014	0.036	0.02	0.037	0.013	0.036
Colour, True	Col. Units	20	7.9	<5	6.6	10.1	13.9	7.5	7.7	6.9	16	5.3	5.9	<5.0
Conductivity - Lab	uS/cm		402	406	403	424	345	337	378	387	384	383	387	410
Conductivity - Field	uS/cm					466	373	361	386	386	396	421	343	371
Cyanide (total CN)	mg/L	0.5	0.00062	0.00056	<0.00050	0.00060	0.00065	0.00062	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Flow *	L/min		780	540	540	1200	6360	7020	1440	960	1140	900	636	438
Hardness	mg/L		209	220	221	244	183	187	233	235	209	206	229	221
pH - Lab	pH	<6.0	8.33	8.19	8.22	8.43	8.34	8.28	8.34	8.29	8.23	8.24	8.37	8.04
pH - Field	pH	<6.0	7.9	8.2	8.1	8.1	7.9	8.5	8.2	8.3	8.3	8.4	8.5	8.1
Sulphate	mg/L		13.8	14	12.7	16.9	15.0	15.8	15.2	15	22	16.1	15.1	15.1
TDS	mg/L		226	216	220	250	190	186	200	224	222	214	198	226
TSS	mg/L	50	<4.0	<4.0	<4.0	<4.0	6.8	1.5	1	1	<1.0	<1.0	<1.0	1.3
Temperature	°C		0.1	0.2	0.2	0.3	1.5	6.6	9.3	9	4.1	0.5	0.1	0.1
Turbidity - Lab	NTU	15	0.53	0.58	0.37	0.52	3.87	0.43	0.61	0.53	0.69	0.56	0.54	0.82
Turbidity - Field	NTU	15				0.65			0.32	0.44	0.69	0.5	0.49	0.57
Total Elements	**Units**	**Permit**												
Aluminum	mg/L		0.0401	0.0092	0.0044	0.0078	0.0825	0.0565	0.0104	0.0076	0.0094	0.0051	0.0076	0.0118
Antimony	mg/L		<0.0005	<0.0005	<0.0005	0.000125	0.000175	0.000181	0.000152	0.00013	0.000112	0.00012	0.00012	0.0001
Arsenic	mg/L	0.05	0.00051	0.00051	0.00046	0.000487	0.000566	0.000698	0.000769	0.000694	0.000592	0.000515	0.000465	0.00053
Barium	mg/l		0.0657	0.0705	0.0746	0.0801	0.064	0.0549	0.0773	0.0732	0.0652	0.063	0.0696	0.0764
Beryllium	mg/L		<0.0001	<0.0001	<0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth	mg/L		<0.001	<0.001	<0.001	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Boron	mg/L		<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	mg/L	0.02	0.000054	0.000051	0.000042	0.000049	0.000134	0.000102	0.000055	0.00005	0.00005	0.000044	0.000055	0.000059
Calcium	mg/L		70.5	73.7	73.8	80.1	61.8	64.2	79.8	81.2	70.7	70.3	78.4	74.4
Chromium	mg/L		<0.001	<0.001	<0.0001	0.00016	0.00017	0.00011	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt	mg/L		<0.0005	<0.0005	<0.0005	0.00003	0.000116	0.000053	0.000033	0.000036	0.000034	0.000027	0.000031	0.0000
Copper	mg/L	0.2	<0.0005	<0.0005	<0.0005	0.00043	0.001	0.00041	0.00028	0.00026	0.00026	0.00021	<0.0002	<0.0002
Iron	mg/L		0.074	0.079	0.068	0.0595	0.14	0.0957	0.081	0.0796	0.0903	0.0715	0.0812	0.103
Lead	mg/L	0.2	0.00036	0.00035	<0.0002	0.000454	0.00297	0.00162	0.0015	0.00031	0.000338	0.000235	0.0003	0.00053
Magnesium	mg/L		7.99	8.77	8.80	10.7	6.90	6.37	8.19	7.76	7.79	7.37	8.05	8.62
Manganese	mg/L		0.0159	0.0167	0.0138	0.013	0.0228	0.0146	0.0187	0.0192	0.0168	0.0172	0.0216	0.033
Molybdenum	mg/L		<0.001	<0.001	<0.001	0.000922	0.000761	0.000861	0.00107	0.000996	0.000891	0.000847	0.000849	0.0008
Nickel	mg/L		<0.001	<0.001	<0.001	0.00026	0.00052	0.00027	0.00021	<0.0002	0.00021	<0.0002	<0.0002	<0.0002
Potassium	mg/L		0.415	0.434	0.441	0.588	0.644	0.499	0.407	0.469	0.543	0.418	0.393	0.473
Selenium	mg/L	0.05	0.00052	0.00051	0.00049	0.000687	0.00063	0.00073	0.000447	0.000381	0.000492	0.000523	0.00059	0.00056
Silver	mg/L	0.1	<0.00002	0.000048	<0.00002	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Sodium	mg/L		1.23	1.19	1.34	1.26	0.860	0.927	1.22	1.15	1.1	1.16	1.18	1.19
Strontium	mg/L		0.275	0.304	0.296	0.333	0.231	0.247	0.289	0.281	0.259	0.286	0.28	0.301
Sulphur	mg/L		<3.0	5.5	5.5	6.1	5.0	5.1	4.7	4.2	6.3	5.5	4.6	5.3
Thallium	mg/L		<0.00005	<0.00005	<0.00005	<0.000002	0.000002	0.000002	0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Tin	mg/L		<0.005	<0.005	<0.005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Titanium	mg/L		<0.005	<0.005	<0.005	<0.0005	0.00329	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L		<0.005	<0.005	<0.005	<0.0002	0.00024	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Zinc	mg/L	0.5	0.017	0.0055	<0.005	0.0047	0.0128	0.0071	0.0041	0.0033	0.0036	0.0033	0.0044	0.0066
Zirconium	mg/L		<0.0005	<0.0005	<0.0005	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Note: green highlight indicates parameter has a permit effluent quality standard

Note: yellow highlight indicates measurement exceeded the permit effluent quality standard

* N/A indicates site was not accessed or has been decommissioned, 0 indicates no flow

Sa Dena Hes Mine, Water Licence QZ15-082
2016 MONTHLY WATER QUALITY DATA

MH-22 - Burnick 1200 Portal			18-Jan	Feb	Mar	Apr	10-May	12-Jun	31-Jul	21-Aug	25-Sep	22-Oct	26-Nov	17-Dec
General Parameters	**Units**	**Permit**												
Alkalinity - $CaCO_3$	mg/L						114	92.8	109	106	109	110	119	112
Ammonia Nitrogen	mg/L	3.5					0.12	0.049	0.067	0.028	0.013	0.033	0.074	0.019
Colour, True	Col. Units	20					<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Conductivity - Lab	uS/cm						440	237	283	294	302	301	300	305
Conductivity - Field	uS/cm						475	271	305	303	305	328	322	332
Flow *	L/min		0	0	0	0	30	420	30	12	12	6		
Hardness	mg/L						214	120	164	159	155	148	159	155
pH - Lab	pH	<6.0					8.09	7.95	8.08	8.05	8.05	8.06	8.21	8.04
pH - Field	pH	<6.0					7.4	7.4	7.2	8	7.6	8.1	7.8	7.9
Sulphate	mg/L						108	28.3	36	41	44	42.1	46.2	44.4
TDS	mg/L						268	132	170	188	180	186	190	168
TSS	mg/L	50					<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	12.6	42.7
Temperature	°C						2.1	3.4	2.3	2.3	2.2	2	1	1.3
Turbidity - Lab	NTU	15					0.45	0.15	0.2	0.11	0.14	0.16	0.8500	6.44
Turbidity - Field	NTU	15							0	0.16	0.06	0.02	0.7500	3.8
Total Elements	**Units**	**Permit**												
Aluminum	mg/L						0.006	0.0027	0.0019	0.0018	0.0018	0.0032	0.0741	0.0707
Antimony	mg/L						0.00267	0.00258	0.00294	0.0029	0.00263	0.00243	0.00274	0.00277
Arsenic	mg/L	0.05					0.00344	0.00396	0.00384	0.00355	0.00354	0.00353	0.00395	0.00416
Barium	mg/l						0.0193	0.0136	0.017	0.0166	0.0163	0.0163	0.0186	0.0177
Beryllium	mg/L						<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00002	0.0000
Bismuth	mg/L						0.00001	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	0.0001	0.0001
Boron	mg/L						<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	mg/L	0.02					0.0083	0.00232	0.00364	0.00385	0.00416	0.00429	0.0044	0.00467
Calcium	mg/L						69.1	39.7	54.7	52.5	51.7	49.2	52.8	50.8
Chromium	mg/L						<0.0001	0.00014	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	0.0002
Cobalt	mg/L						0.000044	0.00005	0.000014	0.000011	0.000011	0.000009	0.000164	0.0002
Copper	mg/L	0.2					0.00021	0.00021	<0.0002	0.00022	<0.0002	<0.0002	0.0008	0.0009
Iron	mg/L						0.0124	0.0048	0.0019	0.0015	0.002	0.0016	0.142	0.138
Lead	mg/L	0.2					0.00114	0.000338	0.000354	0.000312	0.00033	0.000341	0.0108	0.00919
Magnesium	mg/L						10.1	5.16	6.7	6.66	6.32	6.09	6.63	6.74
Manganese	mg/L						0.00143	0.00301	0.00036	0.00021	<0.0002	<0.0002	0.008750	0.0101
Molybdenum	mg/L						0.00867	0.00993	0.0101	0.01	0.00859	0.00761	0.00897	0.0085
Nickel	mg/L						0.00517	0.00361	0.00395	0.00376	0.00345	0.00299	0.00372	0.0036
Potassium	mg/L						0.884	0.48	0.541	0.549	0.559	0.552	0.591	0.601
Selenium	mg/L	0.05					0.0189	0.00842	0.0134	0.013	0.014	0.0142	0.0148	0.016
Silver	mg/L	0.1					<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	0.00002	0.0000
Sodium	mg/L						1.02	0.765	0.866	0.852	0.817	0.871	0.848	0.818
Strontium	mg/L						0.307	0.192	0.236	0.235	0.247	0.264	0.254	0.253
Sulphur	mg/L						35.6	9.7	13.2	13.2	13.3	14.7	14.6	15.1
Thallium	mg/L						0.000015	0.000013	0.00002	0.000011	0.000007	0.000008	0.000016	0.0000
Tin	mg/L						<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Titanium	mg/L						<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0022	0.0026
Vanadium	mg/L						<0.0002	0.00028	<0.0002	0.00021	<0.0002	<0.0002	0.0009	0.0007
Zinc	mg/L	0.5					1.79	0.319	0.617	0.649	0.729	0.734	0.866	0.91
Zirconium	mg/L						<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001

Note: green highlight indicates parameter has a permit effluent quality standard

Note: yellow highlight indicates measurement exceeded the permit effluent quality standard

* N/A indicates site was not accessed or has been decommissioned, 0 indicates no flow

Sa Dena Hes Mine, Water Licence QZ15-082
2016 MONTHLY WATER QUALITY DATA

MH-25 - Site no longer exists			18-Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
General Parameters	**Units**	**Permit**												
Alkalinity - $CaCO_3$	mg/L													
Ammonia Nitrogen	mg/L	3.5												
Colour, True	Col. Units	20												
Conductivity - Lab	uS/cm													
Conductivity - Field	uS/cm													
Flow *	L/min		0	0										
Hardness	mg/L													
pH - Lab	pH	<6.0												
pH - Field	pH	<6.0												
Sulphate	mg/L													
TDS	mg/L													
TSS	mg/L	50												
Temperature	°C													
Turbidity - Lab	NTU	15												
Turbidity - Field	NTU	15												
Total Elements	**Units**	**Permit**												
Aluminum	mg/L													
Antimony	mg/L													
Arsenic	mg/L	0.05												
Barium	mg/l													
Beryllium	mg/L													
Bismuth	mg/L													
Boron	mg/L													
Cadmium	mg/L	0.02												
Calcium	mg/L													
Chromium	mg/L													
Cobalt	mg/L													
Copper	mg/L	0.2												
Iron	mg/L													
Lead	mg/L	0.2												
Magnesium	mg/L													
Manganese	mg/L													
Molybdenum	mg/L													
Nickel	mg/L													
Potassium	mg/L													
Selenium	mg/L	0.05												
Silver	mg/L	0.1												
Sodium	mg/L													
Strontium	mg/L													
Sulphur	mg/L													
Thallium	mg/L													
Tin	mg/L													
Titanium	mg/L													
Vanadium	mg/L													
Zinc	mg/L	0.5												
Zirconium	mg/L													

Note: green highlight indicates parameter has a permit effluent quality standard

Note: yellow highlight indicates measurement exceeded the permit effluent quality standard

* N/A indicates site was not accessed or has been decommissioned, 0 indicates no flow. Note that MH-25 has been decommissioned however the portal vent pipes are checked for flow.

GF indicates previous discharge pipe was removed and flow continues over the ground

Appendix 2B: 2016 Quarterly Water Quality Data

Sa Dena Hes Mine, Water Licence QZ99-045
2016 QUARTERLY WATER QUALITY DATA

MH-01 - South Tailings Outflow (MH-01a) / Ponded Water (MH-01b)			First Quarter - March MH-01	Second Quarter - June MH-01	Third Quarter - September MH-01	Fourth Quarter - December MH-01
General Parameters	**Units**	**Permit**	**MH-01**	**MH-01**	**MH-01**	**MH-01**
Alkalinity - $CaCO_3$	mg/L		272	211	189	321
Ammonia Nitrogen	mg/L	3.5	0.097	0.022	0.09	0.08
Colour, True	Col. Units	20	5.8	8.5	42.5	6
Conductivity - Lab	uS/cm		520	415	408	621
Conductivity - Field	uS/cm			431	409	679
Cyanide (total CN)	mg/L	0.5	<0.00050	0.00081	<0.00050	0.00091
Flow*	L/min				0	
Hardness	mg/L		294	431	224	351
pH - Lab	pH	<6.0	8.33	246	8.29	8.06
pH - Field	pH	<6.0	7.9	8.42	8.3	7.6
Sulphate	mg/L		25.3	8.7	33	32.7
TDS	mg/L		348	29.1	232	346
TSS	mg/L	50	<4.0	248	9.3	1.1
Temperature	°C		0.1	6.6	7.8	0.3
Turbidity - Lab	NTU	15	0.48	13.7	5.61	2.68
Turbidity - Field	NTU	15		3.47	5.07	2.24
Total Elements	**Units**	**Permit**				
Aluminum	mg/L		0.0045	0.0921	0.104	0.0071
Antimony	mg/L		<0.0005	0.00027	0.000184	0.000183
Arsenic	mg/L	0.05	0.00065	0.000674	0.0009	0.000679
Barium	mg/l		0.0747	0.0583	0.0678	0.120
Beryllium	mg/L		<0.0001	<0.00001	<0.00001	<0.00001
Bismuth	mg/L		<0.001	0.000009	0.000007	<0.000005
Boron	mg/L		<0.05	<0.01	<0.01	<0.01
Cadmium	mg/L	0.02	0.000054	0.000192	0.000111	0.000194
Calcium	mg/L		98.3	78	70.8	116
Chromium	mg/L		<0.0001	0.00013	0.00016	0.00032
Cobalt	mg/L		<0.0005	0.000142	0.000167	0.00028
Copper	mg/L	0.2	<0.0005	0.00106	0.0011	0.00156
Iron	mg/L		0.103	0.232	0.375	0.149
Lead	mg/L	0.2	0.00031	0.00505	0.00711	0.0018
Magnesium	mg/L		11.8	12.5	11.4	14.7
Manganese	mg/L		0.495	0.0582	0.0872	0.627
Molybdenum	mg/L		0.0017	0.00249	0.0021	0.00259
Nickel	mg/L		<0.001	0.00057	0.00064	0.00126
Potassium	mg/L		0.844	0.549	0.666	1.22
Selenium	mg/L	0.05	0.00057	0.000496	0.000542	0.000642
Silver	mg/L	0.1	<0.00002	<0.000005	<0.000005	<0.000005
Sodium	mg/L		1.03	0.863	1.01	1.55
Strontium	mg/L		0.446	0.365	0.3	0.525
Sulphur	mg/L		8.9	9.2	9.6	11.9
Thallium	mg/L		<0.00005	0.000003	0.000002	0.000009
Tin	mg/L		<0.005	<0.0002	<0.0002	<0.0002
Titanium	mg/L		<0.005	0.00381	0.00326	<0.0005
Vanadium	mg/L		<0.005	<0.0002	0.0004	<0.0002
Zinc	mg/L	0.5	0.0087	0.0234	0.0147	0.0359
Zirconium	mg/L		<0.0005	<0.0001	0.0002	<0.0001

Note: green highlight indicates parameter has a permit effluent quality standard

Note: yellow highlight indicates measurement exceeded the permit effluent quality standard

Sa Dena Hes Mine, Water Licence QZ99-045
2016 QUARTERLY WATER QUALITY DATA

MH-04 - Lower Camp Creek**			First Quarter - March	Second Quarter - June	Third Quarter - September	Fourth Quarter - December
General Parameters	**Units**	**Permit**				
Alkalinity - $CaCO_3$	mg/L		155	142	144	153
Ammonia Nitrogen	mg/L	3.5	0.055	0.05	0.11	0.021
Colour, True	Col. Units	20	<5.0	<5.0	<5.0	<5.0
Conductivity - Lab	uS/cm		312	293	320	309
Conductivity - Field	uS/cm			318	320	337
Flow*	L/min		120	5040	480	210
Hardness	mg/L		165	158	167	167
pH - Lab	pH	<6.0	8.17	8.22	8.25	8.12
pH - Field	pH	<6.0	8.4	8.3	8.4	8.3
Sulphate	mg/L		12.6	15.5	27	15.3
TDS	mg/L		180	168	192	170
TSS	mg/L	50	<4.0	<1.0	<1.0	<1.0
Temperature	℃		0.8	3.2	2.5	0.6
Turbidity - Lab	NTU	15	<0.10	<0.10	<0.10	0.46
Turbidity - Field	NTU	15			0.04	0.13
Total Elements	**Units**	**Permit**				
Aluminum	mg/L		0.0031	0.006	0.0033	0.0069
Antimony	mg/L		<0.0005	0.000121	0.000121	0.000116
Arsenic	mg/L	0.05	0.00037	0.000349	0.000339	0.000396
Barium	mg/l		0.0235	0.0216	0.0228	0.0228
Beryllium	mg/L		<0.0001	<0.00001	<0.00001	<0.00001
Bismuth	mg/L		<0.001	<0.000005	<0.000005	<0.000005
Boron	mg/L		<0.05	<0.01	<0.01	<0.01
Cadmium	mg/L	0.02	0.00023	0.000297	0.000318	0.000252
Calcium	mg/L		60.3	58	61.7	61.6
Chromium	mg/L		0.00013	0.00015	0.00015	0.00016
Cobalt	mg/L		<0.0005	0.000011	0.000007	0.000008
Copper	mg/L	0.2	<0.0005	0.00037	0.00026	<0.0002
Iron	mg/L		<0.01	0.0078	0.0049	0.0093
Lead	mg/L	0.2	<0.0002	0.00116	0.000284	0.000587
Magnesium	mg/L		3.50	3.11	3.22	3.18
Manganese	mg/L		<0.001	0.00077	0.00077	0.00103
Molybdenum	mg/L		<0.001	0.000544	0.000724	0.000719
Nickel	mg/L		<0.001	<0.0002	<0.0002	<0.0002
Potassium	mg/L		0.365	0.41	0.447	0.4
Selenium	mg/L	0.05	0.00078	0.000646	0.000861	0.000874
Silver	mg/L	0.1	<0.00002	<0.000005	<0.000005	<0.000005
Sodium	mg/L		0.931	0.805	0.776	0.805
Strontium	mg/L		0.217	0.206	0.205	0.222
Sulphur	mg/L		4.8	5.4	7.9	5.3
Thallium	mg/L		<0.00005	<0.000002	<0.000002	<0.000002
Tin	mg/L		<0.005	<0.0002	<0.0002	<0.0002
Titanium	mg/L		<0.005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L		<0.005	<0.0002	<0.0002	<0.0002
Zinc	mg/L	0.5	<0.005	0.0064	0.0059	0.0052
Zirconium	mg/L		<0.0005	<0.0001	<0.0001	<0.0001

Note: green highlight indicates parameter has a permit effluent quality standard

Note: yellow highlight indicates measurement exceeded the permit effluent quality standard

* N/A indicates site was not accessed or has been decommissioned, 0 indicates no flow

**This is an alternate station location, only to be sampled when there is no discharge at MH-03 (Camp Creek Outflow).

Sa Dena Hes Mine, Water Licence QZ99-045
2016 QUARTERLY WATER QUALITY DATA

MH-13 - False Canyon Creek (10 km)			First Quarter - March	Second Quarter - June	Third Quarter - September	Fourth Quarter - December
General Parameters	**Units**	**Permit**				
Alkalinity - $CaCO_3$	mg/L		210	170	195	222
Ammonia Nitrogen	mg/L	3.5	0.031	0.033	0.021	0.0051
Colour, True	Col. Units	20	5.8	9.8	18.8	<5.0
Conductivity - Lab	uS/cm		391	322	371	413
Conductivity - Field	uS/cm			340	370	452
Cyanide (total CN)	mg/L	0.5	<0.00050	0.00078	<0.00050	0.00084
Flow*	L/min		2820	20880	3840	1200
Hardness	mg/L		215	178	199	225
pH - Lab	pH	<6.0	8.34	8.26	8.33	8.09
pH - Field	pH	<6.0	8.1	8.3	8.5	7.9
Sulphate	mg/L		8.66	8.02	11	10.4
TDS	mg/L		186	190	194	218
TSS	mg/L	50	<4.0	1.6	1	<1.0
Temperature	°C		0.2	9.3	5.2	0.2
Turbidity - Lab	NTU	15	1.76	0.6	1.31	0.83
Turbidity - Field	NTU	15			1.45	1
Total Elements	**Units**	**Permit**				
Aluminum	mg/L		<0.003	0.0139	0.0039	0.003
Antimony	mg/L		<0.0005	0.000149	0.000096	0.000089
Arsenic	mg/L	0.05	0.00041	0.00052	0.000453	0.000283
Barium	mg/l		0.168	0.12	0.144	0.156
Beryllium	mg/L		<0.0001	<0.00001	<0.00001	<0.00001
Bismuth	mg/L		<0.001	<0.000005	<0.000005	<0.000005
Boron	mg/L		<0.05	<0.01	<0.01	<0.01
Cadmium	mg/L	0.02	0.000019	0.00003	0.000015	0.00002
Calcium	mg/L		60.4	53.5	58.5	63.6
Chromium	mg/L		<0.0001	0.00029	<0.0001	<0.0001
Cobalt	mg/L		<0.0005	0.000045	0.000022	0.000029
Copper	mg/L	0.2	<0.0005	0.00046	0.00026	0.00022
Iron	mg/L		0.277	0.162	0.196	0.111
Lead	mg/L	0.2	<0.0002	0.00022	0.000044	0.000028
Magnesium	mg/L		15.5	10.9	12.9	16.2
Manganese	mg/L		0.0107	0.0116	0.00461	0.0118
Molybdenum	mg/L		0.0012	0.000902	0.00109	0.00115
Nickel	mg/L		<0.001	0.00042	0.00033	0.00029
Potassium	mg/L		0.398	0.36	0.397	0.402
Selenium	mg/L	0.05	0.00069	0.000675	0.000444	0.000683
Silver	mg/L	0.1	<0.00002	<0.000005	<0.000005	<0.000005
Sodium	mg/L		1.02	0.84	0.873	0.986
Strontium	mg/L		0.22	0.197	0.217	0.226
Sulphur	mg/L		3.2	3.3	<3.0	3.5
Thallium	mg/L		<0.00005	<0.000002	<0.000002	<0.000002
Tin	mg/L		<0.005	<0.0002	<0.0002	<0.0002
Titanium	mg/L		<0.005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L		<0.005	<0.0002	<0.0002	<0.0002
Zinc	mg/L	0.5	<0.005	0.0016	<0.001	0.0011
Zirconium	mg/L		<0.0005	<0.0001	<0.0001	<0.0001

Note: green highlight indicates parameter has a permit effluent quality standard

Note: yellow highlight indicates measurement exceeded the permit effluent quality standard

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Sa Dena Hes Mine, Water Licence QZ99-045
2016 QUARTERLY WATER QUALITY DATA

MH-14 - False Canyon Creek (20 km)			First Quarter - March	Second Quarter - June	Third Quarter - September	Fourth Quarter - December
General Parameters	**Units**	**Permit**				
Alkalinity - $CaCO_3$	mg/L		207	185	202	215
Ammonia Nitrogen	mg/L	3.5	0.027	0.049	0.019	0.05
Colour, True	Col. Units	20	<5.0	8.6	21.7	<5.0
Conductivity - Lab	uS/cm		386	342	387	401
Conductivity - Field	uS/cm			363	384	437
Cyanide (total CN)	mg/L	0.5	<0.00050	0.00064	<0.00050	0.00063
Flow*	L/min		6960	34740	13920	36000
Hardness	mg/L		205	192	209	220
pH - Lab	pH	<6.0	8.28	8.29	8.26	7.99
pH - Field	pH	<6.0	8.1	8.3	8.1	7.9
Sulphate	mg/L		8.59	8.95	9.3	9.11
TDS	mg/L		184	176	198	204
TSS	mg/L	50	<4.0	2.6	1.2	<1.0
Temperature	°C		0.8	10.4	5.6	0.9
Turbidity - Lab	NTU	15	1.70	0.85	1.45	1.04
Turbidity - Field	NTU	15			1.72	1.29
Total Elements	**Units**	**Permit**				
Aluminum	mg/L		<0.003	0.0114	0.0035	0.0103
Antimony	mg/L		<0.0005	0.000095	0.000063	0.000071
Arsenic	mg/L	0.05	0.00024	0.000355	0.000319	0.000201
Barium	mg/l		0.185	0.151	0.16	0.187
Beryllium	mg/L		<0.0001	<0.00001	<0.00001	<0.00001
Bismuth	mg/L		<0.001	<0.000005	<0.000005	<0.000005
Boron	mg/L		<0.05	<0.01	<0.01	<0.01
Cadmium	mg/L	0.02	<0.00001	0.000013	0.000011	0.00002
Calcium	mg/L		58.4	55.4	61	62.1
Chromium	mg/L		<0.0001	<0.0001	<0.0001	<0.0001
Cobalt	mg/L		<0.0005	0.000039	0.00003	0.000034
Copper	mg/L	0.2	<0.0005	0.00031	<0.0002	0.00021
Iron	mg/L		0.266	0.157	0.238	0.198
Lead	mg/L	0.2	<0.0002	0.000072	0.000023	0.000045
Magnesium	mg/L		14.4	13	13.8	15.7
Manganese	mg/L		0.0158	0.0124	0.0158	0.022
Molybdenum	mg/L		<0.001	0.000856	0.000799	0.000844
Nickel	mg/L		<0.001	0.00031	0.00024	<0.0002
Potassium	mg/L		0.555	0.424	0.545	0.556
Selenium	mg/L	0.05	0.00092	0.000728	0.000594	0.000801
Silver	mg/L	0.1	<0.00002	<0.000005	<0.000005	<0.000005
Sodium	mg/L		1.51	1.15	1.27	1.35
Strontium	mg/L		0.244	0.226	0.243	0.248
Sulphur	mg/L		3.7	3.2	<3.0	3.1
Thallium	mg/L		<0.00005	<0.000002	<0.000002	<0.000002
Tin	mg/L		<0.005	<0.0002	<0.0002	<0.0002
Titanium	mg/L		<0.005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L		<0.005	<0.0002	<0.0002	<0.0002
Zinc	mg/L	0.5	<0.005	<0.001	<0.001	<0.001
Zirconium	mg/L		<0.0005	<0.0001	<0.0001	<0.0001

Note: green highlight indicates parameter has a permit effluent quality standard

Note: yellow highlight indicates measurement exceeded the permit effluent quality standard

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Sa Dena Hes Mine, Water Licence QZ99-045
2016 QUARTERLY WATER QUALITY DATA

MH-16 - False Canyon Creek (22 km)			First Quarter - March	Second Quarter - June	Third Quarter - September	Fourth Quarter - December
General Parameters	**Units**	**Permit**				
Alkalinity - $CaCO_3$	mg/L		215	192	206	218
Ammonia Nitrogen	mg/L	3.5	0.027	0.041	0.32	0.04
Colour, True	Col. Units	20	5.3	9.8	14.8	5.3
Conductivity - Lab	uS/cm		395	348	389	404
Conductivity - Field	uS/cm			366	383	445
Cyanide (total CN)	mg/l	0.5		0.00064	0.00053	0.00072
Flow*	L/min		11160	65640	19260	33600
Hardness	mg/L		221	198	209	218
pH - Lab	pH	<6.0	8.25	8.37	8.33	8.09
pH - Field	pH	<6.0	8.5	8.4	8.5	7.9
Sulphate	mg/L		7.44	7.24	8.2	8.41
TDS	mg/L		208	186	208	206
TSS	mg/L	50	<4.0	2.2	<1.0	1.4
Temperature	°C		0.2	9.6	6	0.3
Turbidity - Lab	NTU	15	1.26	0.73	1	1.22
Turbidity - Field	NTU	15			1.09	1
Total Elements	**Units**	**Permit**				
Aluminum	mg/L		0.0039	0.0124	0.0041	0.0057
Antimony	mg/L		<0.0005	0.000109	0.000065	0.00007
Arsenic	mg/L	0.05	0.0003	0.000401	0.000332	0.000235
Barium	mg/l		0.202	0.155	0.174	0.185
Beryllium	mg/L		<0.0001	<0.00001	<0.00001	<0.00001
Bismuth	mg/L		<0.001	<0.000005	<0.000005	<0.000005
Boron	mg/L		<0.05	<0.01	<0.01	<0.01
Cadmium	mg/L	0.02	<0.00001	0.000012	0.00001	0.000008
Calcium	mg/L		62.4	57	59.9	61.3
Chromium	mg/L		<0.0001	<0.0001	<0.0001	<0.0001
Cobalt	mg/L		<0.0005	0.000043	0.000021	0.000022
Copper	mg/L	0.2	<0.0005	0.00028	<0.0002	<0.0002
Iron	mg/L		0.183	0.143	0.151	0.143
Lead	mg/L	0.2	<0.0002	0.00006	0.000022	0.000024
Magnesium	mg/L		15.7	13.6	14.5	15.8
Manganese	mg/L		0.0111	0.014	0.00895	0.0162
Molybdenum	mg/L		0.001	0.00113	0.000982	0.000934
Nickel	mg/L		<0.001	0.0003	0.00024	<0.0002
Potassium	mg/L		0.470	0.385	0.514	0.497
Selenium	mg/L	0.05	0.00056	0.00056	0.000459	0.00065
Silver	mg/L	0.1	<0.00002	<0.000005	<0.000005	<0.000005
Sodium	mg/L		1.41	1.06	1.22	1.32
Strontium	mg/L		0.233	0.222	0.233	0.242
Sulphur	mg/L		3.1	<3.0	<3.0	<3.0
Thallium	mg/L		<0.00005	<0.000002	<0.000002	<0.000002
Tin	mg/L		<0.005	<0.0002	<0.0002	<0.0002
Titanium	mg/L		<0.005	<0.0005	<0.0005	<0.0005
Vanadium	mg/L		<0.005	<0.0002	<0.0002	<0.0002
Zinc	mg/L	0.5	<0.005	<0.001	<0.001	<0.001
Zirconium	mg/L		<0.0005	<0.0001	<0.0001	<0.0001

Note: green highlight indicates parameter has a permit effluent quality standard

Note: yellow highlight indicates measurement exceeded the permit effluent quality standard

* N/A indicates site was not accessed or has been decommissioned, 0 indicates no flow

Appendix 3: 2016 Geotechnical Inspection Report

Teck

2016 Geotechnical Inspection Tailings Management Facility Sä Dena Hes, Yukon Territory

Prepared for

Teck Resources Limited

Prepared by

srk consulting

SRK Consulting (Canada) Inc.
1CT008.057
October 2016

2016 Geotechnical Inspection Tailings Management Facility
Sä Dena Hes, Yukon Territory

October 2016

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1 Introduction

1.1 Purpose, Scope of Work and Methodology

In accordance with an authorization by Mr. Gerry Murdoch, Teck Resources Limited, Mr. Peter Healey PEng. an associate of SRK Consulting (Canada) Inc., completed a geotechnical inspection of structures and features associated with the Tailings Management Area (TMA) that would form part of the closed Sä Dena Hes mine located near Watson Lake, Yukon. The inspection was carried out on July 19, 2016. This report presents our 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 Diversion Channel;
- The North Channel and South Channel;
- The Sediment Retaining Structure; and
- The Burnick and Jewelbox Waste Rock Dump areas.

The weather during the inspection was overcast and cool. 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.

A map showing the overall mine site is provided on Figure 1. The general arrangement map of the TMA is provided in Figure 2.

1.2 Facility Description, 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. 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.

The decant tower, in the South Tailings Pond, was used to discharge the supernatant water in tailings pond into the Reclaim Pond through a 0.5 m dia. corrugated steel (CSP) decant pipe. During the care and maintenance period after the mine shut down in 1982, 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.

An emergency spillway, consisting of two 900 mm diameter CSP culverts, was located on the west abutment of the South Dam. The discharge from the spillway entered the Reclaim Pond downstream via an unlined channel. 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.

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. This primary spillway consisted of two 1,200 mm diameter CSP culverts that was designed to accommodate the 1 in 200-year inflow design event from the catchment for Camp Creek and the TMA.

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.

With 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. Similar to the decommissioning of the Reclaim Dam, the dam foot print was excavated to original ground (with exception of the SRS) and blended into the surrounded topography.

Three drainage channels were built as part of the 2014 TMA decommissioning. The longest of the three was constructed through the former the 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.

A soil cover, varying up to 2.2m in depth was placed onto areas of exposed tailings, specifically the North Tailings Area and the tailings deposited in South Pond area. The cover comprised excavated dam fill material and was used to reduce wind erosion of tailings and to provide a growth medium over the tailings for future revegetation. The cover was also intended to reduce surface water ponding and to promote runoff of non-contact water.

The total soil cover area is about 0.16 sq. km. The North Tailings Area is 0.09 sq. km, the South Pond including the grassy area is 0.03 sq. km, and the Reclaim Pond is 0.04 sq. km.

The Camp Creek Diversion Channel, exit chute, and culverts were decommissioned in 2015. The interceptor ditches were decommissioned in 2015.

1.3 Regulatory Requirements

In accordance with the 2015 Operations, Maintenance and Surveillance (OMS) (SRK, 2014) and the current Water Licence (YTWB 2002), annual inspections of the mine site will be carried out by a qualified professional engineer. The OMS also requires that extraordinary inspections be carried out after any significant storm or seismic event.

The last Dam Safety Review (DSR) was carried out in 2015 by AMECFW. In accordance with the CDA 2014 guidelines, the next DSR would be carried in the 2025.

2 Site Observations

2.1 Visual Observations

2.1.1 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 (Photo 1), which is at an elevation of 1,100 m, 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.

Teck has been surveying the settlement gauges on the North Dam since 1993. Results are shown on Table 2.1. The last set of readings taken using the 1990 datum was completed in 2010. A recent set of readings was completed in 2016 based on the 2012 datum. These readings are also shown in Table 2.1. The results indicate that there has been no significant settlement of the embankment over the 23-year period that readings have been taken.

The three sets of piezometers and protective caps (Photos 3 and 4) along the crest of the North Dam remain intact. Some of the deformation monitoring pins and the original settlement gauges protected by 40-gallon drums are still evident on the crest of the dam but currently serve very little purpose. Labels on each of the piezometers were recently upgraded and have weathered the elements well.

Table 2.1: Summary of Survey Results for North Dam Settlement Gauges

DATE	NDS3	NDS1	NDS2
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

DATE	NDS3	NDS1	NDS2
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/15	1100.572	1100.412	1100.524
September/15	1100.548	1100.391	1100.512
2016	1100.572	1100.425	1100.547

Note: 2015 and 2016 readings are based on the 2012 datum.

Along the downstream toe of the North Dam there is an 80 m long seepage zone. 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 embedded in sandbags. The system is functioning adequately.

2.1.2 Till Tailings Cover

Photo 5 provides a view looking west over the tailings cover at the north end of the TMA. The cover has an overall gentle downslope gradient away from the North Dam. A drainage channel was constructed down the middle of the cover to assist in directing runoff away from the dam. At the time of the site inspection, ponding was noted along the channel as shown in Photos 6 and 7. However, flow in the channel was moving in a southerly direction away from the dam.

Recently, SRK carried out a hydrological study on the cover to assess the likelihood of overtopping 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 does not overtop. Although the backwater effect arising from a blockage scenario in the central channel does result in a much 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 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.

2.1.3 North Creek

The riprapped channel that conveys North Creek over the location of the decommissioned North Creek Dyke is shown in Photo 8. At the outlet of the channel (Photo 9) some of the riprap has been dislodged by the flow exposing a small area of the underlying filter fabric. However, the channel remains stable and no remediation is required.

Below the above channel is a second riprapped channel that was built following the removal of the two culverts as part of the site reclamation (Photo 10). The channel is stable and requires no remediation.

2.1.4 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.

During the 2015 inspection, a small subsidence was observed in the lower portion of the exit chute from the spillway. The material displaced was retained by the geotextile filter fabric and some of the riprap had moved. Teck repaired the spillway after the 2015 inspection by placing additional riprap from the cofferdam located upstream of the pond. No further subsidence was noted during this year's inspection.

The GeoJute erosion protection and the riprap buttress along the downstream toe of the SRS that Teck installed last year has performed well (Photo 11). No further erosion of the downstream slope or the downstream toe of the structure was evident this year.

Seepage from the hillside area to the east of the structure is still evident along the downstream toe of the SRS (Photo 12).

The pond was not very clear at the time of our inspection and an estimate of the silt buildup in the pond was not possible.

2.1.5 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.

Photos 13 to 15 show the North Channel that drains into the SRS. At the outlet of the channel, there was evidence of some subsidence and erosion of the west embankment (Photo 14). However, the erosion would not impact the performance of the channel and no remediation is required.

No movement of the riprap or subsidence was evident in the other channels (Photos 16 to 20).

2.1.6 Burnick and Jewelbox Waste Rock Dumps

SRK inspected the Burnick waste dump at the 1200 portal and the Main Zone and Jewelbox waste dumps (Photos 21 and 23). The locations of these dumps are shown in Figures 8 and 9. The dumps were recontoured to provide added long-term stability. No subsidence of the slopes was noted.

Some minor settlement of the fill that was placed over the 1200 portal was noted (Photo 22). This settlement is to be expected and no remediation is required.

Photo 24 was taken from the Jewelbox dump overlooking the TMA.

2.2 Instrumentation Review

The water levels in the North Dam piezometers are recorded monthly and the 2016 data are presented in Appendix B. Figure B1 in Appendix B shows the seasonal water level fluctuation within the dam over the last two years for all the piezometers. Figure B2 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 and listed in the OMS Manual. The seasonal fluctuations recorded this year in the piezometers are generally consistent with those in previous years and are within acceptable tolerance limits. Table B1 (Appendix B) presents the water levels from 2015 to August 2016.

The peak levels recorded in May, 2016 are plotted on the dam section shown on Figure 4.

3 Dam Safety Assessment

3.1 Design Basis Review

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 3.1. The design criteria was also updated to reflect changes to the CDA 2014 Dam Consequence Classification.

Table 3.1: 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

3.2 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 ensure long-term physical stability. As stated in the 2015 OMS Manual for the mine site, events exceeding the design criteria (Section 3.1) could result in failure from the following failure modes:

- Dam overtopping;
- Dam embankment instability (North Dam); and
- Seismic instability during large earthquake events (North Dam).

The recent studies completed by SRK reviewed the above scenarios. The dam overtopping scenarios are discussed in SRK 2016. The studies also looked at 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 results of the post-seismic stability analyses completed on the North Dam, indicated that the dam exceeds minimum factors of safety requirements as outlined by the CDA (2014).

3.3 Review of Downstream and Upstream Conditions

As stated in the observation made in Section 2.1.1, there have been no changes to the downstream or upstream conditions of the North Dam since the 2015 inspection.

3.4 Dam Consequence Classification Review

Following the issuance of the 2015 Dam Safety Review (AMECFW 2015), it was agreed that the CDA Dam Consequence Classification of the North Dam should be changed from “Low” to “Significant”. The change was based on a recommendation from AMECFW in the 2015 DSR that believed 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. Therefore, 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.

3.5 OMS Manual Review

The last OMS Manual was prepared by SRK in 2015. The manual was reviewed as part of this 2016 DSI and a number of changes to the OMS are required. These include changes to the design criteria based on the updated dam consequence classification and the frequency of settlement readings for the gauges on the North Dam.

3.6 Emergency Preparedness & Response Review

The last Emergency and Response Plan (ERP) was prepared by SRK as part of the 2015 OMS update and focused on the decommissioned site. No changes to the document are required.

4 Summary and Recommendations

4.1 Summary

Table 4.1 provides a summary of key recommendations from the 2016 dam safety inspection (DSI). Details of the recommendations are provided in the following sections.

Table 4.1: Summary of Key Recommendations

Structure	ID#	Deficiency or Non Compliance	Applicable Regulatory or OMS Reference	Recommended Action	Priority (Teck 2014)	Recommended Deadline/ Status
TMA Till Cover	1	Central drainage ditch grade		Regrade channel to reduce ponding in channel	3	Before end of the year

4.2 North Dam

SRK recommends the following:

- Take water level readings as per the OMS.
- To establish trends in dam settlement, annual readings of the settlement gauges on the North Dam should be taken based on the 2012 datum until 2020. This requirement will be updated in the OMS.

4.3 Till Tailings Cover

SRK recommends that the grade of the central drainage channel down the middle of the till cover be modified to improve drainage of runoff from the cover and the instances of ponding currently observed in the channel.

This final report, 2016 Sä Dena Hes Annual Geotechnical Inspection, was prepared by SRK Consulting (Canada) Inc.

Peter Healey, PEng

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.

5 References

Amec Foster Wheeler Environment & Infrastructure, a Division of Amec Foster Wheeler Americas Limited. 2016. Sa Dena Hes Mine, Tailings Management Facility 2051 Dam Safety Review. Report prepared for Teck Resources Limited. TE133102.5000. February 2016.

Canadian Dam Association (CDA). 2014. Draft Technical Bulletin: Application of Dam Safety Guidelines to Mining Dams, April 2014.

SRK Consulting (Canada) Inc., (2015a). 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.

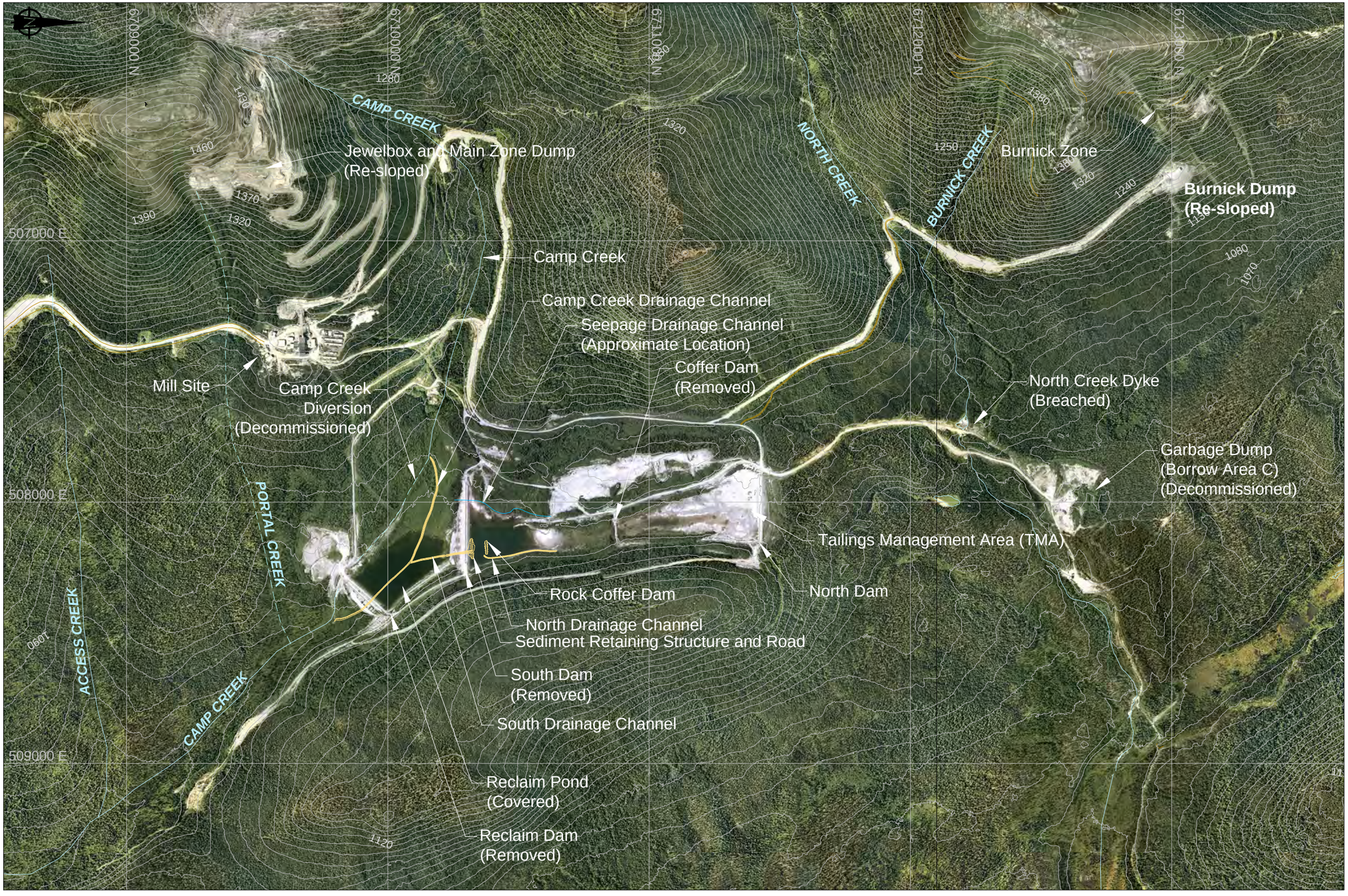
SRK Consulting (Canada) Inc., (2015b). 2015 Geotechnical Inspection, Tailings Management facility, SDH, YT, November 2015.

SRK Consulting (Canada) Inc., 2016. Dam Safety Review Technical Studies, Sa Dena Hes Mine.

Teck Resources Limited (2014). Guidelines for Tailings and Water Retaining Structures, Nov 2014.

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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2016 Geotechnical Inspection

Vicinity Map

SRK JOB NO.:	1CT008.057
FILE NAME:	1CT008.057 - Vicinity Map.dwg

Sä Dena Hes Project

DATE:	APPROVED:	FIGURE:
September 2016	PH	1

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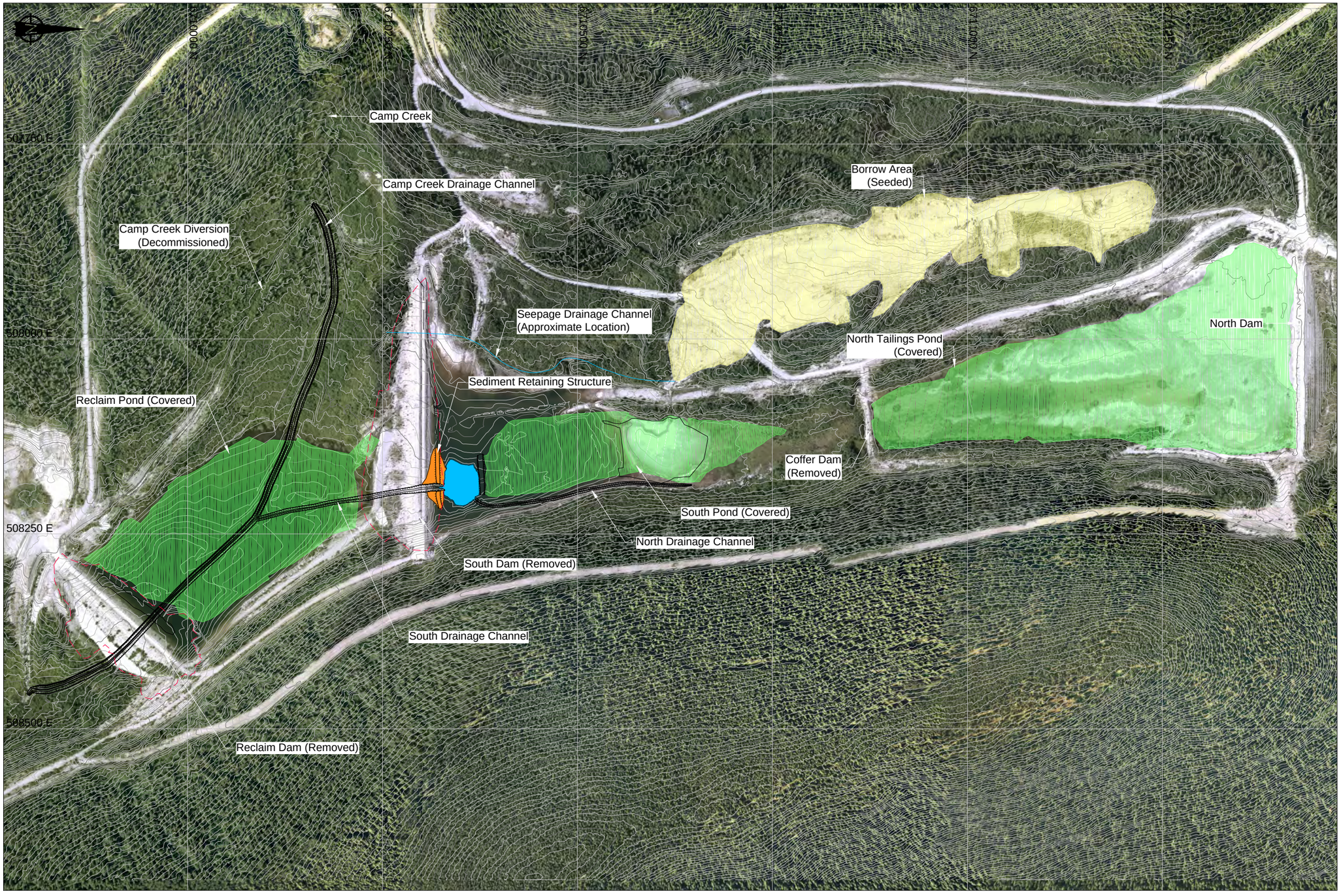

LEGEND

- 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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SRK JOB NO.: 1CT008.057

FILE NAME: 1CT008.057 - General Arrangement.dwg

Teck

Sä Dena Hes Project

2016 Geotechnical Inspection

TMA General Arrangement Map

DATE: September 2016 | APPROVED: PMH | FIGURE: 2

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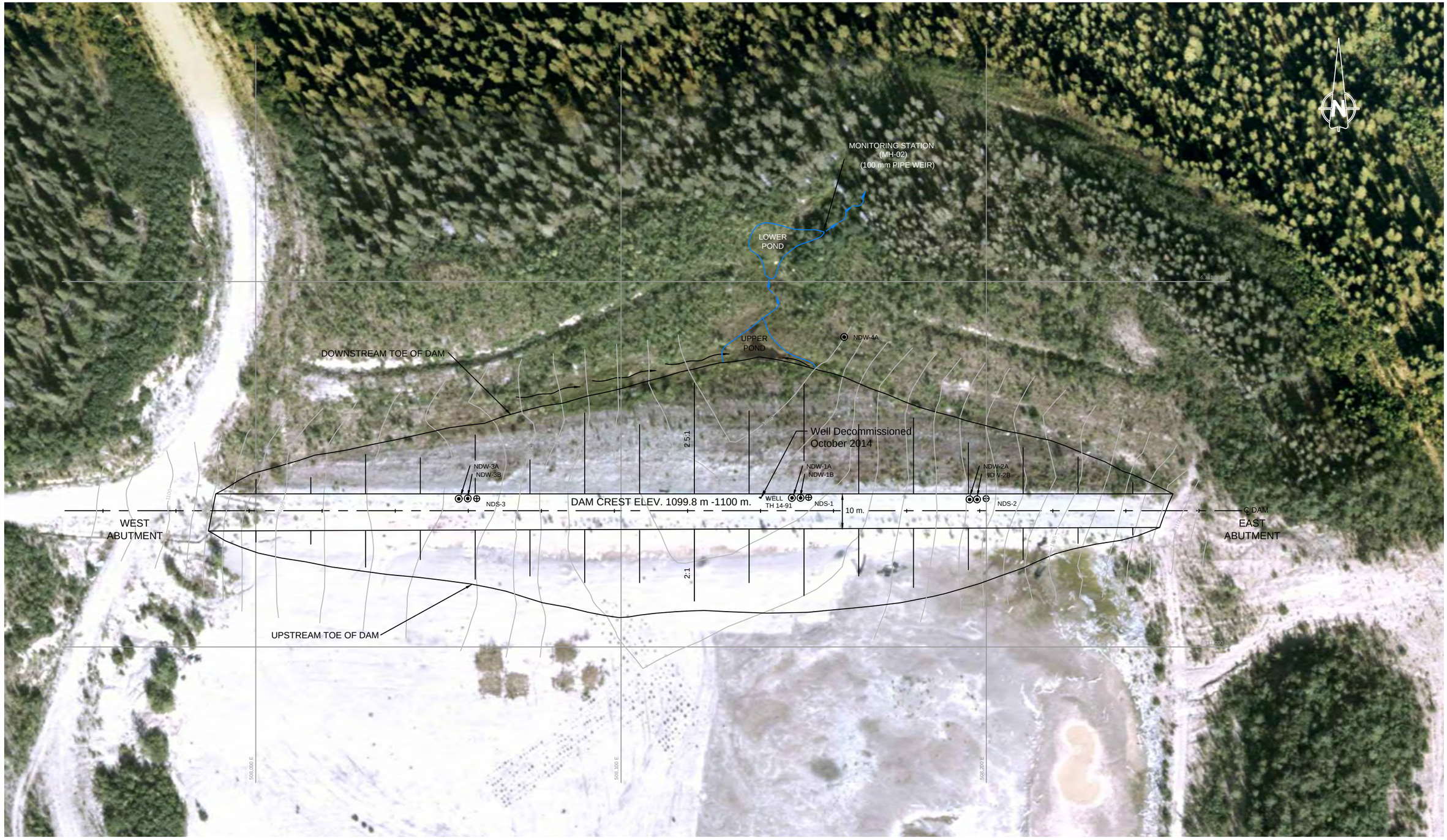

KEY

NDW-1 — PIEZOMETERS INSTALLED (NOV., 1991)

NDS-1 — SETTLEMENT GAUGE INSTALLED (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.: 1CT008.057

FILE NAME: 1CT008.057 – North Dam – plan.dwg

Teck

Sa Dena Hes Project

2016 Geotechnical Inspection

North Dam
Site Plan

DATE:	APPROVED:	FIGURE:
November 2016	P.M.H.	3

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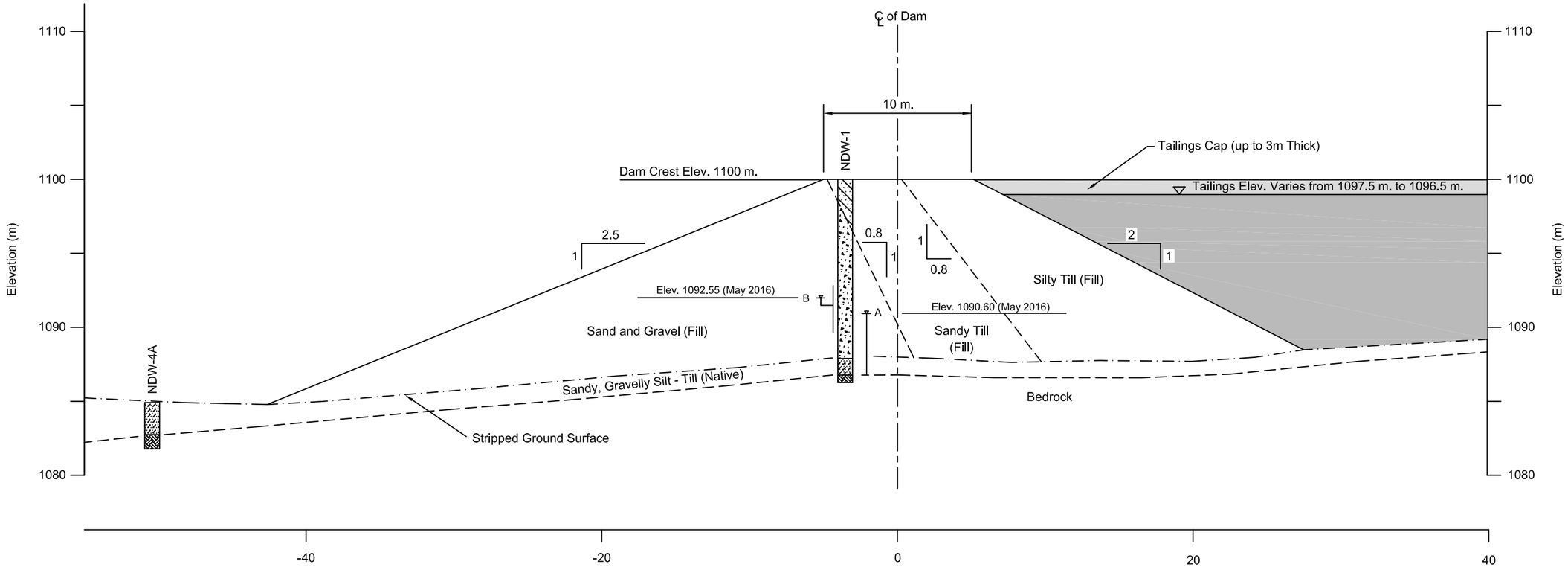

	DATE	T.O.P.	READING	ELEV.
NDW-1B	May 2016	1100.57	8.02	1092.55
NDW-1A	May 2016	1100.69	10.09	1090.60

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.: 1CT008.057

FILE NAME: 1CT008.057 - North Dam XS.dwg

Teck

Sä Dena Hes Project

2016 Geotechnical Inspection

North Dam
Section 0+400

DATE:	APPROVED:	FIGURE:
September 2016	PMH	4

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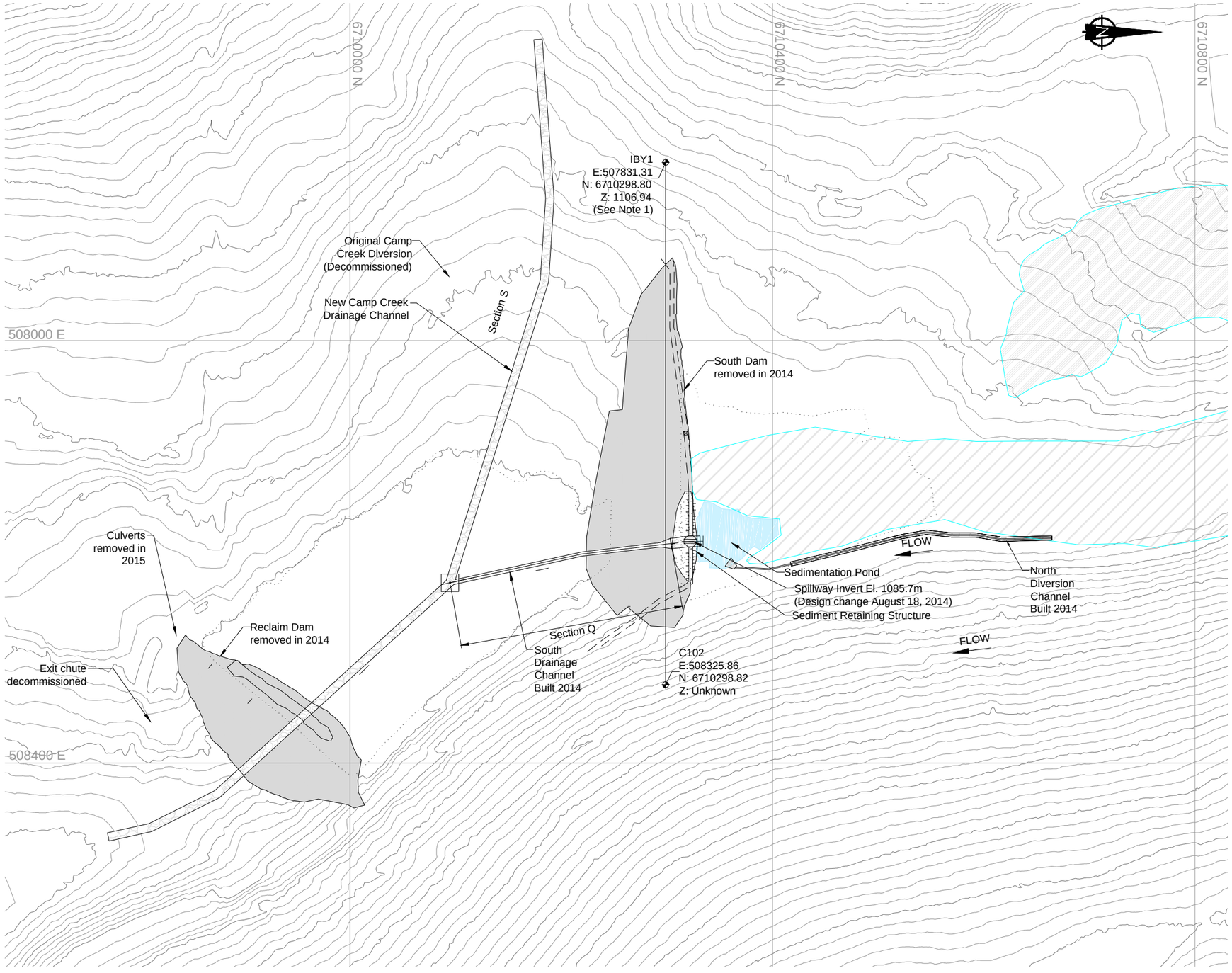

LEGEND

- 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

srk consulting

SRK JOB NO.: 1CT008.057
FILE NAME: 1CT008.057 – TMF.dwg

Teck

Sa Dena Hes Project

2016 Geotechnical Inspection

Sediment Retaining Structure Location Map

DATE:	APPROVED:	FIGURE:
September 2016	PMH	5

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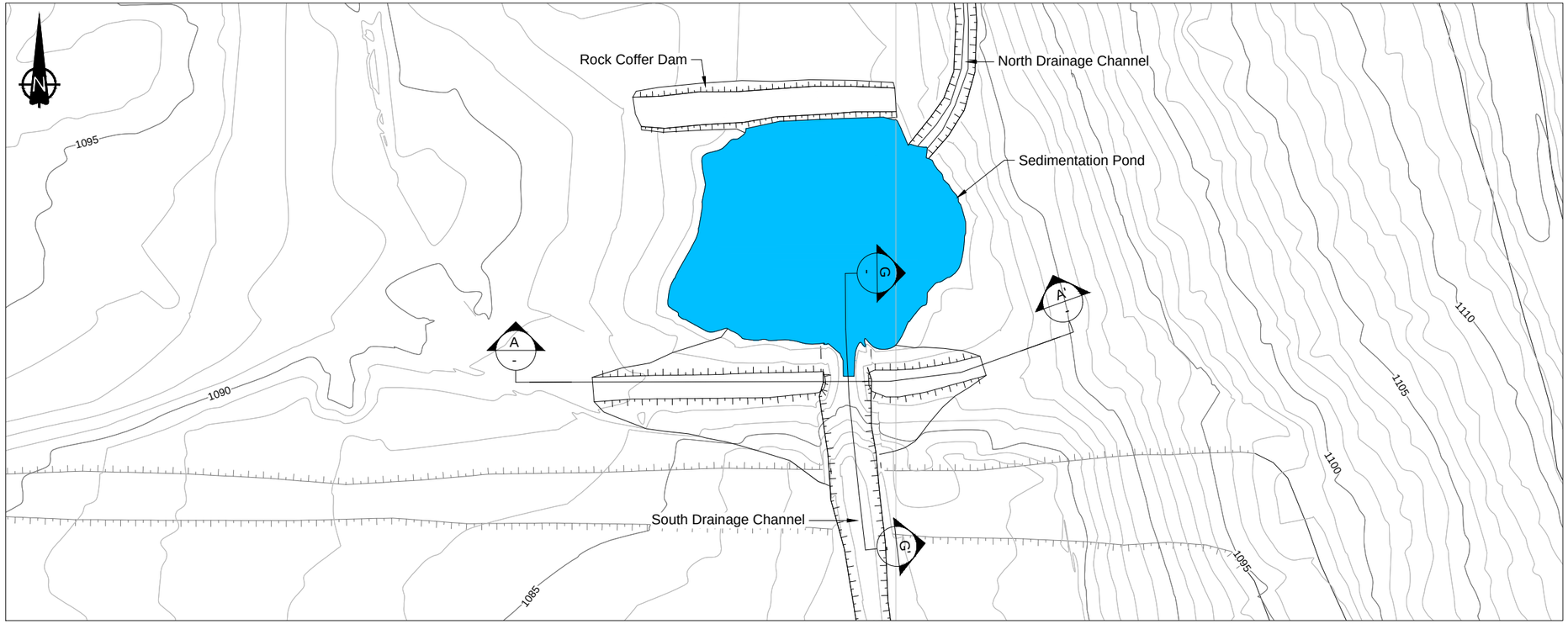


Plan

0m 10 20 30 40

LEGEND

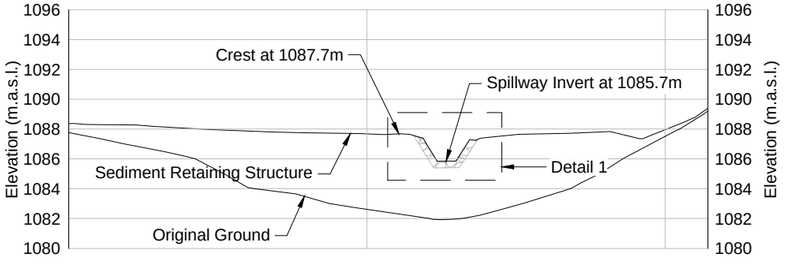
- Major Contour (5m)
- Minor Contour (1m)
- Dam Crest
- Dam Toe
- Edge of Road
- Sediment Pond

PROFILE AND DETAIL LEGEND

- Original Ground
- Non-woven Geotextile
- Riprap

NOTES

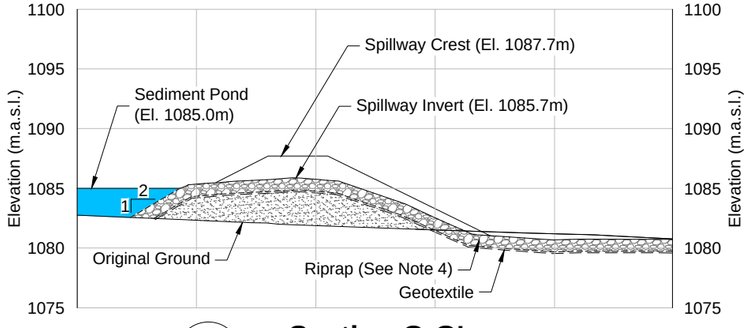
1. Excavated dam fill material was used to cap tailings. The final excavated surface was graded to promote drainage and blended topography into adjacent natural topography.
2. Rip rap from downstream toe buttress was salvaged and reused during channel construction.
3. The decant tower was demolished 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'

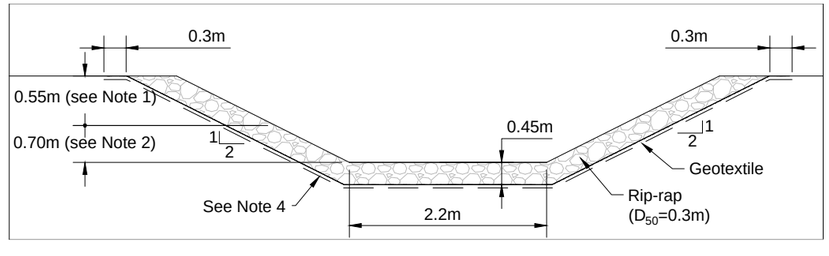
0m 10 20 30 40 Horizontal

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	2016 Geotechnical Investigation	
SRK JOB NO.: 1CT008.057		Sediment Retaining Structure Plan and Profile	
FILE NAME: 1CT008.057 - Sediment Retaining Structure.dwg	Sä Dena Hes Project	DATE: September 2016	APPROVED: PMH / DRAWING: 6

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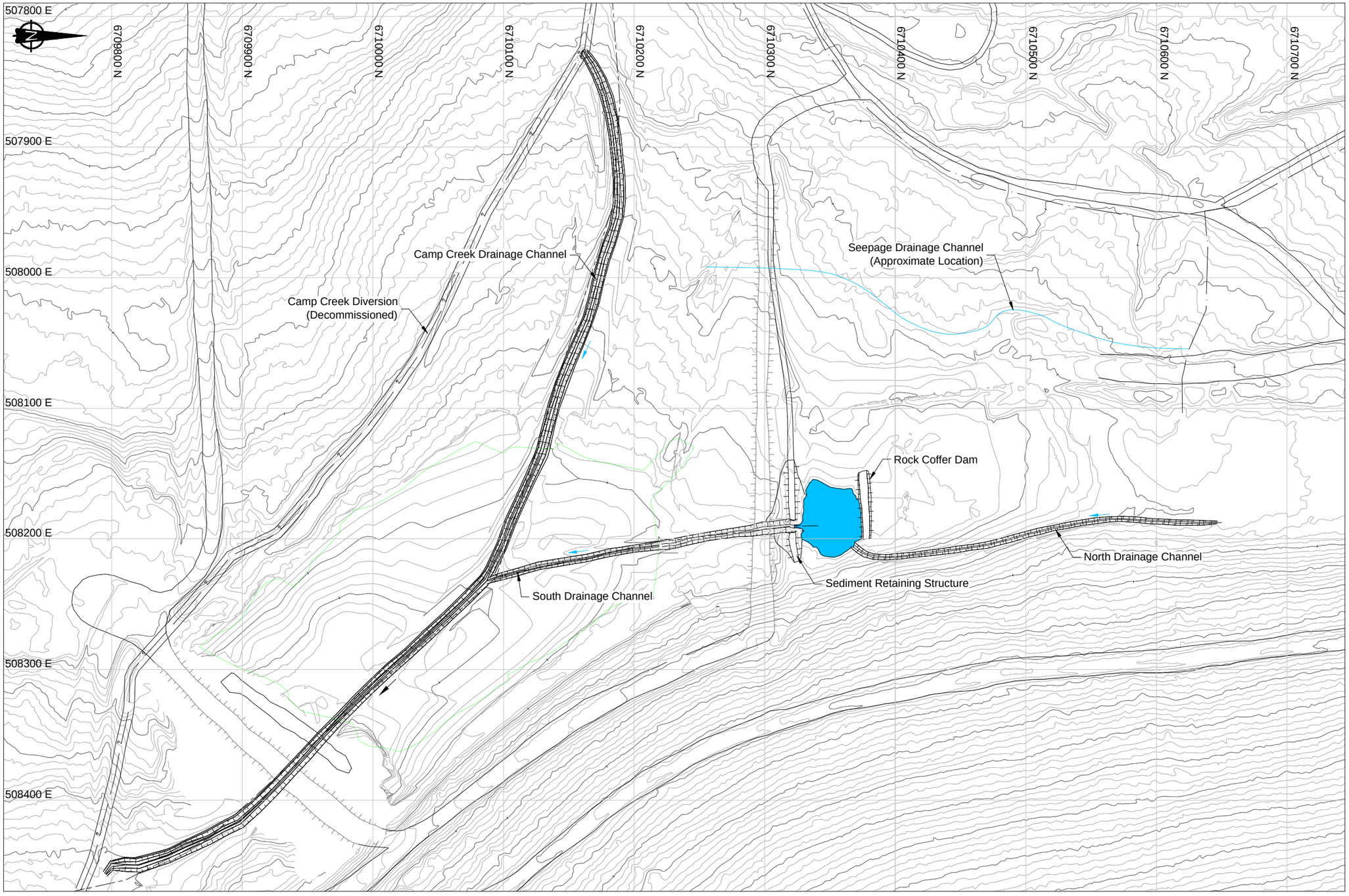

LEGEND

- 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.: 1CT008.057

FILE NAME: 1CT008.057 - Drainage Channel.dwg

Teck

Sä Dena Hes Project

2016 Geotechnical Investigation

Drainage Channel Plan

DATE:	APPROVED:	DRAWING:
September 2016	PMH	7

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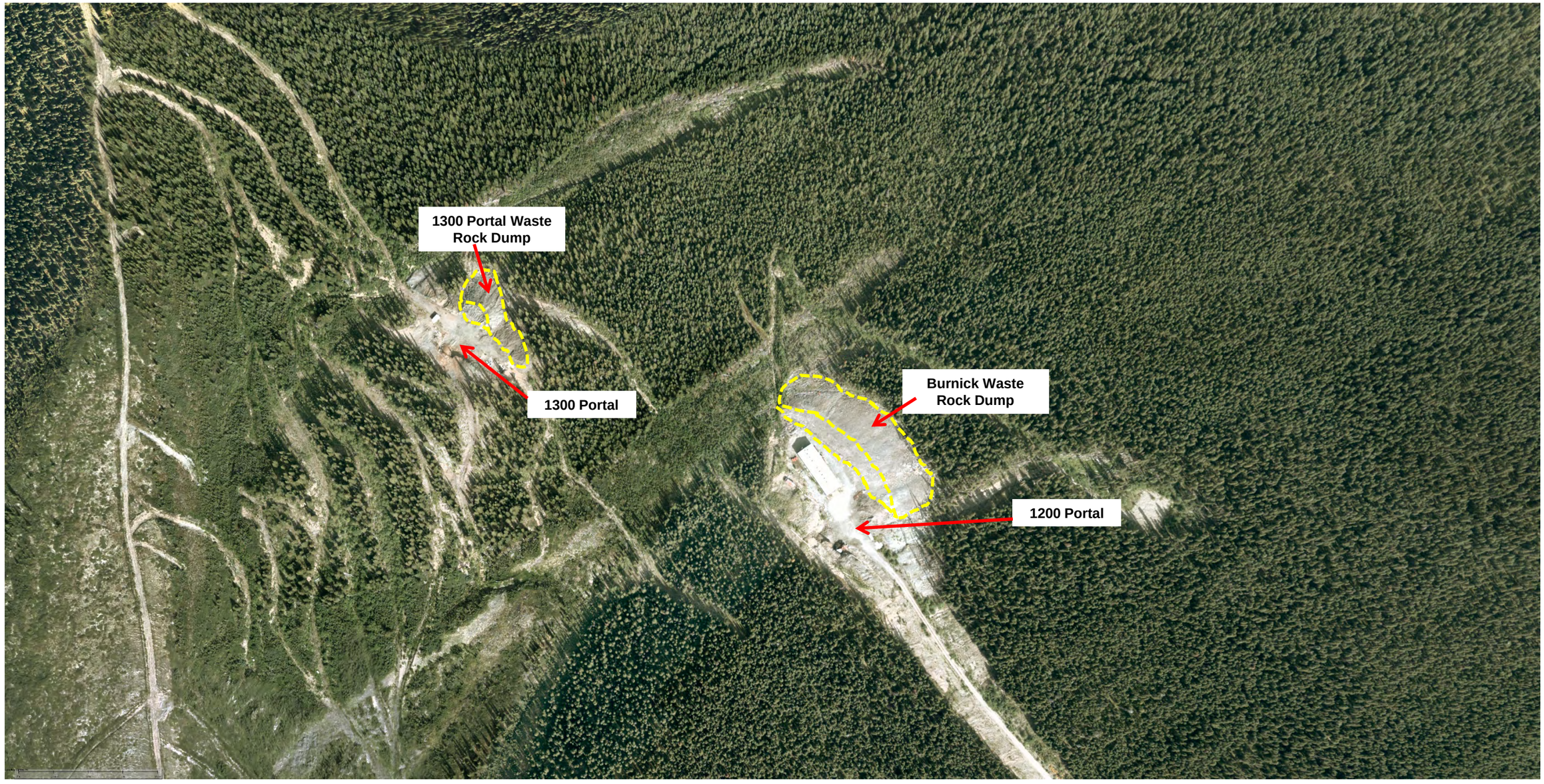

srk consulting	Teck	2016 Geotechnical Inspection
		Burnick Zone Plan View
Job No: 1CT008.057 Filename: Burnick Zone.pptx	Sä Dena Hes	Date: September 2015 · Approved: PMH · Figure: **8**

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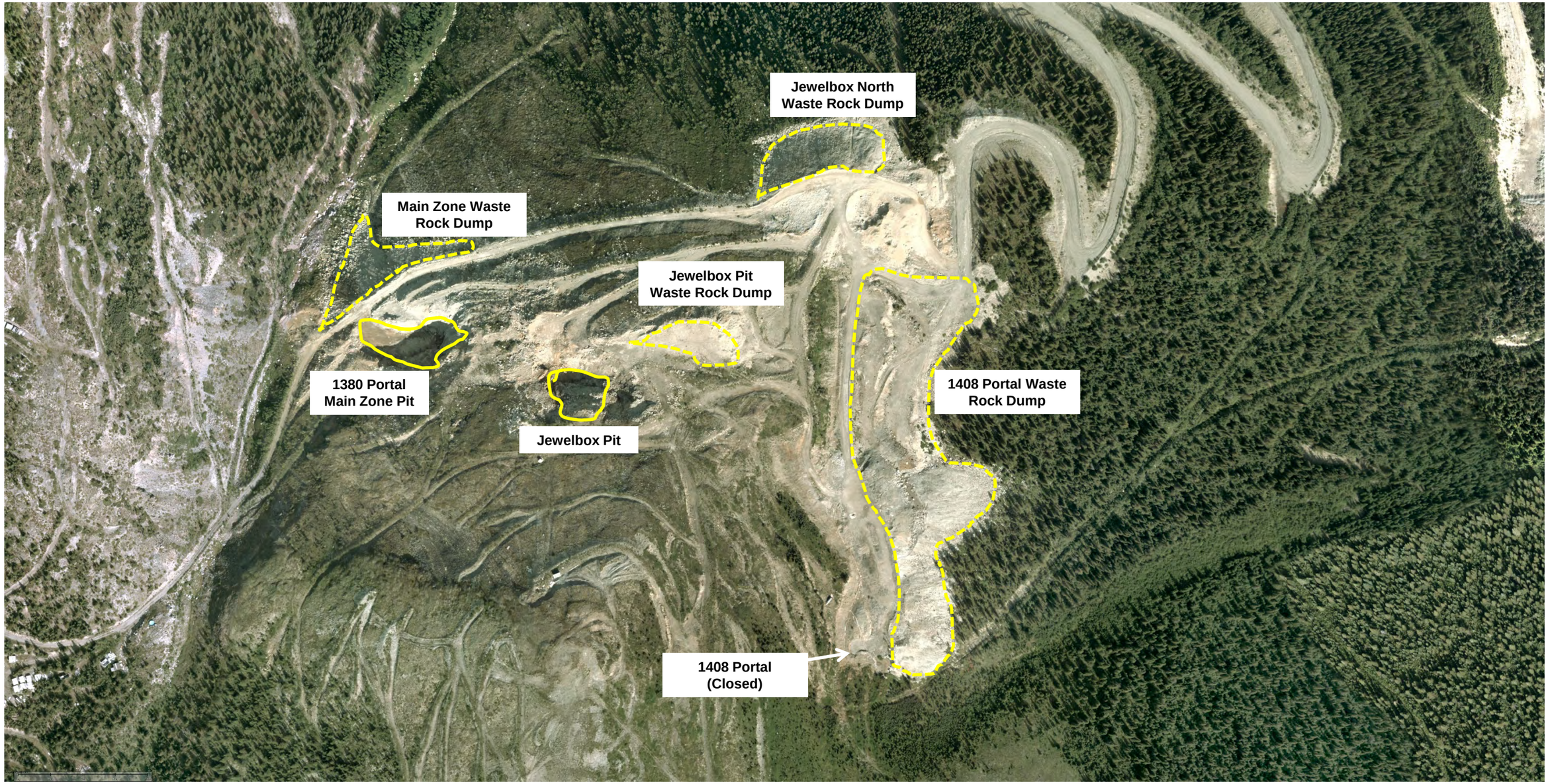

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srk consulting	Teck	2016 Geotechnical Inspection
		Main Zone and Jewelbox Zone Plan View
Job No: 1CT008.057 Filename: Main Zone and Jewelbox Zone.pptx	Sä Dena Hes	Date: September 2016 · Approved: PMH · Figure: **9**

Appendices

Appendix A: Photo Log

Photo 1: View West along the North Dam Crest

Photo 2: View East along the Downstream Face of the North Dam

Photo 3: Protective Steel Caps for Piezometers NDM 3A and 3B, Settlement Gauge NDS 3

Photo 4 PVC Piezometer Inside the Protective Caps

Photo 5: View looking West over the Till Cover Adjacent to the North Dam

Photo 6: Ponding in the Central Drainage Channel within the Till Cover

Photo 7: Central Drainage Channel Looking Downstream

Photo 8: Riprapped Section of North Creek at the Location of the Reclaimed North Creek Dyke

Photo 9: Exposed Fabric at the Outlet of the Riprapped Channel in North Creek

Photo 10: Riprapped Channel at the Second Crossing of North Creek s

Photo 11: Spillway at Sediment Retaining Structure

Photo 12: Seepage along Toe of the Sediment Retaining Structure from Hillside Springs

Photo 13: Upper Reach of the North Channel

Photo 14: Subsidence Zone adjacent to the outlet of the North Channel

Photo 15: Sediment Pond and outlet from the North Drainage channel in background

Photo 16: View downstream of the South drainage channel

Photo 17: View upstream of the Camp Creek drainage channel

Photo 18: View Downstream of the Camp Creek Drainage Channel

Photo 19: Inlet of Camp Creek into the Camp Creek drainage channel

Photo 20: View downstream of the Camp Creek Drainage Channel

Photo 21: Regraded areas of the Jewelbox waste rock dump

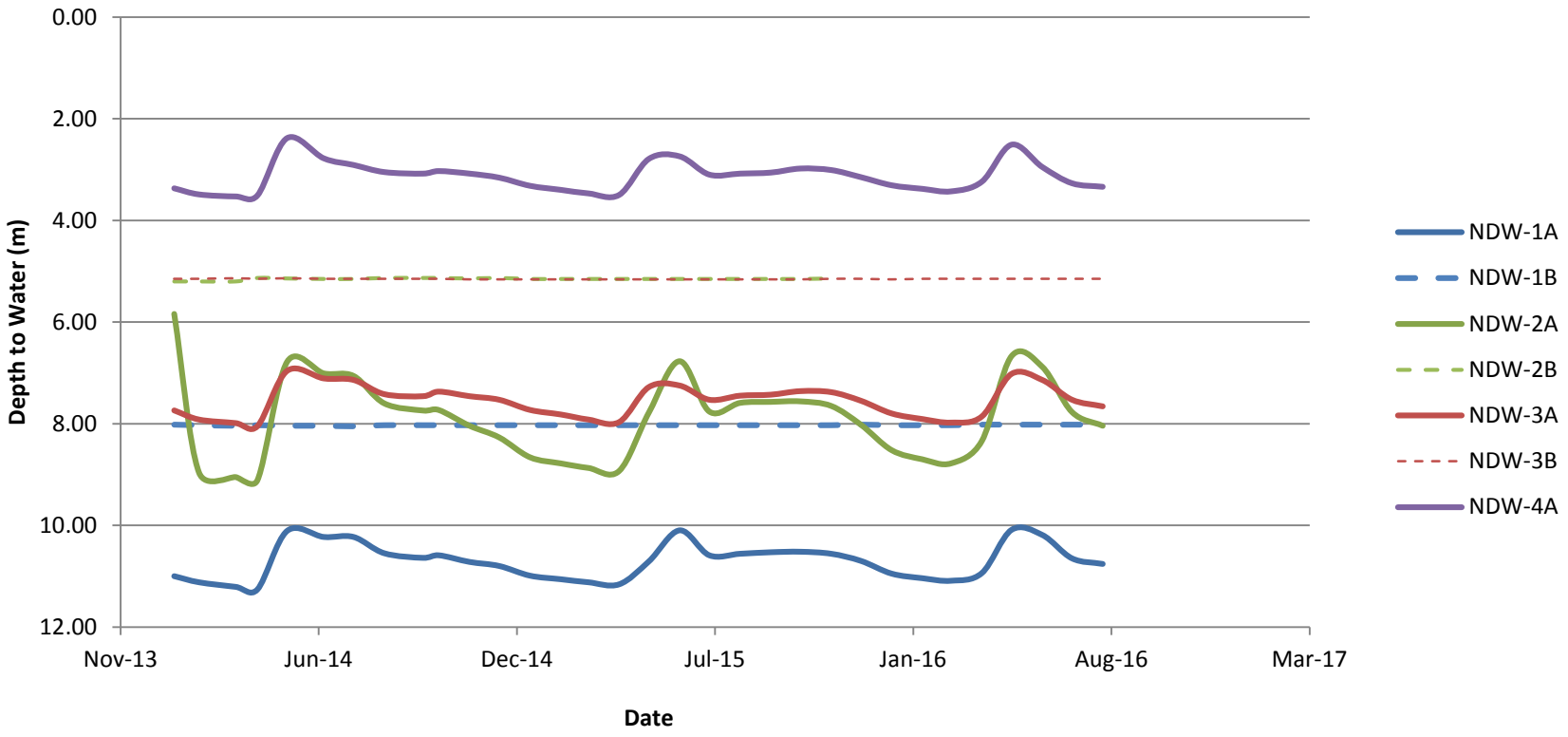
Photo 22: Subsidence Cracks due to Settlement of the Fill Placed over the 1200 Portal

Photo 23: Burnick Dump Slopes

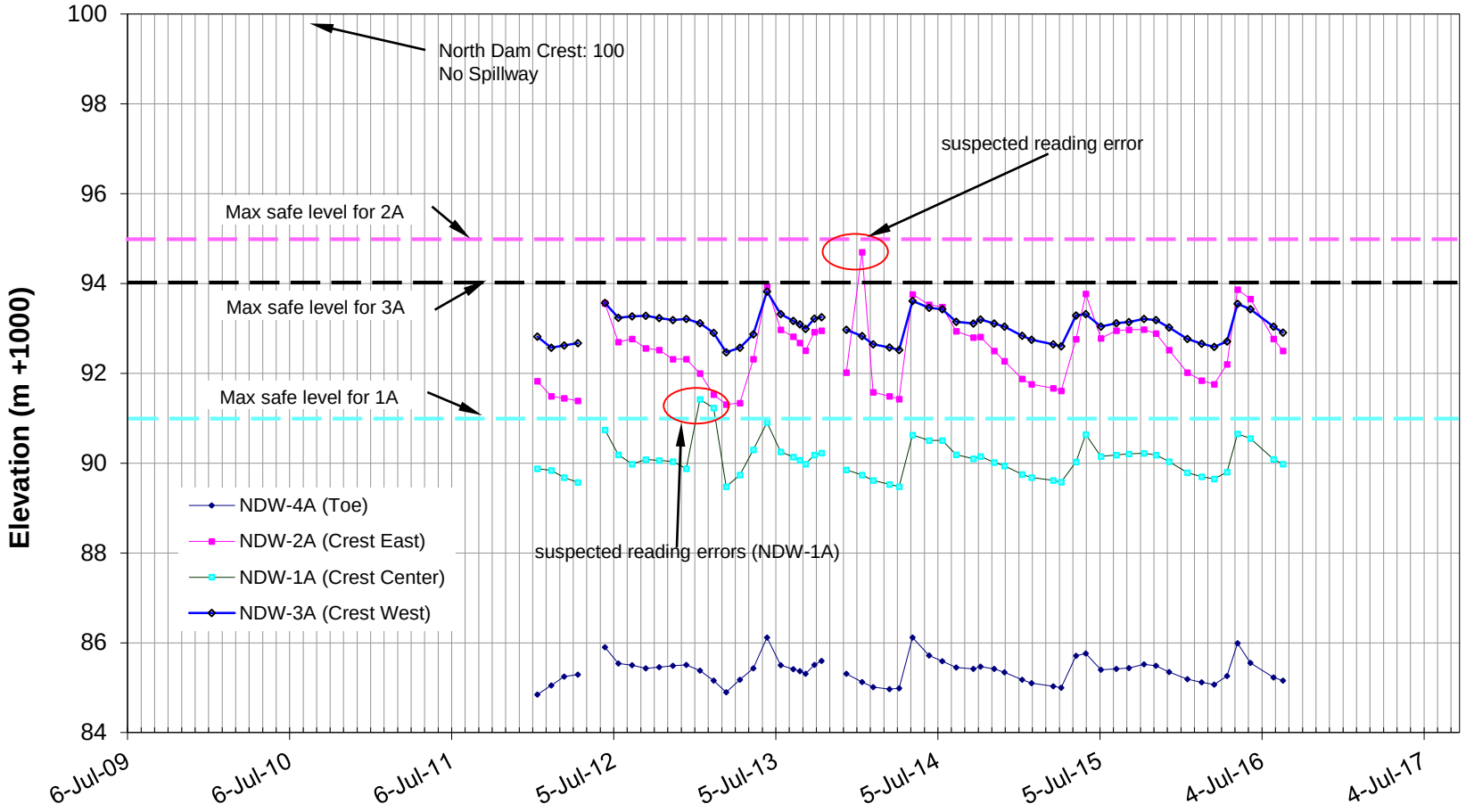
Photo 24: Overview of the TMA from Jewelbox Dump

Appendix B: Water Levels

Depth to Water - North Dam Crest Piezometers 2014-16



srk consulting	Teck	North Dam
		2014-2016 Piezometric Levels in North Dam
Job No: 1CT008.057 Filename: FigB1_2014_2016PiezoLevels_1CT008.057_rev1.pptx	Sa Dena Hes	Date: September 2016 / Approved: PMH / Figure: **B1**



srk consulting	Teck	2016 Geotechnical Inspection
Job No: 1CT008.057 Filename: FigB1_2011_2016PiezoLevels_1CT008.057_rev1.pptx	Sa Dena Hes	**2011-2016 Piezometric Levels in North Dam**
		Date: October 2016 / Approved: PMH / Figure: **B2**

Table B1: NDM Piezometer Levels

	12-Oct-15	08-Nov-15	08-Dec-15	18-Jan-16	21-Feb-16	18-Mar-16	16-Apr-16	10-May-16	08-Jun-16	30-Jul-16	20-Aug-16
NDW-1A	10.52	10.56	10.70	10.95	11.04	11.09	10.94	10.09	10.19	10.65	10.76
NDW-1B	8.02, soft bottom @ 8.05	8.03, soft bottom @ 8.05	8.02, soft bottom @ 8.05	8.03, soft bottom @ 8.05	8.03, soft bottom @ 8.04	8.03, soft bottom @ 8.05	8.02, soft bottom @ 8.05	8.02, soft bottom @ 8.05	8.03, soft bottom @ 8.04	8.01, soft bottom @ 8.04	8.02, soft bottom @ 8.05
NDW-2A	7.56	7.65	8.02	8.52	8.70	8.78	8.34	6.67	6.88	7.77	8.04
NDW-2B	5.13, soft bottom @ 5.16	5.14, soft bottom @ 5.15	5.15, soft bottom @ 5.16	5.15, soft bottom @ 5.16	5.15, soft bottom @ 5.16	5.15, soft bottom @ 5.16	5.13, soft bottom @ 5.16	5.13, soft bottom @ 5.16	5.14, soft bottom @ 5.15	5.14, soft bottom @ 5.16	5.14, soft bottom @ 5.16
NDW-3A	7.36	7.38	7.55	7.80	7.91	7.98	7.86	7.02	7.14	7.53	7.66
NDW-3B	5.15, soft bottom @ 5.23	5.15, soft bottom @ 5.23	5.15, soft bottom @ 5.23	5.16, soft bottom @ 5.23	5.15, soft bottom @ 5.23	5.15, soft bottom @ 5.23	5.15, soft bottom @ 5.23	5.14, soft bottom @ 5.23	5.14, soft bottom @ 5.22	5.14, soft bottom @ 5.23	5.15, soft bottom @ 5.23
NDW-4A	2.98	3.01	3.15	3.31	3.38	3.43	3.24	2.51	2.95	3.27	3.34
TH-14-91	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned
Pond level							NO WATER AGAINST DAM				
RDW-1A	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned
RDW-1B	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned
RDW-1C	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned
RDW-2A	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned
RDW-2B	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned
RDW-2C	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned
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GW-1B	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned
Pond level	Pond filled, covered	Pond filled, covered	Pond filled, covered	Pond filled, covered	Pond filled, covered	Pond filled, covered	Pond filled, covered	Pond filled, covered	Pond filled, covered	Pond filled, covered	Pond filled, covered
SDW-1A	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned
SDW-1B	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned
SDW-2A	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned
SDW-2B	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned
SDW-3A	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned
SDW-3B	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned
SDW-5A	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned
SDW-5B	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned
SDW-4A	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned
SDW-4B	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned
SDW-4C	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned	Decommissioned
Pond level	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

NOTES: Yellow highlighting: water level measurement could not be made; piezometer dry;

Appendix 4: 2016 Environmental Monitoring at False Canyon Creek Report

ENVIRONMENTAL MONITORING

AT

FALSE CANYON CREEK, 2016

For

Teck Resources Ltd

Sä Dena Hes Operating Corporation,

Submitted by

Laberge Environmental Services
&
Can-Nic-A-Nick Environmental Sciences

November 2016

Laberge
ENVIRONMENTAL SERVICES
P.O. Box 21072
Whitehorse, Y.T.
Y1A 6P7

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LETTER OF TRANSMITTAL

Michelle Unger
Senior Environmental Coordinator
Teck Resources Limited
Bag 2000,
Kimberley, BC
V1A 3E1

Dear Michelle:

Re: **Environmental Monitoring at False Canyon Creek, 2016**

We are pleased to submit herewith, the above report covering the environmental monitoring programs completed in 2016 at the Sä Dena Hes property.

The water and stream sediment chemistry in the False Canyon Creek drainage continue to be of good quality for the support of freshwater aquatic life. Robust communities of benthic invertebrates were present at all sites. Fish populations increased at MH-16 and MH-20 in 2016, however, only one sculpin was captured again at MH-13. This may be due to fluctuating water levels of the beaver complex resulting in possible winter kill conditions.

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 Operating 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.

The use of water and disposal of waste at the property was governed by Water Licence Number QZ99-045 which was re-issued by the Yukon Territory Water Board in January 2002 and expired on December 31st, 2015. 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 maintained in a temporary shut down mode. The water licence required that certain fish, benthic invertebrate and sediment monitoring programs be carried out every two years. This license was renewed for one year under License # QZ15-082 effective January 1st, 2016, to accommodate the submission of the 25 year post reclamation license application. Thus, an environmental monitoring program was undertaken in August 2016 to comply with Part F, Sections 54 to 64 of the extended license.

Teck engaged Laberge Environmental Services (LES) and Can-Nic-A-Nick Environmental Sciences to conduct the monitoring programs required for 2014. This report presents the results of the programs with some comparisons made with previous studies conducted in 1992 (P.A. Harder and Associates, 1993), in 1994 (LES and WMEC, 1995), in 1996 (LES, 1996), in 1998 (LES and Can-Nic-A-Nick, 1998), in 2000 (LES and Can-Nic-A-Nick, 2000), in 2002 (LES and Can-Nic-A-Nick, 2002) in 2004 (LES and Can-Nic-A-Nick, 2004), in 2006 (LES and Can-Nic-A-Nick, 2006), in 2008 (LES and Can-Nic-A-Nick, 2008), in 2010 (LES and Can-Nic-A-Nick, 2011), in 2012 (LES and Can-Nic-A-Nick, 2012) and in 2014 (LES and Can-Nic-A-Nick, 2015) .

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 mine was primarily an underground operation with potential for two small open pits. Waste dumps and sediment ponds were situated in tributary drainages. Tailings and wastewater were discharged to the tailings pond. (Note that the mill and mine did not operated after December 2, 1992.) The tailings pond water flowed to the reclaim pond which was licensed to discharge to upper False Canyon Creek, a tributary of the Frances River, during specified time periods each year. Decommissioning of the site has been ongoing for the past few years. During 2014 the reclaim and south tailings ponds were dewatered and the dams were decommissioned, with the remaining topography recontoured and planted with a mix of agronomic grasses, native grasses and/or shrubs.

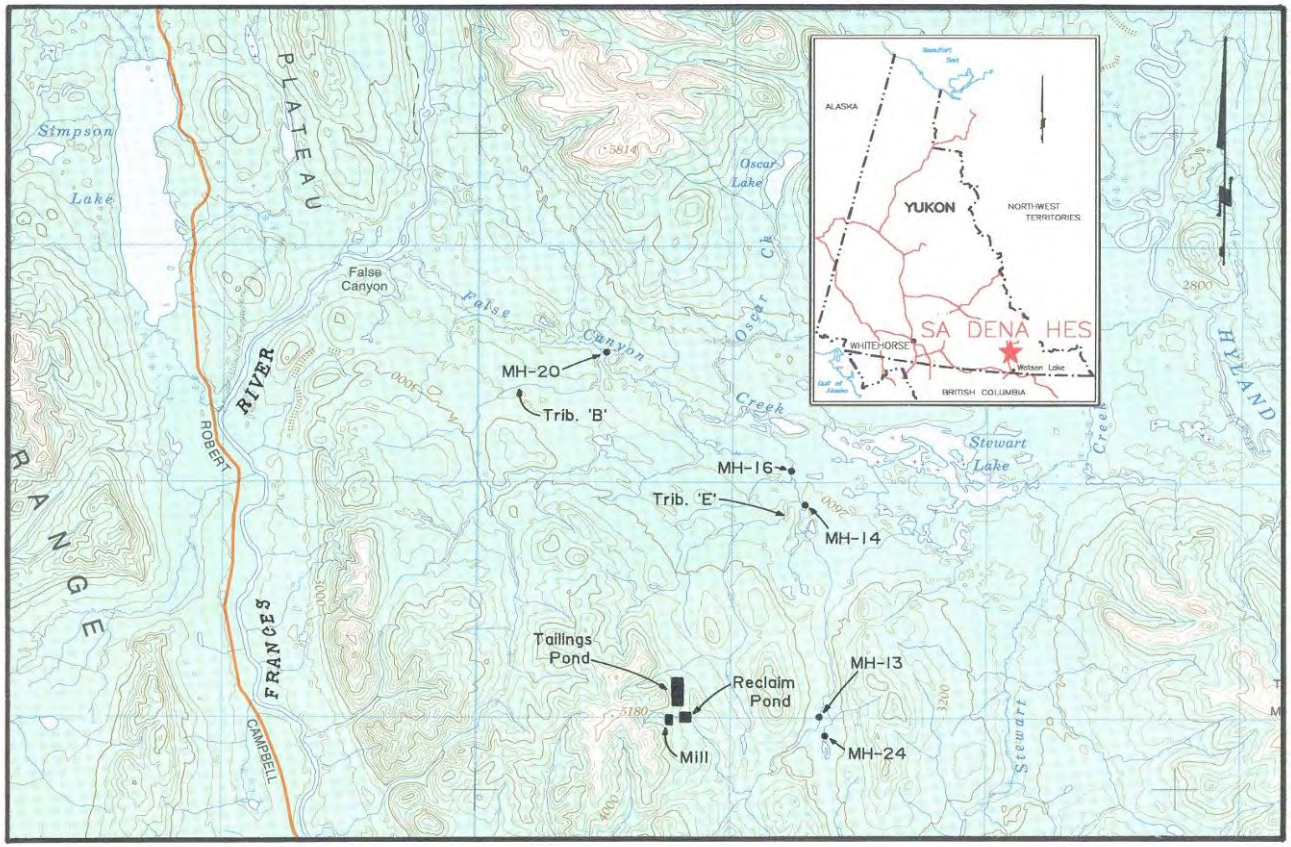
The sample sites are within the drainage basin of False Canyon Creek which has a total catchment area of 492 km^2. The Frances River discharges into the Liard River 55 kilometres downstream from the confluence with False Canyon Creek. Three sites on False Canyon Creek (MH13, MH16 and MH20) were sampled for water, sediment, fish and benthos (Figure 1). The site locations, descriptions and types of monitoring are outlined in Table 1.

TABLE 1
SAMPLE SITE DESCRIPTIONS

SITE #	DESCRIPTION	COORDINATES	SAMPLE TYPE
MH13	False Canyon Cr approx 10 km d/s of reclaim pond.	60° 31' 21.1" N 128° 45' 34.6" W	WQ, SS, BI, F
MH16	False Canyon Cr. approx 22 km d/s of reclaim pond	60° 37' 37.3" N 128° 46' 53.2" W	WQ, SS, BI, F
MH20	False Canyon Cr approx 33 km d/s of reclaim pond	60° 39' 06.8" N 128° 51' 32.4" W	WQ, SS, BI, F

WQ = water quality SS = stream sediments
BI = benthic invertebrates F = fish

The licence states that sampling should also be undertaken at MH14 and MH18 for the benthos, fish and sediment surveys. MH14 was submerged between 1996 to 2006, and the alternate site MH16, located two kilometers downstream, had been used for those studies. The present sampling location at MH14 is now no longer flooded, however in the pursuit of consistency, MH16 was again used as the sample site rather than MH14.



FALSE CANYON CREEK

FIGURE 1 - LOCATION OF SAMPLE SITES

5 0 5 10 15 20 km

SCALE 1 : 250,000

MH-20 · · · · · · · · · · Sample Site

Regular water quality samples are collected quarterly at MH14 however. MH16 is also a quarterly water quality station and is located on the main stem of False Canyon Creek. This area is presently unaffected by beaver activity and is representative of a more stable environment than MH14.

As with all previous monitoring surveys, a suitable landing site could not be located for MH18. To maintain consistency with the 1992, 1994, 1996, 1998, 2000, 2002, 2004, 2006, 2008, 2010 and 2012, and 2014 studies, MH20 was sampled for benthos instead of MH19.

Site MH24, on the headwaters of False Canyon Creek, was to serve as the control site since 1998, as it is unaffected by any potential mining activity. It was discovered in 1998 that the site characteristics and sampling limitations were similar to those associated with MH14. Specifically, MH24 was underlain with water with no defined stable channel, and no safe landing site. These conditions make this site unsuitable as a background/control site for the monitoring program and no attempts were made to collect any data in 2016. An alternate control site, MH-30, has been established upstream on False Canyon Creek above the confluence with Camp Creek. This site will be in the new water license for SDH, effective next year.

Assessments of the fish communities at sites MH13, MH16 and MH20 continued to act as monitors of changes in water quality for 2016. All of these sites now have considerable fisheries, sediment, water quality and benthic invertebrate data, collected over many years providing an opportunity for trend and cumulative effects analyses.

3.0 METHODS

The environmental monitoring programs described below were completed on August 25th and 26th, 2016. All sites were accessed by helicopter.

3.1 Water Quality

Water quality samples were collected at each site. The samples were collected in a fast flowing section of the stream, prior to any other sampling activity.

3.1.1 Field Measurements

In-situ measurements were taken at each site. Temperature, conductivity and pH measurements were obtained using a Hanna multi-probe.

3.1.2 Chemical Analyses

All sample bottles were supplied by Maxxam Analytics Inc of Burnaby, B.C. At each site, samples were collected in 500 mL plastic bottles for sulphates, alkalinity and nonfilterable residue. Samples to be analyzed for total suspended solids were collected in 1 L plastic bottles.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. All sample bottles with the exception of the dissolved metals sample, were partially filled and rinsed three times prior to collecting sample waters. The dissolved metals sample bottle was rinsed three times with the filtrate. Samples were kept cool prior to shipment to Maxxam. All samples were kept cool until delivered to the Maxxam depot in Whitehorse, Yukon.

3.2 Sediment Sampling

Triplicate sediment samples were collected from MH13, MH16 and MH20. Sample sites were selected from areas of deposition along the stream bank, generally characterized by the finest grain size evident at the site. Samples were collected with a stainless steel trowel and placed in ziplock freezer bags. The samples were packed with ice packs when shipped to Maxxam in B.C.

At the lab the samples were dried, passed through a 100 mesh (0.15 mm) stainless steel sieve, and then run through an ICP analysis to determine total metals levels.

3.3 Benthic Invertebrates

Benthic invertebrates were sampled at three similar locations per site. The samples were collected from an undisturbed, fast flowing, gravel strewn riffle habitat at each of the sites where possible. Collections were made with a Surber sampler (area = 0.0929 m^2) which had a 300 micron mesh net. The bed material within the frame was cleaned and washed by hand, with the fast flowing current carrying the disturbed bottom fauna and detritus into the collection bag. The level of effort for each sample and at each site was comparable. The captured invertebrates and detritus were placed in one-litre Nalgene bottles, preserved in 10% formalin, and shipped to Cordillera

Consulting in Summerland, B.C., for sorting, identification and enumeration. At the lab, the following procedures were followed:

- Using a gridded Petri dish, fine forceps and a low power stereo-microscope (Olympus, Nikon, Leica) the sorting technicians removed the invertebrates and sorted them into family/orders.

- The sorting technician kept a running tally of total numbers excluding organisms from Porifera, Nemata, Platyhelminthes, Ostracoda, Copepoda, Cladocera and terrestrial drop-ins such as aphids. These organisms were marked for their presence and left in the sample. They were not included towards the 300-organism subsample count.

- Where specimens were broken or damaged, only heads were counted.

- Subsampling was conducted with the use of a Marchant Box.

- If the 300th organism was found part way into sorting a cell then the balance of that cell was sorted. If the organism count had not reached 300 by the 50th cell then the entire sample was sorted.

- The total number of cells sorted and the number of organisms removed were recorded manually on a bench sheet and then recorded into INSTAR1

- Organisms were stored in vials containing 80% ethanol and an interior label indicating the site names, date of sampling, site code numbers and portion subsampled. This information was also recorded on the laboratory bench sheet and on INSTAR1.

- The sorted portion of the debris was preserved and labeled separately from the unsorted portion and was tested for sorting efficiency (Sorting Quality Control – Sorting Efficiency). The unsorted portion was also labeled and preserved in separate jars.

- 10% of the samples were randomly chosen for re-sorting for quality control

- Identifications were made at the genus/species level for all insect organisms found including Chironomidae (Based on CABIN protocol).

- Non-insect organisms (except those not included in CABIN count) were identified to genus/species where possible and to a minimum of family level with intact and mature specimens.

- The Standard Taxonomic Effort lists compiled by the CABIN manual1, SAFIT2 , and PNAMP3 were used as a guideline for what level of identification to achieve where the condition and maturity of the organism enabled.

- Organisms from the same families/order were kept in separate vials with 80% ethanol and an interior label of printed laser paper.

- Chironomidae was identified to genus/species level where possible and was aided by slide mounts. CMC-10 was used to clear and mount the slide.

- Oligochaetes were identified to family/genus level with the aid of slide mounts. CMC-10 was used to clear and mount the slide.

- Other Annelida (leeches, polychaetes) were identified to the family/genus/species level with undamaged, mature specimens.

- Mollusca was identified to family and genus/species where possible

- Decapoda, Amphipoda and Isopoda were identified at family/genus/species level where possible.

- Bryozoans and Nemata remained at the phylum level

- Hydrachnidae and Cnidaria were identified at the family/genus level where possible.

- When requested, reference collections were made containing at least one individual from each taxa listed. Organisms represented will have been identified to the lowest practical level.

- Reference collection specimens were stored in 55 mm glass vials with screw-cap lids with polyseal inserts (museum quality). They were labeled with taxa name, site code, date identified and taxonomist name. The same information was applied to labels on the slide mounts.

3.4 Fish Monitoring

Three sites on False Canyon Creek (MH13, MH16, and MH20) were sampled for the presence of fish during August of 2016. Fieldwork was completed during the week of August 22 to 26. The methodology and timing of the assessment was consistent with all previous fisheries monitoring programs in the watershed. The current water license requires biennial monitoring during periods when the mine is not active. The mine has not been active since the mid 1990s. Fisheries monitoring programs have been conducted biennially since 1994 (LES 1995).

As in all previous programs, a Smith Route model LR24 battery powered electrofisher was the primary method used for establishing fish presence at each site. A conductivity meter was used to measure the conductivity of the surface flows at each site to assist in determining the most appropriate settings of the electrofisher. The shocking time (seconds) and settings (voltage, frequency and duty cycle) used while fishing were recorded for each sampling site. Three Gee type baited minnow traps were also set overnight at each of the sampling sites using methods described by the Yukon River Panel (2007). Angling was additionally used at sites MH16 and MH20. Angling employed the use of small spinners. The time spent angling was used as an index of sampling effort. All angled fish were identified and measured. The numbers of lure strikes, species and approximate size were noted. A 1.5 X 7 meter beach seine (6.3 mm oval mesh) was also used to sample shallow water sidebars at site MH20. 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 Water Quality

Water quality samples were collected from each of the three sites on the main channel of False Canyon Creek during the 2016 study. As a measure of quality control and quality assurance, a duplicate sample was collected at MH-20. All data are presented in Appendix B. Of the 34 metals analyzed, seven were below detection at each site in both the total and dissolved states (beryllium, bismuth, boron, sulphur, titanium, thallium, and zirconium).

The results for the field data and for the specified licensed parameters are presented in Table 2. 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. None of the examined parameters exceeded their applicable guidelines.

TABLE 2

WATER QUALITY DATA, AUGUST 2016

Sample Site	**MH13**	**MH16**	**MH20**	Detection Limit	CCME Guideline for freshwater aquatic life
Date Sampled	August 25	August 25	August 25		
Time Sampled	10:45	12:30	14:00		
Water Temp °C	9.7	10.1	12.0		
pH: in-situ	7.78	8.17	8.08		6.5 to 9.0
Conductivity (uS/cm) field	366	369	270		
Dissolved Oxygen (mg/L) Dissolved Oxygen (%)	7.5 64.9	9.0 79.7	8.6 80.2		
Alkalinity (mg/L as CaCO3)	234	215	152	0.5	
Sulphate (mg/L)	7.9	6.6	7.7	1.0	
Ammonia (mg/L)	0.030	0.021	0.044	0.005	1.04
Total Suspended Solids (ppm)	1.7	2.0	1.0	1.0	
Cu: total (ug/L) Cu: dissolved (u/gL)	0.53 0.29	0.21 0.23	0.34 0.30	0.20 0.20	3 to 4
Pb: total (ug/L) Pb: dissolved (ug/L)	0.107 <0.020	0.025 <0.020	0.027 <0.020	0.020 0.020	5 to 7
Zn: total (ug/L) Zn: dissolved (ug/L)	1.6 <1.0	<1.0 <1.0	1.1 <1.0	1.0 1.0	30
Fe: total (ug/L) Fe: dissolved (ug/L)	162 51.5	170 43.4	194 77.6	1.0 1.0	300
Total Hardness mg/L as CaC03	143	217	158		

The waters of the study area were seasonally warm 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 MH-13 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.

Sulphate levels were low at all sites ranging from 6.6 to 7.9 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 False Canyon Creek drainage are a reflection of naturally high carbonate/bicarbonate and low sulphate concentrations.

False Creek Canyon waters were clear at all of the sites.

Concentrations of the examined metals were low. The guidelines vary for copper and lead depending on the hardness of the sampled water. All metal concentrations in both the dissolved and total states were well below the guidelines for the protection of freshwater aquatic life.

Concentrations of potential toxicants in water collected during the thirteen surveys (1992, 1994, 1996, 1998, 2000, 2002, 2004, 2006, 2008, 2010, 2012, 2014 and 2016) are compiled in Table 3. The majority of the analyses were below the method detection limit. The method detection limit (MDL) has decreased over time providing more precision at lower concentrations. The concentration of cadmium has slightly exceeded the MDL at each of the sites on rare occasions. The analytical procedure in 2000 allowed for a lower MDL for copper resulting in reportable copper values at each site from 2000 to the present. The level of nickel has consistently been below the MDL with the exception of a low concentration documented in the 1998 dissolved sample at MH16. The MDL for nickel, lead and zinc was lowered in 2014 allowing for reportable concentrations of some of these metals since that time at sites where they had previously been rarely or not documented before. Zinc has been occasionally detected at each of the sites.

None of the detectable values exceeded the CCME recommended guidelines. The low concentrations of reported metals throughout the study area over the study period indicate good water quality for the support of freshwater aquatic life.

4.1.1 Quality Assurance and Quality Control (QA/QC)

As measures of QA/QC, a duplicate sample was collected at MH-20 and a laboratory prepared travel blank accompanied the sampling program. The data for the duplicate were very similar to that of MH-20 indicating excellent sampling technique and a representative sample. Results for the travel blank were below the method detection limits with the exception of detectable nickel in their dissolved sample.

TABLE 3

COMPARISON OF POTENTIAL TOXICANTS (mg/L) AT EACH OF THE SITES OVER THE STUDY PERIOD

Site	Year	Cadmium		Copper		Nickel		Lead		Zinc	
		Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved
MH - 13	1992	<0.0005	<0.0005	<0.001	<0.001	<0.008	<0.008	0.002	<0.001	0.004	<0.002
	1994	<0.0001	<0.0001	<0.002	<0.001	<0.01	<0.008	<0.003	<0.001	<0.01	<0.002
	1996	<0.0001	<0.0001	<0.002	<0.001	<0.01	<0.008	<0.003	<0.001	0.07	<0.002
	1998	<0.002	<0.002	<0.003	0.001	<0.01	<0.008	<0.03	<0.02	<0.01	<0.002
	2000	0.00008	<0.00002	0.0008	0.0006	<0.01	<0.008	<0.001	<0.001	<0.005	<0.005
	2002	<0.00001	0.00002	0.0006	0.0005	<0.008	<0.008	<0.0005	<0.0005	0.01	<0.005
	2004	0.00002	<0.00001	0.0003	0.0004	<0.008	<0.008	<0.0005	<0.0005	<0.005	<0.005
	2006	0.00001	0.00001	0.0003	0.0003	<0.008	<0.008	<0.0005	<0.0005	<0.005	<0.005
	2008	0.00003	0.00003	0.0004	0.0004	<0.001	<0.001	<0.0002	<0.0002	<0.005	<0.005
	2010	not reported	0.00002	0.0003	0.0006	<0.001	<0.001	<0.0002	<0.0002	<0.005	<0.005
	2012	0.000026	0.000019	0.00038	0.0005	<0.0010	<0.0010	<0.00020	<0.00020	<0.0050	<0.0050
	2014	0.000036	0.000017	0.00041	0.00031	0.00053	0.00048	0.000434	0.000032	0.00238	0.00089
	2016	0.000025	0.000014	0.00053	0.00029	0.00031	0.00036	0.000107	<0.000020	0.0016	<0.0010
MH - 16	1992	<0.0005	<0.0005	<0.001	<0.001	<0.008	<0.008	0.003	<0.001	0.002	<0.002
	1998	<0.002	<0.002	0.004	0.001	<0.01	0.010	<0.03	<0.02	<0.01	<0.002
	2000	0.00002	<0.00002	0.0006	0.0006	<0.01	<0.008	<0.001	<0.001	<0.005	<0.005
	2002	<0.00001	<0.00001	0.0005	0.0005	<0.008	<0.008	<0.0005	<0.0005	0.009	<0.005
	2004	0.00002	<0.00001	0.0003	0.0004	<0.008	<0.008	<0.0005	<0.0005	<0.005	<0.005
	2006	0.00002	<0.00001	0.0004	0.0003	<0.0008	<0.008	<0.0005	<0.0005	<0.005	<0.005
	2008	0.00001	0.00004	0.0003	0.0008	<0.001	<0.001	<0.0002	0.0002	<0.005	0.005
	2010	not reported	<0.00001	0.0002	0.0002	<0.001	<0.001	<0.0002	<0.0002	<0.005	<0.005
	2012	0.000012	<0.000010	0.00026	0.00034	<0.0010	<0.0010	<0.00020	<0.00020	<0.0050	<0.0050
	2014	0.000014	0.000008	0.00029	0.00050	0.00035	0.00029	0.000087	0.000007	0.00111	0.00013
	2016	0.000009	0.000008	0.00021	0.00023	0.00025	0.00025	0.000025	<0.000020	<0.0010	<0.0010
MH - 20	1992	<0.0005	<0.0005	<0.001	<0.001	<0.008	<0.008	0.002	0.001	0.002	<0.002
	1994	<0.0001	<0.0001	<0.002	<0.001	<0.01	<0.008	<0.003	<0.001	<0.01	<0.002
	1996	<0.0001	<0.0001	<0.002	<0.001	<0.01	<0.008	<0.003	<0.001	0.01	<0.002
	1998	<0.002	<0.002	<0.003	<0.001	<0.01	<0.008	<0.03	<0.02	<0.01	<0.002
	2000	<0.00002	<0.00002	0.0008	0.0005	<0.01	<0.008	<0.001	<0.001	<0.005	<0.005
	2002	<0.00001	<0.00001	0.0006	0.0005	<0.008	<0.008	<0.0005	<0.0005	0.009	<0.005
	2004	<0.00001	<0.00001	0.0003	0.0005	<0.008	<0.008	<0.0005	0.0006	<0.005	<0.005
	2006	0.00001	<0.00001	0.0003	0.0003	<0.008	<0.008	<0.0005	<0.0005	<0.005	<0.005
	2008	0.00001	0.00001	0.0005	0.0004	<0.001	<0.001	<0.0002	<0.0002	<0.005	<0.005
	2010	not reported	<0.00001	0.0003	0.0003	<0.001	<0.001	<0.0002	<0.0002	<0.005	<0.005
	2012	<0.000010	<0.000010	0.00039	0.00179	<0.0010	<0.0010	<0.00020	<0.00020	<0.0050	<0.0050
	2014	0.00002	0.000012	0.000412	0.00028	0.000635	0.000492	0.000075	0.000011	0.00296	0.00038
	2016	0.000007	0.000006	0.00034	0.00030	0.00048	0.00043	0.000027	<000020	<0.0010	<0.0010

4.2 Sediments

The results for the metals analyses of all stream sediment samples are presented in Appendix B with the water quality data. Of the 30 metals analyzed, seven (As, Cd, Cr, Cu, Hg, Pb, and Zn) were chosen for closer examination as these can be potentially toxic to aquatic systems. The data for the triplicates was averaged per site and standard deviation was performed to determine the spread of the data (Table 4). Metals in sediments are often difficult to interpret because levels can vary widely as a function of natural mineralization of local soils in a given watershed. The standard deviation analysis shows that representative samples were collected at the majority of the sites. The high concentration of copper in sample MH-13B increased the average concentration for this site. Concentrations of copper and lead in sample MH-20A were much higher than the other two replicates, which significantly increased the mean here.

TABLE 4

METAL CONCENTRATIONS (mg/kg) IN THE INDIVIDUAL SEDIMENT SAMPLES, AUGUST 2016

	pH	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Zinc
MH-13 A	8.12	29.4	3.46	16.7	36.4	62.8	0.101	306
MH-13 B	8.1	38.9	6.34	17.6	102	99.4	0.117	364
MH-13 C	8.22	48	3.99	15.3	40.9	66.4	0.097	309
Mean	8.15	38.8	4.60	16.5	59.8	76.2	0.105	326
S.D.	0.06	9.3	1.53	1.2	36.6	20.2	0.011	33
MH-16 A	8.39	8.63	1.18	17	43.3	17.7	0.063	122
MH-16 B	8.39	5.8	0.638	16.8	16.6	11.2	<0.050	88.7
MH-16 C	7.6	13.1	0.897	17.2	17.5	11.7	0.059	108
Mean	8.13	9.2	0.91	17.0	25.8	13.5	0.061	106
S.D.	0.46	3.7	0.27	0.2	15.2	3.6	0.003	17
MH-20 A	7.94	7.94	0.712	44.4	130	38.1	0.054	116
MH-20 B	7.24	6.49	0.51	39.7	24.7	9.54	0.053	70.3
MH-20 C	8.1	6.06	0.438	38.9	32.5	14	<0.050	70.8
Mean	7.76	6.8	0.55	41.0	62.4	20.5	0.054	86
S.D.	0.46	1.0	0.14	3.0	58.7	15.4	0.001	26

The mean concentrations of these metals were compared to the CCME (1999) interim freshwater sediment quality guidelines (ISQG), and to the probable effects levels (PEL). Concentrations greater than the PEL have a 50% incidence of creating adverse biological effects (Table 5).

Arsenic concentrations in the stream sediments exceeded the recommended ISQG guideline at all three sites, and the PEL was also exceeded at MH-13. The ISQG for cadmium was exceeded at MH-13 and MH-16 with the concentration at MH-13 exceeding the PEL.

The ISQG for chromium was exceeded at MH-20 with a value much higher than upstream at MH-13 and MH-16. However, the concentration of chromium in each of the triplicates at MH-20 was similar with a very low standard deviation, indicating that this was a representative sample for MH-20.

Concentrations of copper, lead and zinc exceeded the ISQG guidelines in the sediments collected from MH-13 with the level of zinc also exceeding the PEL.

TABLE 5
SUMMARY OF METAL CONCENTRATIONS (mg/kg) IN THE STREAM SEDIMENTS, AUGUST 2016

	pH	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Zinc
MH-13	8.15	**38.8**	**4.60**	16.5	**59.8**	**76.2**	0.105	**326**
MH-16	8.13	**9.2**	**0.91**	17.0	25.8	13.5	0.061	106
MH-20	7.76	**6.8**	0.55	**41.0**	**62.4**	20.5	0.054	86
ISQG		5.9	0.6	37.3	35.7	35	0.170	123
PEL		17	3.5	90	197	91.3	0.486	315

The 2016 sediment results were compared to data collected in previous studies for sites MH13, MH16 and MH20 (Table 6 and Figures 2 to 6). The applicable ISQG and/or PEL have been plotted on each figure.

The concentration of arsenic in the sediments has consistently surpassed the ISQG, and approached or exceeded the PEL at MH13. The highest concentration occurred in 2016. Copper levels at MH-13 have been low with the exception of the last two sampling periods, 2014 and 2016 where the ISQG was exceeded. Cadmium concentrations have exceeded the ISQG at MH-13 and exceeded the PEL in 2016. The ISQG of lead has been exceeded frequently at MH-13 over time with higher concentrations reported in 2014 and 2016, where the PEL was exceeded in 2014. Zinc concentrations at MH-13 exceeded the ISQG on all occasions and the PEL was slightly exceeded in 2016.

The concentrations of arsenic and cadmium have frequently exceeded the ISQG at MH-16. Copper and lead concentrations at MH-16 have been very low over time and were well below the ISQG. Zinc levels have fluctuated somewhat over time but the ISQG was exceeded only once, in 2010.

The ISQG for arsenic has usually been exceeded at MH-20, however concentrations have been well below the PEL. Copper levels have been similar and very low over time until 2016 when an anomalous reading was reported in one of the triplicate sediment samples collected here resulting in an exceedance of the ISQG. Lead concentrations have generally been low and slightly variable at MH-20 over time, and well below the ISQG. Zinc levels have been fairly consistent over time and remained below the ISGQ.

TABLE 6

COMPARISON OF METALS (ug/g) IN SEDIMENTS OVER THE STUDY PERIOD

Site	Year	Arsenic	Copper	Cadmium	Lead	Zinc
MH - 13	1992	**17.0**	21.7	**1.2**	**65**	**256**
	1994	**11.5**	22.8	**1.5**	**47**	**216**
	1996	**12.0**	19.2	**1.7**	27	**160**
	1998	**14.0**	20.7	**1.2**	**37**	**174**
	2000	**17.3**	24.1	**2.1**	**71**	**266**
	2002	**8.1**	17.8	**1.2**	24	**148**
	2004	**9.6**	23.5	**1.3**	30	**185**
	2006	**18.2**	23.9	**2.4**	**38**	**224**
	2008	**12.8**	22.0	**1.9**	**48**	**226**
	2010	**16.1**	24.5	**1.9**	**38**	**233**
	2012	**16.2**	22.9	**2.0**	28	**199**
	2014	**20.0**	**170.3**	**3.0**	**112**	**267**
	2016	**38.8**	**59.8**	**4.6**	**76**	**326**
MH - 16	1998	**<8**	9.2	0.4	8	72
	2000	**11.3**	9.8	0.4	8	80
	2002	**6.0**	13.0	**0.8**	11	90
	2004	**7.8**	17.5	**1.0**	13	118
	2006	**8.4**	14.6	**0.8**	11	96
	2008	5.9	13.8	**0.8**	11	95
	2010	**9.3**	20.0	**1.4**	15	**138**
	2012	4.3	10.4	0.6	8	82
	2014	**6.3**	14.9	**0.8**	12	105
	2016	**9.2**	25.8	**0.9**	14	106
MH - 20	1992	**13.0**	22.1	**<0.1**	15	78
	1994	**<10**	20.6	0.5	9	70
	1996	**9.0**	16.6	**1.5**	9	69
	1998	**10.0**	18.7	0.3	11	74
	2000	**7.3**	23.0	0.3	13	88
	2002	4.6	16.9	0.3	8	57
	2004	**6.1**	22.9	0.4	10	78
	2006	**6.0**	18.0	0.3	8	66
	2008	5.8	21.2	0.4	10	75
	2010	**9.3**	16.8	0.5	8	75
	2012	**6.0**	21.2	0.6	9	69
	2014	**8.5**	21.9	**0.9**	15	121
	2016	**6.8**	**62.4**	0.55	21	86

Note: ISQG = Interim freshwater Sediment Quality Guidelines, in **bold** where exceeded.
PEL = Probable Effects Level (>50% of adverse effects occur above this level), shaded and in bold where exceeded.

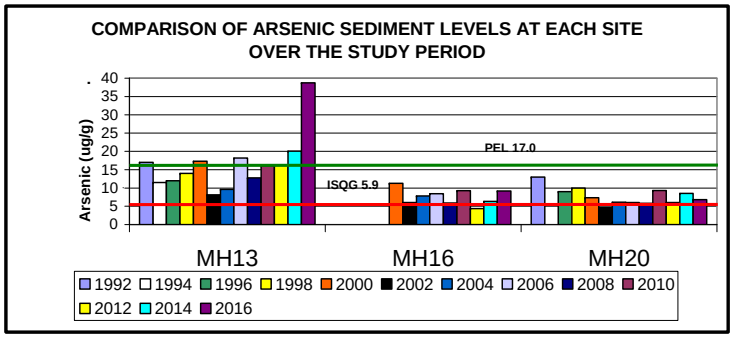


Figure 2

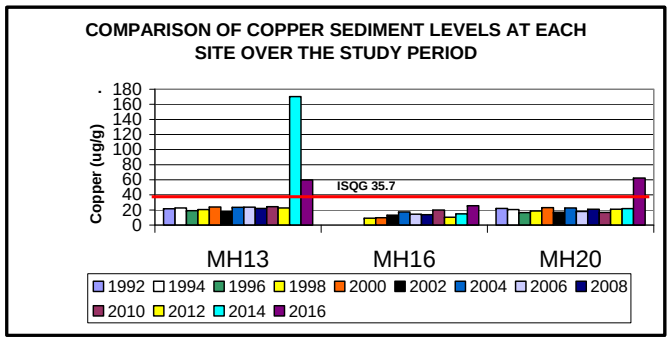


Figure 3

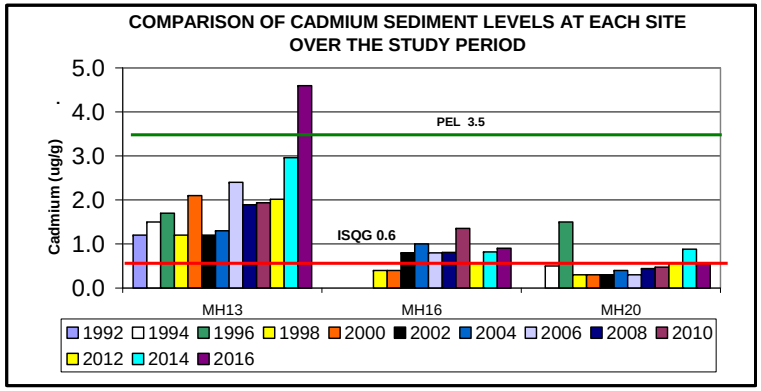


Figure 4

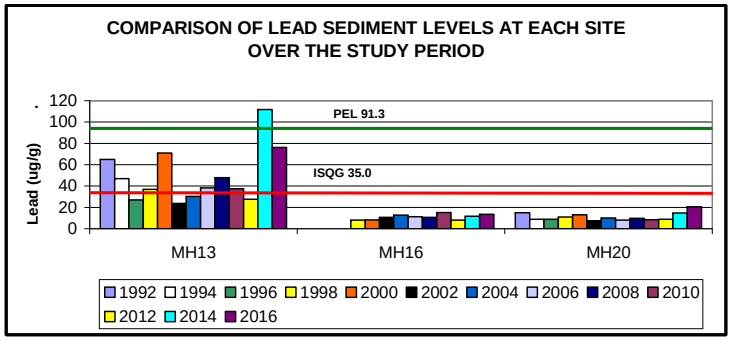


Figure 5

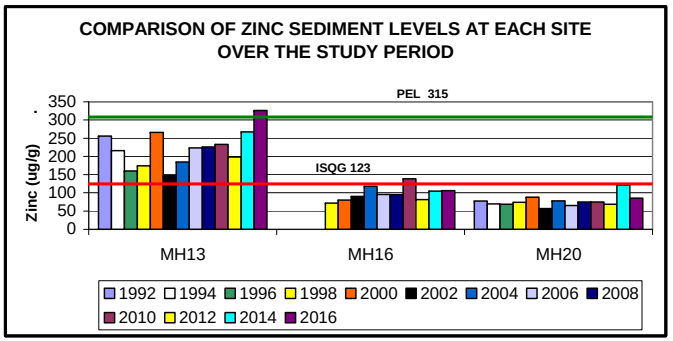


Figure 6

4.3 Benthic Invertebrates

Six phyla were found in the study area: Arthropoda, Mollusca, Nematoda, Annelida, Cnidaria, and Platyhelminthes. Of these, Cordillera Consulting does not consider Nematoda and Platyhelminthes to be benthos organisms. In addition, crustaceans within the order Arthropoda were not considered as benthos. The numbers for these taxa indicated in Appendix C are a reflection of presence not total numbers of individuals in the sample.

Of the organisms that were enumerated, a total of 16,657 benthic invertebrates, representing 92 different taxonomic groups, were identified. The following sections pertain to these taxa.

4.3.1 Abundance and Taxonomic Richness

The total number of organisms of the triplicates for each site was summed to give a total abundance value for that site. The total populations were 4,818 individuals at MH13, 6,839 individuals at MH16, and 5000 individuals at MH20. Density was calculated for each site and these values followed the same trend as the abundance values.

Taxonomic richness was determined for each site by enumerating all the different taxonomic groups identified from species to phylum as a measure of community diversity. All communities were diverse. To further characterize the taxonomic wealth of each community, the diversity was related to the population size using the formula: (Diversity – 1) divided by the natural log of the population. The community at MH20 had the greatest taxonomic wealth and the community at MH16 the least. All of the above data are included in Table 7.

TABLE 7 GENERAL STATISTICS ON THE BENTHIC COMMUNITIES, 2016

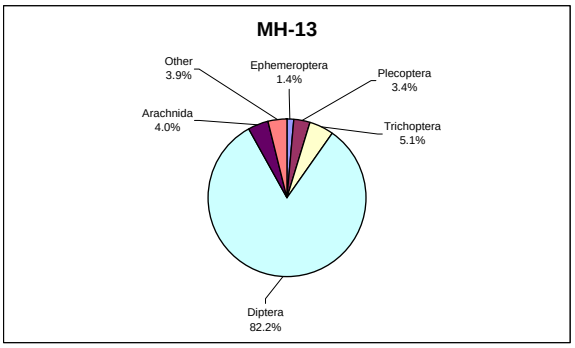
Site	Abundance	Density (#/m^2)	Diversity	Taxonomic Richness
MH-13	4,818	17,287	58	6.7
MH-16	6,839	24,539	52	5.8
MH-20	5,000	17,940	63	7.3

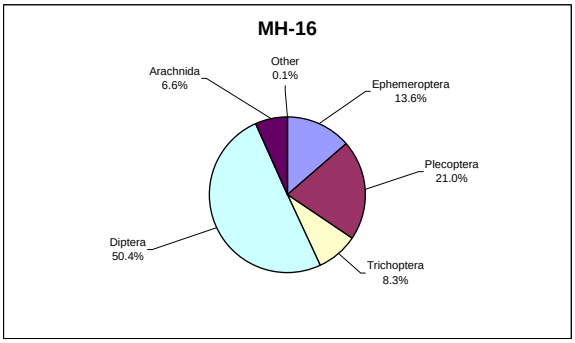
4.3.2 Distribution

The percent composition of the major taxonomic groups was calculated for each station (Figure 7). Based on the percentages of each group, taxa were classified with respect to their dominance within the benthic community for each site (Table 8). The group “Other” includes invertebrates from Collembola, Coleoptera, Tubificida, Bivalvia, Hydrozoa and Thysanoptera.

Diptera was the dominant order at each of the three sites ranging in composition from 50% of the community at MH-16 to 82% at MH-13. Within Diptera, Neostempellina and Rheotanytarsus, both genera of the family Chironomidae, formed 19.9% and 10.8% respectively, of benthic invertebrates collected in the study area. There were no subdominant groups at MH-13 due to the large portion of the population here belonging to the order Diptera. Ephemeroptera was the subdominant order and MH-16 and MH-20 with Plecoptera sharing subdominance at MH-16. Trichoptera and Arachnida were common at all of the sites and the remaining taxonomic groups were common or rare.

FIGURE 7 COMPOSITION OF TAXONOMIC GROUPS AT EACH SITE





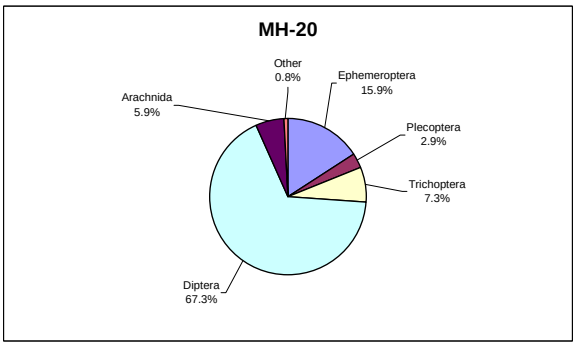


TABLE 8 TAXONOMIC DISTRIBUTION OF BENTHIC INVERTEBRATES

DOMINANT (>25%)	SUBDOMINANT (10% to 24.9%)	COMMON (1.0% to 9.9%)	RARE (0.1% to 0.9%)
Diptera		Trichoptera Arachnidae Other Plecoptera Ephemeroptera	

DOMINANT (>25%)	SUBDOMINANT (10% to 24.9%)	COMMON (1.0% to 9.9%)	RARE (0.1% to 0.9%)
Diptera	Plecoptera Ephemeroptera	Trichoptera Arachnidae	Other

DOMINANT (>25%)	SUBDOMINANT (10% to 24.9%)	COMMON (1.0% to 9.9%)	RARE (0.1% to 0.9%)
Diptera	Ephemeroptera	Trichoptera Arachnidae Plecoptera	Other

4.3.3 EPT

Many aquatic insects require good water quality to thrive. Larvae of mayflies (Ephemeroptera), stoneflies (Plecoptera) and caddisflies (Trichoptera) require clear, clean, well oxygenated water and have very low tolerance to pollution (Rosenberg and Resh, 1993). Analyzing the combined EPT (Ephemeroptera, Plecoptera, Trichoptera) at a site, gives an indication of the overall health of the stream. Table 9 summarizes the number of EPT found per site, the number of EPT taxa (richness) and the proportion of EPT in each community.

EPT abundance, richness and proportion was lowest at MH-13. The habitat here is not of a quality conducive to EPT productivity due to the lack of clean washed gravels. The flow is sluggish with a muddy/fine sand substrate, which favours invertebrates such as chironomids. Other zones within

this reach consisted of beaver dams or flooded willow areas. The community at MH-16 contained the greatest abundance and proportion of EPT. The richest EPT occurred at MH-20 where 30 taxa were identified.

TABLE 9	EPT ABUNDANCE, RICHNESS & PROPORTION		
Site	**EPT Abundance**	**EPT Richness**	**EPT %**
MH-13	475	16	9.9
MH-16	2936	24	42.9
MH-20	1302	30	26.0

Due to the sensitivity of EPT, Lehmkuhl (1979) has identified several groups within these insect orders that have very low tolerance to chemical pollution. Nine of these taxa (five taxa within Plecoptera, two taxa within Ephemeroptera and two taxa within Trichoptera) have been identified in the study area. Table 10 summarizes the presence or absence of each of these taxa per site.

TABLE 10
Presence (+) and Absence (-) of Sensitive Taxa at
False Canyon Creek Study Area, 2016

Sensitive Taxa	MH13	MH16	MH20
Plecoptera			
Capniidae	+	+	+
Chloroperlidae	-	+	+
Nemouridae	+	-	+
Perlodidae	+	+	+
Taeniopterygidae	+	+	+
Ephemeroptera			
Ephemerellidae	+	+	+
Rhrithrogena sp.	-	-	+
Trichoptera			
Brachycentriidae	-	+	+
Rhyacophilidae	+	+	+
Total # of sensitive taxa:	6	7	9

After Lehmkuhl (1979)

All nine of the sensitive taxa were identified at MH20. There were six and seven sensitive taxa at MH-13 and MH-16 respectively. Although there were few EPT at MH-13, several of them are identified as sensitive indicating that the water and sediment quality here are of good condition.

4.3.4 Comparisons with Past Data

Data collected biannually from False Canyon Creek since 1992 have been summarized and compiled in Table 11. Population densities were greatest in 1998 at MH13, in 2010 at MH16 and in 2016 in MH20 (Figure 8). The population at MH13 has fluctuated considerably over the study period which probably reflects the instability of this site. Population numbers have generally been lower downstream at MH20 than at the other two upstream sites.

Diversity has continued to fluctuate over time at MH13 and MH20, but has been relatively stable at MH16. Overall, the communities at MH16 have been the most diverse.

The number of sensitive taxa has varied significantly at MH13 over the study period. This was likely due to natural degradation in habitat quality. The communities at MH16 and MH20 continue to have high numbers of sensitive taxa.

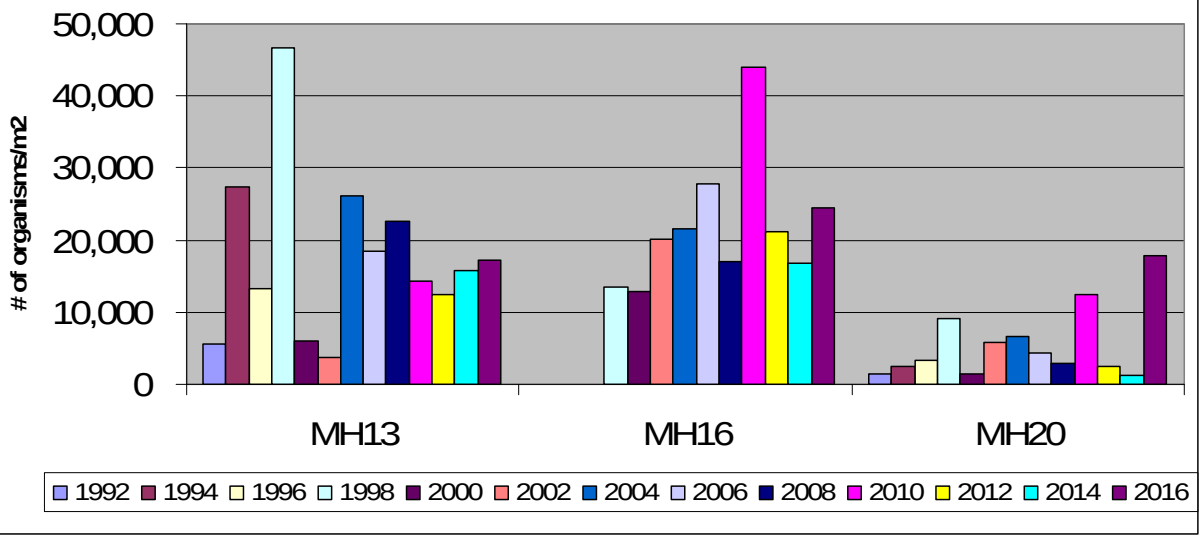
The dominance of the respective communities has remained virtually unchanged over the study period. Diptera has been the dominant or co-dominant order at MH13 during the majority of the surveys, frequently shared with crustaceans (Ostrocoda and sometimes with Copepoda) in recent years. In 2016 the lab only identified the presence of crustaceans but did not enumerate them. It is likely they would have formed a significant portion of the community at MH-13. The presence and abundance of crustaceans at MH-13 is a reflection of the habitat gradually altering from a gravel bottomed stream in 2000 to a heavily ponded environment created through beaver activity. Ephemeroptera and/or Diptera have been the dominant orders at MH16 and MH20 over time. The habitat at these two sites has remained virtually unchanged since monitoring commenced.

The temporal data generally indicates that the community at MH13 fluctuates depending on the changing habitat characteristics during the particular sampling period. Although abundance varies somewhat over time, the communities at MH16 and MH20 appear stable.

Table 11
COMPARISON OF BENTHIC DATA OVER THE STUDY PERIOD

Site	Year	Total Abundance	Diversity	Density (# of organisms/m²)	Dominant Taxa	Total # of Sensitive Taxa
MH-13	1992	1,562	25	5,605	Diptera	7
	1994	7,631	37	27,380	Ephemeroptera & Diptera	9
	1996	3,682	57	13,211	Diptera	8
	1998	13,033	30	46,764	Diptera	2
	2000	1,704	50	6,114	Plecoptera & Diptera	4
	2002	1,020	43	3,660	Diptera	3
	2004	7,289	72	26,153	Diptera	9
	2006	5,168	46	18,543	Diptera	4
	2008	6,319	50	22,673	Diptera & Plecoptera	8
	2010	4,003	33	14,363	Ostracoda & Diptera	0
	2012	3,465	53	12,433	Diptera & Other	3
	2014	4,400	52	15,788	Crustacea	4
	2016	4,818	58	17,287	Diptera	6
MH-16	1998	3,754	60	13,470	Diptera & Ephemeroptera	10
	2000	3,578	65	12,838	Diptera & Ephemeroptera	9
	2002	5,588	67	20,050	Diptera & Ephemeroptera	8
	2004	5,995	63	21,510	Diptera & Ephemeroptera	10
	2006	7,445	76	27,713	Diptera	10
	2008	4,769	58	17,112	Diptera & Ephemeroptera	8
	2010	12,266	52	44,011	Diptera	6
	2012	5,893	61	21,145	Diptera	8
	2014	4,682	55	16,799	Diptera & Ephemeroptera	9
	2016	6,839	52	24,539	Diptera	7
MH-20	1992	394	22	1,414	Ephemeroptera	6
	1994	720	31	2,583	Ephemeroptera & Diptera	8
	1996	936	54	3,358	Ephemeroptera & Diptera	12
	1998	2,564	59	9,200	Ephemeroptera & Diptera	10
	2000	412	28	1,478	Diptera & Ephemeroptera	6
	2002	1,591	43	5,709	Diptera	6
	2004	1,853	56	6,648	Diptera & Ephemeroptera	11
	2006	1,196	64	4,291	Ephemeroptera & Diptera	11
	2008	826	49	2,964	Ephemeroptera & Diptera	7
	2010	3,474	54	12,465	Diptera & Ephemeroptera	8
	2012	682	52	2,447	Ephemeroptera	10
	2014	373	53	1,338	Ephemeroptera	9
	2016	5,000	63	17,940	Diptera	9

FIGURE 8 COMMUNITY DENSITY PER SITE OVER THE STUDY PERIOD



4.4 Fish

4.4.1 Fish Distribution and Abundance

Slimy sculpin (*Cottus cognatus*) and Arctic grayling (*Thymallus arcticus*) continue to be the most common species captured or observed at sampling sites in False Canyon Creek. Other species captured in 2016 were juvenile longnose sucker (*Catostomus catostomus*) and a single whitefish species (*Prosopim sp*). Table 12 summarizes fish capture results using the various gear types at the three surveyed sites in the False Canyon Creek drainage in 2016. Individual fish length and weight data for each site is presented in Table 1 of Appendix D.

As with all previous sampling years, slimy sculpin were the only species documented in the catch at site MH13. As was the case in 2014, only a single sculpin was captured indicating continued low sculpin densities at this site. The modest catch is well below the 2002 to 2014 average catch of 20.0 sculpins at this site (Table 13). Low densities have been documented previously in 1992, 2000 and 2002. No other fish species has ever been documented at this location. The single sculpin was captured in a minnow trap that was set overnight in a still water area of a beaver pond. It's large size (99 mm) is characteristic of an adult life history stage. Slimy sculpin fry, that are usually observed while electrofishing, were visibly absent at site MH13 in 2016.

TABLE 12

SUMMARY OF SAMPLING EFFORT AND TOTAL CATCH USING VARIOUS FISH CAPTURE METHODS AT EACH SAMPLING LOCATION, AUGUST 2016.

SAMPLE SITE	CAPTURE METHOD	SAMPLE EFFORT	CATCH				OBSERVATIONS
			Arctic Grayling	Longnose Sucker	Slimy Sculpin	Whitefish	
MH13	MNT	28.5 hrs	0	0	1	0	
MH13	Electro	491 sec	0	0	0	0	
MH16	MNT	27.0 hrs	0	0	0	0	
MH16	Electro	530 sec	4	0	32	0	7 sculpin + fry
MH16	Angling	15 min	4	0	0	0	6 grayling strikes (< 200 mm TL)
MH20	MNT	25.5 hrs	0	0	2	0	
MH20	Electro	570 sec	4	2	14	0	grayling and sucker fry
MH20	Seine	52 m^2	20	3	6	16	sculpin fry
MH20	Angling	20 min	2	0	0	0	6 grayling strikes (< 300 mm TL)

Legend: MNT = Minnow trap (3 traps)
Electro = Electrofisher
Seine = Pole Seine (3 sweeps)
Angle = Angling

Slimy sculpins of varying size were far more numerous in the catch at sites MH16 and MH20. Capture numbers were well above historic averages (Table 13). Sculpin fry were also observed while electrofishing at both these sites. Large mature adults (> 100mm TL) were not well represented in the 2016 catch. Life history stages and sizes of captured sculpin over the study period are displayed in Figure 1 of Appendix D.

TABLE 13
COMPARISON OF FISH CATCH AT THREE SAMPLING SITES OVER A 24 YEAR PERIOD

SPECIES	SAMPLE SITE	CATCH (#)	
		1992 to 2014* (Average)	2016 (Total)
Slimy sculpin	MH13	20.0	1
	MH16	12.2	32
	MH20	14.4	22
Arctic grayling	MH13	0	0
	MH16	3.0	8
	MH20	4.0	26
Burbot	MH13	0	0
	MH16	1.0	0
	MH20	0.8	0
Whitefish sp.	MH13	0	0
	MH16	0	0
	MH20	1.2	16
Lake chub	MH13	0	0
	MH16	0	0
	MH20	0.1	0
Char sp.	MH13	0	0
	MH16	0	0
	MH20	0.1	0
Longnose Sucker	MH13	0	0
	MH16	0	0
	MH20	0	5

* Note that site MH16 was not sampled during the 1992, 1994 and 1996 surveys.

Arctic grayling were commonly captured by angling and electrofishing at site MH16. These captures were represented by various life history stages. Several sub-adult grayling were also readily observed striking lures while angling at this site. Arctic grayling were similarly abundant at site MH20. A single beach seine sweep at this location captured 16 grayling (52 to 130 mm FL). Historically, captures of grayling at site MH20 have been more numerous compared to site MH16. Arctic grayling of varying sizes and life history stages have previously been well represented in the catch at site MH20 (Figure 2 of Appendix D).

Whitefish continue to be represented in the catch at site MH20. Whitefish (*Prosopium sp*) are known to inhabit the Liard River basin and are native to the area (Anon. 1996, McPhail 2007, LES 2004). Juveniles are easily identified by the presence of well defined circular parr marks.

Several longnose sucker juveniles were captured by electrofishing and beach seining at this site MH20 in 2016. This species that has not been reported at this site nor in any of the previous fish monitoring programs. Longnose suckers are known to inhabit the Liard River basin (Scott and Crossman 1973).

Burbot (*Lota lota*), Dolly Varden/bull trout (*Salvelinus sp*) and lake chub (*Couesius plumbeus*) were not represented in the catch in 2016. While burbot have only been sporadically captured in the past at sites MH16 and MH20, only a single trout and lake chub specimen has ever been

documented over the 24-year monitoring period at site MH20. Dolly Varden, most likely bull trout, are apparently abundant at the confluence with the Frances River and are utilized as part of a food fishery (Donnessey, *pers com*, 2006). Lake chub have been reported to be present in Frances Lake (Lindsey *et al* 1981).

Fish distribution and catch comparisons for all sites sampled in 2016 indicate little change in the dominant fish types or their relative abundance when compared to previous surveys (Table 13). While the absolute number of captured fish varies from year to year, the species composition continues to be consistent and indicative of a stable fish community. Notable in 2016 was the capture of several longnose sucker at site MH20. This species has not been previously documented at this location.

4.4.2 Fish Habitat

Beaver activity at site MH13 continues to be a major habitat influence on the aquatic environment at this location. Catches of slimy sculpin at this site were very low as they were in 2014 during higher water levels. Low sculpin catches have also been recorded in previous programs dating back to 1992, 2000 and 2002. In each of these years less than 10 sculpins were captured. Historic catches suggest slimy sculpin densities at MH13 appear to be cyclic. While concentrations of metals in sediment have fluctuated over time, benthic invertebrate communities at MH13 continue to be diverse and have reasonable representation of sensitive EPT taxa. The many barriers in the form of active and abandoned beaver dams associated with this site are believed to be an impediment to the upstream movement and colonization of other fish species. These barriers likely influence the flow of water and could periodically affect the quality and quantity of fish overwintering habitat at this site.

Water levels at sites MH16 and MH20 were also lower than normal at the time of the survey. Snowpack condition within the Liard River watershed during the spring of 2016 were well below normal (Environment Yukon 2015). The combination of a reduced snowpack and low base flows of the upper Liard River from dryer climatic conditions translated to lower water levels at all three monitoring sites (Environment Canada 2015). False Canyon Creek was easily waded. Gravel bars were noticeably larger than usual and especially at site MH20 where one was used as a landing pad for the helicopter. Evidence of channel modifying flows and flooding was less evident than in years past. The extensive gravel bars made conditions for beach seining ideal.

Main channel habitat features such as deep pools, overhanging vegetation, cutbanks and accumulations of small and large woody debris continue to provide excellent fish cover. The mature forest that predominates the riparian region of the main channel at all of the sampling locations remains healthy. Site-specific physical habitat descriptions for all three sites have been previously described (LES 1998).

5.0 SUMMARY

No anomalies were apparent in the water quality during the 2016 study. The alkaline waters of the drainage were hard to very hard and concentrations of metals were low where detected. All samples met the applicable CCME guidelines for the protection of freshwater aquatic life.

Metal concentrations in the sediments at MH13 were higher than at MH16 and MH20, indicating its location in a mineralized area. Arsenic concentrations continue to exceed the ISQG at each of the sites, with the PEL frequently exceeded at MH-13, over the 24 year study period. Lead and zinc levels have generally been low at MH-16 and MH-20 and have met the ISQG over the study period with the exception of zinc at MH-16 in 2010. Concentrations of metals have fluctuated over time at MH13 but have remained relatively stable at MH16 and MH20.

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, including MH13, suggests that the metals documented in the sediments are likely not in a bioavailable form. There were robust populations at each of the sites in 2016 reflecting productive populations.

Fish distribution and catch comparisons for all sites sampled in 2016 generally indicate little change in the dominant fish types or their relative abundance when compared to previous surveys. While the absolute number of captured fish varies from year to year, the species composition continues to be consistent and indicative of a stable fish community. Notable in 2016 was the capture of several longnose sucker at site MH20. This species has not been previously documented in the watershed.

6.0 REFERENCES

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APPENDIX A

PHOTOGRAPHS, AUGUST 2016

Photo #1: MH-13 sampling site looking d/s. Site conditions very similar to 2014.

Photo #2: MH-13 sampling area looking upstream.

Photo #3: Electro-fishing at MH-16. The physical setting of this site has remained virtually unchanged since monitoring commenced here in 1998.

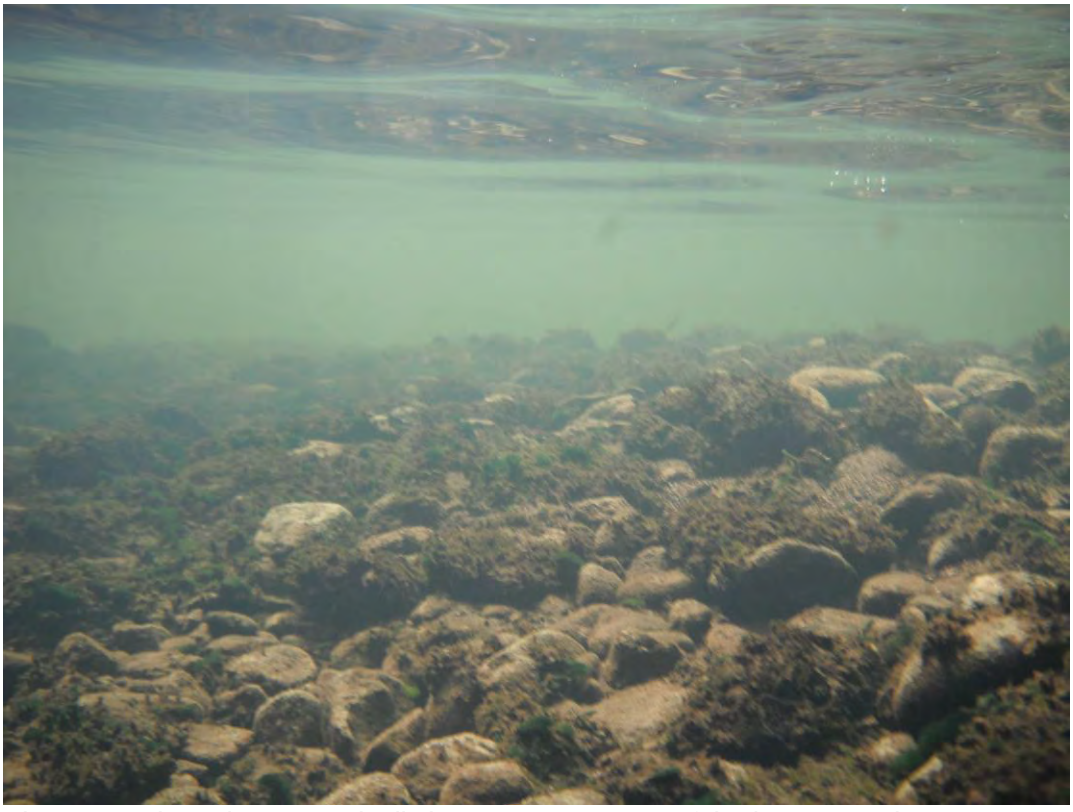

Photo #4: The substrate typically has moss on some of the large gravels.

Photo #5: MH-20 with large gravel bar due to very low water levels.

Photo #6: Low stage of False Canyon Creek at MH-20. Typically water levels have been approximately 20 to 30 cm higher on previous August monitoring assessments.

APPENDIX B

MAXXAM ANALYTICAL REPORT FOR WATER AND SEDIMENT, 2016

- **Work Order #: B673978**

Your P.O. #: 8965
Site Location: SA DENA HES
Your C.O.C. #: 502595-01-01, 08426866

Attention:BONNIE BURNS

LABERGE ENVIRONMENTAL SERVICES
P.O. BOX 21072
WHITEHORSE, YT
CANADA Y1A6P7

Report Date: 2016/09/13
Report #: R2259061
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B673978
Received: 2016/08/29, 13:10

Sample Matrix: Soil
Samples Received: 24

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Elements by ICPMS (total)	20	2016/09/03	2016/09/07	BBY7SOP-00017,	BC SALM,EPA 6020bR2m
Elements by ICPMS (total)	4	2016/09/04	2016/09/07	BBY7SOP-00017,	BC SALM,EPA 6020bR2m
Moisture	24	2016/09/02	2016/09/06	BBY8SOP-00017	BCMOE BCLM Dec2000 m
pH (2:1 DI Water Extract)	20	2016/09/03	2016/09/06	BBY6SOP-00028	BCMOE BCLM Mar2005 m
pH (2:1 DI Water Extract)	4	2016/09/04	2016/09/06	BBY6SOP-00028	BCMOE BCLM Mar2005 m
Particle Size by Sieve (Custom) (1)	24	2016/09/02	2016/09/07	BBY6SOP-00036	ASTM D422-63 2007 m

Sample Matrix: Water
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity - Water	5	2016/08/30	2016/08/31	BBY6SOP-00026	SM 22 2320 B m
Alkalinity - Water	1	2016/08/31	2016/08/31	BBY6SOP-00026	SM 22 2320 B m
Hardness Total (calculated as CaCO3)	5	N/A	2016/09/06	BBY WI-00033	Auto Calc
Hardness Total (calculated as CaCO3)	1	N/A	2016/09/12	BBY WI-00033	Auto Calc
Hardness (calculated as CaCO3)	5	N/A	2016/09/06	BBY WI-00033	Auto Calc
Hardness (calculated as CaCO3)	1	N/A	2016/09/09	BBY WI-00033	Auto Calc
Na, K, Ca, Mg, S by CRC ICPMS (diss.)	6	N/A	2016/09/06	BBY7SOP-00002	EPA 6020B R2 m
Elements by ICPMS Low Level (dissolved)	5	N/A	2016/09/03	BBY7SOP-00002	EPA 6020B R2 m
Elements by ICPMS Low Level (dissolved)	1	N/A	2016/09/06	BBY7SOP-00002	EPA 6020B R2 m
Elements by ICPMS Digested LL (total)	1	2016/09/01	2016/09/05	BBY7SOP-00003,	BCLM2005,EPA6020bR2m
Na, K, Ca, Mg, S by CRC ICPMS (total)	6	N/A	2016/09/06	BBY7SOP-00003,	BCLM2005,EPA6020bR2m
Elements by ICPMS Low Level (total)	4	N/A	2016/09/02	BBY7SOP-00003,	BCLM2005,EPA6020bR2m
Elements by ICPMS Low Level (total)	1	N/A	2016/09/06	BBY7SOP-00003,	BCLM2005,EPA6020bR2m
Ammonia-N (Preserved)	6	N/A	2016/08/31	BBY6SOP-00009	SM 22 4500-NH3- G m
Filter and HNO3 Preserve for Metals	5	N/A	2016/09/06	BBY7 WI-00004	BCMOE Reqs 08/14
pH Water (3)	6	N/A	2016/08/31	BBY6SOP-00026	SM 22 4500-H+ B m
Sulphate by Automated Colourimetry (2)	6	N/A	2016/09/01	AB SOP-00018	SM 22 4500-SO4 E m
Total Suspended Solids-Low Level	6	2016/08/31	2016/09/01	BBY6SOP-00034	SM 22 2540 D

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.

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Your P.O. #: 8965
Site Location: SA DENA HES
Your C.O.C. #: 502595-01-01, 08426866

Attention:BONNIE BURNS

LABERGE ENVIRONMENTAL SERVICES
P.O. BOX 21072
WHITEHORSE, YT
CANADA Y1A6P7

Report Date: 2016/09/13
Report #: R2259061
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B673978

Received: 2016/08/29, 13:10

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Result indicates % of sample retained on the sieve.
(2) This test was performed by Maxxam Edmonton Environmental
(3) The BC-MOE and APHA Standard Method require pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the BC-MOE/APHA Standard Method holding time.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Megan Smith, Project Manager
Email: msmith@maxxam.ca
Phone# (604) 734 7276

==========

This report has been generated and distributed using a secure automated process.
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Maxxam Job #: B673978
Report Date: 2016/09/13

LABERGE ENVIRONMENTAL SERVICES
Site Location: SA DENA HES
Your P.O. #: 8965
Sampler Initials: BB

RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		PJ8532	PJ8533	PJ8534	PJ8535	PJ8541	PJ8542		
Sampling Date		2016/08/25 10:00	2016/08/25 10:00	2016/08/25 10:00	2016/08/25 10:45	2016/08/25 10:45	2016/08/25 10:45		
COC Number		502595-01-01	502595-01-01	502595-01-01	502595-01-01	08426866	08426866		
	UNITS	**MH-30 A**	**MH-30 B**	**MH-30 C**	**MH-13 A**	**MH-13 B**	**MH-13 C**	**RDL**	**QC Batch**
Physical Properties									
Sieve - #100(>0.15mm)	%	65.5	65.5	41.7	67.8	63.9	44.8	0.10	8386306
RDL = Reportable Detection Limit									

Maxxam ID		PJ8543	PJ8544	PJ8545	PJ8546	PJ8547	PJ8548	PJ8549		
Sampling Date		2016/08/25 13:00	2016/08/25 13:00	2016/08/25 13:00	2016/08/25 14:45	2016/08/25 14:45	2016/08/25 14:45	2016/08/25 17:10		
COC Number		08426866	08426866	08426866	08426866	08426866	08426866	08426866		
	UNITS	**MH-16 A**	**MH-16 B**	**MH-16 C**	**MH-20 A**	**MH-20 B**	**MH-20 C**	**MH-04 A**	**RDL**	**QC Batch**
Physical Properties										
Sieve - #100(>0.15mm)	%	27.5	55.3	28.3	31.0	4.68	78.9	38.4	0.10	8386306
RDL = Reportable Detection Limit										

Maxxam ID		PJ8550	PJ8551	PJ8552	PJ8553	PJ8554	PJ8555	PJ8556		
Sampling Date		2016/08/25 17:10	2016/08/25 17:10	2016/08/25 17:45	2016/08/25 17:45	2016/08/25 17:45	2016/08/25 16:35	2016/08/25 16:35		
COC Number		08426866	08426866	08426866	08426866	08426866	08426866	08426866		
	UNITS	**MH-04 B**	**MH-04 C**	**MH-11 A**	**MH-11 B**	**MH-11 C**	**MH-12 A**	**MH-12 B**	**RDL**	**QC Batch**
Physical Properties										
Sieve - #100(>0.15mm)	%	81.8	66.1	83.8	99.8	98.5	56.3	60.6	0.10	8386306
RDL = Reportable Detection Limit										

Maxxam ID		PJ8557	PJ8558	PJ8559	PJ8560		
Sampling Date		2016/08/25 16:35	2016/08/26	2016/08/26	2016/08/26		
COC Number		08426866	08426866	08426866	08426866		
	UNITS	**MH-12 C**	**MH-29 A**	**MH-29 B**	**MH-29 C**	**RDL**	**QC Batch**
Physical Properties							
Sieve - #100(>0.15mm)	%	45.0	71.1	73.6	62.7	0.10	8386307
RDL = Reportable Detection Limit							

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Maxxam Job #: B673978
Report Date: 2016/09/13

LABERGE ENVIRONMENTAL SERVICES
Site Location: SA DENA HES
Your P.O. #: 8965
Sampler Initials: BB

PHYSICAL TESTING (SOIL)

Maxxam ID		PJ8532	PJ8533	PJ8534	PJ8535	PJ8541	PJ8542		
Sampling Date		2016/08/25 10:00	2016/08/25 10:00	2016/08/25 10:00	2016/08/25 10:45	2016/08/25 10:45	2016/08/25 10:45		
COC Number		502595-01-01	502595-01-01	502595-01-01	502595-01-01	08426866	08426866		
	UNITS	**MH-30 A**	**MH-30 B**	**MH-30 C**	**MH-13 A**	**MH-13 B**	**MH-13 C**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	37	76	39	78	81	84	0.30	8386047
RDL = Reportable Detection Limit									

Maxxam ID		PJ8543		PJ8544	PJ8545		PJ8546	PJ8547		
Sampling Date		2016/08/25 13:00		2016/08/25 13:00	2016/08/25 13:00		2016/08/25 14:45	2016/08/25 14:45		
COC Number		08426866		08426866	08426866		08426866	08426866		
	UNITS	**MH-16 A**	**QC Batch**	**MH-16 B**	**MH-16 C**	**QC Batch**	**MH-20 A**	**MH-20 B**	**RDL**	**QC Batch**
Physical Properties										
Moisture	%	49	8386047	38	56	8386067	26	38	0.30	8386047
RDL = Reportable Detection Limit										

Maxxam ID		PJ8548	PJ8549		PJ8550		PJ8551		PJ8552		
Sampling Date		2016/08/25 14:45	2016/08/25 17:10		2016/08/25 17:10		2016/08/25 17:10		2016/08/25 17:45		
COC Number		08426866	08426866		08426866		08426866		08426866		
	UNITS	**MH-20 C**	**MH-04 A**	**QC Batch**	**MH-04 B**	**QC Batch**	**MH-04 C**	**QC Batch**	**MH-11 A**	**RDL**	**QC Batch**
Physical Properties											
Moisture	%	30	66	8386047	36	8386067	49	8386047	21	0.30	8386067
RDL = Reportable Detection Limit											

Maxxam ID		PJ8553	PJ8554	PJ8555	PJ8556		PJ8557		
Sampling Date		2016/08/25 17:45	2016/08/25 17:45	2016/08/25 16:35	2016/08/25 16:35		2016/08/25 16:35		
COC Number		08426866	08426866	08426866	08426866		08426866		
	UNITS	**MH-11 B**	**MH-11 C**	**MH-12 A**	**MH-12 B**	**QC Batch**	**MH-12 C**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	17	23	37	24	8386047	54	0.30	8386067
RDL = Reportable Detection Limit									

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LABERGE ENVIRONMENTAL SERVICES
Site Location: SA DENA HES
Your P.O. #: 8965
Sampler Initials: BB

PHYSICAL TESTING (SOIL)

Maxxam ID		PJ8558	PJ8559	PJ8560		
Sampling Date		2016/08/26	2016/08/26	2016/08/26		
COC Number		08426866	08426866	08426866		
	UNITS	**MH-29 A**	**MH-29 B**	**MH-29 C**	**RDL**	**QC Batch**
Physical Properties						
Moisture	%	24	42	49	0.30	8386047
RDL = Reportable Detection Limit						

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Maxxam Job #: B673978
Report Date: 2016/09/13

LABERGE ENVIRONMENTAL SERVICES
Site Location: SA DENA HES
Your P.O. #: 8965
Sampler Initials: BB

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		PJ8526	PJ8527	PJ8528		PJ8529		
Sampling Date		2016/08/25 09:15	2016/08/25 10:45	2016/08/25 12:30		2016/08/25 14:00		
COC Number		502595-01-01	502595-01-01	502595-01-01		502595-01-01		
	UNITS	**MH-30**	**MH-13**	**MH-16**	**QC Batch**	**MH-20**	**RDL**	**QC Batch**
Calculated Parameters								
Filter and HNO3 Preservation	N/A	FIELD	FIELD	FIELD	ONSITE	FIELD	N/A	ONSITE
Misc. Inorganics								
Alkalinity (Total as CaCO3)	mg/L	174	234	215	8382432	152	0.50	8383698
Alkalinity (PP as CaCO3)	mg/L	1.24	4.37	6.37	8382432	<0.50	0.50	8383698
Bicarbonate (HCO3)	mg/L	209	274	247	8382432	185	0.50	8383698
Carbonate (CO3)	mg/L	1.49	5.24	7.64	8382432	<0.50	0.50	8383698
Hydroxide (OH)	mg/L	<0.50	<0.50	<0.50	8382432	<0.50	0.50	8383698
Anions								
Dissolved Sulphate (SO4)	mg/L	4.1	7.9	6.6	8383615	7.7	1.0	8384144
Nutrients								
Total Ammonia (N)	mg/L	0.023	0.030	0.021	8382586	0.044	0.0050	8382586
Physical Properties								
pH	pH	8.33	8.42	8.52	8382435	8.29		8383702
Physical Properties								
Total Suspended Solids	mg/L	1.0	1.7	2.0	8383802	1.0	1.0	8383802

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B673978
Report Date: 2016/09/13

LABERGE ENVIRONMENTAL SERVICES
Site Location: SA DENA HES
Your P.O. #: 8965
Sampler Initials: BB

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		PJ8530	PJ8531		
Sampling Date		2016/08/25	2016/08/25		
COC Number		502595-01-01	502595-01-01		
	UNITS	**DUPLICATE (DUP)**	**TRAVEL BLANK**	**RDL**	**QC Batch**
Calculated Parameters					
Filter and HNO3 Preservation	N/A	FIELD		N/A	ONSITE
Misc. Inorganics					
Alkalinity (Total as CaCO3)	mg/L	149	<0.50	0.50	8382432
Alkalinity (PP as CaCO3)	mg/L	2.89	<0.50	0.50	8382432
Bicarbonate (HCO3)	mg/L	174	<0.50	0.50	8382432
Carbonate (CO3)	mg/L	3.47	<0.50	0.50	8382432
Hydroxide (OH)	mg/L	<0.50	<0.50	0.50	8382432
Anions					
Dissolved Sulphate (SO4)	mg/L	7.7	<1.0	1.0	8384144
Nutrients					
Total Ammonia (N)	mg/L	0.032	<0.0050	0.0050	8382586
Physical Properties					
pH	pH	8.43	5.36		8382435
Physical Properties					
Total Suspended Solids	mg/L	1.6	<1.0	1.0	8383802
RDL = Reportable Detection Limit					

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Maxxam Job #: B673978
Report Date: 2016/09/13

LABERGE ENVIRONMENTAL SERVICES
Site Location: SA DENA HES
Your P.O. #: 8965
Sampler Initials: BB

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		PJ8532	PJ8533	PJ8534	PJ8535	PJ8541	PJ8542		
Sampling Date		2016/08/25 10:00	2016/08/25 10:00	2016/08/25 10:00	2016/08/25 10:45	2016/08/25 10:45	2016/08/25 10:45		
COC Number		502595-01-01	502595-01-01	502595-01-01	502595-01-01	08426866	08426866		
	UNITS	**MH-30 A**	**MH-30 B**	**MH-30 C**	**MH-13 A**	**MH-13 B**	**MH-13 C**	**RDL**	**QC Batch**
Physical Properties									
Soluble (2:1) pH	pH	7.26	6.88	7.70	8.12	8.10	8.22	N/A	8387279
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	9010	6560	8130	8660	9370	7830	100	8387274
Total Antimony (Sb)	mg/kg	0.99	1.02	1.07	1.20	1.37	1.26	0.10	8387274
Total Arsenic (As)	mg/kg	6.20	149	5.37	29.4	38.9	48.0	0.50	8387274
Total Barium (Ba)	mg/kg	308	515	337	487	660	579	0.10	8387274
Total Beryllium (Be)	mg/kg	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	0.40	8387274
Total Bismuth (Bi)	mg/kg	0.15	<0.10	0.12	0.19	0.21	0.21	0.10	8387274
Total Cadmium (Cd)	mg/kg	1.43	1.50	1.82	3.46	6.34	3.99	0.050	8387274
Total Calcium (Ca)	mg/kg	6010	14600	6870	14200	21000	15400	100	8387274
Total Chromium (Cr)	mg/kg	18.8	14.0	17.9	16.7	17.6	15.3	1.0	8387274
Total Cobalt (Co)	mg/kg	6.70	4.23	6.93	10.8	13.1	10.7	0.30	8387274
Total Copper (Cu)	mg/kg	61.9	43.0	32.8	36.4	102	40.9	0.50	8387274
Total Iron (Fe)	mg/kg	17800	108000	15600	38500	48500	54700	100	8387274
Total Lead (Pb)	mg/kg	73.1	27.4	26.0	62.8	99.4	66.4	0.10	8387274
Total Lithium (Li)	mg/kg	14.9	8.7	12.9	14.1	13.9	12.3	5.0	8387274
Total Magnesium (Mg)	mg/kg	4990	2910	4360	5270	5710	4630	100	8387274
Total Manganese (Mn)	mg/kg	115	673	112	2550	3790	2110	0.20	8387274
Total Mercury (Hg)	mg/kg	0.081	0.101	0.106	0.101	0.117	0.097	0.050	8387274
Total Molybdenum (Mo)	mg/kg	0.96	2.64	1.03	1.60	2.19	1.62	0.10	8387274
Total Nickel (Ni)	mg/kg	24.3	18.5	25.7	31.2	40.4	33.4	0.80	8387274
Total Phosphorus (P)	mg/kg	887	2890	850	1030	1190	967	10	8387274
Total Potassium (K)	mg/kg	644	719	651	826	990	883	100	8387274
Total Selenium (Se)	mg/kg	1.28	2.52	2.01	3.57	6.02	4.31	0.50	8387274
Total Silver (Ag)	mg/kg	0.338	0.346	0.358	0.392	0.387	0.508	0.050	8387274
Total Sodium (Na)	mg/kg	<100	<100	<100	<100	<100	<100	100	8387274
Total Strontium (Sr)	mg/kg	27.9	65.2	29.4	60.5	89.1	70.6	0.10	8387274
Total Thallium (Tl)	mg/kg	0.152	0.165	0.150	0.161	0.197	0.174	0.050	8387274
Total Tin (Sn)	mg/kg	2.07	1.58	0.79	0.51	3.30	0.73	0.10	8387274
Total Titanium (Ti)	mg/kg	110	53.2	71.2	63.7	57.5	50.2	1.0	8387274

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B673978
Report Date: 2016/09/13

LABERGE ENVIRONMENTAL SERVICES
Site Location: SA DENA HES
Your P.O. #: 8965
Sampler Initials: BB

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		PJ8532	PJ8533	PJ8534	PJ8535	PJ8541	PJ8542		
Sampling Date		2016/08/25 10:00	2016/08/25 10:00	2016/08/25 10:00	2016/08/25 10:45	2016/08/25 10:45	2016/08/25 10:45		
COC Number		502595-01-01	502595-01-01	502595-01-01	502595-01-01	08426866	08426866		
	UNITS	**MH-30 A**	**MH-30 B**	**MH-30 C**	**MH-13 A**	**MH-13 B**	**MH-13 C**	**RDL**	**QC Batch**
Total Uranium (U)	mg/kg	1.25	1.35	1.72	1.04	1.52	0.875	0.050	8387274
Total Vanadium (V)	mg/kg	28.1	27.1	25.7	30.7	38.1	35.5	2.0	8387274
Total Zinc (Zn)	mg/kg	198	128	151	306	364	309	1.0	8387274
Total Zirconium (Zr)	mg/kg	1.60	1.97	1.75	1.57	1.61	1.67	0.50	8387274
RDL = Reportable Detection Limit									

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LABERGE ENVIRONMENTAL SERVICES
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CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		PJ8543	PJ8544	PJ8545	PJ8546	PJ8547	PJ8548	PJ8549		
Sampling Date		2016/08/25 13:00	2016/08/25 13:00	2016/08/25 13:00	2016/08/25 14:45	2016/08/25 14:45	2016/08/25 14:45	2016/08/25 17:10		
COC Number		08426866	08426866	08426866	08426866	08426866	08426866	08426866		
	UNITS	**MH-16 A**	**MH-16 B**	**MH-16 C**	**MH-20 A**	**MH-20 B**	**MH-20 C**	**MH-04 A**	**RDL**	**QC Batch**
Physical Properties										
Soluble (2:1) pH	pH	8.39	8.39	7.60	7.94	7.24	8.10	7.69	N/A	8387279
Total Metals by ICPMS										
Total Aluminum (Al)	mg/kg	6760	6150	7150	6740	7530	6850	12000	100	8387274
Total Antimony (Sb)	mg/kg	0.67	0.53	0.61	0.62	0.63	0.63	1.97	0.10	8387274
Total Arsenic (As)	mg/kg	8.63	5.80	13.1	7.94	6.49	6.06	15.0	0.50	8387274
Total Barium (Ba)	mg/kg	346	267	335	261	229	178	88.6	0.10	8387274
Total Beryllium (Be)	mg/kg	<0.40	<0.40	<0.40	0.41	<0.40	<0.40	0.68	0.40	8387274
Total Bismuth (Bi)	mg/kg	0.10	<0.10	<0.10	0.11	0.12	0.11	0.37	0.10	8387274
Total Cadmium (Cd)	mg/kg	1.18	0.638	0.897	0.712	0.510	0.438	10.2	0.050	8387274
Total Calcium (Ca)	mg/kg	10500	7170	7690	6760	5860	6260	11000	100	8387274
Total Chromium (Cr)	mg/kg	17.0	16.8	17.2	44.4	39.7	38.9	27.2	1.0	8387274
Total Cobalt (Co)	mg/kg	6.15	4.93	5.65	8.56	8.94	7.94	9.12	0.30	8387274
Total Copper (Cu)	mg/kg	43.3	16.6	17.5	130	24.7	32.5	54.6	0.50	8387274
Total Iron (Fe)	mg/kg	18600	14700	21700	28400	21200	19200	22000	100	8387274
Total Lead (Pb)	mg/kg	17.7	11.2	11.7	38.1	9.54	14.0	312	0.10	8387274
Total Lithium (Li)	mg/kg	11.2	9.8	11.7	10.4	10.7	10.0	27.3	5.0	8387274
Total Magnesium (Mg)	mg/kg	4630	4380	4660	7590	8040	7950	7840	100	8387274
Total Manganese (Mn)	mg/kg	1070	477	227	298	223	468	509	0.20	8387274
Total Mercury (Hg)	mg/kg	0.063	<0.050	0.059	0.054	0.053	<0.050	0.056	0.050	8387274
Total Molybdenum (Mo)	mg/kg	0.72	0.55	0.58	1.03	0.85	1.03	1.28	0.10	8387274
Total Nickel (Ni)	mg/kg	20.3	17.0	19.5	43.5	47.5	44.5	26.2	0.80	8387274
Total Phosphorus (P)	mg/kg	784	709	825	699	696	618	799	10	8387274
Total Potassium (K)	mg/kg	588	499	568	559	571	574	652	100	8387274
Total Selenium (Se)	mg/kg	1.95	0.90	1.55	0.61	0.57	<0.50	1.74	0.50	8387274
Total Silver (Ag)	mg/kg	0.230	0.382	0.199	0.133	0.159	0.139	0.607	0.050	8387274
Total Sodium (Na)	mg/kg	<100	<100	<100	101	110	101	<100	100	8387274
Total Strontium (Sr)	mg/kg	42.9	29.8	33.6	36.8	31.0	31.3	48.4	0.10	8387274
Total Thallium (Tl)	mg/kg	0.109	0.077	0.100	0.068	0.078	0.065	0.175	0.050	8387274
Total Tin (Sn)	mg/kg	0.62	0.33	0.28	3.82	0.38	0.76	0.68	0.10	8387274
Total Titanium (Ti)	mg/kg	85.7	93.3	92.8	95.1	107	98.8	280	1.0	8387274

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B673978
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LABERGE ENVIRONMENTAL SERVICES
Site Location: SA DENA HES
Your P.O. #: 8965
Sampler Initials: BB

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		PJ8543	PJ8544	PJ8545	PJ8546	PJ8547	PJ8548	PJ8549		
Sampling Date		2016/08/25 13:00	2016/08/25 13:00	2016/08/25 13:00	2016/08/25 14:45	2016/08/25 14:45	2016/08/25 14:45	2016/08/25 17:10		
COC Number		08426866	08426866	08426866	08426866	08426866	08426866	08426866		
	UNITS	**MH-16 A**	**MH-16 B**	**MH-16 C**	**MH-20 A**	**MH-20 B**	**MH-20 C**	**MH-04 A**	**RDL**	**QC Batch**
Total Uranium (U)	mg/kg	0.659	0.566	0.683	0.571	0.617	0.555	1.39	0.050	8387274
Total Vanadium (V)	mg/kg	23.5	20.9	21.6	30.5	25.7	23.8	28.3	2.0	8387274
Total Zinc (Zn)	mg/kg	122	88.7	108	116	70.3	70.8	633	1.0	8387274
Total Zirconium (Zr)	mg/kg	0.96	0.88	1.26	1.46	1.34	1.36	1.24	0.50	8387274
RDL = Reportable Detection Limit										

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LABERGE ENVIRONMENTAL SERVICES
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CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		PJ8550	PJ8551	PJ8552	PJ8553	PJ8554	PJ8555	PJ8556		
Sampling Date		2016/08/25 17:10	2016/08/25 17:10	2016/08/25 17:45	2016/08/25 17:45	2016/08/25 17:45	2016/08/25 16:35	2016/08/25 16:35		
COC Number		08426866	08426866	08426866	08426866	08426866	08426866	08426866		
	UNITS	**MH-04 B**	**MH-04 C**	**MH-11 A**	**MH-11 B**	**MH-11 C**	**MH-12 A**	**MH-12 B**	**RDL**	**QC Batch**
Physical Properties										
Soluble (2:1) pH	pH	7.89	8.13	8.24	8.34	8.38	8.18	8.14	N/A	8387279
Total Metals by ICPMS										
Total Aluminum (Al)	mg/kg	14200	13100	11000	10900	12000	9200	9820	100	8387274
Total Antimony (Sb)	mg/kg	1.98	2.02	1.63	1.73	1.73	2.02	2.26	0.10	8387274
Total Arsenic (As)	mg/kg	21.4	15.3	16.7	16.1	22.7	14.9	16.4	0.50	8387274
Total Barium (Ba)	mg/kg	133	93.9	165	177	169	167	178	0.10	8387274
Total Beryllium (Be)	mg/kg	0.86	0.76	<0.40	<0.40	0.45	<0.40	0.44	0.40	8387274
Total Bismuth (Bi)	mg/kg	0.34	0.38	0.17	0.16	0.37	0.17	0.24	0.10	8387274
Total Cadmium (Cd)	mg/kg	15.6	9.48	3.75	3.84	3.51	2.55	2.83	0.050	8387274
Total Calcium (Ca)	mg/kg	11700	11200	10600	11300	12100	12300	11600	100	8387274
Total Chromium (Cr)	mg/kg	30.9	30.2	27.0	26.8	23.0	20.4	20.9	1.0	8387274
Total Cobalt (Co)	mg/kg	13.0	9.21	8.93	8.52	10.3	7.21	7.79	0.30	8387274
Total Copper (Cu)	mg/kg	82.6	58.9	61.8	81.9	175	39.7	62.6	0.50	8387274
Total Iron (Fe)	mg/kg	28000	22800	23700	23100	27900	18800	19600	100	8387274
Total Lead (Pb)	mg/kg	300	283	227	206	224	160	122	0.10	8387274
Total Lithium (Li)	mg/kg	31.6	29.6	24.6	24.5	28.8	19.4	19.8	5.0	8387274
Total Magnesium (Mg)	mg/kg	9330	8420	8530	8320	10200	7410	7720	100	8387274
Total Manganese (Mn)	mg/kg	1320	557	1450	1520	1810	568	616	0.20	8387274
Total Mercury (Hg)	mg/kg	0.053	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	8387274
Total Molybdenum (Mo)	mg/kg	1.74	1.32	1.58	1.50	1.99	2.49	2.76	0.10	8387274
Total Nickel (Ni)	mg/kg	31.0	26.9	25.3	25.5	27.7	26.2	27.5	0.80	8387274
Total Phosphorus (P)	mg/kg	794	785	809	805	768	878	892	10	8387274
Total Potassium (K)	mg/kg	738	725	568	565	604	643	705	100	8387274
Total Selenium (Se)	mg/kg	1.33	1.24	0.95	0.73	0.57	1.01	1.05	0.50	8387274
Total Silver (Ag)	mg/kg	0.466	0.494	0.270	0.294	0.216	0.303	0.330	0.050	8387274
Total Sodium (Na)	mg/kg	<100	<100	<100	<100	<100	<100	107	100	8387274
Total Strontium (Sr)	mg/kg	49.7	46.6	43.9	44.5	46.2	41.4	41.2	0.10	8387274
Total Thallium (Tl)	mg/kg	0.194	0.176	0.106	0.099	0.092	0.133	0.128	0.050	8387274
Total Tin (Sn)	mg/kg	1.00	0.81	1.66	1.55	2.80	0.55	1.27	0.10	8387274
Total Titanium (Ti)	mg/kg	329	366	359	351	352	305	333	1.0	8387274

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B673978
Report Date: 2016/09/13

LABERGE ENVIRONMENTAL SERVICES
Site Location: SA DENA HES
Your P.O. #: 8965
Sampler Initials: BB

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		PJ8550	PJ8551	PJ8552	PJ8553	PJ8554	PJ8555	PJ8556		
Sampling Date		2016/08/25 17:10	2016/08/25 17:10	2016/08/25 17:45	2016/08/25 17:45	2016/08/25 17:45	2016/08/25 16:35	2016/08/25 16:35		
COC Number		08426866	08426866	08426866	08426866	08426866	08426866	08426866		
	UNITS	**MH-04 B**	**MH-04 C**	**MH-11 A**	**MH-11 B**	**MH-11 C**	**MH-12 A**	**MH-12 B**	**RDL**	**QC Batch**
Total Uranium (U)	mg/kg	1.24	1.08	0.778	0.701	0.770	0.913	0.951	0.050	8387274
Total Vanadium (V)	mg/kg	35.4	30.3	34.2	31.3	33.5	37.7	39.7	2.0	8387274
Total Zinc (Zn)	mg/kg	637	633	587	577	641	341	324	1.0	8387274
Total Zirconium (Zr)	mg/kg	1.23	1.02	1.33	1.24	2.41	0.87	0.82	0.50	8387274
RDL = Reportable Detection Limit										

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LABERGE ENVIRONMENTAL SERVICES
Site Location: SA DENA HES
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Sampler Initials: BB

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		PJ8557	PJ8558	PJ8559	PJ8560		
Sampling Date		2016/08/25 16:35	2016/08/26	2016/08/26	2016/08/26		
COC Number		08426866	08426866	08426866	08426866		
	UNITS	**MH-12 C**	**MH-29 A**	**MH-29 B**	**MH-29 C**	**RDL**	**QC Batch**
Physical Properties							
Soluble (2:1) pH	pH	7.99	7.89	8.22	8.13	N/A	8387860
Total Metals by ICPMS							
Total Aluminum (Al)	mg/kg	11200	14100	13900	14000	100	8387859
Total Antimony (Sb)	mg/kg	2.43	1.62	1.61	1.57	0.10	8387859
Total Arsenic (As)	mg/kg	18.3	21.6	23.5	25.1	0.50	8387859
Total Barium (Ba)	mg/kg	193	169	200	213	0.10	8387859
Total Beryllium (Be)	mg/kg	0.54	0.61	0.50	0.61	0.40	8387859
Total Bismuth (Bi)	mg/kg	0.20	0.33	0.31	0.32	0.10	8387859
Total Cadmium (Cd)	mg/kg	3.06	7.99	9.33	8.41	0.050	8387859
Total Calcium (Ca)	mg/kg	12900	12300	18300	15900	100	8387859
Total Chromium (Cr)	mg/kg	23.3	26.4	23.9	24.0	1.0	8387859
Total Cobalt (Co)	mg/kg	8.39	10.5	10.2	11.0	0.30	8387859
Total Copper (Cu)	mg/kg	44.9	68.9	63.4	72.3	0.50	8387859
Total Iron (Fe)	mg/kg	21300	26600	27000	26600	100	8387859
Total Lead (Pb)	mg/kg	139	108	95.9	96.1	0.10	8387859
Total Lithium (Li)	mg/kg	21.5	33.1	31.4	32.0	5.0	8387859
Total Magnesium (Mg)	mg/kg	8120	10700	10100	9780	100	8387859
Total Manganese (Mn)	mg/kg	791	1470	2050	2250	0.20	8387859
Total Mercury (Hg)	mg/kg	0.051	<0.050	0.051	<0.050	0.050	8387859
Total Molybdenum (Mo)	mg/kg	3.04	1.10	1.08	1.19	0.10	8387859
Total Nickel (Ni)	mg/kg	29.9	26.4	25.1	25.0	0.80	8387859
Total Phosphorus (P)	mg/kg	907	778	776	759	10	8387859
Total Potassium (K)	mg/kg	930	716	733	709	100	8387859
Total Selenium (Se)	mg/kg	1.61	2.14	2.39	2.11	0.50	8387859
Total Silver (Ag)	mg/kg	0.400	0.499	0.465	0.414	0.050	8387859
Total Sodium (Na)	mg/kg	<100	<100	<100	242	100	8387859
Total Strontium (Sr)	mg/kg	47.8	53.5	64.7	61.2	0.10	8387859
Total Thallium (Tl)	mg/kg	0.159	0.146	0.150	0.142	0.050	8387859
Total Tin (Sn)	mg/kg	0.63	1.11	0.78	1.23	0.10	8387859
Total Titanium (Ti)	mg/kg	366	286	262	275	1.0	8387859

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B673978
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LABERGE ENVIRONMENTAL SERVICES
Site Location: SA DENA HES
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Sampler Initials: BB

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		PJ8557	PJ8558	PJ8559	PJ8560		
Sampling Date		2016/08/25 16:35	2016/08/26	2016/08/26	2016/08/26		
COC Number		08426866	08426866	08426866	08426866		
	UNITS	**MH-12 C**	**MH-29 A**	**MH-29 B**	**MH-29 C**	**RDL**	**QC Batch**
Total Uranium (U)	mg/kg	1.07	0.956	0.750	0.799	0.050	8387859
Total Vanadium (V)	mg/kg	45.0	27.0	26.0	25.8	2.0	8387859
Total Zinc (Zn)	mg/kg	357	416	411	401	1.0	8387859
Total Zirconium (Zr)	mg/kg	0.99	1.25	1.24	1.22	0.50	8387859
RDL = Reportable Detection Limit							

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LABERGE ENVIRONMENTAL SERVICES
Site Location: SA DENA HES
Your P.O. #: 8965
Sampler Initials: BB

LOW LEVEL DISSOLVED METALS IN WATER (WATER)

Maxxam ID		PJ8526		PJ8527		PJ8528	PJ8529		
Sampling Date		2016/08/25 09:15		2016/08/25 10:45		2016/08/25 12:30	2016/08/25 14:00		
COC Number		502595-01-01		502595-01-01		502595-01-01	502595-01-01		
	UNITS	**MH-30**	**QC Batch**	**MH-13**	**QC Batch**	**MH-16**	**MH-20**	**RDL**	**QC Batch**
Misc. Inorganics									
Dissolved Hardness (CaCO3)	mg/L	188	8381404	222	8392091	227	163	0.50	8381404
Dissolved Metals by ICPMS									
Dissolved Aluminum (Al)	ug/L	3.3	8383552	2.0	8383552	1.3	1.7	1.0	8383552
Dissolved Antimony (Sb)	ug/L	0.086	8383552	0.107 (1)	8383552	0.093	0.067	0.020	8383552
Dissolved Arsenic (As)	ug/L	0.320	8383552	0.434	8392434	0.376	0.473	0.020	8383552
Dissolved Barium (Ba)	ug/L	234	8383552	158 (1)	8383552	188	135	0.10	8383552
Dissolved Beryllium (Be)	ug/L	<0.010	8383552	<0.010	8383552	<0.010	<0.010	0.010	8383552
Dissolved Bismuth (Bi)	ug/L	<0.0050	8383552	<0.0050	8383552	<0.0050	<0.0050	0.0050	8383552
Dissolved Boron (B)	ug/L	<10	8383552	<10	8383552	<10	<10	10	8383552
Dissolved Cadmium (Cd)	ug/L	0.0500	8383552	0.0140	8383552	0.0080	0.0060	0.0050	8383552
Dissolved Chromium (Cr)	ug/L	<0.10	8383552	<0.10	8392434	<0.10	<0.10	0.10	8383552
Dissolved Cobalt (Co)	ug/L	0.0670	8383552	0.0330	8392434	0.0200	0.0240	0.0050	8383552
Dissolved Copper (Cu)	ug/L	0.58	8383552	0.29	8383552	0.23	0.30	0.20	8383552
Dissolved Iron (Fe)	ug/L	248	8383552	51.5	8392434	43.4	77.6	1.0	8383552
Dissolved Lead (Pb)	ug/L	0.034	8383552	<0.020	8383552	<0.020	<0.020	0.020	8383552
Dissolved Lithium (Li)	ug/L	0.72	8383552	0.94	8392434	1.36	1.32	0.50	8383552
Dissolved Manganese (Mn)	ug/L	14.7	8383552	18.7	8383552	9.13	16.3	0.20	8383552
Dissolved Molybdenum (Mo)	ug/L	1.66	8383552	1.29 (1)	8383552	1.17	1.07	0.050	8383552
Dissolved Nickel (Ni)	ug/L	0.71	8383552	0.36	8383552	0.25	0.43	0.20	8383552
Dissolved Selenium (Se)	ug/L	0.364	8383552	0.372 (1)	8392434	0.506	0.273	0.040	8383552
Dissolved Silicon (Si)	ug/L	2560	8383552	2940 (1)	8383552	3450	3380	50	8383552
Dissolved Silver (Ag)	ug/L	<0.0050	8383552	<0.0050	8383552	<0.0050	<0.0050	0.0050	8383552
Dissolved Strontium (Sr)	ug/L	131	8383552	224 (1)	8383552	234	175	0.050	8383552
Dissolved Thallium (Tl)	ug/L	<0.0020	8383552	<0.0020	8383552	<0.0020	<0.0020	0.0020	8383552
Dissolved Tin (Sn)	ug/L	<0.20	8383552	<0.20	8383552	<0.20	<0.20	0.20	8383552
Dissolved Titanium (Ti)	ug/L	<0.50	8383552	<0.50	8383552	<0.50	<0.50	0.50	8383552
Dissolved Uranium (U)	ug/L	1.50	8383552	1.48 (1)	8383552	0.857	0.550	0.0020	8383552
Dissolved Vanadium (V)	ug/L	<0.20	8383552	<0.20	8383552	<0.20	<0.20	0.20	8383552
Dissolved Zinc (Zn)	ug/L	1.6	8383552	<1.0	8383552	<1.0	<1.0	1.0	8383552
Dissolved Zirconium (Zr)	ug/L	<0.10	8383552	<0.10	8392434	<0.10	<0.10	0.10	8383552

RDL = Reportable Detection Limit
(1) Dissolved greater than total. Reanalysis yields similar results.

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LABERGE ENVIRONMENTAL SERVICES
Site Location: SA DENA HES
Your P.O. #: 8965
Sampler Initials: BB

LOW LEVEL DISSOLVED METALS IN WATER (WATER)

Maxxam ID		PJ8526		PJ8527		PJ8528	PJ8529		
Sampling Date		2016/08/25 09:15		2016/08/25 10:45		2016/08/25 12:30	2016/08/25 14:00		
COC Number		502595-01-01		502595-01-01		502595-01-01	502595-01-01		
	UNITS	**MH-30**	**QC Batch**	**MH-13**	**QC Batch**	**MH-16**	**MH-20**	**RDL**	**QC Batch**
Dissolved Calcium (Ca)	mg/L	48.7	8381406	65.6 (1)	8381406	65.1	46.0	0.050	8381406
Dissolved Magnesium (Mg)	mg/L	16.1	8381406	14.2 (1)	8391195	15.7	11.6	0.050	8381406
Dissolved Potassium (K)	mg/L	0.357	8381406	0.394 (1)	8381406	0.486	0.571	0.050	8381406
Dissolved Sodium (Na)	mg/L	0.728	8381406	0.933 (1)	8381406	1.29	1.40	0.050	8381406
Dissolved Sulphur (S)	mg/L	<3.0	8381406	<3.0	8381406	<3.0	<3.0	3.0	8381406

RDL = Reportable Detection Limit
(1) Dissolved greater than total. Reanalysis yields similar results.

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LOW LEVEL DISSOLVED METALS IN WATER (WATER)

Maxxam ID		PJ8530	PJ8531		
Sampling Date		2016/08/25	2016/08/25		
COC Number		502595-01-01	502595-01-01		
	UNITS	**DUPLICATE (DUP)**	**TRAVEL BLANK**	**RDL**	**QC Batch**
Misc. Inorganics					
Dissolved Hardness (CaCO3)	mg/L	160	<0.50	0.50	8381404
Dissolved Metals by ICPMS					
Dissolved Aluminum (Al)	ug/L	1.5	<1.0	1.0	8383552
Dissolved Antimony (Sb)	ug/L	0.064	<0.020	0.020	8383552
Dissolved Arsenic (As)	ug/L	0.414	<0.020	0.020	8383552
Dissolved Barium (Ba)	ug/L	135	<0.10	0.10	8383552
Dissolved Beryllium (Be)	ug/L	<0.010	<0.010	0.010	8383552
Dissolved Bismuth (Bi)	ug/L	<0.0050	<0.0050	0.0050	8383552
Dissolved Boron (B)	ug/L	<10	<10	10	8383552
Dissolved Cadmium (Cd)	ug/L	<0.0050	<0.0050	0.0050	8383552
Dissolved Chromium (Cr)	ug/L	<0.10	<0.10	0.10	8383552
Dissolved Cobalt (Co)	ug/L	0.0250	<0.0050	0.0050	8383552
Dissolved Copper (Cu)	ug/L	0.33	<0.20	0.20	8383552
Dissolved Iron (Fe)	ug/L	74.0	<1.0	1.0	8383552
Dissolved Lead (Pb)	ug/L	<0.020	<0.020	0.020	8383552
Dissolved Lithium (Li)	ug/L	1.30	<0.50	0.50	8383552
Dissolved Manganese (Mn)	ug/L	16.1	<0.20	0.20	8383552
Dissolved Molybdenum (Mo)	ug/L	1.07	<0.050	0.050	8383552
Dissolved Nickel (Ni)	ug/L	0.44	0.27	0.20	8383552
Dissolved Selenium (Se)	ug/L	0.284	<0.040	0.040	8383552
Dissolved Silicon (Si)	ug/L	3360	<50	50	8383552
Dissolved Silver (Ag)	ug/L	<0.0050	<0.0050	0.0050	8383552
Dissolved Strontium (Sr)	ug/L	171	<0.050	0.050	8383552
Dissolved Thallium (Tl)	ug/L	<0.0020	<0.0020	0.0020	8383552
Dissolved Tin (Sn)	ug/L	<0.20	<0.20	0.20	8383552
Dissolved Titanium (Ti)	ug/L	<0.50	<0.50	0.50	8383552
Dissolved Uranium (U)	ug/L	0.544	<0.0020	0.0020	8383552
Dissolved Vanadium (V)	ug/L	<0.20	<0.20	0.20	8383552
Dissolved Zinc (Zn)	ug/L	<1.0	<1.0	1.0	8383552
Dissolved Zirconium (Zr)	ug/L	<0.10	<0.10	0.10	8383552
Dissolved Calcium (Ca)	mg/L	44.9	<0.050	0.050	8381406
RDL = Reportable Detection Limit					

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LOW LEVEL DISSOLVED METALS IN WATER (WATER)

Maxxam ID		PJ8530	PJ8531		
Sampling Date		2016/08/25	2016/08/25		
COC Number		502595-01-01	502595-01-01		
	UNITS	**DUPLICATE (DUP)**	**TRAVEL BLANK**	**RDL**	**QC Batch**
Dissolved Magnesium (Mg)	mg/L	11.7	<0.050	0.050	8381406
Dissolved Potassium (K)	mg/L	0.554	<0.050	0.050	8381406
Dissolved Sodium (Na)	mg/L	1.37	<0.050	0.050	8381406
Dissolved Sulphur (S)	mg/L	<3.0	<3.0	3.0	8381406
RDL = Reportable Detection Limit					

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Maxxam Job #: B673978
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LABERGE ENVIRONMENTAL SERVICES
Site Location: SA DENA HES
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Sampler Initials: BB

LOW LEVEL TOTAL METALS IN WATER (WATER)

Maxxam ID		PJ8526	PJ8528	PJ8529	PJ8530	PJ8531		
Sampling Date		2016/08/25 09:15	2016/08/25 12:30	2016/08/25 14:00	2016/08/25	2016/08/25		
COC Number		502595-01-01	502595-01-01	502595-01-01	502595-01-01	502595-01-01		
	UNITS	**MH-30**	**MH-16**	**MH-20**	**DUPLICATE (DUP)**	**TRAVEL BLANK**	**RDL**	**QC Batch**
Calculated Parameters								
Total Hardness (CaCO3)	mg/L	184	217	158	160	<0.50	0.50	8381427
Total Metals by ICPMS								
Total Aluminum (Al)	ug/L	6.7	6.8	12.3	16.0	<1.0	1.0	8383605
Total Antimony (Sb)	ug/L	0.091	0.072	0.062	0.062	<0.020	0.020	8383605
Total Arsenic (As)	ug/L	0.386	0.450	0.475	0.483	<0.020	0.020	8383605
Total Barium (Ba)	ug/L	226	186	132	134	<0.10	0.10	8383605
Total Beryllium (Be)	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	8383605
Total Bismuth (Bi)	ug/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	8383605
Total Boron (B)	ug/L	<10	<10	<10	<10	<10	10	8383605
Total Cadmium (Cd)	ug/L	0.0600	0.0090	0.0070	0.0100	<0.0050	0.0050	8383605
Total Chromium (Cr)	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8383605
Total Cobalt (Co)	ug/L	0.0730	0.0300	0.0420	0.0500	<0.0050	0.0050	8383605
Total Copper (Cu)	ug/L	0.57	0.21	0.34	0.34	<0.20	0.20	8383605
Total Iron (Fe)	ug/L	422	170	194	207	<1.0	1.0	8383605
Total Lead (Pb)	ug/L	0.099	0.025	0.027	0.036	<0.020	0.020	8383605
Total Lithium (Li)	ug/L	0.72	1.38	1.33	1.33	<0.50	0.50	8383605
Total Manganese (Mn)	ug/L	15.1	13.4	22.2	22.6	<0.20	0.20	8383605
Total Molybdenum (Mo)	ug/L	1.62	1.14	1.04	1.03	<0.050	0.050	8383605
Total Nickel (Ni)	ug/L	0.70	0.25	0.48	0.48	<0.20	0.20	8383605
Total Selenium (Se)	ug/L	0.346	0.474	0.283	0.293	<0.040	0.040	8383605
Total Silicon (Si)	ug/L	2560	3380	3470	3370	<50	50	8383605
Total Silver (Ag)	ug/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	8383605
Total Strontium (Sr)	ug/L	132	230	171	170	<0.050	0.050	8383605
Total Thallium (Tl)	ug/L	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	8383605
Total Tin (Sn)	ug/L	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	8383605
Total Titanium (Ti)	ug/L	<0.50	<0.50	<0.50	0.72	<0.50	0.50	8383605
Total Uranium (U)	ug/L	1.49	0.820	0.559	0.557	<0.0020	0.0020	8383605
Total Vanadium (V)	ug/L	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	8383605
Total Zinc (Zn)	ug/L	1.4	<1.0	1.1	<1.0	<1.0	1.0	8383605
Total Zirconium (Zr)	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8383605
Total Calcium (Ca)	mg/L	47.4	62.0	44.4	45.1	<0.050	0.050	8381873
RDL = Reportable Detection Limit								

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LABERGE ENVIRONMENTAL SERVICES
Site Location: SA DENA HES
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Sampler Initials: BB

LOW LEVEL TOTAL METALS IN WATER (WATER)

Maxxam ID		PJ8526	PJ8528	PJ8529	PJ8530	PJ8531		
Sampling Date		2016/08/25 09:15	2016/08/25 12:30	2016/08/25 14:00	2016/08/25	2016/08/25		
COC Number		502595-01-01	502595-01-01	502595-01-01	502595-01-01	502595-01-01		
	UNITS	**MH-30**	**MH-16**	**MH-20**	**DUPLICATE (DUP)**	**TRAVEL BLANK**	**RDL**	**QC Batch**
Total Magnesium (Mg)	mg/L	15.9	15.2	11.4	11.4	<0.050	0.050	8381873
Total Potassium (K)	mg/L	0.342	0.482	0.564	0.564	<0.050	0.050	8381873
Total Sodium (Na)	mg/L	0.716	1.27	1.37	1.38	<0.050	0.050	8381873
Total Sulphur (S)	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	3.0	8381873
RDL = Reportable Detection Limit								

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LABERGE ENVIRONMENTAL SERVICES
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LL TOTAL METALS (DIGESTED) IN WATER

Maxxam ID		PJ8527		
Sampling Date		2016/08/25 10:45		
COC Number		502595-01-01		
	UNITS	**MH-13**	**RDL**	**QC Batch**
Calculated Parameters				
Total Hardness (CaCO3)	mg/L	143	0.50	8392038
Total Metals by ICPMS				
Total Aluminum (Al)	ug/L	12.6	3.0	8393193
Total Antimony (Sb)	ug/L	0.080	0.020	8393193
Total Arsenic (As)	ug/L	0.398	0.020	8393193
Total Barium (Ba)	ug/L	115	0.050	8384545
Total Beryllium (Be)	ug/L	<0.010	0.010	8393193
Total Bismuth (Bi)	ug/L	<0.010	0.010	8393193
Total Boron (B)	ug/L	<10	10	8393193
Total Cadmium (Cd)	ug/L	0.0250	0.0050	8393193
Total Chromium (Cr)	ug/L	0.38	0.10	8393193
Total Cobalt (Co)	ug/L	0.043	0.010	8393193
Total Copper (Cu)	ug/L	0.53	0.10	8393193
Total Iron (Fe)	ug/L	162	5.0	8384545
Total Lead (Pb)	ug/L	0.107	0.020	8393193
Total Lithium (Li)	ug/L	1.14	0.50	8384545
Total Manganese (Mn)	ug/L	21.0	0.10	8384545
Total Molybdenum (Mo)	ug/L	0.898	0.050	8384545
Total Nickel (Ni)	ug/L	0.31	0.10	8393193
Total Selenium (Se)	ug/L	0.241	0.040	8393193
Total Silicon (Si)	ug/L	2380	50	8384545
Total Silver (Ag)	ug/L	<0.010	0.010	8384545
Total Strontium (Sr)	ug/L	166	0.050	8384545
Total Thallium (Tl)	ug/L	0.0020	0.0020	8393193
Total Tin (Sn)	ug/L	<0.20	0.20	8384545
Total Titanium (Ti)	ug/L	<2.0	2.0	8393193
Total Uranium (U)	ug/L	1.07	0.0050	8384545
Total Vanadium (V)	ug/L	<0.20	0.20	8393193
Total Zinc (Zn)	ug/L	1.6	1.0	8393193
Total Zirconium (Zr)	ug/L	<0.10	0.10	8393193
Total Calcium (Ca)	mg/L	40.5	0.25	8381873
RDL = Reportable Detection Limit				

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LL TOTAL METALS (DIGESTED) IN WATER

Maxxam ID		PJ8527		
Sampling Date		2016/08/25 10:45		
COC Number		502595-01-01		
	UNITS	**MH-13**	**RDL**	**QC Batch**
Total Magnesium (Mg)	mg/L	10.1	0.25	8381873
Total Potassium (K)	mg/L	0.28	0.25	8381873
Total Sodium (Na)	mg/L	0.64	0.25	8381873
Total Sulphur (S)	mg/L	<3.0	3.0	8391258
RDL = Reportable Detection Limit				

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LABERGE ENVIRONMENTAL SERVICES
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GENERAL COMMENTS

Sample PJ8527, Elements by ICPMS Low Level (dissolved): Test repeated.
Sample PJ8527, Na, K, Ca, Mg, S by CRC ICPMS (diss.): Test repeated.
Sample PJ8527, Elements by ICPMS Digested LL (total): Test repeated.
Sample PJ8527, Na, K, Ca, Mg, S by CRC ICPMS (total): Test repeated.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

LABERGE ENVIRONMENTAL SERVICES
Site Location: SA DENA HES
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			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8382432	Alkalinity (PP as CaCO3)	2016/08/31					<0.50	mg/L				
8382432	Alkalinity (Total as CaCO3)	2016/08/31			94	80 - 120	<0.50	mg/L				
8382432	Bicarbonate (HCO3)	2016/08/31					<0.50	mg/L				
8382432	Carbonate (CO3)	2016/08/31					<0.50	mg/L				
8382432	Hydroxide (OH)	2016/08/31					<0.50	mg/L				
8382435	pH	2016/08/31			102	97 - 103						
8382586	Total Ammonia (N)	2016/08/31	NC	80 - 120	101	80 - 120	<0.0050	mg/L	0.87	20		
8383552	Dissolved Aluminum (Al)	2016/09/03	106	80 - 120	104	80 - 120	<0.50	ug/L	NC	20		
8383552	Dissolved Antimony (Sb)	2016/09/03	105	80 - 120	102	80 - 120	<0.020	ug/L	NC	20		
8383552	Dissolved Arsenic (As)	2016/09/03	104	80 - 120	99	80 - 120	<0.020	ug/L	NC	20		
8383552	Dissolved Barium (Ba)	2016/09/03	100	80 - 120	100	80 - 120	<0.020	ug/L	NC	20		
8383552	Dissolved Beryllium (Be)	2016/09/03	99	80 - 120	95	80 - 120	<0.010	ug/L	NC	20		
8383552	Dissolved Bismuth (Bi)	2016/09/03	99	80 - 120	99	80 - 120	<0.0050	ug/L	NC	20		
8383552	Dissolved Boron (B)	2016/09/03	105	80 - 120	105	80 - 120	<10	ug/L	NC	20		
8383552	Dissolved Cadmium (Cd)	2016/09/03	101	80 - 120	97	80 - 120	<0.0050	ug/L	NC	20		
8383552	Dissolved Chromium (Cr)	2016/09/03	99	80 - 120	102	80 - 120	<0.10	ug/L	NC	20		
8383552	Dissolved Cobalt (Co)	2016/09/03	101	80 - 120	102	80 - 120	<0.0050	ug/L	NC	20		
8383552	Dissolved Copper (Cu)	2016/09/03	102	80 - 120	106	80 - 120	<0.050	ug/L	1.3	20		
8383552	Dissolved Iron (Fe)	2016/09/03	105	80 - 120	106	80 - 120	<1.0	ug/L	NC	20		
8383552	Dissolved Lead (Pb)	2016/09/03	97	80 - 120	97	80 - 120	<0.0050	ug/L	NC	20		
8383552	Dissolved Lithium (Li)	2016/09/03	95	80 - 120	92	80 - 120	<0.50	ug/L	NC	20		
8383552	Dissolved Manganese (Mn)	2016/09/03	101	80 - 120	101	80 - 120	<0.050	ug/L	NC	20		
8383552	Dissolved Molybdenum (Mo)	2016/09/03	102	80 - 120	103	80 - 120	<0.050	ug/L	NC	20		
8383552	Dissolved Nickel (Ni)	2016/09/03	102	80 - 120	102	80 - 120	<0.020	ug/L	NC	20		
8383552	Dissolved Selenium (Se)	2016/09/03	107	80 - 120	104	80 - 120	<0.040	ug/L	NC	20		
8383552	Dissolved Silicon (Si)	2016/09/03					<50	ug/L	NC	20		
8383552	Dissolved Silver (Ag)	2016/09/03	104	80 - 120	95	80 - 120	<0.0050	ug/L	NC	20		
8383552	Dissolved Strontium (Sr)	2016/09/03	99	80 - 120	90	80 - 120	<0.050	ug/L	NC	20		
8383552	Dissolved Thallium (Tl)	2016/09/03	95	80 - 120	99	80 - 120	<0.0020	ug/L	NC	20		
8383552	Dissolved Tin (Sn)	2016/09/03	101	80 - 120	102	80 - 120	<0.20	ug/L	NC	20		
8383552	Dissolved Titanium (Ti)	2016/09/03	92	80 - 120	93	80 - 120	<0.50	ug/L	NC	20		

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			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8383552	Dissolved Uranium (U)	2016/09/03	98	80 - 120	99	80 - 120	<0.0020	ug/L	NC	20		
8383552	Dissolved Vanadium (V)	2016/09/03	101	80 - 120	100	80 - 120	<0.20	ug/L	NC	20		
8383552	Dissolved Zinc (Zn)	2016/09/03	104	80 - 120	101	80 - 120	<0.10	ug/L	NC	20		
8383552	Dissolved Zirconium (Zr)	2016/09/03					<0.10	ug/L	NC	20		
8383605	Total Aluminum (Al)	2016/09/02	105	80 - 120	105	80 - 120	<0.50	ug/L	0.057	20		
8383605	Total Antimony (Sb)	2016/09/02	105	80 - 120	102	80 - 120	<0.020	ug/L	NC	20		
8383605	Total Arsenic (As)	2016/09/02	105	80 - 120	100	80 - 120	<0.020	ug/L	10	20		
8383605	Total Barium (Ba)	2016/09/02	NC	80 - 120	102	80 - 120	<0.020	ug/L	0.23	20		
8383605	Total Beryllium (Be)	2016/09/02	102	80 - 120	97	80 - 120	<0.010	ug/L	NC	20		
8383605	Total Bismuth (Bi)	2016/09/02	101	80 - 120	98	80 - 120	<0.0050	ug/L	NC	20		
8383605	Total Boron (B)	2016/09/02	105	80 - 120	98	80 - 120	<10	ug/L	NC	20		
8383605	Total Cadmium (Cd)	2016/09/02	98	80 - 120	99	80 - 120	<0.0050	ug/L	NC	20		
8383605	Total Chromium (Cr)	2016/09/02	100	80 - 120	99	80 - 120	<0.10	ug/L	NC	20		
8383605	Total Cobalt (Co)	2016/09/02	97	80 - 120	101	80 - 120	<0.0050	ug/L	NC	20		
8383605	Total Copper (Cu)	2016/09/02	97	80 - 120	105	80 - 120	<0.050	ug/L	7.6	20		
8383605	Total Iron (Fe)	2016/09/02	106	80 - 120	103	80 - 120	<1.0	ug/L	NC	20		
8383605	Total Lead (Pb)	2016/09/02	99	80 - 120	97	80 - 120	<0.0050	ug/L	NC	20		
8383605	Total Lithium (Li)	2016/09/02	99	80 - 120	97	80 - 120	<0.50	ug/L	NC	20		
8383605	Total Manganese (Mn)	2016/09/02	100	80 - 120	102	80 - 120	<0.050	ug/L	NC	20		
8383605	Total Molybdenum (Mo)	2016/09/02	104	80 - 120	102	80 - 120	<0.050	ug/L	5.3	20		
8383605	Total Nickel (Ni)	2016/09/02	93	80 - 120	103	80 - 120	<0.020	ug/L	3.6	20		
8383605	Total Selenium (Se)	2016/09/02	105	80 - 120	103	80 - 120	<0.040	ug/L	1.9	20		
8383605	Total Silicon (Si)	2016/09/02					<50	ug/L	2.0	20		
8383605	Total Silver (Ag)	2016/09/02	86	80 - 120	95	80 - 120	<0.0050	ug/L	NC	20		
8383605	Total Strontium (Sr)	2016/09/02	NC	80 - 120	96	80 - 120	<0.050	ug/L	2.8	20		
8383605	Total Thallium (Tl)	2016/09/02	95	80 - 120	99	80 - 120	<0.0020	ug/L	NC	20		
8383605	Total Tin (Sn)	2016/09/02	104	80 - 120	100	80 - 120	<0.20	ug/L	NC	20		
8383605	Total Titanium (Ti)	2016/09/02	102	80 - 120	102	80 - 120	<0.50	ug/L	NC	20		
8383605	Total Uranium (U)	2016/09/02	103	80 - 120	100	80 - 120	<0.0020	ug/L	1.5	20		
8383605	Total Vanadium (V)	2016/09/02	102	80 - 120	99	80 - 120	<0.20	ug/L	NC	20		
8383605	Total Zinc (Zn)	2016/09/02	102	80 - 120	103	80 - 120	<0.10	ug/L	NC	20		

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QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8383605	Total Zirconium (Zr)	2016/09/02					<0.10	ug/L	NC	20		
8383615	Dissolved Sulphate (SO4)	2016/09/01	NC	80 - 120	104	80 - 120	<1.0	mg/L	2.0	20		
8383698	Alkalinity (PP as CaCO3)	2016/08/31					<0.50	mg/L	NC	20		
8383698	Alkalinity (Total as CaCO3)	2016/08/31	NC	80 - 120	99	80 - 120	<0.50	mg/L	2.8	20		
8383698	Bicarbonate (HCO3)	2016/08/31					<0.50	mg/L	2.8	20		
8383698	Carbonate (CO3)	2016/08/31					<0.50	mg/L	NC	20		
8383698	Hydroxide (OH)	2016/08/31					<0.50	mg/L	NC	20		
8383702	pH	2016/08/31			102	97 - 103						
8383802	Total Suspended Solids	2016/09/01			102	80 - 120	<1.0	mg/L				
8384144	Dissolved Sulphate (SO4)	2016/09/01	113	80 - 120	105	80 - 120	<1.0	mg/L	NC	20		
8384545	Total Barium (Ba)	2016/09/05	NC	80 - 120	105	80 - 120	<0.050	ug/L	2.1	20		
8384545	Total Iron (Fe)	2016/09/05	NC	80 - 120	106	80 - 120	<5.0	ug/L	0.58	20		
8384545	Total Lithium (Li)	2016/09/05	109	80 - 120	115	80 - 120	<0.50	ug/L	NC	20		
8384545	Total Manganese (Mn)	2016/09/05	NC	80 - 120	104	80 - 120	<0.10	ug/L	1.5	20		
8384545	Total Molybdenum (Mo)	2016/09/05	NC	80 - 120	105	80 - 120	<0.050	ug/L	0.22	20		
8384545	Total Silicon (Si)	2016/09/05					<50	ug/L	1.8	20		
8384545	Total Silver (Ag)	2016/09/05	111	80 - 120	91	80 - 120	<0.010	ug/L	NC	20		
8384545	Total Strontium (Sr)	2016/09/05	NC	80 - 120	105	80 - 120	<0.050	ug/L	1.7	20		
8384545	Total Tin (Sn)	2016/09/05	110	80 - 120	108	80 - 120	<0.20	ug/L	NC	20		
8384545	Total Uranium (U)	2016/09/05	110	80 - 120	108	80 - 120	<0.0050	ug/L	1.1	20		
8386047	Moisture	2016/09/06					<0.30	%	7.9	20		
8386067	Moisture	2016/09/06					<0.30	%	7.3	20		
8386306	Sieve - #100(>0.15mm)	2016/09/07							3.4	35		
8386307	Sieve - #100(>0.15mm)	2016/09/07							3.4	35		
8387274	Total Aluminum (Al)	2016/09/07					<100	mg/kg	3.6	35	94	70 - 130
8387274	Total Antimony (Sb)	2016/09/07	101	75 - 125	89	75 - 125	<0.10	mg/kg	0.072	30	108	70 - 130
8387274	Total Arsenic (As)	2016/09/07	96	75 - 125	86	75 - 125	<0.50	mg/kg	1.7	30	92	70 - 130
8387274	Total Barium (Ba)	2016/09/07	NC	75 - 125	87	75 - 125	<0.10	mg/kg	2.3	35	94	70 - 130
8387274	Total Beryllium (Be)	2016/09/07	105	75 - 125	93	75 - 125	<0.40	mg/kg	NC	30	107	70 - 130
8387274	Total Bismuth (Bi)	2016/09/07					<0.10	mg/kg	NC	30		
8387274	Total Cadmium (Cd)	2016/09/07	106	75 - 125	98	75 - 125	<0.050	mg/kg	1.8	30	116	70 - 130

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8387274	Total Calcium (Ca)	2016/09/07					<100	mg/kg	0.068	30	96	70 - 130
8387274	Total Chromium (Cr)	2016/09/07	98	75 - 125	92	75 - 125	<1.0	mg/kg	5.4	30	103	70 - 130
8387274	Total Cobalt (Co)	2016/09/07	95	75 - 125	91	75 - 125	<0.30	mg/kg	4.2	30	95	70 - 130
8387274	Total Copper (Cu)	2016/09/07	94	75 - 125	98	75 - 125	<0.50	mg/kg	1.5	30	99	70 - 130
8387274	Total Iron (Fe)	2016/09/07					<100	mg/kg	3.3	30	93	70 - 130
8387274	Total Lead (Pb)	2016/09/07	103	75 - 125	96	75 - 125	<0.10	mg/kg	1.4	35	102	70 - 130
8387274	Total Lithium (Li)	2016/09/07	99	75 - 125	89	75 - 125	<5.0	mg/kg	NC	30	99	70 - 130
8387274	Total Magnesium (Mg)	2016/09/07					<100	mg/kg	3.6	30	108	70 - 130
8387274	Total Manganese (Mn)	2016/09/07	NC	75 - 125	94	75 - 125	0.22, RDL=0.20	mg/kg	1.1	30	99	70 - 130
8387274	Total Mercury (Hg)	2016/09/07	99	75 - 125	90	75 - 125	<0.050	mg/kg	NC	35	94	70 - 130
8387274	Total Molybdenum (Mo)	2016/09/07	100	75 - 125	85	75 - 125	<0.10	mg/kg	10	35	111	70 - 130
8387274	Total Nickel (Ni)	2016/09/07	95	75 - 125	95	75 - 125	1.13, RDL=0.80	mg/kg	1.7	30	102	70 - 130
8387274	Total Phosphorus (P)	2016/09/07					<10	mg/kg	3.2	30	92	70 - 130
8387274	Total Potassium (K)	2016/09/07					<100	mg/kg	5.8	35	85	70 - 130
8387274	Total Selenium (Se)	2016/09/07	103	75 - 125	93	75 - 125	<0.50	mg/kg	NC	30		
8387274	Total Silver (Ag)	2016/09/07	97	75 - 125	86	75 - 125	<0.050	mg/kg	NC	35	82	70 - 130
8387274	Total Sodium (Na)	2016/09/07					<100	mg/kg	NC	35	99	70 - 130
8387274	Total Strontium (Sr)	2016/09/07	NC	75 - 125	85	75 - 125	<0.10	mg/kg	4.4	35	100	70 - 130
8387274	Total Thallium (Tl)	2016/09/07	98	75 - 125	90	75 - 125	<0.050	mg/kg	NC	30	91	70 - 130
8387274	Total Tin (Sn)	2016/09/07	95	75 - 125	84	75 - 125	<0.10	mg/kg	NC	35	94	70 - 130
8387274	Total Titanium (Ti)	2016/09/07	NC	75 - 125	88	75 - 125	<1.0	mg/kg	6.4	35		
8387274	Total Uranium (U)	2016/09/07	94	75 - 125	97	75 - 125	<0.050	mg/kg	3.4	30	98	70 - 130
8387274	Total Vanadium (V)	2016/09/07	97	75 - 125	88	75 - 125	<2.0	mg/kg	1.5	30	96	70 - 130
8387274	Total Zinc (Zn)	2016/09/07	NC	75 - 125	94	75 - 125	<1.0	mg/kg	3.1	30	101	70 - 130
8387274	Total Zirconium (Zr)	2016/09/07					<0.50	mg/kg	NC	30		
8387279	Soluble (2:1) pH	2016/09/06			100	97 - 103			0.13	N/A		
8387859	Total Aluminum (Al)	2016/09/07					<100	mg/kg	5.0	35	93	70 - 130
8387859	Total Antimony (Sb)	2016/09/07	95	75 - 125	94	75 - 125	<0.10	mg/kg	3.0	30	107	70 - 130
8387859	Total Arsenic (As)	2016/09/07	95	75 - 125	91	75 - 125	<0.50	mg/kg	0.66	30	91	70 - 130

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8387859	Total Barium (Ba)	2016/09/07	NC	75 - 125	92	75 - 125	<0.10	mg/kg	3.1	35	93	70 - 130
8387859	Total Beryllium (Be)	2016/09/07	101	75 - 125	96	75 - 125	<0.40	mg/kg	NC	30	102	70 - 130
8387859	Total Bismuth (Bi)	2016/09/07					<0.10	mg/kg	NC	30		
8387859	Total Cadmium (Cd)	2016/09/07	104	75 - 125	103	75 - 125	<0.050	mg/kg	0.80	30	127	70 - 130
8387859	Total Calcium (Ca)	2016/09/07					<100	mg/kg	4.5	30	96	70 - 130
8387859	Total Chromium (Cr)	2016/09/07	92	75 - 125	91	75 - 125	<1.0	mg/kg	2.3	30	96	70 - 130
8387859	Total Cobalt (Co)	2016/09/07	90	75 - 125	93	75 - 125	<0.30	mg/kg	0.58	30	91	70 - 130
8387859	Total Copper (Cu)	2016/09/07	NC	75 - 125	94	75 - 125	<0.50	mg/kg	3.6	30	94	70 - 130
8387859	Total Iron (Fe)	2016/09/07					<100	mg/kg	2.5	30	91	70 - 130
8387859	Total Lead (Pb)	2016/09/07	NC	75 - 125	99	75 - 125	<0.10	mg/kg	0.52	35	102	70 - 130
8387859	Total Lithium (Li)	2016/09/07	95	75 - 125	91	75 - 125	<5.0	mg/kg	NC	30	98	70 - 130
8387859	Total Magnesium (Mg)	2016/09/07					<100	mg/kg	1.2	30	105	70 - 130
8387859	Total Manganese (Mn)	2016/09/07	NC	75 - 125	95	75 - 125	<0.20	mg/kg	2.5	30	95	70 - 130
8387859	Total Mercury (Hg)	2016/09/07	97	75 - 125	95	75 - 125	<0.050	mg/kg	NC	35	102	70 - 130
8387859	Total Molybdenum (Mo)	2016/09/07	100	75 - 125	92	75 - 125	<0.10	mg/kg	0.86	35	101	70 - 130
8387859	Total Nickel (Ni)	2016/09/07	NC	75 - 125	92	75 - 125	<0.80	mg/kg	1.4	30	96	70 - 130
8387859	Total Phosphorus (P)	2016/09/07					<10	mg/kg	3.0	30	91	70 - 130
8387859	Total Potassium (K)	2016/09/07					<100	mg/kg	0.81	35	85	70 - 130
8387859	Total Selenium (Se)	2016/09/07	101	75 - 125	99	75 - 125	<0.50	mg/kg	NC	30		
8387859	Total Silver (Ag)	2016/09/07	92	75 - 125	91	75 - 125	<0.050	mg/kg	6.6	35	84	70 - 130
8387859	Total Sodium (Na)	2016/09/07					<100	mg/kg	NC	35	94	70 - 130
8387859	Total Strontium (Sr)	2016/09/07	NC	75 - 125	92	75 - 125	<0.10	mg/kg	0.40	35	99	70 - 130
8387859	Total Thallium (Tl)	2016/09/07	97	75 - 125	95	75 - 125	<0.050	mg/kg	NC	30	93	70 - 130
8387859	Total Tin (Sn)	2016/09/07	92	75 - 125	89	75 - 125	<0.10	mg/kg	6.1	35	87	70 - 130
8387859	Total Titanium (Ti)	2016/09/07	NC	75 - 125	90	75 - 125	<1.0	mg/kg	0.59	35	80	N/A
8387859	Total Uranium (U)	2016/09/07	93	75 - 125	86	75 - 125	<0.050	mg/kg	1.4	30	95	70 - 130
8387859	Total Vanadium (V)	2016/09/07	NC	75 - 125	91	75 - 125	<2.0	mg/kg	0.12	30	95	70 - 130
8387859	Total Zinc (Zn)	2016/09/07	NC	75 - 125	98	75 - 125	<1.0	mg/kg	0.58	30	103	70 - 130
8387859	Total Zirconium (Zr)	2016/09/07					<0.50	mg/kg	NC	30		
8387860	Soluble (2:1) pH	2016/09/06			100	97 - 103			0.37	N/A		
8392434	Dissolved Arsenic (As)	2016/09/09	NC	80 - 120	98	80 - 120	<0.020	ug/L	0.67	20		

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QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8392434	Dissolved Chromium (Cr)	2016/09/09	100	80 - 120	97	80 - 120	<0.10	ug/L	NC	20		
8392434	Dissolved Cobalt (Co)	2016/09/09	92	80 - 120	99	80 - 120	<0.0050	ug/L	2.9	20		
8392434	Dissolved Iron (Fe)	2016/09/09	95	80 - 120	96	80 - 120	1.2, RDL=1.0	ug/L	NC	20		
8392434	Dissolved Lithium (Li)	2016/09/09	NC	80 - 120	101	80 - 120	<0.50	ug/L	7.4	20		
8392434	Dissolved Selenium (Se)	2016/09/09	127 (1)	80 - 120	97	80 - 120	<0.040	ug/L	NC	20		
8392434	Dissolved Zirconium (Zr)	2016/09/09					<0.10	ug/L	0.20	20		
8393193	Total Aluminum (Al)	2016/09/10	109	80 - 120	107	80 - 120	<3.0	ug/L	NC	20		
8393193	Total Antimony (Sb)	2016/09/10	104	80 - 120	107	80 - 120	<0.020	ug/L	NC	20		
8393193	Total Arsenic (As)	2016/09/10	108	80 - 120	101	80 - 120	<0.020	ug/L	11	20		
8393193	Total Beryllium (Be)	2016/09/10	102	80 - 120	107	80 - 120	<0.010	ug/L	NC	20		
8393193	Total Bismuth (Bi)	2016/09/10	94	80 - 120	95	80 - 120	<0.010	ug/L	NC	20		
8393193	Total Boron (B)	2016/09/10	101	80 - 120	105	80 - 120	<10	ug/L	NC	20		
8393193	Total Cadmium (Cd)	2016/09/10	107	80 - 120	103	80 - 120	<0.0050	ug/L	NC	20		
8393193	Total Chromium (Cr)	2016/09/10	100	80 - 120	105	80 - 120	<0.10	ug/L	NC	20		
8393193	Total Cobalt (Co)	2016/09/10	99	80 - 120	104	80 - 120	<0.010	ug/L	9.0	20		
8393193	Total Copper (Cu)	2016/09/10	98	80 - 120	106	80 - 120	<0.10	ug/L	NC	20		
8393193	Total Lead (Pb)	2016/09/10	101	80 - 120	101	80 - 120	<0.020	ug/L	NC	20		
8393193	Total Nickel (Ni)	2016/09/10	97	80 - 120	114	80 - 120	<0.10	ug/L	NC	20		
8393193	Total Selenium (Se)	2016/09/10	107	80 - 120	103	80 - 120	<0.040	ug/L	NC	20		
8393193	Total Thallium (Tl)	2016/09/10	93	80 - 120	84	80 - 120	<0.0020	ug/L	NC	20		
8393193	Total Titanium (Ti)	2016/09/10	100	80 - 120	105	80 - 120	<2.0	ug/L	NC	20		
8393193	Total Vanadium (V)	2016/09/10	104	80 - 120	100	80 - 120	<0.20	ug/L	NC	20		
8393193	Total Zinc (Zn)	2016/09/10	98	80 - 120	112	80 - 120	<1.0	ug/L	NC	20		

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Maxxam Job #: B673978
Report Date: 2016/09/13

QUALITY ASSURANCE REPORT(CONT'D)

LABERGE ENVIRONMENTAL SERVICES
Site Location: SA DENA HES
Your P.O. #: 8965
Sampler Initials: BB

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8393193	Total Zirconium (Zr)	2016/09/10					<0.10	ug/L	NC	20		

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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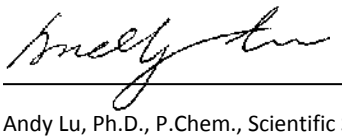
Report Date: 2016/09/13

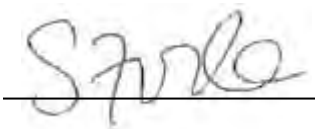
LABERGE ENVIRONMENTAL SERVICES
Site Location: SA DENA HES
Your P.O. #: 8965
Sampler Initials: BB

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Andy Lu, Ph.D., P.Chem., Scientific Specialist



Suwan Fock, B.Sc., QP, Inorganics Senior Analyst

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Chain Of Custody Record

INVOICE TO:		Report Information		Project Information		Laboratory Use Only	
Company Name	#1787 TECK RESOURCES LTD.	Company Name	#26043 LABERGE ENVIRONMENTAL SERVICES	Quotation #	B60892	Maxxam Job #	Bottle Order #: 502595
Contact Name	PURCHASING KIMBERLEY	Contact Name	BONNIE BURNS	P.O. #			
Address	BAG 2000 601 Knighton Rd. KIMBERLEY BC V1A 3E1	Address	P.O. BOX 21072 WHITEHORSE YT Y1A6P7	Project #		Chain Of Custody Record	Project Manager
Phone	(250) 427-8409 Fax: (250) 427-8451	Phone	(867) 668-6838 Fax:	Project Name		C#502595-01-01	Megan Smith
Email	Roxanne.Menear@teck.com; michelle.unger@teck.com	Email	BONNIEBURNS@Northwestel.net	Site #			
				Sampled By	B. BURNS		

Regulatory Criteria:
- [ ] CSR
- [x] CCME
- [ ] BC Water Quality
- [ ] Other

Special Instructions: all lower case - See attached for instructions & more samples for soil

SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:

Please provide advance notice for rush projects

Regular (Standard) TAT:
(will be applied if Rush TAT is not specified):
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
1 DAY ☐ 2 Day ☐ 3 Day ☐ Date Required: _____
Rush Confirmation Number: _____ (call lab for #)

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Metals Field Filtered ? (Y/N)	pH	hardness	alkalinity	sulphate	TSS	Total ammonia	Total metals - low level	Dissolved metals - low level	# of Bottles	Comments
1		MH-30	Aug 25/16	9:15	H_2O	✓	✓	✓	✓	✓	✓	✓	✓	✓		
2		MH-13	"	10:45	H_2O	✓	✓	✓	✓	✓	✓	✓	✓	✓		
3		MH-16	"	12:30	H_2O	✓	✓	✓	✓	✓	✓	✓	✓	✓		
4		MH-20	"	14:00	H_2O	✓	✓	✓	✓	✓	✓	✓	✓	✓		
5		DUPLICATE (DUP)	"	—	H_2O	✓	✓	✓	✓	✓	✓	✓	✓	✓		
6		Travel Blank	—	—	H_2O		✓	✓	✓	✓	✓	✓	✓	✓		
7		MH-30 A	Aug 25/16	10:00	Soil											
8		MH-30 B	"	10:00	Soil											
9		MH-30 C	"	10:00	Soil											
10		MH-13A	"	10:45	Soil											

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Lab Use Only: Time Sensitive	Temperature (°C) on Receipt	Custody Seal Intact on Cooler?
			Ken Robillo	16/08/25	13:10		☐	4, 4, 5	☐ Yes ☐ No
									N/A

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

White: Maxxam Yellow: Client

Maxxam Analytics International Corporation o/a Maxxam Analytics

Soil (Stream Sediment) Samples

Sample I.D. cont	Date	Time
MH-13 B	Aug 25/16	~~10:00~~ 10:45
MH-13 C	"	~~10:00~~ 10:45
MH-16 A	"	~~[illegible]~~ 13:00
MH-16 B	"	13:00
MH-16 C	"	13:00
MH-20 A	"	14:45
MH-20 B	"	14:45
MH-20 C	"	14:45
MH-04 A	"	17:10
MH-04 B	"	17:10
MH-04 C	"	17:10
MH-11 A	"	17:45
MH-11 B	"	17:45
MH-11 C	"	17:45
MH-12 A	"	16:35
MH-12 B	"	16:35
MH-12 C	"	16:35
MH-29 A	Aug 26/16	
MH-29 B	"	
MH-29 C	"	

Soil instructions: ① Dry samples
② Sieve thru a 100 mesh (0.15 mm) stainless steel sieve
③ Analyze the portion that passes for total metals with low detection limits.

contact me by email bonnieburns@northwestel.net, if you have questions.

APPENDIX C

BENTHIC INVERTEBRATE DATA, 2016

APPENDIX C **BENTHIC INVERTEBRATE DATA, 2016**

	MH-13A	MH-13B	MH-13C	MH-16A	MH-16B	MH-16C	MH-20A	MH-20B	MH-20C	Totals	%
Phylum: Arthropoda											
| Order: Collembola		3							7	10	0.1
Subphylum: Hexapoda											
| Class: Insecta											
| Order: Ephemeroptera											
| Family: Ameletidae											
Ameletus					15	4		2		21	0.1
| Family: Baetidae		5				4		4		13	0.1
Baetis		46		340	70	92	239	204	129	1120	6.7
| Family: Ephemerellidae		3		80	20	104		2	7	216	1.3
Drunella							6			6	0.04
Drunella grandis group					15	4	17	2		38	0.2
Ephemerella				30	40	20				90	0.5
Ephemerella excrucians		6								6	0.04
| Family: Heptageniidae		6		10	35	24	83	46	14	218	1.3
Rhithrogena								6		6	0.04
| Family: Leptophlebiidae				20	5		28	6		59	0.4
| Order: Plecoptera											
| Family: Capniidae	8	58	15	10	15	144	39	14		303	1.8
| Family: Chloroperlidae					5	20	6	4		35	0.2
Sweltsa					5	4	17			26	0.2
| Family: Nemouridae		8	15					4		27	0.2
Zapada		18		200	75	64		6	7	370	2.2
Zapada cinctipes		11		210	35	52	28	6		342	2.1
Zapada columbiana		5	8		5	4		2		24	0.1
| Family: Perlodidae		8	8	80		4		4		104	0.6
| Family: Taeniopterygidae											
Taenionema		2		320	65	116		6		509	3.1
| Order: Trichoptera											
| Family: Brachycentridae							6			6	0.04
Brachycentrus				200		12		16		228	1.4
Brachycentrus americanus				50		4	6	10		70	0.4
Micrasema		2		60	30					92	0.6
| Family: Glossosomatidae											
Glossosoma							6	6		12	0.1
| Family: Hydropsychidae				10				8		18	0.1
Parapsyche				40		8				48	0.3
| Family: Hydroptilidae							28		50	78	0.5
Hydroptila					5		56		129	190	1.1
| Family: Leptoceridae							22			22	0.1
| Family: Limnephilidae	16	74	146					2		238	1.4
Ecclisomyia		5								5	0.03
| Family: Rhyacophilidae											
Rhyacophila		2		60	30	32		6		130	0.8
Rhyacophila brunnea/vemna group				30			11	2		43	0.3
| Order: Coleoptera											
| Family: Dytiscidae			8							8	0.05
Agabus		2								2	0.01
| Order: Diptera	12	5	15							32	0.2
| Family: Ceratopogonidae											
Ceratopogon	4	3								7	0.04
Dasyhelea			8							8	0.05
Probezzia				10	5	4	6	2		27	0.2
| Family: Chironomidae		8		20	5	0	22	6	7	68	0.4
| Subfamily: Chironominae											
| Tribe: Chironomini										0	
Polypedilum	4								14	18	0.1
Stictochironomus									7	7	0.04
| Tribe: Tanytarsini											
Micropsectra	20	3		90	70	28	106		64	381	2.3
Neostempellina	1080	38	2162	10	25	4				3319	19.9

APPENDIX C **BENTHIC INVERTEBRATE DATA, 2016**

	MH-13A	MH-13B	MH-13C	MH-16A	MH-16B	MH-16C	MH-20A	MH-20B	MH-20C	Totals	%
Rheotanytarsus		3		950	200	56	217	58	321	1805	10.8
Stempellinella				100			100	12	321	533	3.2
Sublettea coffmani				150	120	28	189	8		495	3.0
| Tribe: Diamesini											
Pagastia		2		140	135	56	117	14	229	693	4.2
Potthastia longimana group							6		7	13	0.1
| Subfamily: Orthocladiinae	8									8	0.05
Brillia	4	24	38							66	0.4
Corynoneura	4	24								28	0.2
Diplocladius cultriger			8							8	0.05
Eukiefferiella	4	13		40	5	8	17	12		99	0.6
Heleniella	32	5	8	10	10	44			7	116	0.7
Limnophyes	8	6	15							29	0.2
Orthocladius complex	8	6		100	335	108	272	82	693	1604	9.6
Parametriocnemus			8							8	0.05
Paraphaenocladius	8									8	0.05
Rheosmittia							6	6	50	62	0.4
Thienemanniella				10						10	0.1
Tvetenia	8	3							36	47	0.3
| Subfamily: Podonominae											
| Tribe: Boreochlini											
Boreochlus		2								2	0.01
| Subfamily: Tanypodinae											
Ablabesmyia	8	26	108							142	0.9
Zavrelimyia			23	10	5	4				42	0.3
| Tribe: Pentaneurini											
Thienemannimyia group		6					56	2	57	121	0.7
| Family: Dixidae		3								3	0.02
| Family: Empididae	20	5	38	10		8	39		29	149	0.9
Chelifera/ Metachela	24			30	40	36	28	8	36	202	1.2
Oreogeton								2		2	0.0
| Family: Muscidae											
Limnophora											
| Family: Psychodidae											
Pericoma/Telmatoscopus	4	5		160	105	92	11	6	36	419	2.5
| Family: Simuliidae											
Simulium		2			5	32		8		47	0.3
| Family: Tipulidae	24	8				20				52	0.3
Dicranota	20	11	15			12	17	2	7	84	0.5
Limnophila									7	7	0.04
| Order: Thysanoptera		3								3	0.02
Subphylum: Chelicerata											
| Class: Arachnida											
| Order: Trombidiformes		8					11	2	7	28	0.2
| Family: Aturidae											
Aturus				50	50	24	28	6	57	215	1.3
| Family: Hygrobatidae											
Atractides				30			28	2	7	67	0.4
Hygrobates	40	67	23		15	24				169	1.0
| Family: Lebertiidae											
Lebertia			8		5	4	39		14	70	0.4
| Family: Sperchontidae											
Sperchon		6		10	30	8	22	10	14	100	0.6
Sperchonopsis				30	5		11			46	0.3
| Family: Torrenticolidae											
Testudacarus				70	60	24	22		14	190	1.1
| Order: Oribatida	8	19	15	10	5					57	0.3
Phylum: Mollusca											
| Class: Bivalvia											
| Order: Veneroida											
| Family: Pisidiidae						4				4	0.02

APPENDIX C **BENTHIC INVERTEBRATE DATA, 2016**

	MH-13A	MH-13B	MH-13C	MH-16A	MH-16B	MH-16C	MH-20A	MH-20B	MH-20C	Totals	%
Phylum: Annelida											
Subphylum: Clitellata											
| Class: Oligochaeta											
| Order: Tubificida											
| Family: Enchytraeidae											
Enchytraeus								4	7	11	0.1
Mesenchytraeus	36	16	115							167	1.0
| Family: Naididae											
Nais									21	21	0.1
Phylum: Cnidaria											
| Class: Hydrozoa											
| Order: Anthoathecatae											
| Family: Hydridae											
Hydra		5								5	0.03
Totals / Sample	1412	599	2807	3790	1705	1344	1968	620	2412	16657	100
Totals / Site	4818			6839			5000				
Diversity / Sample	25	48	22	39	38	42	39	44	33		
Diversity / Site	58			52			63				
Taxa present but not included:											
Phylum: Arthropoda											
Subphylum: Crustacea											
| Class: Ostracoda	4	2	8	10	5	4				33	
| Class: Branchiopoda											
| Order: Cladocera		2								2	
| Class: Maxillipoda											
| Class: Copepoda	4	2	8							14	
Phylum: Nemata	4	2		10		4	6	2	7	35	
Phylum: Platyhelminthes											
| Class: Turbellaria				10	5	4				19	

APPENDIX D

FISH DATA, 2016

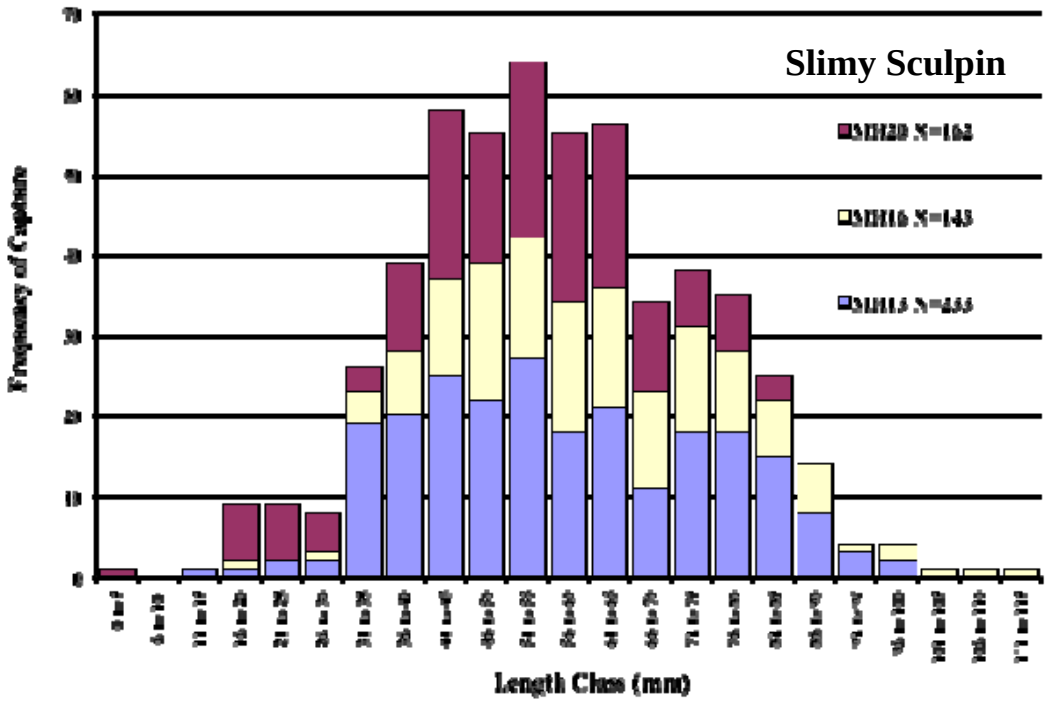
APPENDIX D TABLE 1: LENGTH DATA COLLECTED FROM FISH CAPTURED DURING SAMPLING OF FALSE CANYON CREEK, AUGUST 2016.

Species	Sample Site	Length (mm)	Weight (gms)
Arctic Grayling	MH16	62	1.9
Arctic Grayling	MH16	63	2.2
Arctic Grayling	MH16	65	2.8
Arctic Grayling	MH16	68	3.2
Arctic Grayling	MH16	120	-
Arctic Grayling	MH16	135	-
Arctic Grayling	MH16	165	-
Arctic Grayling	MH16	210	-
Arctic Grayling	MH20	52	1.5
Arctic Grayling	MH20	53	1.4
Arctic Grayling	MH20	56	2
Arctic Grayling	MH20	56	1.8
Arctic Grayling	MH20	58	1.9
Arctic Grayling	MH20	58	1.8
Arctic Grayling	MH20	58	2.0
Arctic Grayling	MH20	58	1.4
Arctic Grayling	MH20	60	1.9
Arctic Grayling	MH20	60	1.9
Arctic Grayling	MH20	61	2.3
Arctic Grayling	MH20	63	2.2
Arctic Grayling	MH20	63	2.5
Arctic Grayling	MH20	65	2.3
Arctic Grayling	MH20	65	2.3
Arctic Grayling	MH20	65	2.4
Arctic Grayling	MH20	67	2.6

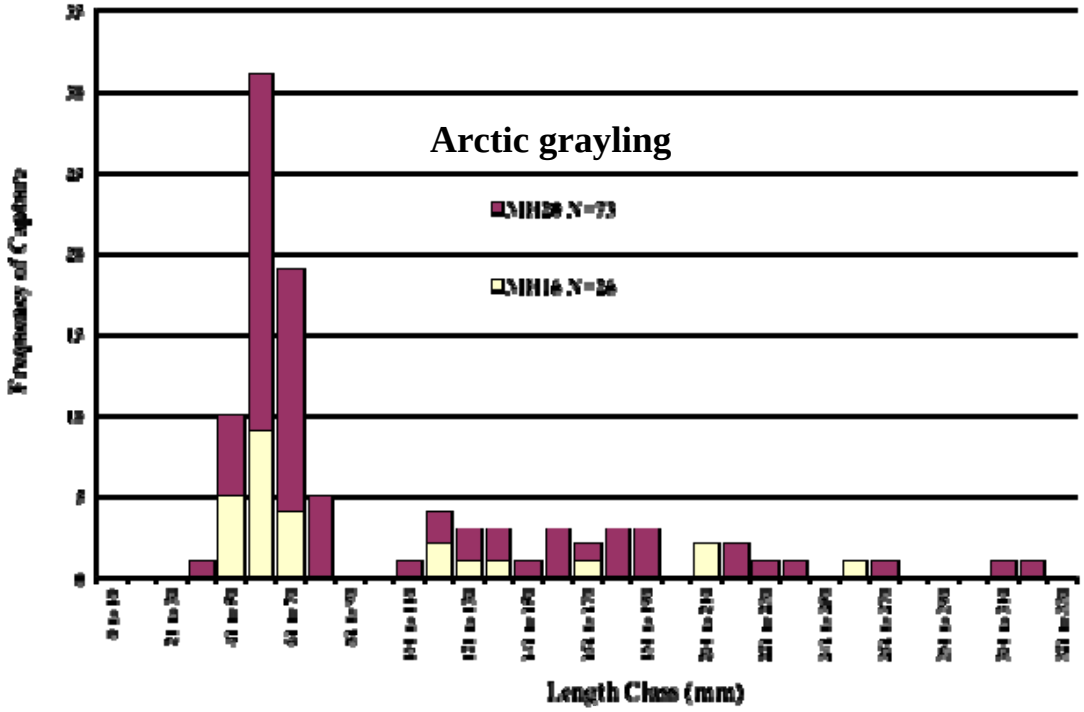
Species	Sample Site	Length (mm)	Weight (gms)
Arctic Grayling	MH20	67	2.9
Arctic Grayling	MH20	70	3.1
Arctic Grayling	MH20	75	3.6
Arctic Grayling	MH20	78	4.3
Arctic Grayling	MH20	112	13.9
Arctic Grayling	MH20	115	13.4
Arctic Grayling	MH20	130	21.5
Arctic Grayling	MH20	135	-
Arctic Grayling	MH20	185	-
Longnose Sucker	MH20	33	0.3
Longnose Sucker	MH20	35	0.5
Longnose Sucker	MH20	35	0.5
Longnose Sucker	MH20	35	0.5
Longnose Sucker	MH20	35	0.4
Slimy Sculpin	MH13	25	0.2
Slimy Sculpin	MH16	40	0.8
Slimy Sculpin	MH16	41	0.9
Slimy Sculpin	MH16	42	0.7
Slimy Sculpin	MH16	44	0.9
Slimy Sculpin	MH16	45	1.1
Slimy Sculpin	MH16	46	1.1
Slimy Sculpin	MH16	47	1.1
Slimy Sculpin	MH16	49	1.3
Slimy Sculpin	MH16	50	1.5
Slimy Sculpin	MH16	51	1.3
Slimy Sculpin	MH16	52	1.5
Slimy Sculpin	MH16	52	1.7
Slimy Sculpin	MH16	52	1.5
Slimy Sculpin	MH16	55	1.5

Species	Sample Site	Length (mm)	Weight (gms)
Slimy Sculpin	MH16	55	1.8
Slimy Sculpin	MH16	56	1.8
Slimy Sculpin	MH16	57	2.1
Slimy Sculpin	MH16	58	2.1
Slimy Sculpin	MH16	58	2.1
Slimy Sculpin	MH16	60	2.2
Slimy Sculpin	MH16	61	2.3
Slimy Sculpin	MH16	62	2.2
Slimy Sculpin	MH16	65	2.7
Slimy Sculpin	MH16	66	2.7
Slimy Sculpin	MH16	71	3.7
Slimy Sculpin	MH16	71	3.8
Slimy Sculpin	MH16	72	3.8
Slimy Sculpin	MH16	76	4.4
Slimy Sculpin	MH16	77	4.7
Slimy Sculpin	MH16	90	8.0
Slimy Sculpin	MH16	96	9.4
Slimy Sculpin	MH20	20	-
Slimy Sculpin	MH20	20	-
Slimy Sculpin	MH20	20	-
Slimy Sculpin	MH20	20	-
Slimy Sculpin	MH20	20	-
Slimy Sculpin	MH20	20	-
Slimy Sculpin	MH20	37	0.5
Slimy Sculpin	MH20	37	0.5
Slimy Sculpin	MH20	40	0.7
Slimy Sculpin	MH20	40	0.7
Slimy Sculpin	MH20	41	0.7
Slimy Sculpin	MH20	41	0.9
Slimy Sculpin	MH20	46	1.0

Species	Sample Site	Length (mm)	Weight (gms)
Slimy Sculpin	MH20	50	1.5
Slimy Sculpin	MH20	54	1.8
Slimy Sculpin	MH20	54	1.8
Slimy Sculpin	MH20	54	1.5
Slimy Sculpin	MH20	61	2.0
Slimy Sculpin	MH20	70	3.5
Slimy Sculpin	MH20	72	3.8
Slimy Sculpin	MH20	77	5.4
Slimy Sculpin	MH20	81	5.7
Whitefish sp.	MH20	52	1.2
Whitefish sp.	MH20	56	2.0
Whitefish sp.	MH20	58	2.1
Whitefish sp.	MH20	62	2.0
Whitefish sp.	MH20	63	2.3
Whitefish sp.	MH20	63	2.3
Whitefish sp.	MH20	65	2.5
Whitefish sp.	MH20	65	2.4
Whitefish sp.	MH20	67	3.0
Whitefish sp.	MH20	70	2.9
Whitefish sp.	MH20	71	3.9
Whitefish sp.	MH20	73	3.9
Whitefish sp.	MH20	73	3.7
Whitefish sp.	MH20	75	3.5
Whitefish sp.	MH20	75	3.8
Whitefish sp.	MH20	133	23.1



APPENDIX D FIGURE 1: LENGTH FREQUENCIES OF SLIMY SCULPIN MEASURED AT SITES OF CAPTURE IN FALSE CANYON CREEK, YUKON, 1994 TO 2016.



APPENDIX D FIGURE 2: LENGTH FREQUENCY OF ARCTIC GRAYLING MEASURED AT SITES OF CAPTURE IN FALSE CANYON CREEK, YUKON, 1994 TO 2016.

REVEGETATION MONITORING AT THE RECLAIMED SÄ DENA HES MINING SITE, 2016

For

Teck Resources Ltd

Sä Dena Hes Operating Corporation

Submitted by

Laberge ENVIRONMENTAL SERVICES

February 2017

Laberge
ENVIRONMENTAL SERVICES
P.O. Box 21072
Whitehorse, Y.T.
Y1A 6P7

Office Phone: 867-668-6838
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LETTER OF TRANSMITTAL

Michelle Unger
Senior Environmental Coordinator,
Teck Resources Limited
Bag 2000,
Kimberley, BC
V1A 3E1

Dear Michelle:

Re: **Revegetation Monitoring at the Reclaimed Sä Dena Hes Mine Site**

This report provides the results of Year One monitoring of the grass seeded areas and the tree planted areas at the reclaimed Sä Dena Hes mine site. An invasive plant survey 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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1.0 BACKGROUND

Teck Resources Limited (Teck) initiated permanent closure of the Sä Dena Hes Mine in September of 2013. Decommissioning and reclamations activities were undertaken in 2013, 2014 and 2015.

In 2015, willow, poplar and aspen tree plugs, grown from seed collected from Sä Dena Hes in 2014, were planted on the tailings management area (TMA). The waste rock zones at Jewel Box and Burnick were contoured and then seeded with various grass species in 2015. The TMA wasn't seeded until September 2016. The delay in seeding the TMA was to give the 2015 plantings one year with less grass competition.

Teck retained Laberge Environmental Services (Laberge) to monitor these revegetated areas and to conduct an invasive plant survey 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 700,000 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 and 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 2016.

The fourteen plots were monitored from July 18th to 20th, 2016. Table 2 summarizes the assessment of the first 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.

Of the types of tree seedlings planted, the willows exhibited the most robust and vigorous growth. Generally, alder growth appeared suppressed, however it should be noted that they were planted in late August and thus had less time to become fully established prior to the onset of winter, whereas the willows and poplars were planted in late June. Survival rates were generally higher in

the willow/poplar plots, although some trees that were indicated as dead in Table 2 may have been dormant. For some of the plots, the total of live and dead trees exceeds the total number of trees planted. This discrepancy is likely due to the fact that the initially planted dormant willows and poplars resembled dry sticks and were often difficult to observe against the grey/brown rocky substrate, with the possibility of the occasional one being overlooked.

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	508103	6710511	---	alder	south pond area
VMP 13	508088	6711391	1088.4	alder	north pond area
VMP-14	507423	6709674	1186.9	alder	mill site

Some of the willow plugs appeared to be pushed above the ground surface, likely due to frost action. However this does not seem to have significantly affected their growth (Photo #5). Likewise, some of the willows became prone over the winter, but continued to thrive in the prostrate form (Photo #6).

Various grass species were noted in many of the plots. Areas around the Reclaim Pond and the South Pond were seeded in 2014 in an effort to promote vegetation growth and assist with sediment and erosion control. The low elevation native seed mix (see Table 4 in Section 2.2) and fall rye were hand broadcasted. However most of these areas were prepared by contouring and ripping prior to the tree planting program. The presence of the seed bank will likely provide ongoing germination of some of these grass species.

Throughout the study area plots VMP-1, VMP-3, VMP-5 AND VMP-9 displayed the healthiest growth.

General observations were made in the planted area of the boneyard on July 20th, 2016. The planted alder ranged from dead plugs to suppressed and healthy plants. Several other species were growing in the assessed area: subalpine seedling, Salix spp, poplar (Photo #14), grasses (including fescue) and lupine.

To further assess the progress, heights of randomly selected trees were measured (Table 3). This will allow future evaluation on the growth rate of the individual species.

-149,000 -148,000 -147,000

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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

-149,000 -148,000 -147,000

Teck

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.

0 100 200 Meters

1:12,000

DATE:	MINE OPERATION:
3/14/2017	Sa Dena Hes
DRAWN BY:	COORDINATE SYSTEM:
goulton	NAD 1983 UTM Zone 11N

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TABLE 2 YEAR ONE MONITORING OF TREE PLOTS, JULY 2016

	Site	Date Established	# of plugs planted	Date Assessed	# of live trees	# of dead trees	Survival Rate (%)	Species	Other Species	Comments	Invasive Species
Willow / Poplar	VMP-1	6/24/2015	42	7/18/2018	42	0	100.0	Salix	Lupin, Alpine bluegrass, wheatgrass	very healthy growth, alsike clover in plot	alsike clover
	VMP-2	6/26/2015	59	7/18/2016	52	3	88.1	28 poplar 27 Salix	Alpine bluegrass, unknown grass and fescue	some growth appears stressed	nil
	VMP-3	6/27/2015	60	7/18/2016	59	0	98.3	4 poplar 55 Salix	Equisetum, fescue, ticklegrass and unknown grass	very healthy growth, appears to be one natural/unplanted poplar	nil
	VMP-4	6/29/2015	24	7/18/2016	24	2	100.0	Salix sp	Equisetum	some plugs partially above ground possibly due to frost heave, some suppressed growth.	dandelion just outside of plot
	VMP-5	6/29/2015	24	7/18/2016	26	0	100.0	9 poplar 17 Salix	Alpine bluegrass, unknown grass, fescue, equisetum, mustard	very healthy growth, high biodiversity, ≥ 20% veg cover, moist soil conditions	nil
	VMP-6	6/30/2015	50	7/18/2016	50	1	100.0	26 poplar 24 Salix	lupine	appears to be 3 species of willow	nil
	VMP-7	7/1/2015	67	7/18/2016	68	4	100.0	70 poplar 2 Salix	Dwarf fireweed, unknown grasses, fescue, wheatgrass, Alpine Bluegrass, same mustard as VMP 5	mostly healthy growth, dead trees were in small draw upslope in plot, osprey nest still occupied outside of plot	Hawks beard SE of plot
	VMP-8*	8/27/2015	37	7/20/2016	36	1	97.3	34 poplar 3 Salix	Alpine bluegrass, unknown grasses	some stressed growth, many poplar have dead tops	nil
Alder	VMP-9	8/23/2015	12	7/20/2016	13	0	100.0	alder	Alpine bluegrass, wheatgrass, fescue, fireweed, unknown grass	healthy growth	Hawks beard in plot, plus large clump near forest edge
	VMP-10	8/25/2015	15	7/18/2016	9	3	60.0	alder	none	poor growth, very compact soil	nil
	VMP-11	8/25/2015	12	7/18/2016	13	0	100.0	alder	Alpine bluegrass, unknown grass	some suppressed growth	nil
	VMP-12	8/27/2015	15	7/18/2016	11	1	73.3	alder	Alpine bluegrass, fescue, grasses	not very healthy alder growth but good grass growth	nil
	VMP-13	8/27/2015	7	7/18/2016	7	1	100.0	alder	Alpine bluegrass	alder growth not as healthy as willow growth in nearby plot VMP 6	nil
	VMP-14	8/27/2015	10	7/20/2016	5	2	50.0	alder	none	stressed growth	nil

* 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 2016		
Site	**Species Planted**	**Random Heights (cm)**
VMP-1	Willow	15, 25, 13, 12, 26
VMP-2	Poplar Willow	41, 40, 24, 28, 24 20, 26, 4, 25, 2.5
VMP-3	Poplar Willow	23, 40, 31, 5 18, 25, 29, 19, 20
VMP-4	Willow	27, 22, 15, 7, 6
VMP-5	Poplar Willow	18, 32, 36, 16 28, 34, 20, 23
VMP-6	Poplar Willow	30, 38, 40, 39, 35 18, 22, 20, 15, 23
VMP-7	Poplar Willow	18, 41, 24, 35, 19 8,
VMP-8	Poplar Willow	33, 15, 17, 22 16, 19, 7
VMP-9	Alder	13, 9, 14, 16
VMP-10	Alder	12, 11, 13, 12, 17
VMP-11	Alder	15, 22, 11, 7
VMP-12	Alder	9, 9, 9, 12
VMP-13	Alder	19, 9.5, 9, 5.5
VMP-14	Alder	15, 7, 3.5

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

TABLE 4 LOW ELEVATION SEED MIX AND AMOUNTS			
Common Name	**Scientific Name**	**Weight %**	**Composition %**
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 Rydb.*	15	17
Chariot Hard Fescue	*Fesuca brebipila*	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 roads but general observations were made. Due to the proximity of seed sources from the native forest, natural colonization of local species will likely occur relatively rapidly on these reclaimed linear disturbances.

2.2.1 Methods to Establish Plots

There are numerous methods for monitoring grasslands. In keeping with the method used for establishing the tree monitoring plots, the same protocol was employed for the sites seeded with grasses at the Sä Dena Hes mine site. A labeled wooden stake was installed as the centre point of each plot. A circle, with a radius of 3.99 m, was demarked with orange forestry paint around the wooden stake producing a survey area of 50 m^2 (1/200th of a ha). The area within this circle was assessed for percent cover, species present, soil conditions, aspect, slope and erosion. 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. The location of each grass monitoring plot is provided in Table 6 and on Figure 1.

TABLE 6 LOCATIONS OF GRASS MONITORING PLOTS, JULY 2016				
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

2.2.2 Monitoring of Grass Plots

Even from a short distance grass growth appears nonexistent (Photos 15, 17 and 18). Upon closer investigation, blades and clumps of grass were observed (Table 7). Grass growth was understandably sparse at all of the waste rock sites due to the short amount of growing time since seeding. Grasses were too immature to identify, however due to the basal leaf structure and colour, alpine bluegrass were readily recognizable. This species was present at all of the plots with the exception of GP-4 (Table 7). No grass species were present in this plot and it appears that the upper section of Burnick 1300 was missed during the seeding process. The lower portion did contain grass and Plot GP-5 was established there.

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. An "island" of vegetation was left untouched at the Jewel Box waste rock zone, just downslope from GP-2 (Photo #17). A brief inventory of the species present are as follows; subalpine fir, fireweed, spike trisetum, Salix sp, various forbs, fescue, sedge, wintergreen and alpine bluegrass. This island will be a seed source and will also add biodiversity to the area.

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 (Photo #26). A willow was also growing in this plot (Photo #22).

Table 8 lists the first, second and third dominant species in each plot along with random heights of each. Although the grasses are yet too immature to accurately identify, some differentiation between types could be ascertained. The category 'unknown grasses' could actually represent more than one species, but until they mature, it will not be evident which species is dominant. However, Table 8 represents a starting point. Plot GP-7 was the only site where three separate grass types were obvious.

Grass growth was sparse on the roads to the portals although denser sections were observed on the Burnick access road. Also, some buried willows were resprouting, helping to colonize the area.

3.0 INVASIVE SPECIES SURVEY

An invasive plant survey was completed during the revegetation monitoring program. Invasive species were noted and locations of larger populations were documented with a hand held GPS. The most common invasive species was *Crepis tectorum*, (hawksbeard) and was generally found 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. A notable population was documented near the monitoring plot VMP-9, along the forest edge to the northwest of the plot (Photo #23). It was also observed within some of the monitoring plots (see Tables 2 and 7), in the north pond area, and along the access route to the south pond area. A few common dandelion plants were observed in the north pond area. Table 9 summarizes the observations.

TABLE 7 YEAR ONE DATA FOR THE GRASS MONITORING PLOTS, JULY 2016

Grass Plot #	Date Established	Substrate	Aspect	% Cover	Planted Grass Species	Other Species Present	Invasive Species	Signs of Erosion	Comments
GP-1	7/20/2016	Hard, compact gravels. Some moisture below surface	north facing slope	1 - 5%	unknown grasses Alpine bluegrass	none	none	minor rilling	Healthy but sparse growth,
GP-2	7/20/2016	Hard, compact gravels. Some moisture below surface	north east facing	<1%	unknown grasses Alpine bluegrass	none	none	minor rilling	Stressed growth, very sparse growth
GP-3	7/20/2016	Hard, compact gravels. Some moisture below surface	East, steep slope	1 -5%	unknown grasses Alpine bluegrass	none	none	rills throughout all of slope	Healthy, growth is clustered
GP-4	7/20/2016	Less compact and with higher moisture than on Jewel Box. Brown coloured soils.	East, steep slope	<1%	none	subalpine fir seedlinngs Fireweed	none	none	Appears to be grass growth only further down slope.
GP-5	7/20/2016	Less compact and with higher moisture than on Jewel Box. Brown coloured soils.	North east, slope ~ 30%	1%	unknown grasses Alpine bluegrass	subalpine fir	none	none	Suppressed growth
GP-6	7/20/2016	More compact and drier than GP-4 and GP-5. Dark grey soil.	north north east, slope ~20%	5%	unknown grasses Alpine bluegrass	subalpine fir	none	none	Moderately stressed to healthy growth
GP-7	7/20/2016	Half of plot is in light brown soil and other in light grey soil.	south, slight slope	5 to 10%	Alpine bluegrass Unknown grasses Fescue	Unknown forbs Salix sp	Hawksbeard	none	Healthy grass growth

TABLE 8 DOMINANT GRASS SPECIES PER PLOT AND HEIGHT OF CURRENT GROWTH, JULY 2016

Plot #	GP-1	GP-2	GP-3	GP-4	GP-5	GP-6	GP-7
Dominant Species	unknown grasses	unknown grasses	unknown grasses		unknown grasses	unknown grasses	Poa alpina
Random heights of dominant species (cm)	14, 7, 4.5, 5, 3.5	6, 3, 5, 2	4, 6, 3.5 4, 6		7, 2.5, 4, 4, 4.5	6, 9, 5, 4, 5	2, 2.5, 2.5, 3.0, 2.5
2nd Dominant Species	Poa alpina	Poa alpina	Poa alpina		Poa alpina	Poa alpina	unknown grasses
Random heights of 2nd dominant species (cm)	1.5, 2.0, 1.5, 1.0, 1.5	0.5, 1.5, 2, 1	2, 3, 2, 2, 2, 2		0.5, 1.0	0.5, 3.5, 1.0, 1.0	12.5, 8.0, 8.0
3rd Dominant Species							Festuca sp
Random heights of 3rd dominant species (cm)							14.5

TABLE 9 OBSERVATIONS OF INVASIVE PLANTS IN THE TMA				
Waypoint or Plot #	**NAD 83 Zone 9V**		**General Location**	**Invasive Species**
	Easting	**Northing**		
VMP-1	508182	6710456	south pond area	Alsike clover
na			near VMP-4	common dandelion
na			southeast of VMP-7	hawksbeard
na			east slope of north pond	common dandelion
VMP-9	508027	6712609	landfill	hawksbeard
GP-7	508293	6712639	small borrow pit	hawksbeard
WP #96	507894	6710305	by access route to south pond	hawksbeard
WP #114	508016	6712629	near VMP-9, near forest	hawksbeard

In addition, a road side survey documenting the invasive species on the Sä Dena Hes access road was conducted on July 19th, 2016. Again, the most common species was hawksbeard and was distributed along the length of the road. A significant population of white sweetclover was observed near the junction with the Robert Campbell Highway, and a single plant was pulled at Km 19. A patch of approximately a dozen oxeye daisies was present near the gate to the site at Km 23 (Photo #25). This data is summarized in Table 10.

TABLE 10 ROADSIDE SURVEY OF INVASIVE SPECIES, JULY 2016								
WP #	**NAD 83 Zone 9V**		**Elevation (m)**	**Species**	**Abundance Category**	**Stem Count**	**Photos (Y or N)**	**Comments**
	Easting	**Northing**						
95	507271	6708757	1177	leucvulg	3	B	Y	Km 23, west side
97	507494	6708292	1204	creptect	1	A	N	Km 22.5, east side, pulled single plant
98	507450	6707500	1180	creptect	4	D	N	Km 22, both sides for 100 m
99	506717	6706289	1106	creptect	4	C	N	Km 21, east side for 150 m
100	506118	6706037	1073	creptect	2	B	N	Km 20.5, east side
101	506028	6705992	1067	creptect	4	E	N	Km 20, both sides for 500 m
102	505271	6705437	1072	creptect	4	B	N	Km 19, both sides
103	505272	6705438	1076	melialba	1	A	N	Km 19, west side, pulled single plant
104	504990	6705143	1066	creptect	4	C	N	Km 18.5, both sides for 200 m
105	504280	6702995	983	creptect	2	A	N	Km 16, east side
106	504274	6702491	973	creptect	2	F	N	Km 15.5, both sides for about 1 km
107	502552	6702756	994	creptect	2	C	N	Km 13, both sides for 300 m
108	501815	6702879	1012	creptect	2	B	N	Km 12.5, west side
109	500356	6702000	1085	creptect	2	C	N	Km 12, both sides for 300 m
110	500514	6700565	1031	creptect	2	B	N	Km 9, both sides for 100 m
111	500426	6697007	954	creptect	2	C	N	Km 5.5, both sides
112	498255	6695223	816	creptect	4	C	N	Km 1.5, both sides for 300 m
113	497539	6694919	817	melialba	7	D	N	Km 0.5, both sides for 150 m

Legend: leucvulg = Leucanthemum vulgare (oxeye daisy) creptect = Crepis tectorum (narrowleaf hawksbeard)
melialba = Melilotus alba (White sweetclover)

Abundance: 1 = rare individual, a single occurrence, 2 = a few sproadically occurring individuals, 3 = a single patch or clump of species
4 = several sproadically occurring individuals, 7 = continuous occurrence of a spec ies with a few gaps in the distribution

Stem Count: A = 1, B = 6 - 25, C = 26 - 50, D = 51 - 150, E 151 - 500, F = 500+

4.0 SUMMARY

Monitoring of the first year of the planted tree plugs shows that willow were the most successful species in terms of vigour and growth. Poplar were not producing many leaves per plant on the date of assessment but generally appeared healthy. Alder appeared to experience more stress, however they were planted late in the year of 2015 (late August) and had little time to adapt to

their conditions prior to the onset of winter. The willows and poplar were planted in June and had the 2015 summer season to become established. However, overall the survival rate was high; greater than 88% in 11 of the 14 plots. The survival rate at the other three plots ranged from 50% to 73% but only had 10 to 15 plants per plot.

Grass growth was very sparse at all plots.

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.

5.0 RECOMMENDATIONS

It is recommended that annual monitoring of all plots, and observations on growth throughout the site in general, continue for 2017. In addition, new monitoring plots on the TMA should be established to monitor the areas seeded with grass in September 2016.

6.0 REFERENCES

Laberge Environmental Services. 2015. Tree Planting at the Reclaimed Sä Dena Hes Mining Site, 2015. Prepared for Teck Resources Ltd.

APPENDIX A

PHOTOGRAPHS, JULY 2016

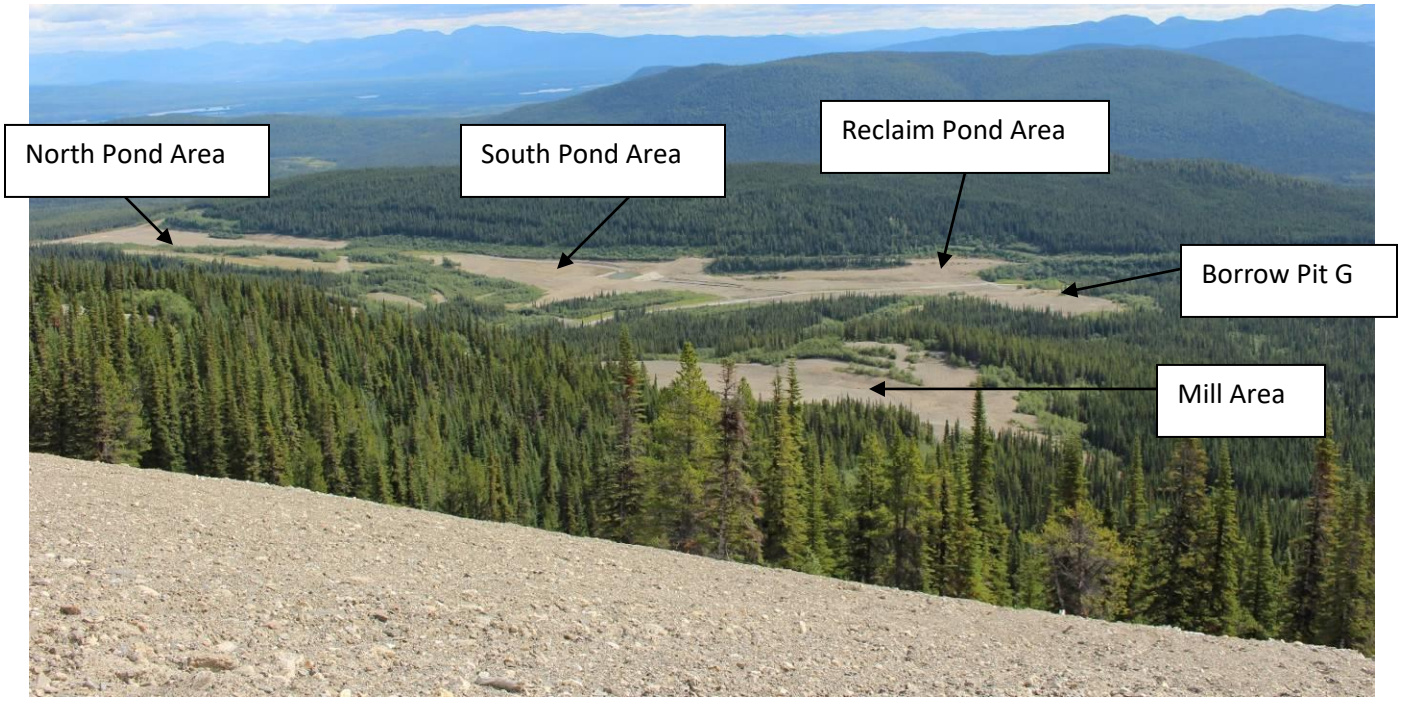

Photo #1: View of TMA and Mill area from Jewel Box waste rock zone.

Photo #2: View of plot # VMP-3 and beyond, numerous trees are visible.

Photo #3: Significant grass cover and healthy trees at VMP-5.

Photo #4: Healthy willow (likely *S. alaxensis*) growing with alpine bluegrass at VMP-7.

Photo #5: Healthy willows whose plugs have been pushed above ground at VMP-3.

Photo #6: Prostrate form of a willow. Adventitious roots will likely form from the stem at the leaf clusters. This plant was in Plot VMP-6.

Photo #7: Willows thriving in the north pond area.

Photo #8: Poplars growing in VMP-7.

Photo #9: Healthy alder growing at VMP-9.

Photo #10: One of three dead alder at VMP-10.

Photo #11: Healthy alder among grasses at VMP-12.

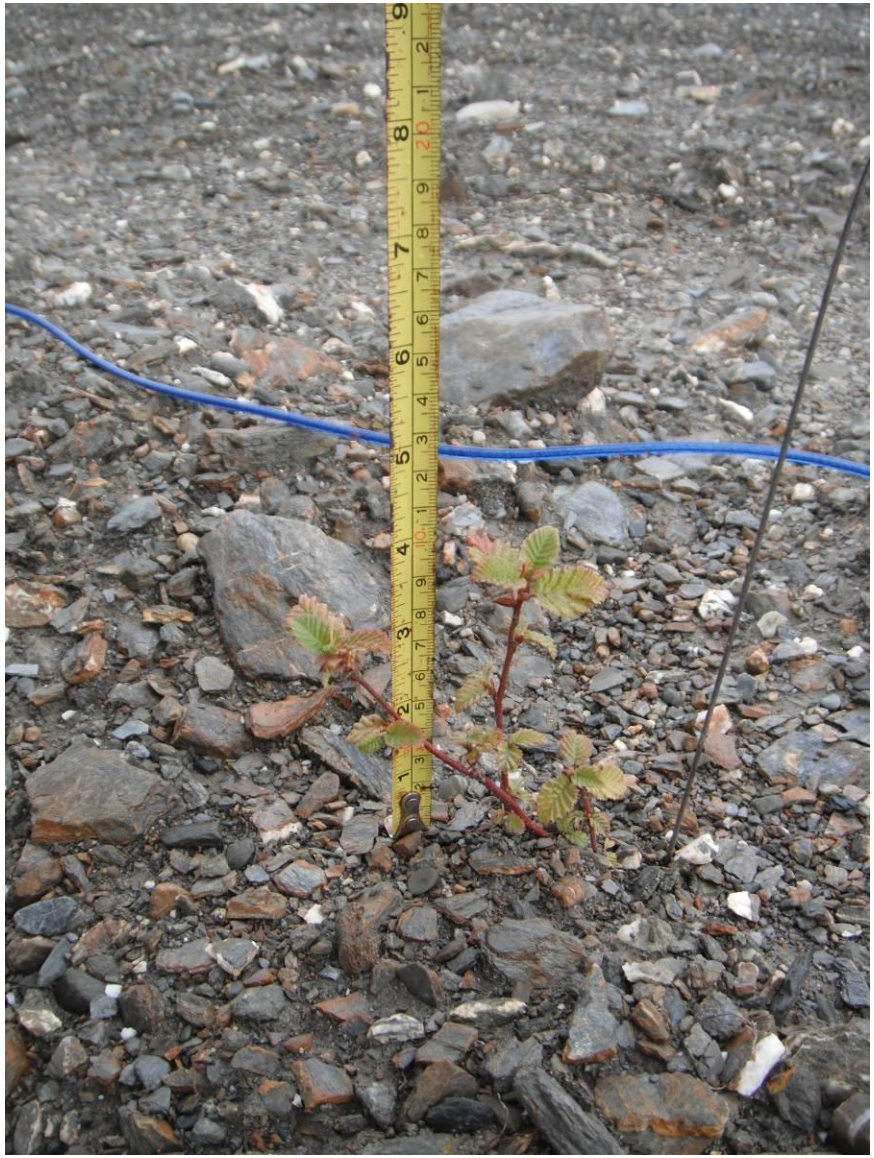

Photo #12: A stressed alder at VMP-13.

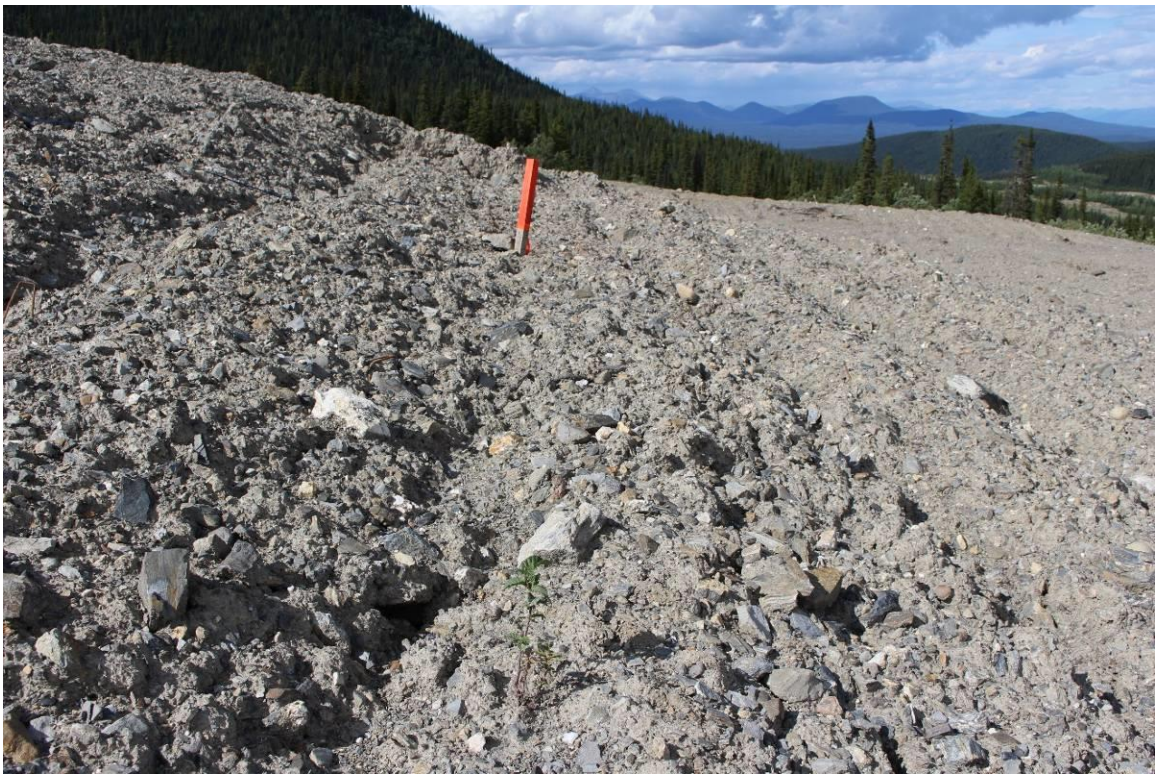

Photo #13: It’s difficult to see the alders in plot VMP-14, but a healthy one can be observed in the center foreground.

Photo #14: A volunteer poplar growing in the assessed area of the boneyard.

Photo #15: Overview of grass plot GP-1 at the Jewel Box waste rock zone.

Photo #16: Grasses at GP-1.

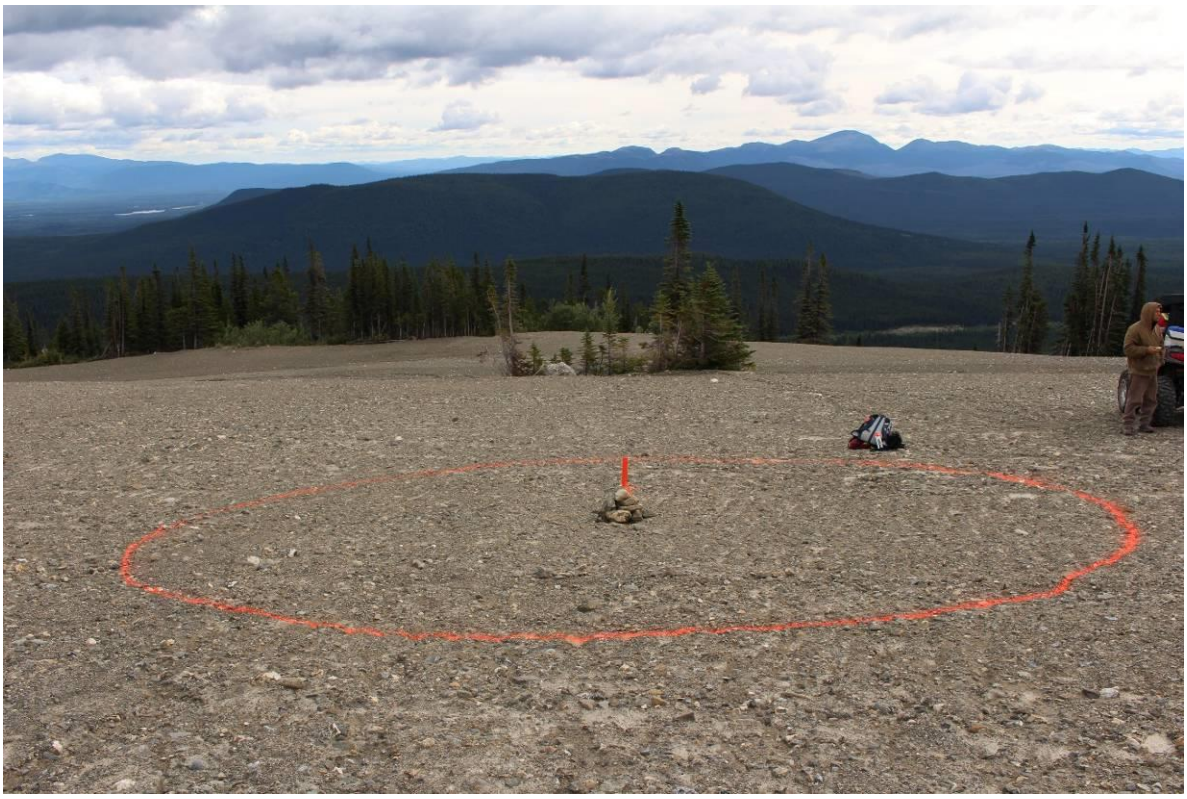

Photo #17: An “island” left in place at Jewel Box area downslope from GP-2.

Photo #18: Plot GP-3 showing the steepness of the site and the rilling on the slope.

Photo #19: Grasses growing in a rill at GP-3.

Photo #20: Suppressed growth of grass at GP-5.

Photo #21: Dense grass growth with volunteer fireweed growing on the slope on the route to Burnick 1300.

Photo #22: A willow growing in Plot GP-7 that likely was buried during seeding preparation.

Photo # 23: A fairly large patch of hawksbeard (stem count of approximately 25 to 50) at waypoint #114 near VMP-9.

Photo #24: Many occurring individuals of hawksbeard (stem count approximately 50) growing at waypoint #96 on route to the south pond area.

Photo #25: Oxeye daisy at Waypoint #95.

Photo #26: A single hawksbeard in Plot GP-7.

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Memo

To:	Michelle Unger, Teck	**Client:**	Teck
From:	Eduardo Marquez, SRK Tom Sharp, SRK	**Project No:**	1CT008.063
Cc:	Lisa Barazzuol, SRK Kaitlyn Kooy, SRK	**Date:**	March 30, 2017
Subject:	Supplementary Memo: 2016 Surface Water and Groundwater Monitoring Data, Sä Dena Hes Mine		

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 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 Territory Water Board regulates water management of mine sites within the Territory through the use of site specific Water Use Licences. Water Use Licence QZ15-082 came into effect on January 1, 2016 and it expires on December 31, 2016. In December 2016, an extension was granted for three months (QZ16-080 replaces QZ15-082), as a new water licence addressing permanent closure of the site is anticipated in spring 2017 (QZ16-051).

In an effort to document data collected from monitoring stations relevant to the Environmental Monitoring, Surveillance and Reporting Plan (EMSRP) and Adaptive Management Plan (AMP) developed in June 2016 and the proposed monitoring in the new water licence, SRK Consulting (Canada) Inc. was retained by Teck to prepare a supplementary memo of the 2016 monitoring data. Note that there were a few revisions to sample frequency and locations in the EMSRP in the final water licence application submitted to the Yukon Water Board.

2 Methods

2.1 Sample Collection and Analysis

Table 1 presents the 2016 surface water and groundwater quality monitoring program in support of the pending water use licence addressing permanent closure of the site and Figure 1 presents the station locations. The groundwater monitoring programs were designed to monitor the landfill and areas at the mine site determined to be contaminated sites or influenced by mine sources (Alexco 2017).

Four surface water stations (MH-02, MH-04, MH-11 and MH-12) that are regulated under the existing licence QZ15-082 are relevant to the EMSPR and the pending water licence. The complete data set for these stations are presented and discussed in this memo.

Groundwater well MW13-05 was monitored but contained no water, therefore there are no 2016 data are available.

Table 1: 2016 Water Sampling and Analytical Program, Surface and Groundwater Station

Station Type	Station ID	Description	Monitoring Frequency[1]	Field Parameters[3]	Low Level Total Metals [4]	Low Level Dissolved Metals [4]	General Parameters [5]	TSS (Low Level) & Turbidity	Nutrients [6]	Anions [7]	Bromide	Cyanide -SAD & WAD [8]	Cr+3 & Cr+6 [9]	Hydrocarbons[10]
Surface	MH-02	North dam seepage	Monthly	X	X	X	X	X	X	X		X	X	
Surface	MH-04	Lower Camp Creek	Monthly	X	X	X	X	X	X	X	X		X	
Surface	MH-11	Upper False Canyon Creek	Monthly	X	X	X	X	X	X	X	X	X	X	
Surface	MH-12	Tributary E, east fork [2]	Monthly	X	X	X	X	X	X	X			X	
Surface	MH-22	Burnick portal	Monthly	X	X	X	X	X	X	X			X	
Surface	SDH-S2	Seepage from 1380 Waste Rock	Opportunistic	X		X	X	X	X	X				
Surface	MH-29	Access Creek upstream of Camp Creek	Monthly	X	X	X	X	X	X	X			X	
Surface	MH-30	Tributary to False Canyon Creek	Monthly	X	X	X	X	X	X	X			X	
Surface	MH-15	West Fork of Tributary E	Quarterly	X	X	X	X	X	X	X			X	
Landfill Groundwater	MW14-01	Landfill Monitoring Well	Quarterly	X		X	X		X	X			X	X
Landfill Groundwater	MW14-02	Landfill Monitoring Well	Quarterly	X		X	X		X	X			X	X
Landfill Groundwater	MW14-03	Landfill Monitoring Well	Quarterly	X		X	X		X	X			X	X
Landfill Groundwater	MW14-04	Landfill Monitoring Well	Quarterly	X		X	X		X	X			X	X
Mine Source Groundwater	MW13-01	Monitoring Well downgradient of SDH-S2 & upstream of Camp Creek	Semi-annual	X		X	X		X	X	X			X
Mine Source Groundwater	MW13-06	Monitoring Well downgradient of Burnick portal	Semi-annual	X		X	X		X	X				X
Mine Source Groundwater	MW13-13	Monitoring Well downgradient of SDH-S2 & upstream of Camp Creek	Semi-annual	X		X	X		X	X	X			X
Contaminated Sites Groundwater	MW13-04	Monitoring Well for background conditions	Annual	X		X	X		X	X				X
Contaminated Sites Groundwater	MW13-05	Monitoring Well downgradient of soil contamination	Annual	X		X	X		X	X				X
Contaminated Sites Groundwater	MW13-10	Monitoring Well at Mill Site	Annual	X		X	X		X	X				
Contaminated Sites Groundwater	MW13-07	Monitoring Well at Tailings Pond Area	Annual	X		X	X		X	X				X

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Footnotes:

1) In 2016, surface water samples were taken between January and December. Groundwater samples were taken in March, June, September and December.

2) Above confluence of small tributary flowing north from a small lake

3) Field parameters include Turbidity, Temperature, pH, Cond, Flow.

4) Includes Hg by ICP-MS and low level Cr

5) General parameters include pH, EC, Total Alkalinity, TDS, TSS, colour

6) Nutrients include nitrate, nitrite, ammonia, DOC

7) Anions include Cl and SO4

8) If Cyanide-SAD >=0.2, request for Cyanide-WAD

9) If low level Cr (total or dissolved) is >1 ppb, then analyze Cr speciation

10) Hydrocarbons include benzene, toluene, ethylbenzene, xylenes (BTEX), volatile petroleum hydrocarbons (VPHw), light and heavy extractable petroleum hydrocarbons (LEPHw/HEPH), and polycyclic aromatic hydrocarbons (PAH)

2.2 Data QA/QC

SRK's assessment of the quality of the data based on our internal quality assurance and control (QA/QC) is documented below. All data passed Maxxam's QAQC criteria.

2.2.1 Surface Water Monitoring

Fourteen field duplicates, 13 travel blanks and 12 field blanks were taken at surface water monitoring stations in 2016.

The concentrations in the field blanks were generally below detection and maximum above two times the detection limit for all parameters except dissolved organic carbon (DOC), ammonium and, in one case, sodium. Field blanks consistently showed concentration of ammonium above two times and up to ten times the detection limit (January, March, April, June, July, September and December samples). DOC in the field blanks was detected in concentrations around three times the detection limit in the February, March, June and September. The occurrence of these two parameters in the field blanks indicates high natural concentrations of DOC and ammonium in the surficial environment. DOC was detected in the June travel blank in concentrations five times the detection limit, which could indicate some contamination during the analysis. Sodium was detected in the field blank in July (~4x DL) and may represent the influence of dust on the sample.

The concentrations above analytical uncertainty (x10 DL) of all of the duplicate samples were within 30% relative percent difference (RPD), indicating a good reproducibility of the sampling methods.

In addition to the QA/QC samples, the results underwent SRK's QA/QC checks as follows:

- Ion charge balances within 10%:
  - All samples passed.
- Total > dissolved concentrations, or within 20% RPD:
  - All measurements passed except for: arsenic (40%) and manganese (46%) at MH-02 and barium (31%), molybdenum (23%) and uranium (21%) at MH-04 in June; arsenic (71%) and manganese (37%) at MH-02 in August; arsenic (42%) at MH-02 in September. These discrepancies may indicate trace element variability in surface samples rather than analytical error since separate samples are taken for analyzing dissolved and total concentrations.
- Field and lab pH measurements within 1 pH unit:
  - All samples passed.
- Field and lab EC and turbidity measurements within 30% RPD:
  - All turbidity measurements passed except for selected low field turbidity measurements in May (MH-02, MH-12, SDH-S2), July (MH-04, MH-11), October (MH-04 and MH-22) and

December (MH-12, MH-22, MH-29). The lab indicated that calibration of the field turbidity meter was unreliable in May.

  - All EC measurements passed except for selected low field EC measurements relative to lab measurements in January at station MH-02 and in December at station MH-29. As per the lab, the difference in measurements in January may have occurred due to ice crystal lodging in the field meter. A similar effect may have occurred in December.

Results that failed any of the aforementioned QA/QC checks were reanalyzed and either confirmed or updated. Overall, data quality was good and all data were accepted.

2.2.2 Groundwater Monitoring

Four field blank samples and three travel blank samples were collected during the groundwater sampling events in 2016. Four field duplicates were taken of groundwater samples.

Concentrations in the field blanks were generally below detection and maximum levels above two times the detection limit for all parameters except ammonium. High concentrations of ammonium (close to ten times the detection limit) were reported for the June, September and December field blanks. The June and September values were within the range of ammonium concentrations of other samples from the same sampling event, while the December value was above those reported for the monitoring samples and travel blank. The lab reran the analyses and did not find any indication of carryover or contamination in the instrument. The source of these high ammonium concentrations was undefined.

The concentrations above analytical uncertainty (x10 DL) of duplicate groundwater samples from March, September and December were within 30% relative percent difference (RPD), indicating good reproducibility of the sampling methods. The duplicate measurements from June showed RPD values above this criteria for turbidity and trace metals including turbidity, aluminum, barium, copper, lead, manganese, sodium and potassium. The parameters showing high RPD values were reanalyzed and confirmed. These differences in concentrations indicate either a sampling error or high heterogeneity in the sampled groundwater.

In addition to the QA/QC samples, the results underwent SRK's QA/QC checks as follows, assuming results were above the analytical uncertainty:

- Ion charge balances within 10%:
  - All samples passed.
- Field and lab pH measurements within 1 pH unit:
  - One sample failed in March (1.1 pH unit difference) at station MW14-04. The lab measurement was done past the recommended holding time and therefore may not indicate a data quality issue.
- Field and lab EC and turbidity measurements within 30% RPD:
  - All samples passed.

Total metals were not analyzed therefore there was no comparison between total and dissolved concentrations. Results that failed any of the aforementioned QA/QC checks were reanalyzed and either confirmed or updated. Overall, data quality was good and all data were accepted.

3 Results and Discussion

3.1 Surface Water Monitoring

Surface water samples from nine surface water monitoring stations were compared to the approved and working British Columbia Water Quality Guidelines (BWQGs) (MOE 2017) for the protection of aquatic life as a screening measure. A comparison to BCWQGs is not a permit requirement but was done in place of the proposed water license limits which have not yet been approved. The results and the guidelines used are included in Attachment A.

Most parameter concentrations in the surface water samples were below their respective guidelines. The only exceptions were selected element parameters at stations MH-04, MH-22, and SDH-S2, which are discussed below and highlighted in Attachment A.

One out of 11 samples from station MH-04 (September) contained dissolved cadmium that was slightly above the 30-day average guideline. The cadmium concentrations decreased below the guideline values in subsequent months.

All eight samples from station MH-22 contained (May to December) contained elevated concentrations of dissolved cadmium, total selenium and total zinc. Two samples from November and December contained elevated concentrations of lead. Dissolved cadmium concentrations for the eight samples were generally within five times the short-term maximum and within 15 times the 30-day average value for the eight samples. Selenium values were within an order magnitude of the 30-day average guideline for the eight samples, while zinc values were generally within an order of magnitude of the short-term maximum and slightly over an order of magnitude higher than the 30-day average guideline. The elevated lead concentrations were only slightly above the 30-day average guideline.

Total concentrations were not analyzed for samples from station SDH-S2, therefore dissolved concentrations were compared to guidelines for total elements. Both samples from May and June contained elevated concentrations of dissolved cadmium, lead, selenium and zinc. The lead concentration in May was twice as high as the maximum short-term guideline and about 30 times greater than the 30-day average. The subsequent sample from June also surpassed the 30-day average value for lead. Selenium concentrations were approximately twice as high as the guideline, while zinc values were up to two order of magnitude higher than the 30-day average and short-term maximum. Dissolved cadmium was within two orders of magnitude higher than the short-term maximum and greater than two orders of magnitude relative to the 30-day average for both samples.

3.2 Landfill Groundwater Monitoring

Debris from demolition and waste generated during operations at the Mill site, former camp and office buildings have been placed in the landfill, along with miscellaneous debris from the site. SDHOC Waste Management Permit (#81-020) for the landfill requires that the base of the landfill cells remain a minimum of three meters higher than observed water table elevations. In addition to this, groundwater quality is being monitored through four monitoring wells (MW14-01 to MW14-04) around the landfill to detect if any buried materials are leaching metals or are a source of hydrocarbons. In 2016, nine samples were collected from these wells. Groundwater quality was compared to the Yukon Contaminated Site Regulation (CSR) standards (Schedule 3; Environment Yukon, 2002) for freshwater aquatic life. The results and the guidelines used are included in Attachment B.

Table 2 presents the groundwater levels expressed as elevations (masl). The groundwater table around the landfill has generally been higher than three meters below the base of the landfill (Alexco 2017). The water table elevations at MW14-01 in the first half of 2016 were slightly higher than the September 2015 elevation (by up to 0.81m), indicating some recovery of the aquifer since then, and were similar to the September 2014 measurement. The elevation decreased from August 2016 towards December, reaching a lower elevation equal to that of June 2015. Readings from monitoring well MW14-02 indicate the well was dry in the first half of 2016, as it was during the mid-2015 readings. From July to September 2016, water table elevations were lower than the September 2014. Similarly, monitoring well MW14-03 was dry through August 2016, as it was during the mid-2015 readings. Similarly, the readings at MW14-03 were lower than the September 2014 measurement. The water levels were below the bottom of the monitoring well screen throughout the year with the exception of September. Based on the water table elevation observed at MW14-03 (1025.08 m and 1024.88) and the elevation of the bottom of the North Mill Debris Cell (1028.63 m) there was a separation between the base of the landfill cell and the water table greater than 3.0 m. At MW14-04, the groundwater elevation values in 2016 were between the elevations measured from September 2014 to September 2015, with an initially lower elevation in March.

As mentioned previously, four landfill monitoring wells were sampled in 2016. One to four samples were collected at each well on a quarterly basis from March to December. Field pH values were neutral, ranging from 6.9 (MW14-03 in September) to 8.0 (MW14-04 in September). Field conductivity values ranged from 253 µS/cm (MW14-04 in March) to 731 µS/cm (MW14-03 in September). Turbidity measurements were not carried out systematically. Turbidity was reported as 35.9 NTU at MW14-01 and 1210 NTU at MW14-04 in June. All parameter concentrations in the landfill groundwater samples were below their respective guidelines.

Table 2: Groundwater Elevations from 2014 to 2016 at Landfill Monitoring Stations

Monitoring Station	Top of Casing Elevation (m)	Depth to Bottom (mbtc[1])	Ground Elevation (m)	Groundwater Elevation (masl)												
				2014	2015		2016									
				27-Sep	24-Jun	3-Sep	20-Mar	9-Jun	11-Jun	30-Jul	21-Aug	22-Sep	24-Sep	23-Oct	27-Nov	18-Dec
MW14-01	1040.87	15.85	1039.87	1026.75	1025.15	1026.09	dry	1026.82	1026.9	1026.82	1026.44	1026.14	1026.09	1025.71	1025.36	1025.17
MW14-02	1034.37	16.16	1033.32	1019.89	dry	dry	dry	dry	-	1018.67	1018.94	1018.6	1018.51	dry	dry	dry
MW14-03	1031.26	7.20	1030.14	1026.12	dry	dry	dry	dry	-	dry	dry	1025.08	1024.88	dry	dry	dry
MW14-04	1029.98	13.88	1028.82	1019.85	1017.31	1017.11	1016.86	-	1017.57	1018.69	1018.79	1018.83	1018.68	1018.56	1018.48	1018.35

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[1] mbtc: meteres below top of casing

"-" indicates no reading was taken

3.3 Mine Source and Contaminated Sites Groundwater Monitoring

Golder Associates carried out an environmental assessment between 2011 and 2014 and identified areas of elevated petroleum hydrocarbons and trace metals in the soil relative to the Yukon CSR standards (Alexco 2017). Wells MW13-04, MW13-07, and MW13-10 represent contaminated sites monitoring wells. Stations MW13-01, MW13-06, MW13-13 monitor mine source loadings along the groundwater flowpath. All results are compared to the Yukon CSR standards and are presented in Attachment C. As previously mentioned, well MW13-05 was dry and thus contains no data.

All parameter concentrations were below their respective guideline with the exception of dissolved cadmium at MW13-01 (September) and MW13-13 (June and September). The elevated cadmium concentration at MW13-01 was only slightly above the CSR guideline value and an order of magnitude higher than the June sample. The elevated cadmium concentrations at MW13-13 were about 5 times greater than the CSR guideline value, similar to selected values from 2014 and 2015.

4 Summary and Conclusions

In 2016, SRK monitored water quality surface water and groundwater stations relevant to the proposed EMSRP, AMP and new water licence. Data and comparisons to guidelines are presented in this supplementary memo. Surface water samples from nine surface water monitoring stations were compared to the approved and working British Columbia Water Quality Guidelines (BWQGs) (MOE 2017) for the protection of aquatic life as a screening measure. A comparison to BCWQGs is not a permit requirement but was done in place of the proposed water license limits which have not yet been approved. Groundwater quality was compared to the Yukon Contaminated Site Regulation (CSR) standards (Schedule 3; Environment Yukon, 2002) for freshwater aquatic life.

Samples were collected from nine surface water monitoring stations, four of which are included in the current water licence QZ15-082. In addition, eleven groundwater monitoring stations were sampled. Four of these wells are landfill groundwater monitoring wells, three are mine source monitoring wells and four which are contaminated sites monitoring wells.

Most parameter concentrations in the surface water samples were below their respective guidelines. The only exceptions were selected element parameters at surface water stations MH-04, MH-22, and SDH-S2 including cadmium, lead, selenium and zinc which showed varying concentrations up to two orders of magnitude above their respective guidelines.

Groundwater elevations were monitored in the landfill monitoring wells as per the SDHOC Waste Management Permit (#81-020). Water elevations at MW14-01 were similar to 2014 and 2015 values. Water elevations at MW14-02 and MW14-03 were similar or lower than the recorded elevations from 2014 and 2015. MW14-03 water levels were greater than the 3.0 m separation between the base of the landfill cell and the water table. The water table at MW14-04 was between the September 2014 and September 2015 readings. All parameter concentrations in the landfill groundwater samples were below their respective guidelines.

All parameter concentrations in samples from the contaminated sites and mine source groundwater monitoring wells were below their respective guideline with the exception of dissolved cadmium at MW13-01 (September) and MW13-13 (June and September). The elevated cadmium concentrations were up to 5 times greater than the CSR guideline value, similar to selected values from 2014 and 2015.

This memo was prepared by SRK Consulting (Canada) Inc.

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5 References

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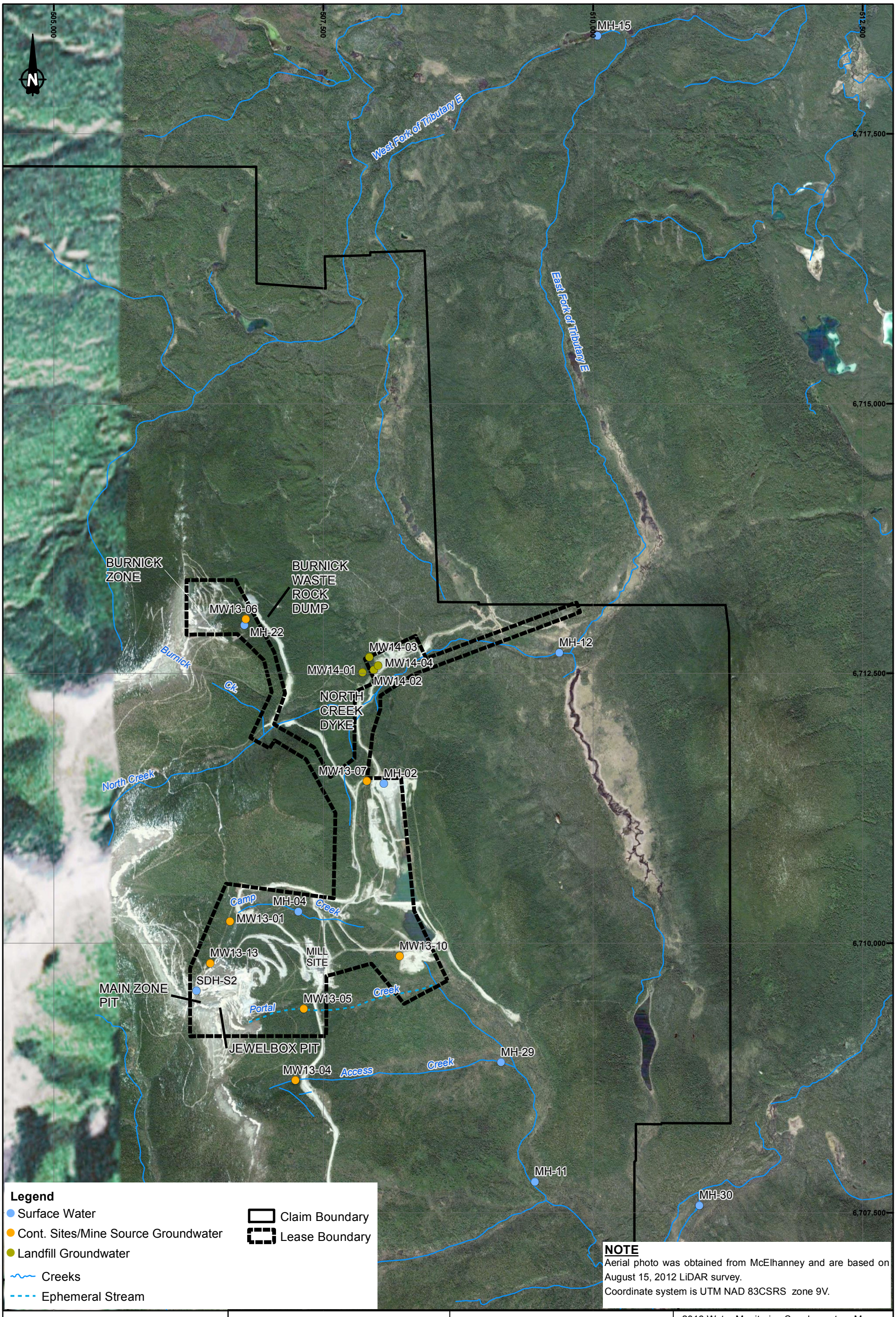
Figures



srk consulting

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Teck

Sa Dena Hes Mine

2016 Water Monitoring Supplementary Memo

Surface and Groundwater Monitoring Stations

Date:	Approved:	Figure:
Mar 2017	TRS	1

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Attachment A – 2016 Surface Water Monitoring Results and Guidelines

2016 Surface Water Monitoring Results and Guidelines

Station MH-02
Location North Dam Seepage

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jan	Feb	Mar	Apr	May	Jun
	Max	Working Mean	30-day Mean	1/18/2016	2/21/2016	3/18/2016	4/16/2016	5/10/2016	6/8/2016
pH - Lab	6.5 to 9	—	—	8.17	7.96	8.19	8.3	8.26	8.13
pH - Field	—	—	—	8	7.6	7.6	7.8	7.9	7.9
Conductivity (µS/cm) - Lab	—	—	—	1080	1110	1100	1040	422	922
Conductivity (µS/cm) - Field	—	—	—	949	1177	1210	1118	469	934
Temperature (°C) - Field	—	—	—	0.1	0.2	0.2	1.5	5.3	16.1
Turbidity (NTU) - Lab	see table	—	see table	0.26	0.39	0.28	0.55	24	0.21
Turbidity (NTU) - Field	see table	—	see table	0.25	0.35	0.4	0.63		
Flow (L/min)	—	—	—	12	7.2	2.4	12	180	30
TSS	see table	—	see table	<4	<4	<4	<4	7.8	<1
TDS	—	—	—	762	742	740	754	252	628
Alkalinity, Total (as CaCO3)	see table	—	—	312	307	299	277	143	262
Sulphate (SO4)	—	—	hardness dep	300	295	313	298	76.6	282
Hardness (as CaCO3)	—	—	—	596	662	586	619	229	538
Bromide (Br)	—	—	—						
Chloride (Cl)	600	—	150	0.79	0.86	0.98	0.91	0.92	1.2
Total Cyanide (SAD-CN)	—	—	—	0.0009	0.00098	0.00057	0.00087	0.00073	0.00085
WAD Cyanide	0.01	—	0.005						0.00065
Nitrate (NO3)	32.8	—	3	0.034	0.032	0.033	0.034	<0.02	<0.02
Nitrite (NO2)	0.06	—	0.02 (see table)	<0.005	<0.005	<0.005	<0.005	0.0077	<0.005
Ammonia, Total (NH3)	see table	—	see table	0.041	0.046	0.055	0.11	0.057	0.07
Colour, True (Col. units)	—	—	see table	<5	<5	<5	11.3	<5	<5
DOC	see table	—	—		1.99	3.01	2.94	1.75	3.01
Aluminum (Al)-total	—	—	—	0.0367	0.0047	0.003	0.0016	0.191	0.003
Antimony (Sb)-total	—	0.009	—	<0.0005	<0.0005	<0.0005	0.000053	0.000142	0.00014
Arsenic (As)-total	0.005	—	—	0.00041	0.00041	0.00038	0.000396	0.000398	0.000421
Barium (Ba)-total	—	—	1	0.0588	0.0615	0.0664	0.068	0.0425	0.0709
Beryllium (Be)-total	—	0.00013	—	<0.0001	<0.0001	<0.0001	<0.00001	0.000011	<0.00001
Bismuth (Bi)-total	—	—	—	<0.001	<0.001	<0.001	<5E-06	0.000015	<0.000005
Boron (B)-total	1.2	—	—	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
Cadmium (Cd)-total	—	—	—	0.000074	0.000052	0.000057	0.000062	0.000082	0.000022
Calcium (Ca)-total	see table	—	—	202	216	202	206	87	185
Chromium (Cr)-total	0.001	—	—	<0.001	<0.001	<0.0001	<0.0001	0.00023	<0.0001
Chromium (Cr6+)-total	0.001	0.001	—		<0.001				
Chromium (Cr3+)-total	—	0.0089	—		<0.001				
Cobalt (Co)-total	0.11	—	0.004	0.00095	0.00084	0.00089	0.000815	0.000307	0.000439
Copper (Cu)-total	hardness dep	—	hardness dep	<0.0005	<0.0005	<0.0005	<0.0002	0.0005	<0.0002
Iron (Fe)-total	1	—	—	0.116	0.1	0.068	0.105	0.189	0.034
Lead (Pb)-total	hardness dep	—	hardness dep	0.00123	<0.0002	0.00033	0.000259	0.0121	0.000422
Lithium (Li)-total	—	—	0.096	<0.005	<0.005	<0.005	0.00166	0.00065	0.00169
Magnesium (Mg)-total	—	—	—	19.6	19.6	19	17.8	5.6	13.9
Manganese (Mn)-total	hardness dep	—	hardness dep	0.697	0.808	0.632	0.7	0.0774	0.0711
Mercury (Hg)-total	—	—	0.00002	<0.00001	<0.00001	<0.00005	<0.00001	<0.00001	<0.00001
Molybdenum (Mo)-total	2	—	1	<0.001	<0.001	<0.001	0.000314	0.00043	0.000485
Nickel (Ni)-total	—	hardness dep	—	<0.001	<0.001	<0.001	0.00042	0.00038	0.0002
Potassium (K)-total	—	—	—	1.37	1.42	1.58	1.64	1.02	1.69
Selenium (Se)-total	—	—	0.002	<0.0001	<0.0001	<0.0001	0.000071	0.000378	0.000136
Silicon (Si)-total	—	—	—	4.24	4.79	4.71	5.47	2.76	3.78
Silver (Ag)-total	hardness dep	—	hardness dep	<0.00002	<0.00002	<0.00002	<5E-06	0.000008	0.000005
Sodium (Na)-total	—	—	—	10.4	11	11.1	9.74	3.58	8.8
Strontium (Sr)-total	—	—	—	0.678	0.717	0.763	0.795	0.267	0.631
Sulphur (S)-total	—	—	—	101	122	127	122	30.5	91.3
Thallium (Tl)-total	—	0.0008	—	<0.00005	<0.00005	<0.00005	0.000002	0.000003	0.000002
Tin (Sn)-total	—	—	—	<0.005	<0.005	<0.005	<0.0002	<0.0002	<0.0002
Titanium (Ti)-total	—	—	—	<0.005	<0.005	<0.005	<0.0005	0.00775	<0.0005
Uranium (U)-total	—	0.0085	—	0.00181	0.00195	0.00201	0.00199	0.000823	0.00174
Vanadium (V)-total	—	—	0.02	<0.005	<0.005	<0.005	<0.0002	0.00029	<0.0002
Zinc (Zn)-total	hardness dep	—	hardness dep	0.0476	0.0362	0.0363	0.0368	0.0341	0.0132
Zirconium (Zr)-total	—	—	—	<0.0005	<0.0005	<0.0005	<0.0001	0.00016	<0.0001
Aluminum (Al)-dissolved	0.1	—	0.05	0.0287	<0.003	0.0126	0.0012	0.0019	0.0013
Antimony (Sb)-dissolved	—	—	—	<0.0005	<0.0005	<0.0005	0.000058	0.000138	0.000128
Arsenic (As)-dissolved	—	—	—	0.00038	0.00034	0.00043	0.000361	0.00026	0.000633
Barium (Ba)-dissolved	—	—	—	0.0563	0.0639	0.0599	0.0688	0.0375	0.0725
Beryllium (Be)-dissolved	—	—	—	<0.0001	<0.0001	<0.0001	<0.00001	<0.00001	<0.00001
Bismuth (Bi)-dissolved	—	—	—	<0.001	<0.001	<0.001	<5E-06	<0.000005	<0.000005
Boron (B)-dissolved	—	—	—	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
Cadmium (Cd)-dissolved	hardness dep	—	hardness dep	0.000037	0.000025	0.000028	0.000026	0.000054	0.0000194
Calcium (Ca)-dissolved	—	—	—	209	232	204	219	83.1	192
Chromium (Cr)-dissolved	—	—	—	<0.001	<0.001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt (Co)-dissolved	—	—	—	0.00088	0.0006	0.00076	0.000792	0.000133	0.000476
Copper (Cu)-dissolved	—	—	—	0.0003	<0.0002	0.00036	<0.0002	<0.0002	<0.0002
Iron (Fe)-dissolved	0.35	—	—	0.0234	0.0469	0.0377	0.0464	0.0084	0.0368

Station MH-02
Location North Dam Seepage

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jan	Feb	Mar	Apr	May	Jun
	Max	Working Mean	30-day Mean	1/18/2016	2/21/2016	3/18/2016	4/16/2016	5/10/2016	6/8/2016
Lead (Pb)-dissolved	—	—	—	<0.0002	<0.0002	<0.0002	0.000056	0.00171	0.00014
Lithium (Li)-dissolved	—	—	—	<0.005	<0.005	<0.005	0.00132	0.00069	0.00206
Magnesium (Mg)-dissolved	—	—	—	18.3	20	19	17.7	5.15	13.9
Manganese (Mn)-dissolved	—	—	—	0.598	0.79	0.597	0.678	0.0699	0.114
Mercury (Hg)-dissolved	—	—	—	<0.00001	<0.00001		<0.00001	<0.00001	<0.00001
Molybdenum (Mo)-dissolved	—	—	—	<0.001	<0.001	<0.001	0.000318	0.000442	0.000404
Nickel (Ni)-dissolved	—	—	—	<0.001	<0.001	<0.001	0.00041	<0.0002	0.00021
Potassium (K)-dissolved	—	—	—	1.39	1.44	1.5	1.62	0.945	1.72
Selenium (Se)-dissolved	—	—	—	<0.0001	<0.0001	<0.0001	0.000077	0.000361	0.00014
Silicon (Si)-dissolved	—	—	—	4.23	5.58	4.43	5.51	2.24	3.88
Silver (Ag)-dissolved	—	—	—	<0.00002	<0.00002	<0.00002	<5E-06	<0.000005	<0.000005
Sodium (Na)-dissolved	—	—	—	10.5	11.1	10.2	9.76	3.53	9.03
Strontium (Sr)-dissolved	—	—	—	0.701	0.682	0.711	0.768	0.251	0.666
Thallium (Tl)-dissolved	—	—	—	<0.00005	<0.00005	<0.00005	<2E-06	<0.000002	<0.000002
Tin (Sn)-dissolved	—	—	—	<0.005	<0.005	<0.005	<0.0002	<0.0002	<0.0002
Titanium (Ti)-dissolved	—	—	—	<0.005	<0.005	<0.005	<0.0005	<0.0005	<0.0005
Uranium (U)-dissolved	—	—	—	0.00179	0.00163	0.00198	0.00202	0.000692	0.00164
Vanadium (V)-dissolved	—	—	—	<0.005	<0.005	<0.005	<0.0002	<0.0002	<0.0002
Zinc (Zn)-dissolved	—	—	—	0.0405	0.0379	0.039	0.0354	0.0222	0.0118
Zirconium (Zr)-dissolved	—	—	—	<0.0005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001

NOTE:
Values in bold and underlined exceed the BC 30-day mean water quality guideline for the protection of
Values shaded yellow exceed the BC maximum water quality guideline for the protection of aquatic life
Blanks and #N/A no data available

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month	Jan	Feb	Mar	Apr	May	Jun
	Hardness (as CaCO3 mg/L)	**596**	**662**	**586**	**619**	**229**	**538**
BC Approved Maximum Guideline (Short Term)	**Ammonia**	6.6	12.6	12.6	9.0	7.3	
	Dissolved Cadmium	0.00370	0.00412	0.00363	0.00385	0.00138	0.00333
	Copper	0.058	0.064	0.057	0.060	0.024	0.053
	Lead	0.79	0.91	0.78	0.83	0.23	0.70
	Manganese	7.1	7.8	7.0	7.4	3.1	6.5
	Silver	0.003	0.003	0.003	0.003	0.003	0.003
	Zinc	0.4125	0.462	0.405	0.42975	0.13725	0.369
BC Working Maximum Guideline	**Nickel**	0.15	0.15	0.15	0.15	0.15	0.15
BC Approved 30-day Average Guideline	**Ammonia**	1.26	2.09	2.09	1.73	1.41	
	Dissolved Cadmium	0.000787	0.00085	0.000777	0.000809	0.000389154	0.00073
	Copper	0.0238	0.0265	0.0234	0.0248	0.0092	0.0215
	Lead	0.0342	0.0386	0.0336	0.0357	0.0125	0.0304
	Manganese	3.2	3.5	3.2	3.3	1.6	3.0
	Silver	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
	Sulphate	429	429	429	429	429	429
	Zinc	0.387	0.437	0.380	0.404	0.112	0.344

Station MH-02
Location North Dam Seepage

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jul	Aug	Sep	Oct	Nov	Dec
	Max	Working Mean	30-day Mean	7/30/2016	8/20/2016	9/20/2016	10/22/2016	11/28/2016	12/18/2016
pH - Lab	6.5 to 9	—	—	8.2	8.18	8.23	7.94	8.04	7.8
pH - Field	—	—	—	7.9	7.9	8	7.6	7.6	7.6
Conductivity (µS/cm) - Lab	—	—	—	978	995	965	1080	1130	1150
Conductivity (µS/cm) - Field	—	—	—	950	970	962	1196	1137	1246
Temperature (°C) - Field	—	—	—	18.8	13.1	7	0.4	0.1	0.4
Turbidity (NTU) - Lab	see table	—	see table	0.52	0.3	0.32	0.26	0.28	0.6
Turbidity (NTU) - Field	see table	—	see table		0.29	0.27	0.18	0.38	0.17
Flow (L/min)	—	—	—	12	18	18	18	12	2.4
TSS	see table	—	see table	<1	<1	<1	<1	<1	5
TDS	—	—	—	660	724	666	786	838	818
Alkalinity, Total (as CaCO3)	see table	—	—	279	268	274	318	318	321
Sulphate (SO4)	—	—	hardness dep	268	290	280	290	338	297
Hardness (as CaCO3)	—	—	—	557	597	535	603	700	651
Bromide (Br)	—	—	—						
Chloride (Cl)	600	—	150	0.88	2.1	1.3	1.2	0.58	1.1
Total Cyanide (SAD-CN)	—	—	—	0.00052	<0.0005	<0.0005	0.0006	0.00095	0.00092
WAD Cyanide	0.01	—	0.005						
Nitrate (NO3)	32.8	—	3	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nitrite (NO2)	0.06	—	0.02 (see table)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ammonia, Total (NH3)	see table	—	see table	0.061	0.046	<0.005	0.017	0.15	0.043
Colour, True (Col. units)	—	—	see table	<5	7.6	7.3	<5	<5	<5
DOC	see table	—	—	3.73	3.25	3.32	1.82	2.25	3.11
Aluminum (Al)-total	—	—	—	0.0051	0.0035	0.0026	0.0029	0.0015	0.0129
Antimony (Sb)-total	—	0.009	—	0.000111	0.000078	0.000052	0.000039	0.000049	0.000063
Arsenic (As)-total	0.005	—	—	0.000602	0.000543	0.000389	0.000356	0.000299	0.000747
Barium (Ba)-total	—	—	1	0.0662	0.0562	0.0512	0.0571	0.0641	0.0761
Beryllium (Be)-total	—	0.00013	—	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi)-total	—	—	—	<0.000005	<0.000005	<5E-06	<0.000005	<0.000005	<0.00001
Boron (B)-total	1.2	—	—	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium (Cd)-total	—	—	—	0.000025	0.000014	0.000015	0.000072	0.000062	0.000153
Calcium (Ca)-total	see table	—	—	212	205	182	209	256	218
Chromium (Cr)-total	0.001	—	—	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00016
Chromium (Cr6+)-total	0.001	0.001	—						
Chromium (Cr3+)-total	—	0.0089	—						
Cobalt (Co)-total	0.11	—	0.004	0.00055	0.000525	0.000513	0.000621	0.000745	0.00116
Copper (Cu)-total	hardness dep	—	hardness dep	<0.0002	<0.0002	<0.0002	0.00024	<0.0002	0.00035
Iron (Fe)-total	1	—	—	0.0915	0.0594	0.0468	0.039	0.0665	0.43
Lead (Pb)-total	hardness dep	—	hardness dep	0.0011	0.000285	0.000495	0.000145	0.000126	0.00189
Lithium (Li)-total	—	—	0.096	0.0018	0.00124	0.00157	0.00123	0.00125	0.00128
Magnesium (Mg)-total	—	—	—	17.7	18.4	16.2	17.9	19	17.4
Manganese (Mn)-total	hardness dep	—	hardness dep	0.22	0.15	0.124	0.43	0.556	1.35
Mercury (Hg)-total	—	—	0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Molybdenum (Mo)-total	2	—	1	0.000578	0.000514	0.000307	0.000211	0.000222	0.000268
Nickel (Ni)-total	—	hardness dep	—	0.00027	0.00024	0.00022	0.00035	0.00035	0.00068
Potassium (K)-total	—	—	—	1.86	2.55	2.11	1.33	1.31	1.24
Selenium (Se)-total	—	—	0.002	0.000098	0.00007	0.000077	0.000056	0.000083	0.000085
Silicon (Si)-total	—	—	—	4	4.46	4.19	5.01	4.53	4.34
Silver (Ag)-total	hardness dep	—	hardness dep	<0.000005	<0.000005	<5E-06	<0.000005	<0.000005	<0.00001
Sodium (Na)-total	—	—	—	11.5	11.4	9.55	9.57	10.7	9.47
Strontium (Sr)-total	—	—	—	0.783	0.722	0.658	0.763	0.771	0.73
Sulphur (S)-total	—	—	—	103	104	91.1	110	122	113
Thallium (Tl)-total	—	0.0008	—	0.000002	<0.000002	<2E-06	0.000002	0.000002	0.000003
Tin (Sn)-total	—	—	—	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Titanium (Ti)-total	—	—	—	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.002
Uranium (U)-total	—	0.0085	—	0.00173	0.00155	0.0016	0.00196	0.00206	0.00187
Vanadium (V)-total	—	—	0.02	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Zinc (Zn)-total	hardness dep	—	hardness dep	0.009	0.0058	0.0081	0.0508	0.0533	0.0849
Zirconium (Zr)-total	—	—	—	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Aluminum (Al)-dissolved	0.1	—	0.05	0.0018	0.0017	0.0016	0.002	0.0012	0.0012
Antimony (Sb)-dissolved	—	—	—	0.000099	0.000081	0.000058	0.000044	0.000044	0.000046
Arsenic (As)-dissolved	—	—	—	0.00053	0.00114	0.000597	0.000355	0.000327	0.00029
Barium (Ba)-dissolved	—	—	—	0.0608	0.06	0.0527	0.055	0.0666	0.0602
Beryllium (Be)-dissolved	—	—	—	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi)-dissolved	—	—	—	<0.000005	<0.000005	<5E-06	<0.000005	<0.000005	<0.000005
Boron (B)-dissolved	—	—	—	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium (Cd)-dissolved	hardness dep	—	hardness dep	0.000025	0.000012	0.000016	0.000064	0.000067	0.000066
Calcium (Ca)-dissolved	—	—	—	196	208	187	211	248	229
Chromium (Cr)-dissolved	—	—	—	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt (Co)-dissolved	—	—	—	0.000511	0.000582	0.000522	0.000683	0.000738	0.000727
Copper (Cu)-dissolved	—	—	—	<0.0002	<0.0002	<0.0002	<0.0002	0.00021	<0.0002
Iron (Fe)-dissolved	0.35	—	—	0.0148	0.0585	0.0239	0.0346	0.0543	0.0332

Station MH-02
Location North Dam Seepage

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jul	Aug	Sep	Oct	Nov	Dec
	Max	Working Mean	30-day Mean	7/30/2016	8/20/2016	9/20/2016	10/22/2016	11/28/2016	12/18/2016
Lead (Pb)-dissolved	—	—	—	0.000268	0.000052	0.000112	0.000073	0.000053	0.000051
Lithium (Li)-dissolved	—	—	—	0.00161	0.00133	0.00138	0.00099	0.00131	0.00135
Magnesium (Mg)-dissolved	—	—	—	16.6	18.8	16.6	18.3	19.8	19.2
Manganese (Mn)-dissolved	—	—	—	0.207	0.218	0.161	0.436	0.577	0.536
Mercury (Hg)-dissolved	—	—	—	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Molybdenum (Mo)-dissolved	—	—	—	0.000547	0.000501	0.000318	0.00021	0.000225	0.00023
Nickel (Ni)-dissolved	—	—	—	0.00025	0.00025	0.0002	0.0004	0.00042	0.00046
Potassium (K)-dissolved	—	—	—	1.72	2.53	2.13	1.33	1.37	1.41
Selenium (Se)-dissolved	—	—	—	0.000099	0.000071	0.000072	0.000051	0.000076	0.000081
Silicon (Si)-dissolved	—	—	—	4.26	4.44	4.49	4.58	4.86	4.45
Silver (Ag)-dissolved	—	—	—	<0.000005	<0.000005	<5E-06	<0.000005	<0.000005	<0.000005
Sodium (Na)-dissolved	—	—	—	10.5	11.5	9.71	9.9	11	10.3
Strontium (Sr)-dissolved	—	—	—	0.744	0.726	0.641	0.692	0.809	0.774
Thallium (Tl)-dissolved	—	—	—	0.000002	<0.000002	<2E-06	<0.000002	<0.000002	<0.000002
Tin (Sn)-dissolved	—	—	—	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Titanium (Ti)-dissolved	—	—	—	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Uranium (U)-dissolved	—	—	—	0.00168	0.00163	0.00161	0.00191	0.00208	0.00193
Vanadium (V)-dissolved	—	—	—	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Zinc (Zn)-dissolved	—	—	—	0.0067	0.0056	0.0076	0.0526	0.0552	0.0543
Zirconium (Zr)-dissolved	—	—	—	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

NOTE:
Values in bold and underlined exceed the BC 30-day mean water quality guideline for
Values shaded yellow exceed the BC maximum water quality guideline for the protecti
Blanks and #N/A no data available

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month	Jul	Aug	Sep	Oct	Nov	Dec
	Hardness (as CaCO3 mg/L)	557	597	535	603	700	651
BC Approved Maximum Guideline (Short Term)	Ammonia		6.8	6.0	12.6	12.6	12.6
	Dissolved Cadmium	0.00345	0.00370	0.00331	0.00374	0.00436	0.00405
	Copper	0.054	0.058	0.052	0.059	0.068	0.063
	Lead	0.73	0.79	0.69	0.80	0.97	0.89
	Manganese	6.7	7.1	6.4	7.2	8.3	7.7
	Silver	0.003	0.003	0.003	0.003	0.003	0.003
	Zinc	0.38325	0.41325	0.36675	0.41775	0.4905	0.45375
BC Working Maximum Guideline	Nickel	0.15	0.15	0.15	0.15	0.15	0.15
BC Approved 30-day Average Guideline	Ammonia		1.31	1.16	2.09	2.09	2.09
	Dissolved Cadmium	0.00075	0.00079	0.00073	0.00079	0.00089	0.00084
	Copper	0.0223	0.0239	0.0214	0.0241	0.0280	0.0260
	Lead	0.0317	0.0343	0.0302	0.0347	0.0412	0.0379
	Manganese	3.1	3.2	3.0	3.3	3.7	3.5
	Silver	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
	Sulphate	429	429	429	429	429	429
	Zinc	0.358	0.388	0.341	0.392	0.465	0.428

Station MH-04
Location Lower Camp Creek

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jan	Feb	Mar	Apr	May	Jun
	Max	Working Mean	30-day Mean	--	2/21/2016	3/19/2016	4/16/2016	5/11/2016	6/8/2016
pH - Lab	6.5 to 9	—	—		8.24	8.17	8.37	8.34	8.22
pH - Field	—	—	—		8.3	8.4	8.4	8.2	8.3
Conductivity (µS/cm) - Lab	—	—	—		312	312	322	340	293
Conductivity (µS/cm) - Field	—	—	—		331	350	350	371	318
Temperature (°C) - Field	—	—	—		0.2	0.8	1	1.5	3.2
Turbidity (NTU) - Lab	see table	—	see table		0.19	<0.1	0.15	0.33	<0.1
Turbidity (NTU) - Field	see table	—	see table		0.06	0.19	0.22		
Flow (L/min)	—	—	—		120	120	198	780	5040
TSS	see table	—	see table		<4	<4	<4	1.4	<1
TDS	—	—	—		176	180	190	188	168
Alkalinity, Total (as CaCO3)	see table	—	—		156	155	162	175	142
Sulphate (SO4)	—	—	hardness dep		12.6	12.6	13	11.3	15.5
Hardness (as CaCO3)	—	—	—		163	165	175	191	160
Bromide (Br)	—	—	—		<0.01	<0.01	<0.01	<0.01	<0.01
Chloride (Cl)	600	—	150		0.55	<0.5	<0.5	0.89	0.67
Total Cyanide (SAD-CN)	—	—	—		0.00056	<0.0005	0.00063	0.00084	
WAD Cyanide	0.01	—	0.005						
Nitrate (NO3)	32.8	—	3		0.223	0.208	0.21	0.378	0.204
Nitrite (NO2)	0.06	—	0.02 (see table)		<0.005	<0.005	<0.005	<0.005	<0.005
Ammonia, Total (NH3)	see table	—	see table		0.0065	0.055	0.0055	0.033	0.05
Colour, True (Col. units)	—	—	see table		<5	<5	<5	8.7	<5
DOC	see table	—	—		1.93	1.6	0.97	3.06	1.99
Aluminum (Al)-total	—	—	—		0.0062	0.0031	0.0037	0.0079	0.006
Antimony (Sb)-total	—	0.009	—		<0.0005	<0.0005	0.000117	0.000105	0.000121
Arsenic (As)-total	0.005	—	—		0.00041	0.00037	0.000347	0.000303	0.000349
Barium (Ba)-total	—	—	1		0.0217	0.0235	0.0257	0.032	0.0216
Beryllium (Be)-total	—	0.00013	—		<0.0001	<0.0001	<0.00001	<0.00001	<0.00001
Bismuth (Bi)-total	—	—	—		<0.001	<0.001	<5E-06	<0.000005	<5E-06
Boron (B)-total	1.2	—	—		<0.05	<0.05	<0.01	<0.01	<0.01
Cadmium (Cd)-total	—	—	—		0.000215	0.00023	0.000239	0.000276	0.000297
Calcium (Ca)-total	see table	—	—		59.2	60.3	64.2	90.9	58
Chromium (Cr)-total	0.001	—	—		<0.001	0.00013	0.00012	<0.0001	0.00015
Chromium (Cr6+)-total	0.001	0.001	—		<0.001				
Chromium (Cr3+)-total	—	0.0089	—		<0.001				
Cobalt (Co)-total	0.11	—	0.004		<0.0005	<0.0005	0.000006	0.000028	0.000011
Copper (Cu)-total	hardness dep	—	hardness dep		<0.0005	<0.0005	<0.0002	0.00027	0.00037
Iron (Fe)-total	1	—	—		<0.01	<0.01	0.0035	0.0187	0.0078
Lead (Pb)-total	hardness dep	—	hardness dep		0.00021	<0.0002	0.000153	0.000879	0.00116
Lithium (Li)-total	—	—	0.096		<0.005	<0.005	0.00151	0.00089	0.0013
Magnesium (Mg)-total	—	—	—		3.18	3.5	3.39	3.51	3.11
Manganese (Mn)-total	hardness dep	—	hardness dep		<0.001	<0.001	0.0004	0.00159	0.00077
Mercury (Hg)-total	—	—	0.00002		<0.00001	<0.00005	<0.00001	<0.00001	<0.00001
Molybdenum (Mo)-total	2	—	1		<0.001	<0.001	0.000725	0.000477	0.000544
Nickel (Ni)-total	—	hardness dep	—		<0.001	<0.001	<0.0002	<0.0002	<0.0002
Potassium (K)-total	—	—	—		0.391	0.365	0.397	0.491	0.41
Selenium (Se)-total	—	—	0.002		0.00074	0.00078	0.000745	0.000826	0.000646
Silicon (Si)-total	—	—	—		3.2	3.29	3.82	3.43	3.38
Silver (Ag)-total	hardness dep	—	hardness dep		<0.00002	<0.00002	<5E-06	<0.000005	<5E-06
Sodium (Na)-total	—	—	—		0.851	0.931	0.928	0.871	0.805
Strontium (Sr)-total	—	—	—		0.227	0.217	0.25	0.24	0.206
Sulphur (S)-total	—	—	—		6.9	4.8	4.6	3.7	5.4
Thallium (Tl)-total	—	0.0008	—		<0.00005	<0.00005	<2E-06	0.000002	<2E-06
Tin (Sn)-total	—	—	—		<0.005	<0.005	<0.0002	<0.0002	<0.0002
Titanium (Ti)-total	—	—	—		<0.005	<0.005	<0.0005	<0.0005	<0.0005
Uranium (U)-total	—	0.0085	—		0.00094	0.00096	0.00101	0.000832	0.000772
Vanadium (V)-total	—	—	0.02		<0.005	<0.005	<0.0002	<0.0002	<0.0002
Zinc (Zn)-total	hardness dep	—	hardness dep		0.0051	<0.005	0.0044	0.0061	0.0064
Zirconium (Zr)-total	—	—	—		<0.0005	<0.0005	<0.0001	<0.0001	<0.0001
Aluminum (Al)-dissolved	0.1	—	0.05		0.0046	0.0116	0.0019	0.003	0.0026
Antimony (Sb)-dissolved	—	—	—		<0.0005	<0.0005	0.000126	0.000104	0.000152
Arsenic (As)-dissolved	—	—	—		0.00039	0.00041	0.000344	0.000319	0.000323
Barium (Ba)-dissolved	—	—	—		0.0226	0.0214	0.0257	0.0313	0.0214
Beryllium (Be)-dissolved	—	—	—		<0.0001	<0.0001	<0.00001	<0.00001	<0.00001
Bismuth (Bi)-dissolved	—	—	—		<0.001	<0.001	<5E-06	<0.000005	<5E-06
Boron (B)-dissolved	—	—	—		<0.05	<0.05	<0.01	<0.01	<0.01
Cadmium (Cd)-dissolved	hardness dep	—	hardness dep		0.000219	0.000218	0.000244	0.000246	0.00028
Calcium (Ca)-dissolved	—	—	—		60	60.9	64.5	70.6	59.1
Chromium (Cr)-dissolved	—	—	—		<0.001	0.00013	0.00013	<0.0001	0.00014
Cobalt (Co)-dissolved	—	—	—		<0.0005	<0.0005	0.000005	0.000024	8.4E-06
Copper (Cu)-dissolved	—	—	—		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Iron (Fe)-dissolved	0.35	—	—		<0.005	<0.005	0.0024	0.0044	0.0014

Station MH-04
Location Lower Camp Creek

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jan	Feb	Mar	Apr	May	Jun
	Max	Working Mean	30-day Mean	--	2/21/2016	3/19/2016	4/16/2016	5/11/2016	6/8/2016
Lead (Pb)-dissolved	—	—	—		0.00028	<0.0002	0.000071	0.000131	0.00028
Lithium (Li)-dissolved	—	—	—		<0.005	<0.005	0.0015	0.00076	0.00202
Magnesium (Mg)-dissolved	—	—	—		3.29	3.25	3.48	3.56	3.02
Manganese (Mn)-dissolved	—	—	—		<0.001	<0.001	0.00036	0.00046	<0.0002
Mercury (Hg)-dissolved	—	—	—		<0.00001	<0.00005	<0.00001	<0.00001	<0.00001
Molybdenum (Mo)-dissolved	—	—	—		<0.001	<0.001	0.000702	0.000501	0.000585
Nickel (Ni)-dissolved	—	—	—		<0.001	<0.001	<0.0002	<0.0002	<0.0002
Potassium (K)-dissolved	—	—	—		0.414	0.369	0.399	0.496	0.408
Selenium (Se)-dissolved	—	—	—		0.00071	0.0008	0.000744	0.000659	0.00066
Silicon (Si)-dissolved	—	—	—		3.67	3.29	3.91	3.31	3.48
Silver (Ag)-dissolved	—	—	—		<0.00002	<0.00002	<5E-06	<0.000005	<5E-06
Sodium (Na)-dissolved	—	—	—		0.871	0.887	0.954	0.867	0.768
Strontium (Sr)-dissolved	—	—	—		0.22	0.214	0.249	0.253	0.213
Thallium (Tl)-dissolved	—	—	—		<0.00005	<0.00005	<2E-06	0.000002	<2E-06
Tin (Sn)-dissolved	—	—	—		<0.005	<0.005	<0.0002	<0.0002	<0.0002
Titanium (Ti)-dissolved	—	—	—		<0.005	<0.005	<0.0005	<0.0005	<0.0005
Uranium (U)-dissolved	—	—	—		0.00088	0.00097	0.00103	0.000803	0.000951
Vanadium (V)-dissolved	—	—	—		<0.005	<0.005	<0.0002	<0.0002	<0.0002
Zinc (Zn)-dissolved	—	—	—		<0.005	<0.005	0.0042	0.0052	0.0055
Zirconium (Zr)-dissolved	—	—	—		<0.0005	<0.0005	<0.0001	<0.0001	<0.0001

NOTE:

Values in bold and underlined exceed the BC 30-day mean water quality guideline for the protection of aquatic life

Values shaded yellow exceed the BC maximum water quality guideline for the protection of aquatic life
Blanks and #N/A no data available

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month	Jan	Feb	Mar	Apr	May	Jun
	Hardness (as CaCO3 mg/L)		**163**	**165**	**175**	**191**	**160**
BC Approved Maximum Guideline (Short Term)	**Ammonia**		3.3	2.6	2.6	4.0	3.2
	Dissolved Cadmium		0.00097	0.00099	0.00105	0.00115	0.00095
	Copper		0.017	0.018	0.018	0.020	0.017
	Lead		0.15	0.15	0.17	0.19	0.15
	Manganese		2.3	2.4	2.5	2.6	2.3
	Silver		0.003	0.003	0.003	0.003	0.003
	Zinc		0.08775	0.08925	0.09675	0.10875	0.0855
BC Working Maximum Guideline	**Nickel**		0.138553	0.139843	0.146238	0.15	0.13661
BC Approved 30-day Average Guideline	**Ammonia**		0.64	0.50	0.50	0.78	0.61
	Dissolved Cadmium		0.000303	0.000306	0.000319	0.000340505	0.00030
	Copper		0.0065	0.0066	0.0070	0.0076	0.0064
	Lead		0.0092	0.0093	0.0098	0.0106	0.0091
	Manganese		1.3	1.3	1.4	1.4	1.3
	Silver		0.0015	0.0015	0.0015	0.0015	0.0015
	Sulphate		309	309	309	429	309
	Zinc		0.062	0.064	0.071	0.083	0.060

Station MH-04
Location Lower Camp Creek

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jul	Aug	Sep	Oct	Nov	Dec
	Max	Working Mean	30-day Mean	7/31/2016	8/21/2016	9/27/2016	10/22/2016	11/28/2016	12/21/2016
pH - Lab	6.5 to 9	—	—	8.26	8.23	8.25	8.21	8.29	8.12
pH - Field	—	—	—	8.4	8.4	8.4	8.3	8.2	8.3
Conductivity (µS/cm) - Lab	—	—	—	298	309	320	315	310	309
Conductivity (µS/cm) - Field	—	—	—	316	312	320	345	330	337
Temperature (°C) - Field	—	—	—	5.6	4.9	2.5	1.5	0.2	0.6
Turbidity (NTU) - Lab	see table	—	see table	0.53	0.14	<0.1	0.18	0.26	0.46
Turbidity (NTU) - Field	see table	—	see table	0.02	0.13	0.04	0.01	0.05	0.13
Flow (L/min)	—	—	—	480	360	480	300	144	210
TSS	see table	—	see table	<1	<1	<1	1.2	1.7	<1
TDS	—	—	—	160	166	192	172	178	170
Alkalinity, Total (as CaCO3)	see table	—	—	149	146	144	150	153	153
Sulphate (SO4)	—	—	hardness dep	15.2	19	27	18.3	16.1	15.3
Hardness (as CaCO3)	—	—	—	170	175	163	166	169	163
Bromide (Br)	—	—	—	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chloride (Cl)	600	—	150	<0.5	<1	<1	0.77	<0.5	0.6
Total Cyanide (SAD-CN)	—	—	—						0.00075
WAD Cyanide	0.01	—	0.005						
Nitrate (NO3)	32.8	—	3	0.171	0.17	0.298	0.234	0.246	0.234
Nitrite (NO2)	0.06	—	0.02 (see table)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ammonia, Total (NH3)	see table	—	see table	0.013	0.032	0.11	0.032	0.037	0.021
Colour, True (Col. units)	—	—	see table	<5	<5	<5	<5	<5	<5
DOC	see table	—	—	1.45	2.09	2.5	1.22	0.88	<0.5
Aluminum (Al)-total	—	—	—	0.0079	0.0112	0.0033	0.0036	0.0061	0.0069
Antimony (Sb)-total	—	0.009	—	0.000135	0.00013	0.000121	0.000116	0.000125	0.000116
Arsenic (As)-total	0.005	—	—	0.000395	0.000413	0.000339	0.000373	0.000354	0.000396
Barium (Ba)-total	—	—	1	0.0228	0.0231	0.0228	0.0213	0.0222	0.0228
Beryllium (Be)-total	—	0.00013	—	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi)-total	—	—	—	<0.000005	<0.000005	<5E-06	<0.000005	<0.000005	<0.000005
Boron (B)-total	1.2	—	—	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium (Cd)-total	—	—	—	0.000313	0.00029	0.000318	0.000258	0.000254	0.000252
Calcium (Ca)-total	see table	—	—	66.7	65	61.7	61.5	63.4	61.6
Chromium (Cr)-total	0.001	—	—	0.00013	0.00015	0.00015	0.00012	0.00012	0.00016
Chromium (Cr6+)-total	0.001	0.001	—						
Chromium (Cr3+)-total	—	0.0089	—						
Cobalt (Co)-total	0.11	—	0.004	0.000014	0.000017	0.000007	0.000008	0.000012	0.000008
Copper (Cu)-total	hardness dep	—	hardness dep	0.00041	0.00021	0.00026	<0.0002	<0.0002	<0.0002
Iron (Fe)-total	1	—	—	0.0112	0.0186	0.0049	0.0036	0.01	0.0093
Lead (Pb)-total	hardness dep	—	hardness dep	0.000682	0.00107	0.000284	0.000245	0.000568	0.000587
Lithium (Li)-total	—	—	0.096	0.00161	0.00127	0.00171	0.00106	0.00153	0.00153
Magnesium (Mg)-total	—	—	—	3.48	3.22	3.22	3.17	3.15	3.18
Manganese (Mn)-total	hardness dep	—	hardness dep	0.00134	0.00181	0.00077	0.00068	0.00135	0.00103
Mercury (Hg)-total	—	—	0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Molybdenum (Mo)-total	2	—	1	0.000754	0.000727	0.000724	0.000691	0.000718	0.000719
Nickel (Ni)-total	—	hardness dep	—	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Potassium (K)-total	—	—	—	0.375	0.386	0.447	0.385	0.359	0.36
Selenium (Se)-total	—	—	0.002	0.000822	0.000714	0.000861	0.000775	0.000841	0.000874
Silicon (Si)-total	—	—	—	3.04	3.16	3.27	3.52	3.41	3.39
Silver (Ag)-total	hardness dep	—	hardness dep	<0.000005	<0.000005	<5E-06	<0.000005	<0.000005	<0.000005
Sodium (Na)-total	—	—	—	0.872	0.858	0.776	0.917	0.814	0.805
Strontium (Sr)-total	—	—	—	0.218	0.207	0.205	0.226	0.212	0.222
Sulphur (S)-total	—	—	—	5.7	5.6	7.9	6.6	5.2	5.3
Thallium (Tl)-total	—	0.0008	—	<0.000002	<0.000002	<2E-06	0.000002	0.000002	<0.000002
Tin (Sn)-total	—	—	—	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Titanium (Ti)-total	—	—	—	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Uranium (U)-total	—	0.0085	—	0.000888	0.000875	0.00084	0.000908	0.000949	0.000959
Vanadium (V)-total	—	—	0.02	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Zinc (Zn)-total	hardness dep	—	hardness dep	0.006	0.0059	0.0059	0.005	0.0052	0.0052
Zirconium (Zr)-total	—	—	—	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Aluminum (Al)-dissolved	0.1	—	0.05	0.0024	0.0022	0.0025	0.0028	0.0018	0.0022
Antimony (Sb)-dissolved	—	—	—	0.00012	0.000126	0.00012	0.000119	0.000122	0.000119
Arsenic (As)-dissolved	—	—	—	0.000359	0.000383	0.000378	0.000367	0.000338	0.00037
Barium (Ba)-dissolved	—	—	—	0.0215	0.023	0.0225	0.0219	0.022	0.022
Beryllium (Be)-dissolved	—	—	—	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi)-dissolved	—	—	—	<0.000005	<0.000005	<5E-06	<0.000005	<0.000005	<0.000005
Boron (B)-dissolved	—	—	—	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium (Cd)-dissolved	hardness dep	—	hardness dep	0.000269	0.000273	**0.000318**	0.000255	0.000251	0.00024
Calcium (Ca)-dissolved	—	—	—	63.1	64.7	60.3	61.4	62.6	59.9
Chromium (Cr)-dissolved	—	—	—	0.00015	0.00012	0.00021	0.00013	0.00012	0.00026
Cobalt (Co)-dissolved	—	—	—	0.000007	0.000007	<5E-06	0.000006	<0.000005	<0.000005
Copper (Cu)-dissolved	—	—	—	<0.0002	<0.0002	0.00025	<0.0002	<0.0002	<0.0002
Iron (Fe)-dissolved	0.35	—	—	0.0019	0.002	0.0056	0.0013	0.0013	<0.001

Station MH-04
Location Lower Camp Creek

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jul	Aug	Sep	Oct	Nov	Dec
	Max	Working Mean	30-day Mean	7/31/2016	8/21/2016	9/27/2016	10/22/2016	11/28/2016	12/21/2016
Lead (Pb)-dissolved	—	—	—	0.000167	0.000169	0.000119	0.000089	0.000073	0.00007
Lithium (Li)-dissolved	—	—	—	0.00145	0.00123	0.00143	0.00127	0.00148	0.00145
Magnesium (Mg)-dissolved	—	—	—	3.06	3.26	3.17	3.14	3.14	3.28
Manganese (Mn)-dissolved	—	—	—	0.00035	0.00045	0.00046	0.00036	0.00034	<0.0002
Mercury (Hg)-dissolved	—	—	—	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Molybdenum (Mo)-dissolved	—	—	—	0.0007	0.000734	0.000713	0.000694	0.000728	0.000746
Nickel (Ni)-dissolved	—	—	—	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Potassium (K)-dissolved	—	—	—	0.343	0.388	0.449	0.379	0.358	0.351
Selenium (Se)-dissolved	—	—	—	0.00074	0.000743	0.000913	0.000779	0.000882	0.000834
Silicon (Si)-dissolved	—	—	—	3.18	3.18	3.27	3.38	3.27	3.4
Silver (Ag)-dissolved	—	—	—	<0.000005	<0.000005	<5E-06	<0.000005	<0.000005	<0.000005
Sodium (Na)-dissolved	—	—	—	0.787	0.859	0.767	0.804	0.804	0.826
Strontium (Sr)-dissolved	—	—	—	0.199	0.204	0.209	0.215	0.205	0.217
Thallium (Tl)-dissolved	—	—	—	<0.000002	<0.000002	<2E-06	<0.000002	<0.000002	<0.000002
Tin (Sn)-dissolved	—	—	—	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Titanium (Ti)-dissolved	—	—	—	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Uranium (U)-dissolved	—	—	—	0.000834	0.000852	0.000844	0.000933	0.000982	0.000944
Vanadium (V)-dissolved	—	—	—	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Zinc (Zn)-dissolved	—	—	—	0.0048	0.0048	0.0059	0.0047	0.0047	0.0042
Zirconium (Zr)-dissolved	—	—	—	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

NOTE:

Values in bold and underlined exceed the BC 30-day mean water quality guideline for aquatic life

Values shaded yellow exceed the BC maximum water quality guideline for the protecti
Blanks and #N/A no data available

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month	Jul	Aug	Sep	Oct	Nov	Dec
	Hardness (as CaCO3 mg/L)	170	175	163	166	169	163
BC Approved Maximum Guideline (Short Term)	Ammonia	2.5	2.5	2.5	3.2	4.2	3.3
	Dissolved Cadmium	0.00102	0.00105	0.00097	0.00099	0.00101	0.00097
	Copper	0.018	0.018	0.017	0.018	0.018	0.017
	Lead	0.16	0.17	0.15	0.16	0.16	0.15
	Manganese	2.4	2.5	2.3	2.4	2.4	2.3
	Silver	0.003	0.003	0.003	0.003	0.003	0.003
	Zinc	0.093	0.09675	0.08775	0.09	0.09225	0.08775
BC Working Maximum Guideline	Nickel	0.1430518	0.14623828	0.138553	0.1404864	0.1424118	0.1385526
BC Approved 30-day Average Guideline	Ammonia	0.48	0.48	0.49	0.62	0.80	0.63
	Dissolved Cadmium	0.00031	0.00032	0.00030	0.00031	0.00031	0.00030
	Copper	0.0068	0.0070	0.0065	0.0066	0.0068	0.0065
	Lead	0.0096	0.0098	0.0092	0.0094	0.0095	0.0092
	Manganese	1.4	1.4	1.3	1.3	1.3	1.3
	Silver	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
	Sulphate	309	309	309	309	309	309
	Zinc	0.068	0.071	0.062	0.065	0.067	0.062

Station MH-11
Location Upper False Canyon Creek

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jan	Feb	Mar	Apr	May	Jun
	Max	Working Mean	30-day Mean	1/19/2016	2/22/2016	3/19/2016	4/17/2016	5/11/2016	6/8/2016
pH - Lab	6.5 to 9	—	—	8.33	8.19	8.22	8.43	8.34	8.28
pH - Field	—	—	—	7.9	8.2	8.1	8.1	7.9	8.5
Conductivity (µS/cm) - Lab	—	—	—	402	406	403	424	345	337
Conductivity (µS/cm) - Field	—	—	—	435	448	456	466	373	361
Temperature (°C) - Field	—	—	—	0.1	0.2	0.2	0.3	1.5	6.6
Turbidity (NTU) - Lab	see table	—	see table	0.53	0.58	0.37	0.52	3.87	0.43
Turbidity (NTU) - Field	see table	—	see table	0.52	0.55	0.45	0.65		
Flow (L/min)	—	—	—	780	540	540	1200	6360	7020
TSS	see table	—	see table	<4	<4	<4	<4	6.8	1.5
TDS	—	—	—	226	216	220	250	190	186
Alkalinity, Total (as CaCO3)	see table	—	—	208	213	211	223	173	172
Sulphate (SO4)	—	—	hardness dep	13.8	14	12.7	16.9	15	15.8
Hardness (as CaCO3)	—	—	—	204	227	212	253	184	190
Bromide (Br)	—	—	—	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chloride (Cl)	600	—	150	0.62	<0.5	0.68	<0.5	0.97	1
Total Cyanide (SAD-CN)	—	—	—	0.00062	0.00056	<0.0005	0.0006	0.00065	0.00062
WAD Cyanide	0.01	—	0.005						<0.0005
Nitrate (NO3)	32.8	—	3	0.138	0.125	0.111	0.113	0.161	0.16
Nitrite (NO2)	0.06	—	0.02 (see table)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ammonia, Total (NH3)	see table	—	see table	0.0091	0.01	0.16	0.043	0.039	0.021
Colour, True (Col. units)	—	—	see table	7.9	<5	6.6	10.1	13.9	7.5
DOC	see table	—	—		1.71	2.74	3.8	4.77	3.18
Aluminum (Al)-total	—	—	—	0.0401	0.0092	0.0044	0.0078	0.0825	0.0565
Antimony (Sb)-total	—	0.009	—	<0.0005	<0.0005	<0.0005	0.000125	0.000175	0.000181
Arsenic (As)-total	0.005	—	—	0.00051	0.00051	0.00046	0.000487	0.000566	0.000698
Barium (Ba)-total	—	—	1	0.0657	0.0705	0.0746	0.0801	0.064	0.0549
Beryllium (Be)-total	—	0.00013	—	<0.0001	<0.0001	<0.0001	<0.00001	<0.00001	<0.00001
Bismuth (Bi)-total	—	—	—	<0.001	<0.001	<0.001	<5E-06	<0.000005	<5E-06
Boron (B)-total	1.2	—	—	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
Cadmium (Cd)-total	—	—	—	0.000054	0.000051	0.000042	0.000049	0.000134	0.000102
Calcium (Ca)-total	see table	—	—	70.5	73.7	73.8	80.1	61.8	64.2
Chromium (Cr)-total	0.001	—	—	<0.001	<0.001	<0.0001	0.00016	0.00017	0.00011
Chromium (Cr6+)-total	0.001	0.001	—		<0.001				
Chromium (Cr3+)-total	—	0.0089	—		<0.001				
Cobalt (Co)-total	0.11	—	0.004	<0.0005	<0.0005	<0.0005	0.00003	0.000116	0.000053
Copper (Cu)-total	hardness dep	—	hardness dep	<0.0005	<0.0005	<0.0005	0.00043	0.001	0.00041
Iron (Fe)-total	1	—	—	0.074	0.079	0.068	0.0595	0.14	0.0957
Lead (Pb)-total	hardness dep	—	hardness dep	0.00036	0.00035	<0.0002	0.000454	0.00297	0.00162
Lithium (Li)-total	—	—	0.096	<0.005	<0.005	<0.005	0.00195	0.0011	0.00147
Magnesium (Mg)-total	—	—	—	7.99	8.77	8.8	10.7	6.9	6.37
Manganese (Mn)-total	hardness dep	—	hardness dep	0.0159	0.0167	0.0138	0.013	0.0228	0.0146
Mercury (Hg)-total	—	—	0.00002	<0.00001	<0.00001	<0.00005	<0.00001	<0.00001	<0.00001
Molybdenum (Mo)-total	2	—	1	<0.001	<0.001	<0.001	0.000922	0.000761	0.000861
Nickel (Ni)-total	—	hardness dep	—	<0.001	<0.001	<0.001	0.00026	0.00052	0.00027
Potassium (K)-total	—	—	—	0.415	0.434	0.441	0.588	0.644	0.499
Selenium (Se)-total	—	—	0.002	0.00052	0.00051	0.00049	0.000687	0.00063	0.00073
Silicon (Si)-total	—	—	—	3.5	3.86	3.96	4.64	3.41	3.83
Silver (Ag)-total	hardness dep	—	hardness dep	<0.00002	0.000048	<0.00002	<5E-06	<0.000005	<5E-06
Sodium (Na)-total	—	—	—	1.23	1.19	1.34	1.26	0.86	0.927
Strontium (Sr)-total	—	—	—	0.275	0.304	0.296	0.333	0.231	0.247
Sulphur (S)-total	—	—	—	<3	5.5	5.5	6.1	5	5.1
Thallium (Tl)-total	—	0.0008	—	<0.00005	<0.00005	<0.00005	<2E-06	0.000002	0.000002
Tin (Sn)-total	—	—	—	<0.005	<0.005	<0.005	<0.0002	<0.0002	<0.0002
Titanium (Ti)-total	—	—	—	<0.005	<0.005	<0.005	<0.0005	0.00329	<0.0005
Uranium (U)-total	—	0.0085	—	0.00117	0.0012	0.00132	0.00155	0.00102	0.000984
Vanadium (V)-total	—	—	0.02	<0.005	<0.005	<0.005	<0.0002	0.00024	<0.0002
Zinc (Zn)-total	hardness dep	—	hardness dep	0.017	0.0055	<0.005	0.0047	0.0128	0.0071
Zirconium (Zr)-total	—	—	—	<0.0005	<0.0005	<0.0005	<0.0001	<0.0001	0.0002
Aluminum (Al)-dissolved	0.1	—	0.05	0.0298	0.0032	0.0118	0.0031	0.0049	0.0035
Antimony (Sb)-dissolved	—	—	—	<0.0005	<0.0005	<0.0005	0.000127	0.000156	0.000173
Arsenic (As)-dissolved	—	—	—	0.00046	0.00046	0.00052	0.000457	0.000441	0.000566
Barium (Ba)-dissolved	—	—	—	0.0648	0.0697	0.0672	0.0787	0.0583	0.0534
Beryllium (Be)-dissolved	—	—	—	<0.0001	<0.0001	<0.0001	<0.00001	<0.00001	<0.00001
Bismuth (Bi)-dissolved	—	—	—	<0.001	<0.001	<0.001	<5E-06	<0.000005	<5E-06
Boron (B)-dissolved	—	—	—	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
Cadmium (Cd)-dissolved	hardness dep	—	hardness dep	0.000042	0.000034	0.000036	0.000037	0.000057	6.87E-05
Calcium (Ca)-dissolved	—	—	—	68.5	77.8	70.8	83.8	62	66.4
Chromium (Cr)-dissolved	—	—	—	<0.001	<0.001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt (Co)-dissolved	—	—	—	<0.0005	<0.0005	<0.0005	0.00002	0.000054	2.01E-05
Copper (Cu)-dissolved	—	—	—	0.00041	0.00034	0.00024	0.00021	0.00032	0.00029
Iron (Fe)-dissolved	0.35	—	—	0.0368	0.0216	0.0269	0.026	0.0193	0.0273

Station MH-11
Location Upper False Canyon Creek

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jan	Feb	Mar	Apr	May	Jun
	Max	Working Mean	30-day Mean	1/19/2016	2/22/2016	3/19/2016	4/17/2016	5/11/2016	6/8/2016
Lead (Pb)-dissolved	—	—	—	<0.0002	<0.0002	<0.0002	0.000061	0.000184	0.000187
Lithium (Li)-dissolved	—	—	—	<0.005	<0.005	<0.005	0.00155	0.00091	0.0017
Magnesium (Mg)-dissolved	—	—	—	7.96	8.06	8.51	10.5	7.08	5.84
Manganese (Mn)-dissolved	—	—	—	0.0151	0.013	0.0118	0.0109	0.0101	0.00446
Mercury (Hg)-dissolved	—	—	—	<0.00001	<0.00001	<0.00005	<0.00001	<0.00001	<0.00001
Molybdenum (Mo)-dissolved	—	—	—	<0.001	<0.001	<0.001	0.000934	0.000783	0.000792
Nickel (Ni)-dissolved	—	—	—	<0.001	<0.001	<0.001	0.00022	0.00029	<0.0002
Potassium (K)-dissolved	—	—	—	0.414	0.464	0.381	0.562	0.615	0.473
Selenium (Se)-dissolved	—	—	—	0.00062	0.00052	0.00051	0.000687	0.000709	0.000791
Silicon (Si)-dissolved	—	—	—	3.36	4.41	3.75	4.69	3.29	3.83
Silver (Ag)-dissolved	—	—	—	<0.00002	<0.00002	<0.00002	<5E-06	<0.000005	<5E-06
Sodium (Na)-dissolved	—	—	—	1.27	1.22	1.26	1.26	0.81	0.879
Strontium (Sr)-dissolved	—	—	—	0.275	0.28	0.278	0.333	0.237	0.258
Thallium (Tl)-dissolved	—	—	—	<0.00005	<0.00005	<0.00005	<2E-06	<0.000002	<2E-06
Tin (Sn)-dissolved	—	—	—	<0.005	<0.005	<0.005	<0.0002	<0.0002	<0.0002
Titanium (Ti)-dissolved	—	—	—	<0.005	<0.005	<0.005	<0.0005	<0.0005	<0.0005
Uranium (U)-dissolved	—	—	—	0.00126	0.00097	0.00144	0.00158	0.000964	0.000922
Vanadium (V)-dissolved	—	—	—	<0.005	<0.005	<0.005	<0.0002	<0.0002	<0.0002
Zinc (Zn)-dissolved	—	—	—	0.0062	<0.005	<0.005	0.0037	0.0054	0.0037
Zirconium (Zr)-dissolved	—	—	—	<0.0005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001

NOTE:
Values in bold and underlined exceed the BC 30-day mean water quality guideline for the protection of
Values shaded yellow exceed the BC maximum water quality guideline for the protection of aquatic life
Blanks and #N/A no data available

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month	Jan	Feb	Mar	Apr	May	Jun
	Hardness (as CaCO3 mg/L)	204	227	212	253	184	190
BC Approved Maximum Guideline (Short Term)	Ammonia	7.8	4.2	5.2	5.2	7.6	2.0
	Dissolved Cadmium	0.00123	0.00137	0.00128	0.00153	0.00110	0.00114
	Copper	0.021	0.023	0.022	0.026	0.019	0.020
	Lead	0.20	0.23	0.21	0.27	0.18	0.18
	Manganese	2.8	3.0	2.9	3.3	2.6	2.6
	Silver	0.003	0.003	0.003	0.003	0.003	0.003
	Zinc	0.1185	0.13575	0.1245	0.15525	0.1035	0.108
BC Working Maximum Guideline	Nickel	0.15	0.15	0.15	0.15	0.15	0.15
BC Approved 30-day Average Guideline	Ammonia	1.50	0.80	1.00	1.00	1.46	0.38
	Dissolved Cadmium	0.000357	0.000387	0.000368	0.000419	0.000331275	0.00034
	Copper	0.0082	0.0091	0.0085	0.0101	0.0074	0.0076
	Lead	0.0112	0.0124	0.0116	0.0137	0.0102	0.0105
	Manganese	1.5	1.6	1.5	1.7	1.4	1.4
	Silver	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
	Sulphate	429	429	429	429	429	429
	Zinc	0.093	0.110	0.099	0.130	0.078	0.083

Station MH-11
Location Upper False Canyon Creek

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jul	Aug	Sep	Oct	Nov	Dec
	Max	Working Mean	30-day Mean	7/30/2016	8/20/2016	9/20/2016	10/22/2016	11/27/2016	12/17/2016
pH - Lab	6.5 to 9	—	—	8.34	8.29	8.23	8.24	8.37	8.04
pH - Field	—	—	—	8.2	8.3	8.3	8.4	8.5	8.1
Conductivity (µS/cm) - Lab	—	—	—	378	387	384	383	387	410
Conductivity (µS/cm) - Field	—	—	—	386	386	396	421	343	371
Temperature (°C) - Field	—	—	—	9.3	9	4.1	0.5	0.1	0.1
Turbidity (NTU) - Lab	see table	—	see table	0.61	0.53	0.69	0.56	0.54	0.82
Turbidity (NTU) - Field	see table	—	see table	0.32	0.44	0.69	0.5	0.49	0.57
Flow (L/min)	—	—	—	1440	960	1140	900	636	438
TSS	see table	—	see table	1	1	<1	<1	<1	1.3
TDS	—	—	—	200	224	222	214	198	226
Alkalinity, Total (as CaCO3)	see table	—	—	201	193	192	197	206	212
Sulphate (SO4)	—	—	hardness dep	15.2	15	22	16.1	15.1	15.1
Hardness (as CaCO3)	—	—	—	216	223	205	211	226	237
Bromide (Br)	—	—	—	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chloride (Cl)	600	—	150	0.52	1.2	1.3	0.89	<0.5	0.75
Total Cyanide (SAD-CN)	—	—	—	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
WAD Cyanide	0.01	—	0.005						
Nitrate (NO3)	32.8	—	3	0.068	0.04	0.088	0.136	0.148	0.119
Nitrite (NO2)	0.06	—	0.02 (see table)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ammonia, Total (NH3)	see table	—	see table	0.014	0.036	0.02	0.037	0.013	0.036
Colour, True (Col. units)	—	—	see table	7.7	6.9	16	5.3	5.9	<5
DOC	see table	—	—	3.54	3.21	4.28	2.9	1.58	1.5
Aluminum (Al)-total	—	—	—	0.0104	0.0076	0.0094	0.0051	0.0076	0.0118
Antimony (Sb)-total	—	0.009	—	0.000152	0.00013	0.000112	0.000119	0.000115	0.000113
Arsenic (As)-total	0.005	—	—	0.000769	0.000694	0.000592	0.000515	0.000465	0.000525
Barium (Ba)-total	—	—	1	0.0773	0.0732	0.0652	0.063	0.0696	0.0764
Beryllium (Be)-total	—	0.00013	—	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi)-total	—	—	—	<0.000005	<0.000005	<5E-06	<0.000005	<0.000005	<0.000005
Boron (B)-total	1.2	—	—	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium (Cd)-total	—	—	—	0.000055	0.00005	0.00005	0.000044	0.000055	0.000059
Calcium (Ca)-total	see table	—	—	79.8	81.2	70.7	70.3	78.4	74.4
Chromium (Cr)-total	0.001	—	—	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium (Cr6+)-total	0.001	0.001	—						
Chromium (Cr3+)-total	—	0.0089	—						
Cobalt (Co)-total	0.11	—	0.004	0.000033	0.000036	0.000034	0.000027	0.000031	0.000044
Copper (Cu)-total	hardness dep	—	hardness dep	0.00028	0.00026	0.00026	0.00021	<0.0002	<0.0002
Iron (Fe)-total	1	—	—	0.081	0.0796	0.0903	0.0715	0.0812	0.103
Lead (Pb)-total	hardness dep	—	hardness dep	0.0015	0.00031	0.000338	0.000235	0.0003	0.000532
Lithium (Li)-total	—	—	0.096	0.00189	0.00167	0.00192	0.00098	0.00169	0.00177
Magnesium (Mg)-total	—	—	—	8.19	7.76	7.79	7.37	8.05	8.62
Manganese (Mn)-total	hardness dep	—	hardness dep	0.0187	0.0192	0.0168	0.0172	0.0216	0.0328
Mercury (Hg)-total	—	—	0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Molybdenum (Mo)-total	2	—	1	0.00107	0.000996	0.000891	0.000847	0.000849	0.000815
Nickel (Ni)-total	—	hardness dep	—	0.00021	<0.0002	0.00021	<0.0002	<0.0002	<0.0002
Potassium (K)-total	—	—	—	0.407	0.469	0.543	0.418	0.393	0.473
Selenium (Se)-total	—	—	0.002	0.000447	0.000381	0.000492	0.000523	0.00059	0.000562
Silicon (Si)-total	—	—	—	3.72	3.9	3.44	3.97	3.97	3.79
Silver (Ag)-total	hardness dep	—	hardness dep	<0.000005	<0.000005	<5E-06	<0.000005	<0.000005	<0.000005
Sodium (Na)-total	—	—	—	1.22	1.15	1.1	1.16	1.18	1.19
Strontium (Sr)-total	—	—	—	0.289	0.281	0.259	0.286	0.28	0.301
Sulphur (S)-total	—	—	—	4.7	4.2	6.3	5.5	4.6	5.3
Thallium (Tl)-total	—	0.0008	—	0.000002	<0.000002	<2E-06	<0.000002	<0.000002	<0.000002
Tin (Sn)-total	—	—	—	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Titanium (Ti)-total	—	—	—	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Uranium (U)-total	—	0.0085	—	0.00108	0.001	0.000992	0.00114	0.00123	0.0012
Vanadium (V)-total	—	—	0.02	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Zinc (Zn)-total	hardness dep	—	hardness dep	0.0041	0.0033	0.0036	0.0033	0.0044	0.0066
Zirconium (Zr)-total	—	—	—	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Aluminum (Al)-dissolved	0.1	—	0.05	0.0032	0.0035	0.003	0.0027	0.0031	0.0024
Antimony (Sb)-dissolved	—	—	—	0.000132	0.000131	0.000112	0.000115	0.000113	0.000112
Arsenic (As)-dissolved	—	—	—	0.000646	0.000688	0.000559	0.000487	0.000422	0.000374
Barium (Ba)-dissolved	—	—	—	0.0694	0.0735	0.0652	0.0619	0.0688	0.0758
Beryllium (Be)-dissolved	—	—	—	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi)-dissolved	—	—	—	<0.000005	<0.000005	<5E-06	<0.000005	<0.000005	<0.000005
Boron (B)-dissolved	—	—	—	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium (Cd)-dissolved	hardness dep	—	hardness dep	0.000044	0.00004	0.000043	0.000034	0.000033	0.000038
Calcium (Ca)-dissolved	—	—	—	73.9	76	69.3	71.8	77.3	80.9
Chromium (Cr)-dissolved	—	—	—	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt (Co)-dissolved	—	—	—	0.000023	0.000024	0.000027	0.000023	0.000026	0.000033
Copper (Cu)-dissolved	—	—	—	0.00028	0.00026	0.00025	0.00021	0.0002	0.0004
Iron (Fe)-dissolved	0.35	—	—	0.03	0.0358	0.0318	0.0342	0.0278	0.0298

Station MH-11
Location Upper False Canyon Creek

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jul	Aug	Sep	Oct	Nov	Dec
	Max	Working Mean	30-day Mean	7/30/2016	8/20/2016	9/20/2016	10/22/2016	11/27/2016	12/17/2016
Lead (Pb)-dissolved	—	—	—	0.000061	0.000069	0.000065	0.000044	0.000049	0.000039
Lithium (Li)-dissolved	—	—	—	0.00172	0.00141	0.00164	0.00064	0.00161	0.00181
Magnesium (Mg)-dissolved	—	—	—	7.7	8.06	7.69	7.61	7.89	8.58
Manganese (Mn)-dissolved	—	—	—	0.0123	0.0146	0.0148	0.0153	0.0181	0.0257
Mercury (Hg)-dissolved	—	—	—	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Molybdenum (Mo)-dissolved	—	—	—	0.000985	0.000981	0.000904	0.000844	0.000847	0.000823
Nickel (Ni)-dissolved	—	—	—	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Potassium (K)-dissolved	—	—	—	0.383	0.475	0.538	0.417	0.402	0.469
Selenium (Se)-dissolved	—	—	—	0.000394	0.000337	0.00048	0.000528	0.000553	0.000567
Silicon (Si)-dissolved	—	—	—	3.66	3.71	3.7	3.76	3.9	3.78
Silver (Ag)-dissolved	—	—	—	<0.000005	<0.000005	<5E-06	<0.000005	<0.000005	<0.000005
Sodium (Na)-dissolved	—	—	—	1.05	1.17	1.08	1.13	1.15	1.18
Strontium (Sr)-dissolved	—	—	—	0.277	0.275	0.272	0.261	0.278	0.297
Thallium (Tl)-dissolved	—	—	—	<0.000002	<0.000002	<2E-06	<0.000002	<0.000002	<0.000002
Tin (Sn)-dissolved	—	—	—	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Titanium (Ti)-dissolved	—	—	—	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Uranium (U)-dissolved	—	—	—	0.00105	0.00102	0.00103	0.00111	0.00118	0.00122
Vanadium (V)-dissolved	—	—	—	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Zinc (Zn)-dissolved	—	—	—	0.0025	0.0026	0.0029	0.0031	0.0036	0.0054
Zirconium (Zr)-dissolved	—	—	—	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

NOTE:
Values in bold and underlined exceed the BC 30-day mean water quality guideline for
Values shaded yellow exceed the BC maximum water quality guideline for the protecti
Blanks and #N/A no data available

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month	Jul	Aug	Sep	Oct	Nov	Dec
	Hardness (as CaCO3 mg/L)	216	223	205	211	226	237
BC Approved Maximum Guideline (Short Term)	Ammonia	3.8	3.0	3.2	2.6	2.1	5.2
	Dissolved Cadmium	0.00130	0.00134	0.00123	0.00127	0.00136	0.00143
	Copper	0.022	0.023	0.021	0.022	0.023	0.024
	Lead	0.22	0.23	0.20	0.21	0.23	0.24
	Manganese	2.9	3.0	2.8	2.9	3.0	3.2
	Silver	0.003	0.003	0.003	0.003	0.003	0.003
	Zinc	0.1275	0.13275	0.11925	0.12375	0.135	0.14325
BC Working Maximum Guideline	Nickel	0.15	0.15	0.15	0.15	0.15	0.15
BC Approved 30-day Average Guideline	Ammonia	0.72	0.58	0.61	0.50	0.41	1.00
	Dissolved Cadmium	0.00037	0.00038	0.00036	0.00037	0.00039	0.00040
	Copper	0.0086	0.0089	0.0082	0.0084	0.0090	0.0095
	Lead	0.0118	0.0122	0.0113	0.0115	0.0123	0.0129
	Manganese	1.6	1.6	1.5	1.5	1.6	1.6
	Silver	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
	Sulphate	429	429	429	429	429	429
	Zinc	0.102	0.107	0.094	0.098	0.110	0.118

Station MH-12
Location Tributary East, east fork (above confluence of small tributary flowing north from a small lake)

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jan	Feb	Mar	Apr	May	Jun	Jul
	Max	Working Mean	30-day Mean	1/18/2016	2/21/2016	3/18/2016	4/16/2016	5/10/2016	6/9/2016	7/30/2016
pH - Lab	6.5 to 9	—	—	8.35	8.26	8.2	8.35	8.34	8.3	8.33
pH - Field	—	—	—	8.5	8.4	8.3	8.5	8.5	8.4	8.6
Conductivity (µS/cm) - Lab	—	—	—	336	341	336	335	331	281	319
Conductivity (µS/cm) - Field	—	—	—	330	369	371	365	359	302	327
Temperature (°C) - Field	—	—	—	0.1	0.2	0.2	0.5	1.9	5.6	8.8
Turbidity (NTU) - Lab	see table	—	see table	0.23	0.38	0.14	0.18	6.84	0.4	0.27
Turbidity (NTU) - Field	see table	—	see table	0.13	0.22	0.22	0.28			0.2
Flow (L/min)	—	—	—	420	300	240	324	12840	47280	
TSS	see table	—	see table	<4	<4	<4	<4	28.9	2.5	<1
TDS	—	—	—	198	194	180	194	190	160	182
Alkalinity, Total (as CaCO3)	see table	—	—	171	174	172	173	165	145	168
Sulphate (SO4)	—	—	hardness dep	13.8	12.2	12.3	12	15.5	9.49	10.4
Hardness (as CaCO3)	—	—	—	180	184	182	188	176	149	179
Bromide (Br)	—	—	—							
Chloride (Cl)	600	—	150	<0.5	0.56	<0.5	0.86	1	0.94	<0.5
Total Cyanide (SAD-CN)	—	—	—	0.00067	0.00062	<0.0005	0.00092	0.00064		
WAD Cyanide	0.01	—	0.005							
Nitrate (NO3)	32.8	—	3	0.138	0.142	0.138	0.118	0.091	0.086	0.027
Nitrite (NO2)	0.06	—	0.02 (see table)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ammonia, Total (NH3)	see table	—	see table	0.058	0.01	0.1	0.0081	0.062	0.031	0.046
Colour, True (Col. units)	—	—	see table	<5	<5	<5	6.4	7.8	<5	<5
DOC	see table	—	—		2.31	1.97	2.06	3.49	2.59	2.28
Aluminum (Al)-total	—	—	—	0.0402	0.0167	0.006	0.0067	0.216	0.021	0.0119
Antimony (Sb)-total	—	0.009	—	<0.0005	<0.0005	<0.0005	0.000186	0.000198	0.000234	0.000228
Arsenic (As)-total	0.005	—	—	0.00082	0.00087	0.00078	0.000781	0.00122	0.00122	0.000981
Barium (Ba)-total	—	—	1	0.0688	0.0746	0.0755	0.0754	0.0774	0.0589	0.0798
Beryllium (Be)-total	—	0.00013	—	<0.0001	<0.0001	<0.0001	<0.00001	0.000016	<0.00001	<0.00001
Bismuth (Bi)-total	—	—	—	<0.001	<0.001	<0.001	<5E-06	<0.00002	<5E-06	<0.000005
Boron (B)-total	1.2	—	—	<0.05	<0.05	<0.05	<0.01	<0.05	<0.01	<0.01
Cadmium (Cd)-total	—	—	—	0.000035	0.000044	0.000032	0.000031	0.000172	0.000048	0.000045
Calcium (Ca)-total	see table	—	—	61.2	63.5	62.9	64	62	52.8	68.9
Chromium (Cr)-total	0.001	—	—	<0.001	<0.001	0.00017	0.00015	<0.0005	0.00027	0.00018
Chromium (Cr6+)-total	0.001	0.001	—		<0.001					
Chromium (Cr3+)-total	—	0.0089	—		<0.001					
Cobalt (Co)-total	0.11	—	0.004	<0.0005	<0.0005	<0.0005	0.000011	0.000253	0.000037	0.000023
Copper (Cu)-total	hardness dep	—	hardness dep	<0.0005	<0.0005	<0.0005	0.00022	0.00115	0.00026	0.00027
Iron (Fe)-total	1	—	—	0.014	0.025	<0.01	0.0069	0.399	0.0364	0.021
Lead (Pb)-total	hardness dep	—	hardness dep	0.00027	0.00032	<0.0002	0.000101	0.0049	0.00259	0.000717
Lithium (Li)-total	—	—	0.096	<0.005	<0.005	<0.005	0.00111	0.00175	0.00148	0.00167
Magnesium (Mg)-total	—	—	—	5.98	6.22	6.77	6.58	6.06	4.77	6.24
Manganese (Mn)-total	hardness dep	—	hardness dep	0.0037	0.0029	0.0013	0.00107	0.0478	0.00573	0.00462
Mercury (Hg)-total	—	—	0.00002	<0.00001	<0.00001	<0.00005	<0.00001	<0.00001	<0.00001	<0.00001
Molybdenum (Mo)-total	2	—	1	0.0012	0.0013	0.0014	0.0014	0.000977	0.00115	0.00138
Nickel (Ni)-total	—	hardness dep	—	<0.001	<0.001	<0.001	<0.0002	0.0008	<0.0002	<0.0002
Potassium (K)-total	—	—	—	0.399	0.452	0.446	0.525	0.73	0.447	0.423
Selenium (Se)-total	—	—	0.002	0.00083	0.00071	0.0008	0.000752	0.000872	0.000757	0.000665
Silicon (Si)-total	—	—	—	3.63	4.15	4.15	4.52	4.12	4.17	3.89
Silver (Ag)-total	hardness dep	—	hardness dep	<0.00002	<0.00002	<0.00002	<5E-06	<0.000005	<5E-06	<0.000005
Sodium (Na)-total	—	—	—	1.15	1.07	1.19	1.11	0.91	0.861	1.15
Strontium (Sr)-total	—	—	—	0.236	0.233	0.235	0.247	0.233	0.203	0.231
Sulphur (S)-total	—	—	—	3.7	3.7	5.1	4.1	<15	3.3	4
Thallium (Tl)-total	—	0.0008	—	<0.00005	<0.00005	<0.00005	<2E-06	0.000006	<2E-06	<0.000002
Tin (Sn)-total	—	—	—	<0.005	<0.005	<0.005	<0.0002	<0.0002	<0.0002	<0.0002
Titanium (Ti)-total	—	—	—	<0.005	<0.005	<0.005	<0.0005	0.0052	0.00075	<0.0005
Uranium (U)-total	—	0.0085	—	0.00099	0.00097	0.00108	0.00117	0.00114	0.000895	0.00102
Vanadium (V)-total	—	—	0.02	<0.005	<0.005	<0.005	<0.0002	0.00092	<0.0002	0.00032
Zinc (Zn)-total	hardness dep	—	hardness dep	<0.005	<0.005	<0.005	0.0011	0.0118	0.0035	0.0021
Zirconium (Zr)-total	—	—	—	<0.0005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001
Aluminum (Al)-dissolved	0.1	—	0.05	0.0319	0.004	0.0043	0.0028	0.0034	0.0032	0.0028
Antimony (Sb)-dissolved	—	—	—	<0.0005	<0.0005	<0.0005	0.000199	0.000185	0.000205	0.000212
Arsenic (As)-dissolved	—	—	—	0.00076	0.00077	0.00076	0.000704	0.000706	0.00101	0.000939
Barium (Ba)-dissolved	—	—	—	0.0683	0.078	0.0719	0.0756	0.0707	0.0557	0.0736
Beryllium (Be)-dissolved	—	—	—	<0.0001	<0.0001	<0.0001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi)-dissolved	—	—	—	<0.001	<0.001	<0.001	<5E-06	<0.000005	<5E-06	<0.000005
Boron (B)-dissolved	—	—	—	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01
Cadmium (Cd)-dissolved	hardness dep	—	hardness dep	0.000029	0.00003	0.000028	0.000032	0.000039	3.51E-05	0.000041
Calcium (Ca)-dissolved	—	—	—	62	63.2	62.8	64.3	60.7	52.4	62.5
Chromium (Cr)-dissolved	—	—	—	<0.001	<0.001	0.00015	0.00013	<0.0001	0.00023	0.00019
Cobalt (Co)-dissolved	—	—	—	<0.0005	<0.0005	<0.0005	0.000007	0.000021	0.000013	0.000012
Copper (Cu)-dissolved	—	—	—	0.00026	<0.0002	<0.0002	<0.0002	<0.0002	0.00024	0.0003
Iron (Fe)-dissolved	0.35	—	—	<0.005	<0.005	0.0234	0.0028	0.007	0.0038	0.0029

Station MH-12
Location Tributary East, east fork (above confluence of small tributary flowing north from a small lake)

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jan	Feb	Mar	Apr	May	Jun	Jul
	Max	Working Mean	30-day Mean	1/18/2016	2/21/2016	3/18/2016	4/16/2016	5/10/2016	6/9/2016	7/30/2016
Lead (Pb)-dissolved	—	—	—	<0.0002	<0.0002	<0.0002	0.000021	0.000084	0.000233	0.000093
Lithium (Li)-dissolved	—	—	—	<0.005	<0.005	<0.005	0.00124	0.00104	0.00148	0.00144
Magnesium (Mg)-dissolved	—	—	—	6	6.41	6.05	6.72	6.05	4.45	5.52
Manganese (Mn)-dissolved	—	—	—	0.0011	<0.001	0.0018	0.00021	0.00171	0.0013	0.00153
Mercury (Hg)-dissolved	—	—	—	<0.00001	<0.00001	<0.00005	<0.00001	<0.00001	<0.00001	<0.00001
Molybdenum (Mo)-dissolved	—	—	—	0.0012	0.0014	0.0013	0.00142	0.00116	0.00108	0.00126
Nickel (Ni)-dissolved	—	—	—	<0.001	<0.001	<0.001	<0.0002	<0.0002	<0.0002	<0.0002
Potassium (K)-dissolved	—	—	—	0.369	0.458	0.42	0.522	0.762	0.434	0.404
Selenium (Se)-dissolved	—	—	—	0.00082	0.00077	0.00084	0.000754	0.000966	0.000766	0.000635
Silicon (Si)-dissolved	—	—	—	3.68	4.52	4.19	4.67	3.73	4.03	4.06
Silver (Ag)-dissolved	—	—	—	<0.00002	<0.00002	<0.00002	<5E-06	<0.000005	<5E-06	<0.000005
Sodium (Na)-dissolved	—	—	—	1.1	1.13	0.89	1.13	0.915	0.836	0.968
Strontium (Sr)-dissolved	—	—	—	0.225	0.228	0.216	0.251	0.224	0.185	0.228
Thallium (Tl)-dissolved	—	—	—	<0.00005	<0.00005	<0.00005	<2E-06	0.000002	<2E-06	<0.000002
Tin (Sn)-dissolved	—	—	—	<0.005	<0.005	<0.005	<0.0002	<0.0002	<0.0002	<0.0002
Titanium (Ti)-dissolved	—	—	—	<0.005	<0.005	<0.005	<0.0005	<0.0005	<0.0005	<0.0005
Uranium (U)-dissolved	—	—	—	0.001	0.00102	0.00109	0.0012	0.00117	0.000873	0.000944
Vanadium (V)-dissolved	—	—	—	<0.005	<0.005	<0.005	0.00021	<0.0002	0.0003	0.0003
Zinc (Zn)-dissolved	—	—	—	<0.005	<0.005	<0.005	0.001	0.0012	0.0011	0.0012
Zirconium (Zr)-dissolved	—	—	—	<0.0005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001

NOTE:
Values in bold and underlined exceed the BC 30-day mean water quality guideline for the protection of
Values shaded yellow exceed the BC maximum water quality guideline for the protection of aquatic life
Blanks and #N/A no data available

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month	Jan	Feb	Mar	Apr	May	Jun	Jul
	Hardness (as CaCO3 mg/L)	180	184	182	188	176	149	179
BC Approved Maximum Guideline (Short Term)	Ammonia	2.1	2.6	3.3	2.1	2.1	2.5	1.6
	Dissolved Cadmium	0.00108	0.00110	0.00109	0.00113	0.00105	0.00089	0.00107
	Copper	0.019	0.019	0.019	0.020	0.019	0.016	0.019
	Lead	0.17	0.18	0.17	0.18	0.17	0.14	0.17
	Manganese	2.5	2.6	2.5	2.6	2.5	2.2	2.5
	Silver	0.003	0.003	0.003	0.003	0.003	0.003	0.003
	Zinc	0.1005	0.1035	0.102	0.1065	0.0975	0.07725	0.09975
BC Working Maximum Guideline	Nickel	0.15	0.15	0.15	0.15	0.146872937	0.129412	0.14877174
BC Approved 30-day Average Guideline	Ammonia	0.41	0.51	0.64	0.40	0.40	0.48	0.30
	Dissolved Cadmium	0.000326	0.000331	0.000329	0.000337	0.000320612	0.00028	0.00032
	Copper	0.0072	0.0074	0.0073	0.0075	0.0070	0.0060	0.0072
	Lead	0.0100	0.0102	0.0101	0.0104	0.0099	0.0086	0.0100
	Manganese	1.4	1.4	1.4	1.4	1.4	1.3	1.4
	Silver	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
	Sulphate	429	429	429	429	309	309	309
	Zinc	0.075	0.078	0.077	0.081	0.072	0.052	0.074

Station MH-12
Location Tributary East, east fork (above confluence of sm

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Aug	Sep	Oct	Nov	Dec
	Max	Working Mean	30-day Mean	8/21/2016	9/24/2016	10/23/2016	11/27/2016	12/18/2016
pH - Lab	6.5 to 9	—	—	8.33	8.26	8.21	8.33	8.14
pH - Field	—	—	—	8.6	8.4	8.3	8.2	8.2
Conductivity (µS/cm) - Lab	—	—	—	328	331	318	315	329
Conductivity (µS/cm) - Field	—	—	—	328	336	352	342	363
Temperature (°C) - Field	—	—	—	6.7	4.2	1.1	0.1	0.2
Turbidity (NTU) - Lab	see table	—	see table	0.16	0.26	0.3	0.23	0.18
Turbidity (NTU) - Field	see table	—	see table	0.1	0.1	0.14	0.08	0.12
Flow (L/min)	—	—	—	720	1200	420		120
TSS	see table	—	see table	<1	<1	<1	<1	<1
TDS	—	—	—	176	176	188	180	172
Alkalinity, Total (as CaCO3)	see table	—	—	165	163	164	171	170
Sulphate (SO4)	—	—	hardness dep	13	13	10.3	11.5	11.2
Hardness (as CaCO3)	—	—	—	178	173	169	180	176
Bromide (Br)	—	—	—					
Chloride (Cl)	600	—	150	<1	2.1	0.65	<0.5	0.63
Total Cyanide (SAD-CN)	—	—	—		0.00052	<0.0005	<0.0005	0.0008
WAD Cyanide	0.01	—	0.005					
Nitrate (NO3)	32.8	—	3	<0.02	0.031	0.099	0.128	0.131
Nitrite (NO2)	0.06	—	0.02 (see table)	<0.005	<0.005	<0.005	<0.005	<0.005
Ammonia, Total (NH3)	see table	—	see table	0.042	0.06	0.0066	0.041	0.079
Colour, True (Col. units)	—	—	see table	<5	5.2	<5	<5	<5
DOC	see table	—	—	1.93	2.97	<0.5	1.17	0.92
Aluminum (Al)-total	—	—	—	0.0057	0.0091	0.0057	0.0059	0.0058
Antimony (Sb)-total	—	0.009	—	0.000209	0.000188	0.000185	0.000183	0.000186
Arsenic (As)-total	0.005	—	—	0.000831	0.000798	0.00073	0.000644	0.000681
Barium (Ba)-total	—	—	1	0.0769	0.0758	0.0675	0.0705	0.0718
Beryllium (Be)-total	—	0.00013	—	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi)-total	—	—	—	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Boron (B)-total	1.2	—	—	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium (Cd)-total	—	—	—	0.000043	0.000044	0.000033	0.000037	0.000036
Calcium (Ca)-total	see table	—	—	65.9	60.6	58.3	65.7	59.8
Chromium (Cr)-total	0.001	—	—	0.00018	0.00017	0.00016	0.00022	0.00015
Chromium (Cr6+)-total	0.001	0.001	—					
Chromium (Cr3+)-total	—	0.0089	—					
Cobalt (Co)-total	0.11	—	0.004	0.00002	0.000022	0.000012	0.000013	0.000015
Copper (Cu)-total	hardness dep	—	hardness dep	0.00025	0.00023	<0.0002	0.00023	<0.0002
Iron (Fe)-total	1	—	—	0.0119	0.0165	0.0067	0.01	0.0074
Lead (Pb)-total	hardness dep	—	hardness dep	0.000365	0.000364	0.000378	0.000293	0.000218
Lithium (Li)-total	—	—	0.096	0.00124	0.00134	0.00094	0.00137	0.00136
Magnesium (Mg)-total	—	—	—	6.23	5.76	5.73	5.93	6.15
Manganese (Mn)-total	hardness dep	—	hardness dep	0.00284	0.00234	0.00133	0.00185	0.00146
Mercury (Hg)-total	—	—	0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Molybdenum (Mo)-total	2	—	1	0.0013	0.00127	0.00121	0.00129	0.00128
Nickel (Ni)-total	—	hardness dep	—	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Potassium (K)-total	—	—	—	0.415	0.455	0.389	0.38	0.414
Selenium (Se)-total	—	—	0.002	0.000584	0.000581	0.000613	0.000723	0.000742
Silicon (Si)-total	—	—	—	3.94	4.05	4.12	4.12	3.82
Silver (Ag)-total	hardness dep	—	hardness dep	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Sodium (Na)-total	—	—	—	1.09	0.968	0.968	1	0.996
Strontium (Sr)-total	—	—	—	0.225	0.231	0.225	0.217	0.225
Sulphur (S)-total	—	—	—	3.7	3.5	3.7	3.5	3.7
Thallium (Tl)-total	—	0.0008	—	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Tin (Sn)-total	—	—	—	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Titanium (Ti)-total	—	—	—	<0.0005	<0.0005	0.00071	<0.0005	<0.0005
Uranium (U)-total	—	0.0085	—	0.00096	0.000947	0.000976	0.00101	0.000993
Vanadium (V)-total	—	—	0.02	0.00029	0.00022	<0.0002	0.00022	<0.0002
Zinc (Zn)-total	hardness dep	—	hardness dep	0.0017	0.0024	0.0018	0.002	0.0017
Zirconium (Zr)-total	—	—	—	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Aluminum (Al)-dissolved	0.1	—	0.05	0.0032	0.002	0.0027	0.0017	0.0019
Antimony (Sb)-dissolved	—	—	—	0.000203	0.000188	0.000189	0.000187	0.000179
Arsenic (As)-dissolved	—	—	—	0.000763	0.000739	0.000678	0.000677	0.000648
Barium (Ba)-dissolved	—	—	—	0.0765	0.0742	0.0678	0.074	0.0696
Beryllium (Be)-dissolved	—	—	—	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi)-dissolved	—	—	—	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Boron (B)-dissolved	—	—	—	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium (Cd)-dissolved	hardness dep	—	hardness dep	0.000041	0.000037	0.000029	0.000031	0.000034
Calcium (Ca)-dissolved	—	—	—	61.3	59.7	58.1	61.8	60.7
Chromium (Cr)-dissolved	—	—	—	0.00026	0.00019	0.00018	0.00021	0.00017
Cobalt (Co)-dissolved	—	—	—	0.000019	0.000008	0.000008	0.000008	0.000007
Copper (Cu)-dissolved	—	—	—	0.00034	<0.0002	<0.0002	0.00022	<0.0002
Iron (Fe)-dissolved	0.35	—	—	0.0028	0.0025	0.0013	0.0022	0.0027

Station MH-12
Location Tributary East, east fork (above confluence of sm

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Aug	Sep	Oct	Nov	Dec
	Max	Working Mean	30-day Mean	8/21/2016	9/24/2016	10/23/2016	11/27/2016	12/18/2016
Lead (Pb)-dissolved	—	—	—	0.000069	0.000052	0.00004	0.000029	0.000025
Lithium (Li)-dissolved	—	—	—	0.00153	0.00166	0.00132	0.00141	0.00134
Magnesium (Mg)-dissolved	—	—	—	6.14	5.79	5.79	6.37	5.98
Manganese (Mn)-dissolved	—	—	—	0.00159	0.00059	0.0002	0.00022	0.00035
Mercury (Hg)-dissolved	—	—	—	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Molybdenum (Mo)-dissolved	—	—	—	0.00128	0.00128	0.00126	0.00134	0.00128
Nickel (Ni)-dissolved	—	—	—	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Potassium (K)-dissolved	—	—	—	0.386	0.45	0.387	0.405	0.414
Selenium (Se)-dissolved	—	—	—	0.000489	0.000575	0.000607	0.000718	0.000723
Silicon (Si)-dissolved	—	—	—	3.97	4.01	4.07	4.17	4.01
Silver (Ag)-dissolved	—	—	—	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Sodium (Na)-dissolved	—	—	—	1.05	0.965	0.962	1.05	0.969
Strontium (Sr)-dissolved	—	—	—	0.206	0.225	0.218	0.23	0.224
Thallium (Tl)-dissolved	—	—	—	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Tin (Sn)-dissolved	—	—	—	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Titanium (Ti)-dissolved	—	—	—	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Uranium (U)-dissolved	—	—	—	0.000972	0.000918	0.000987	0.00106	0.000993
Vanadium (V)-dissolved	—	—	—	0.0004	0.00021	<0.0002	<0.0002	0.00021
Zinc (Zn)-dissolved	—	—	—	0.0018	0.0012	0.0013	0.0016	0.0014
Zirconium (Zr)-dissolved	—	—	—	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

NOTE:
Values in bold and underlined exceed the BC 30-day mean water quality guideline for t
Values shaded yellow exceed the BC maximum water quality guideline for the protectic
Blanks and #N/A no data available

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month	Aug	Sep	Oct	Nov	Dec
	Hardness (as CaCO3 mg/L)	178	173	169	180	176
BC Approved Maximum Guideline (Short Term)	Ammonia	1.6	2.5	3.3	4.2	4.2
	Dissolved Cadmium	0.00107	0.00103	0.00101	0.00108	0.00105
	Copper	0.019	0.018	0.018	0.019	0.019
	Lead	0.17	0.16	0.16	0.17	0.17
	Manganese	2.5	2.4	2.4	2.5	2.5
	Silver	0.003	0.003	0.003	0.003	0.003
	Zinc	0.099	0.09525	0.09225	0.1005	0.0975
BC Working Maximum Guideline	Nickel	0.14813966	0.14496634	0.1424118	0.15	0.1468729
BC Approved 30-day Average Guideline	Ammonia	0.30	0.48	0.63	0.80	0.80
	Dissolved Cadmium	0.00032	0.00032	0.00031	0.00033	0.00032
	Copper	0.0071	0.0069	0.0068	0.0072	0.0070
	Lead	0.0099	0.0097	0.0095	0.0100	0.0099
	Manganese	1.4	1.4	1.3	1.4	1.4
	Silver	0.0015	0.0015	0.0015	0.0015	0.0015
	Sulphate	309	309	309	429	309
	Zinc	0.074	0.070	0.067	0.075	0.072

2016 Surface Water Monitoring Results and Guidelines

Station MH-22
Location Burnick Portal

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jan	Feb	Mar	Apr	May	Jun
	Max	Working Mean	30-day Mean	1/18/2016	2/21/2016	3/18/2016	4/16/2016	5/10/2016	6/12/2016
pH - Lab	6.5 to 9	—	—					8.09	7.95
pH - Field	—	—	—					7.4	7.4
Conductivity (µS/cm) - Lab	—	—	—					440	237
Conductivity (µS/cm) - Field	—	—	—					475	271
Temperature (°C) - Field	—	—	—					2.1	3.4
Turbidity (NTU) - Lab	see table	—	see table					0.45	0.15
Turbidity (NTU) - Field	see table	—	see table					<0.05	
Flow (L/min)	—	—	—					30	420
TSS	see table	—	see table					<1	<1
TDS	—	—	—					268	132
Alkalinity, Total (as CaCO3)	see table	—	—					114	92.8
Sulphate (SO4)	—	—	hardness dep					108	28.3
Hardness (as CaCO3)	—	—	—					231	121
Bromide (Br)	—	—	—						
Chloride (Cl)	600	—	150					0.5	0.68
Total Cyanide (SAD-CN)	—	—	—					0.00061	
WAD Cyanide	0.01	—	0.005						
Nitrate (NO3)	32.8	—	3					0.151	0.153
Nitrite (NO2)	0.06	—	0.02 (see table)					<0.005	<0.005
Ammonia, Total (NH3)	see table	—	see table					0.12	0.049
Colour, True (Col. units)	—	—	see table					<5	<5
DOC	see table	—	—					1.02	1.3
Aluminum (Al)-total	—	—	—					0.006	0.0027
Antimony (Sb)-total	—	0.009	—					0.00267	0.00258
Arsenic (As)-total	0.005	—	—					0.00344	0.00396
Barium (Ba)-total	—	—	1					0.0193	0.0136
Beryllium (Be)-total	—	0.00013	—					<0.00001	<0.00001
Bismuth (Bi)-total	—	—	—					0.00001	<5E-06
Boron (B)-total	1.2	—	—					<0.01	<0.01
Cadmium (Cd)-total	—	—	—					0.0083	0.00232
Calcium (Ca)-total	see table	—	—					69.1	39.7
Chromium (Cr)-total	0.001	—	—					<0.0001	0.00014
Chromium (Cr6+)-total	0.001	0.001	—						
Chromium (Cr3+)-total	—	0.0089	—						
Cobalt (Co)-total	0.11	—	0.004					0.000044	0.00005
Copper (Cu)-total	hardness dep	—	hardness dep					0.00021	0.00021
Iron (Fe)-total	1	—	—					0.0124	0.0048
Lead (Pb)-total	hardness dep	—	hardness dep					0.00114	0.000338
Lithium (Li)-total	—	—	0.096					0.00734	0.00511
Magnesium (Mg)-total	—	—	—					10.1	5.16
Manganese (Mn)-total	hardness dep	—	hardness dep					0.00143	0.00301
Mercury (Hg)-total	—	—	0.00002					<0.00001	<0.00001
Molybdenum (Mo)-total	2	—	1					0.00867	0.00993
Nickel (Ni)-total	—	hardness dep	—					0.00517	0.00361
Potassium (K)-total	—	—	—					0.884	0.48
Selenium (Se)-total	—	—	0.002					**0.0189**	**0.00842**
Silicon (Si)-total	—	—	—					5.07	4.6
Silver (Ag)-total	hardness dep	—	hardness dep					<0.000005	<5E-06
Sodium (Na)-total	—	—	—					1.02	0.765
Strontium (Sr)-total	—	—	—					0.307	0.192
Sulphur (S)-total	—	—	—					35.6	9.7
Thallium (Tl)-total	—	0.0008	—					0.000015	0.000013
Tin (Sn)-total	—	—	—					<0.0002	<0.0002
Titanium (Ti)-total	—	—	—					<0.0005	<0.0005
Uranium (U)-total	—	0.0085	—					0.00552	0.00272
Vanadium (V)-total	—	—	0.02					<0.0002	0.00028
Zinc (Zn)-total	hardness dep	—	hardness dep					**1.79**	**0.319**
Zirconium (Zr)-total	—	—	—					<0.0001	<0.0001
Aluminum (Al)-dissolved	0.1	—	0.05					0.0012	0.0022
Antimony (Sb)-dissolved	—	—	—					0.00264	0.0024
Arsenic (As)-dissolved	—	—	—					0.00359	0.00383
Barium (Ba)-dissolved	—	—	—					0.0193	0.0134
Beryllium (Be)-dissolved	—	—	—					<0.00001	<0.00001
Bismuth (Bi)-dissolved	—	—	—					<0.000005	<5E-06
Boron (B)-dissolved	—	—	—					<0.01	<0.01
Cadmium (Cd)-dissolved	hardness dep	—	hardness dep					**0.00817**	**0.0025**
Calcium (Ca)-dissolved	—	—	—					74.8	40.2
Chromium (Cr)-dissolved	—	—	—					<0.0001	0.00013
Cobalt (Co)-dissolved	—	—	—					0.000038	4.94E-05
Copper (Cu)-dissolved	—	—	—					<0.0002	0.00034
Iron (Fe)-dissolved	0.35	—	—					0.0025	0.0021

Station MH-22
Location Burnick Portal

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jan	Feb	Mar	Apr	May	Jun
	Max	Working Mean	30-day Mean	1/18/2016	2/21/2016	3/18/2016	4/16/2016	5/10/2016	6/12/2016
Lead (Pb)-dissolved	—	—	—					0.000703	0.000342
Lithium (Li)-dissolved	—	—	—					0.00758	0.00527
Magnesium (Mg)-dissolved	—	—	—					10.8	5.1
Manganese (Mn)-dissolved	—	—	—					0.00091	0.00288
Mercury (Hg)-dissolved	—	—	—					<0.00001	<0.00001
Molybdenum (Mo)-dissolved	—	—	—					0.00898	0.00898
Nickel (Ni)-dissolved	—	—	—					0.0052	0.00356
Potassium (K)-dissolved	—	—	—					0.956	0.518
Selenium (Se)-dissolved	—	—	—					0.0205	0.0094
Silicon (Si)-dissolved	—	—	—					4.92	5.16
Silver (Ag)-dissolved	—	—	—					<0.000005	<5E-06
Sodium (Na)-dissolved	—	—	—					1.1	0.853
Strontium (Sr)-dissolved	—	—	—					0.336	0.207
Thallium (Tl)-dissolved	—	—	—					0.000014	1.48E-05
Tin (Sn)-dissolved	—	—	—					0.00024	<0.0002
Titanium (Ti)-dissolved	—	—	—					<0.0005	<0.0005
Uranium (U)-dissolved	—	—	—					0.00516	0.00265
Vanadium (V)-dissolved	—	—	—					<0.0002	<0.0002
Zinc (Zn)-dissolved	—	—	—					1.8	0.312
Zirconium (Zr)-dissolved	—	—	—					<0.0001	<0.0001

NOTE:
Values in bold and underlined exceed the BC 30-day mean water quality guideline for the protection of
Values shaded yellow exceed the BC maximum water quality guideline for the protection of aquatic life
Blanks and #N/A no data available

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month	Jan	Feb	Mar	Apr	May	Jun
	Hardness (as CaCO3 mg/L)	**-**	**-**	**-**	**-**	**231**	**121**
BC Approved Maximum Guideline (Short Term)	**Ammonia**					15.7	15.5
	Dissolved Cadmium					0.00139	0.00072
	Copper					0.024	0.013
	Lead					0.24	0.10
	Manganese					3.1	1.9
	Silver					0.003	0.003
	Zinc					0.13875	0.05625
BC Working Maximum Guideline	**Nickel**					0.15	0.110476
BC Approved 30-day Average Guideline	**Ammonia**					2.02	2.00
	Dissolved Cadmium					0.000391652	0.00024
	Copper					0.0092	0.0048
	Lead					0.0126	0.0074
	Manganese					1.6	1.1
	Silver					0.0015	0.0015
	Sulphate					429	309
	Zinc					0.113	0.031

Station MH-22
Location Burnick Portal

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jul	Aug	Sep	Oct	Nov	Dec
	Max	Working Mean	30-day Mean	7/31/2016	8/21/2016	9/25/2016	10/22/2016	11/26/2016	12/17/2016
pH - Lab	6.5 to 9	—	—	8.08	8.05	8.05	8.06	8.21	8.04
pH - Field	—	—	—	7.2	8	7.6	8.1	7.8	7.9
Conductivity (µS/cm) - Lab	—	—	—	283	294	302	301	300	305
Conductivity (µS/cm) - Field	—	—	—	305	303	305	328	322	332
Temperature (°C) - Field	—	—	—	2.3	2.3	2.2	2	1	1.3
Turbidity (NTU) - Lab	see table	—	see table	0.2	0.11	0.14	0.16	0.85	6.44
Turbidity (NTU) - Field	see table	—	see table	<0.05	0.16	0.06	0.02	0.75	3.8
Flow (L/min)	—	—	—	30	12	12	6		
TSS	see table	—	see table	<1	<1	<1	<1	12.6	42.7
TDS	—	—	—	170	188	180	186	190	168
Alkalinity, Total (as CaCO3)	see table	—	—	109	106	109	110	119	112
Sulphate (SO4)	—	—	hardness dep	36	41	44	42.1	46.2	44.4
Hardness (as CaCO3)	—	—	—	148	160	151	153	154	151
Bromide (Br)	—	—	—						
Chloride (Cl)	600	—	150	<0.5	1.2	<1	0.65	<0.5	0.64
Total Cyanide (SAD-CN)	—	—	—						
WAD Cyanide	0.01	—	0.005						
Nitrate (NO3)	32.8	—	3	0.142	0.133	0.135	0.132	0.138	0.125
Nitrite (NO2)	0.06	—	0.02 (see table)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ammonia, Total (NH3)	see table	—	see table	0.067	0.028	0.013	0.033	0.074	0.019
Colour, True (Col. units)	—	—	see table	<5	<5	<5	<5	<5	<5
DOC	see table	—	—	1.09	1.16	1.95	<0.5	<0.5	0.74
Aluminum (Al)-total	—	—	—	0.0019	0.0018	0.0018	0.0032	0.0741	0.0707
Antimony (Sb)-total	—	0.009	—	0.00294	0.0029	0.00263	0.00243	0.00274	0.00277
Arsenic (As)-total	0.005	—	—	0.00384	0.00355	0.00354	0.00353	0.00395	0.00416
Barium (Ba)-total	—	—	1	0.017	0.0166	0.0163	0.0163	0.0186	0.0177
Beryllium (Be)-total	—	0.00013	—	<0.00001	<0.00001	<0.00001	<0.00001	0.000021	0.000026
Bismuth (Bi)-total	—	—	—	<0.000005	<0.000005	<5E-06	<0.000005	0.000104	0.000069
Boron (B)-total	1.2	—	—	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium (Cd)-total	—	—	—	0.00364	0.00385	0.00416	0.00429	0.0044	0.00467
Calcium (Ca)-total	see table	—	—	54.7	52.5	51.7	49.2	52.8	50.8
Chromium (Cr)-total	0.001	—	—	<0.0001	<0.0001	<0.0001	<0.0001	0.00021	0.00017
Chromium (Cr6+)-total	0.001	0.001	—						
Chromium (Cr3+)-total	—	0.0089	—						
Cobalt (Co)-total	0.11	—	0.004	0.000014	0.000011	0.000011	0.000009	0.000164	0.000185
Copper (Cu)-total	hardness dep	—	hardness dep	<0.0002	0.00022	<0.0002	<0.0002	0.0008	0.00094
Iron (Fe)-total	1	—	—	0.0019	0.0015	0.002	0.0016	0.142	0.138
Lead (Pb)-total	hardness dep	—	hardness dep	0.000354	0.000312	0.00033	0.000341	**0.0108**	**0.00919**
Lithium (Li)-total	—	—	0.096	0.00622	0.00541	0.00605	0.00494	0.00638	0.00635
Magnesium (Mg)-total	—	—	—	6.7	6.66	6.32	6.09	6.63	6.74
Manganese (Mn)-total	hardness dep	—	hardness dep	0.00036	0.00021	<0.0002	<0.0002	0.00875	0.0101
Mercury (Hg)-total	—	—	0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Molybdenum (Mo)-total	2	—	1	0.0101	0.01	0.00859	0.00761	0.00897	0.00846
Nickel (Ni)-total	—	hardness dep	—	0.00395	0.00376	0.00345	0.00299	0.00372	0.00358
Potassium (K)-total	—	—	—	0.541	0.549	0.559	0.552	0.591	0.601
Selenium (Se)-total	—	—	0.002	**0.0134**	**0.013**	**0.014**	**0.0142**	**0.0148**	**0.0156**
Silicon (Si)-total	—	—	—	4.28	4.23	4.48	4.92	4.65	4.51
Silver (Ag)-total	hardness dep	—	hardness dep	<0.000005	<0.000005	<5E-06	<0.000005	0.00002	0.000015
Sodium (Na)-total	—	—	—	0.866	0.852	0.817	0.871	0.848	0.818
Strontium (Sr)-total	—	—	—	0.236	0.235	0.247	0.264	0.254	0.253
Sulphur (S)-total	—	—	—	13.2	13.2	13.3	14.7	14.6	15.1
Thallium (Tl)-total	—	0.0008	—	0.00002	0.000011	0.000007	0.000008	0.000016	0.000019
Tin (Sn)-total	—	—	—	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Titanium (Ti)-total	—	—	—	<0.0005	<0.0005	<0.0005	<0.0005	0.00221	0.00259
Uranium (U)-total	—	0.0085	—	0.00392	0.0038	0.0038	0.00376	0.0042	0.00416
Vanadium (V)-total	—	—	0.02	<0.0002	0.00021	<0.0002	<0.0002	0.00093	0.00071
Zinc (Zn)-total	hardness dep	—	hardness dep	**0.617**	**0.649**	**0.729**	**0.734**	**0.866**	**0.91**
Zirconium (Zr)-total	—	—	—	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00011
Aluminum (Al)-dissolved	0.1	—	0.05	0.0014	0.0012	0.0017	0.0023	0.0021	0.0018
Antimony (Sb)-dissolved	—	—	—	0.00265	0.00296	0.00264	0.00241	0.00271	0.00276
Arsenic (As)-dissolved	—	—	—	0.0035	0.00353	0.0035	0.00347	0.00346	0.00344
Barium (Ba)-dissolved	—	—	—	0.0155	0.0165	0.0164	0.0157	0.0175	0.0174
Beryllium (Be)-dissolved	—	—	—	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi)-dissolved	—	—	—	<0.000005	<0.000005	<5E-06	<0.000005	<0.000005	<0.000005
Boron (B)-dissolved	—	—	—	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium (Cd)-dissolved	hardness dep	—	hardness dep	**0.00362**	**0.00384**	**0.00406**	**0.00425**	**0.00439**	**0.00424**
Calcium (Ca)-dissolved	—	—	—	49.5	53	50	50.7	50.5	49.8
Chromium (Cr)-dissolved	—	—	—	0.0003	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt (Co)-dissolved	—	—	—	0.000013	0.000009	0.000011	0.000008	0.000008	0.000007
Copper (Cu)-dissolved	—	—	—	<0.0002	<0.0002	0.00024	<0.0002	<0.0002	<0.0002
Iron (Fe)-dissolved	0.35	—	—	0.0019	<0.001	0.0016	0.0011	<0.001	<0.001

Station MH-22
Location Burnick Portal

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jul	Aug	Sep	Oct	Nov	Dec
	Max	Working Mean	30-day Mean	7/31/2016	8/21/2016	9/25/2016	10/22/2016	11/26/2016	12/17/2016
Lead (Pb)-dissolved	—	—	—	0.000268	0.000296	0.000341	0.000305	0.00116	0.000716
Lithium (Li)-dissolved	—	—	—	0.00553	0.00551	0.006	0.0055	0.00616	0.0063
Magnesium (Mg)-dissolved	—	—	—	5.95	6.63	6.33	6.41	6.77	6.55
Manganese (Mn)-dissolved	—	—	—	0.00033	<0.0002	0.00022	0.00021	<0.0002	<0.0002
Mercury (Hg)-dissolved	—	—	—	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Molybdenum (Mo)-dissolved	—	—	—	0.00932	0.0101	0.00853	0.00772	0.00894	0.00893
Nickel (Ni)-dissolved	—	—	—	0.00361	0.00382	0.00345	0.00328	0.00337	0.00313
Potassium (K)-dissolved	—	—	—	0.502	0.552	0.562	0.541	0.603	0.588
Selenium (Se)-dissolved	—	—	—	0.0121	0.0129	0.0142	0.0145	0.0149	0.0153
Silicon (Si)-dissolved	—	—	—	4.41	4.27	4.33	4.48	4.67	4.52
Silver (Ag)-dissolved	—	—	—	<0.000005	<0.000005	<5E-06	<0.000005	<0.000005	<0.000005
Sodium (Na)-dissolved	—	—	—	0.789	0.847	0.846	0.881	0.89	0.818
Strontium (Sr)-dissolved	—	—	—	0.222	0.232	0.242	0.241	0.268	0.252
Thallium (Tl)-dissolved	—	—	—	0.000017	0.000009	0.000008	0.000006	0.000009	0.000013
Tin (Sn)-dissolved	—	—	—	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Titanium (Ti)-dissolved	—	—	—	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Uranium (U)-dissolved	—	—	—	0.0037	0.00402	0.00378	0.00373	0.00407	0.00407
Vanadium (V)-dissolved	—	—	—	<0.0002	<0.0002	<0.0002	<0.0002	0.00024	0.00024
Zinc (Zn)-dissolved	—	—	—	0.561	0.652	0.723	0.765	0.854	0.793
Zirconium (Zr)-dissolved	—	—	—	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

NOTE:
Values in bold and underlined exceed the BC 30-day mean water quality guideline for
Values shaded yellow exceed the BC maximum water quality guideline for the protecti
Blanks and #N/A no data available

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month	Jul	Aug	Sep	Oct	Nov	Dec
	Hardness (as CaCO3 mg/L)	148	160	151	153	154	151
BC Approved Maximum Guideline (Short Term)	Ammonia	19.3	6.4	12.0	5.1	9.1	7.7
	Dissolved Cadmium	0.00088	0.00095	0.00090	0.00091	0.00092	0.00090
	Copper	0.016	0.017	0.016	0.016	0.016	0.016
	Lead	0.13	0.15	0.14	0.14	0.14	0.14
	Manganese	2.2	2.3	2.2	2.2	2.2	2.2
	Silver	0.003	0.003	0.003	0.003	0.003	0.003
	Zinc	0.0765	0.0855	0.07875	0.08025	0.081	0.07875
BC Working Maximum Guideline	Nickel	0.12875113	0.13661027	0.13073	0.1320437	0.1326991	0.1307298
BC Approved 30-day Average Guideline	Ammonia	2.02	1.23	2.03	0.98	1.75	1.48
	Dissolved Cadmium	0.00028	0.00030	0.00029	0.00029	0.00029	0.00029
	Copper	0.0059	0.0064	0.0060	0.0061	0.0062	0.0060
	Lead	0.0086	0.0091	0.0087	0.0088	0.0088	0.0087
	Manganese	1.3	1.3	1.3	1.3	1.3	1.3
	Silver	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
	Sulphate	309	309	309	309	309	309
	Zinc	0.051	0.060	0.053	0.055	0.056	0.053

Station MH-29
Location

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jan	Feb	Mar	Apr	May	Jun
	Max	Working Mean	30-day Mean	--	--	--	--	--	6/8/2016
pH - Lab	6.5 to 9	—	—						8.25
pH - Field	—	—	—						8.5
Conductivity (µS/cm) - Lab	—	—	—						307
Conductivity (µS/cm) - Field	—	—	—						331
Temperature (°C) - Field	—	—	—						4.2
Turbidity (NTU) - Lab	see table	—	see table						0.16
Turbidity (NTU) - Field	see table	—	see table						
Flow (L/min)	—	—	—						1860
TSS	see table	—	see table						1.3
TDS	—	—	—						164
Alkalinity, Total (as CaCO3)	see table	—	—						166
Sulphate (SO4)	—	—	hardness dep						4.81
Hardness (as CaCO3)	—	—	—						166
Bromide (Br)	—	—	—						
Chloride (Cl)	600	—	150						0.89
Total Cyanide (SAD-CN)	—	—	—						
WAD Cyanide	0.01	—	0.005						
Nitrate (NO3)	32.8	—	3						0.12
Nitrite (NO2)	0.06	—	0.02 (see table)						<0.005
Ammonia, Total (NH3)	see table	—	see table						0.046
Colour, True (Col. units)	—	—	see table						7
DOC	see table	—	—						3.52
Aluminum (Al)-total	—	—	—						0.0097
Antimony (Sb)-total	—	0.009	—						0.000203
Arsenic (As)-total	0.005	—	—						0.00085
Barium (Ba)-total	—	—	1						0.041
Beryllium (Be)-total	—	0.00013	—						<0.00001
Bismuth (Bi)-total	—	—	—						<5E-06
Boron (B)-total	1.2	—	—						<0.01
Cadmium (Cd)-total	—	—	—						0.000095
Calcium (Ca)-total	see table	—	—						62.1
Chromium (Cr)-total	0.001	—	—						<0.0001
Chromium (Cr6+)-total	0.001	0.001	—						
Chromium (Cr3+)-total	—	0.0089	—						
Cobalt (Co)-total	0.11	—	0.004						0.000017
Copper (Cu)-total	hardness dep	—	hardness dep						0.00036
Iron (Fe)-total	1	—	—						0.0191
Lead (Pb)-total	hardness dep	—	hardness dep						0.000217
Lithium (Li)-total	—	—	0.096						0.00144
Magnesium (Mg)-total	—	—	—						4.6
Manganese (Mn)-total	hardness dep	—	hardness dep						0.00452
Mercury (Hg)-total	—	—	0.00002						<0.00001
Molybdenum (Mo)-total	2	—	1						0.00061
Nickel (Ni)-total	—	hardness dep	—						<0.0002
Potassium (K)-total	—	—	—						0.376
Selenium (Se)-total	—	—	0.002						0.000676
Silicon (Si)-total	—	—	—						4.08
Silver (Ag)-total	hardness dep	—	hardness dep						<5E-06
Sodium (Na)-total	—	—	—						0.735
Strontium (Sr)-total	—	—	—						0.208
Sulphur (S)-total	—	—	—						<3
Thallium (Tl)-total	—	0.0008	—						<2E-06
Tin (Sn)-total	—	—	—						<0.0002
Titanium (Ti)-total	—	—	—						<0.0005
Uranium (U)-total	—	0.0085	—						0.000672
Vanadium (V)-total	—	—	0.02						<0.0002
Zinc (Zn)-total	hardness dep	—	hardness dep						0.0016
Zirconium (Zr)-total	—	—	—						<0.0001
Aluminum (Al)-dissolved	0.1	—	0.05						0.003
Antimony (Sb)-dissolved	—	—	—						0.000194
Arsenic (As)-dissolved	—	—	—						0.000773
Barium (Ba)-dissolved	—	—	—						0.0377
Beryllium (Be)-dissolved	—	—	—						<0.00001
Bismuth (Bi)-dissolved	—	—	—						<5E-06
Boron (B)-dissolved	—	—	—						<0.01
Cadmium (Cd)-dissolved	hardness dep	—	hardness dep						0.000073
Calcium (Ca)-dissolved	—	—	—						59.5
Chromium (Cr)-dissolved	—	—	—						<0.0001
Cobalt (Co)-dissolved	—	—	—						1.52E-05
Copper (Cu)-dissolved	—	—	—						0.00032
Iron (Fe)-dissolved	0.35	—	—						0.0033

Station **MH-29**
Location

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jan	Feb	Mar	Apr	May	Jun
	Max	Working Mean	30-day Mean	--	--	--	--	--	6/8/2016
Lead (Pb)-dissolved	—	—	—						<0.00002
Lithium (Li)-dissolved	—	—	—						0.00153
Magnesium (Mg)-dissolved	—	—	—						4.32
Manganese (Mn)-dissolved	—	—	—						0.00053
Mercury (Hg)-dissolved	—	—	—						<0.00001
Molybdenum (Mo)-dissolved	—	—	—						0.000511
Nickel (Ni)-dissolved	—	—	—						<0.0002
Potassium (K)-dissolved	—	—	—						0.366
Selenium (Se)-dissolved	—	—	—						0.000652
Silicon (Si)-dissolved	—	—	—						3.92
Silver (Ag)-dissolved	—	—	—						<5E-06
Sodium (Na)-dissolved	—	—	—						0.715
Strontium (Sr)-dissolved	—	—	—						0.185
Thallium (Tl)-dissolved	—	—	—						<2E-06
Tin (Sn)-dissolved	—	—	—						<0.0002
Titanium (Ti)-dissolved	—	—	—						<0.0005
Uranium (U)-dissolved	—	—	—						0.000605
Vanadium (V)-dissolved	—	—	—						<0.0002
Zinc (Zn)-dissolved	—	—	—						<0.001
Zirconium (Zr)-dissolved	—	—	—						<0.0001

NOTE:
Values in bold and underlined exceed the BC 30-day mean water quality guideline for the protection of
Values shaded yellow exceed the BC maximum water quality guideline for the protection of aquatic life
Blanks and #N/A no data available

Station MH-29
Location

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jan	Feb	Mar	Apr	May	Jun
	Max	Working Mean	30-day Mean	--	--	--	--	--	6/8/2016

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month	Jan	Feb	Mar	Apr	May	Jun
	Hardness (as CaCO3 mg/L)						166
BC Approved Maximum Guideline (Short Term)	Ammonia						2.0
	Dissolved Cadmium						0.00099
	Copper						0.018
	Lead						0.16
	Manganese						2.4
	Silver						0.003
	Zinc						0.09
BC Working Maximum Guideline	Nickel						0.140486
BC Approved 30-day Average Guideline	Ammonia						0.39
	Dissolved Cadmium						0.00031
	Copper						0.0066
	Lead						0.0094
	Manganese						1.3
	Silver						0.0015
	Sulphate						309
	Zinc						0.065

Station **MH-29**
Location

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jul	Aug	Sep	Oct	Nov	Dec
	Max	Working Mean	30-day Mean	7/30/2016	8/20/2016	9/20/2016	10/22/2016	11/27/2016	12/17/2016
pH - Lab	6.5 to 9	—	—	8.33	8.32	8.32	8.15	8.38	8.02
pH - Field	—	—	—	8.4	8.5	8.4	8.3	8.6	8
Conductivity (µS/cm) - Lab	—	—	—	349	361	355	345	357	401
Conductivity (µS/cm) - Field	—	—	—	359	360	364	386	346	213
Temperature (°C) - Field	—	—	—	8.2	7.8	3.9	0.3	0.1	0.1
Turbidity (NTU) - Lab	see table	—	see table	0.28	0.11	0.15	0.26	0.14	0.36
Turbidity (NTU) - Field	see table	—	see table	<0.05	0.07	0.11	0.05	0.06	0.13
Flow (L/min)	—	—	—	240	180	180	60	66	18
TSS	see table	—	see table	<1	1.1	<1	<1	4.9	1.2
TDS	—	—	—	188	222	198	204	206	234
Alkalinity, Total (as CaCO3)	see table	—	—	194	207	188	184	196	214
Sulphate (SO4)	—	—	hardness dep	4.21	5.8	4.7	4.66	6.19	5.88
Hardness (as CaCO3)	—	—	—	201	216	195	192	243	235
Bromide (Br)	—	—	—						
Chloride (Cl)	600	—	150	<0.5	1.1	1	0.86	<0.5	0.82
Total Cyanide (SAD-CN)	—	—	—			<0.0005		<0.0005	
WAD Cyanide	0.01	—	0.005						
Nitrate (NO3)	32.8	—	3	0.045	0.028	0.028	0.117	0.151	0.095
Nitrite (NO2)	0.06	—	0.02 (see table)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ammonia, Total (NH3)	see table	—	see table	0.026	0.031	<0.005	0.0054	0.011	<0.005
Colour, True (Col. units)	—	—	see table	8.3	7.9	13.1	7.6	6.6	6.3
DOC	see table	—	—	3.63	3.54	5.26	1.96	1.62	2.8
Aluminum (Al)-total	—	—	—	0.0109	0.0059	0.0031	0.0064	0.0044	0.0057
Antimony (Sb)-total	—	0.009	—	0.0002	0.000177	0.000135	0.000157	0.000147	0.000128
Arsenic (As)-total	0.005	—	—	0.000887	0.000839	0.000665	0.000641	0.000561	0.000415
Barium (Ba)-total	—	—	1	0.055	0.053	0.051	0.0464	0.0495	0.0551
Beryllium (Be)-total	—	0.00013	—	<0.00001	<0.00001	<0.00001	0.00003	<0.00001	<0.00001
Bismuth (Bi)-total	—	—	—	<0.000005	<0.000005	<0.000005	0.000006	<0.000005	<0.000005
Boron (B)-total	1.2	—	—	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium (Cd)-total	—	—	—	0.000072	0.000059	0.000049	0.000072	0.00005	0.000062
Calcium (Ca)-total	see table	—	—	75.5	75.3	70.2	67.3	72.7	74.2
Chromium (Cr)-total	0.001	—	—	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium (Cr6+)-total	0.001	0.001	—						
Chromium (Cr3+)-total	—	0.0089	—						
Cobalt (Co)-total	0.11	—	0.004	0.00002	0.000015	0.000014	0.000034	0.000014	0.000016
Copper (Cu)-total	hardness dep	—	hardness dep	0.00038	0.00038	0.00044	0.00051	0.00024	0.00034
Iron (Fe)-total	1	—	—	0.0236	0.0178	0.015	0.0202	0.0252	0.0165
Lead (Pb)-total	hardness dep	—	hardness dep	0.000322	0.000076	<0.00002	0.000068	0.000069	0.000072
Lithium (Li)-total	—	—	0.096	0.00177	0.00116	0.00162	0.00095	0.00145	0.00145
Magnesium (Mg)-total	—	—	—	5.73	5.54	5.97	5.43	5.94	6.84
Manganese (Mn)-total	hardness dep	—	hardness dep	0.00592	0.00561	0.00431	0.00541	0.00946	0.00787
Mercury (Hg)-total	—	—	0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Molybdenum (Mo)-total	2	—	1	0.000772	0.00079	0.000653	0.000697	0.000651	0.000482
Nickel (Ni)-total	—	hardness dep	—	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Potassium (K)-total	—	—	—	0.28	0.32	0.352	0.292	0.246	0.331
Selenium (Se)-total	—	—	0.002	0.000475	0.000382	0.000329	0.000512	0.000633	0.000493
Silicon (Si)-total	—	—	—	3.85	4.11	3.4	3.95	4.01	3.77
Silver (Ag)-total	hardness dep	—	hardness dep	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Sodium (Na)-total	—	—	—	0.915	0.928	0.923	1.52	0.885	0.944
Strontium (Sr)-total	—	—	—	0.249	0.239	0.241	0.242	0.24	0.261
Sulphur (S)-total	—	—	—	<3	<3	<3	<3	<3	<3
Thallium (Tl)-total	—	0.0008	—	<0.000002	<0.000002	<0.000002	0.000006	<0.000002	<0.000002
Tin (Sn)-total	—	—	—	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Titanium (Ti)-total	—	—	—	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Uranium (U)-total	—	0.0085	—	0.000711	0.0007	0.000597	0.000731	0.000745	0.000728
Vanadium (V)-total	—	—	0.02	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Zinc (Zn)-total	hardness dep	—	hardness dep	0.0011	<0.001	<0.001	0.0011	<0.001	0.0018
Zirconium (Zr)-total	—	—	—	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Aluminum (Al)-dissolved	0.1	—	0.05	0.0038	0.0039	0.0041	0.0026	0.003	0.0024
Antimony (Sb)-dissolved	—	—	—	0.00019	0.000188	0.000146	0.000137	0.000144	0.000131
Arsenic (As)-dissolved	—	—	—	0.000824	0.87	0.00066	0.000596	0.000514	0.000402
Barium (Ba)-dissolved	—	—	—	0.0516	0.0528	0.0508	0.044	0.0486	0.0559
Beryllium (Be)-dissolved	—	—	—	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi)-dissolved	—	—	—	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Boron (B)-dissolved	—	—	—	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium (Cd)-dissolved	hardness dep	—	hardness dep	0.000056	0.000053	0.000054	0.000044	0.000056	0.000054
Calcium (Ca)-dissolved	—	—	—	71.5	77.5	68.7	67.6	87.4	83.2
Chromium (Cr)-dissolved	—	—	—	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt (Co)-dissolved	—	—	—	0.00001	0.000014	0.000015	0.000012	0.000012	0.000012
Copper (Cu)-dissolved	—	—	—	0.00032	0.0003	0.00037	0.00026	0.00027	0.00027
Iron (Fe)-dissolved	0.35	—	—	0.0082	0.0109	0.0169	0.0151	0.0225	0.0106

Station **MH-29**
Location

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jul	Aug	Sep	Oct	Nov	Dec
	Max	Working Mean	30-day Mean	7/30/2016	8/20/2016	9/20/2016	10/22/2016	11/27/2016	12/17/2016
Lead (Pb)-dissolved	—	—	—	0.000047	<0.00002	0.000036	<0.00002	0.000031	<0.00002
Lithium (Li)-dissolved	—	—	—	0.00163	0.00142	0.00151	0.00085	0.00141	0.00147
Magnesium (Mg)-dissolved	—	—	—	5.44	5.54	5.61	5.54	5.95	6.75
Manganese (Mn)-dissolved	—	—	—	0.0024	0.00346	0.00488	0.00436	0.00797	0.00672
Mercury (Hg)-dissolved	—	—	—	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Molybdenum (Mo)-dissolved	—	—	—	0.000711	0.000787	0.00065	0.000637	0.000634	0.000492
Nickel (Ni)-dissolved	—	—	—	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Potassium (K)-dissolved	—	—	—	0.264	0.318	0.337	0.268	0.265	0.331
Selenium (Se)-dissolved	—	—	—	0.000464	0.000381	0.000305	0.000495	0.000767	0.000534
Silicon (Si)-dissolved	—	—	—	3.96	4.05	3.82	3.76	4.06	3.89
Silver (Ag)-dissolved	—	—	—	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Sodium (Na)-dissolved	—	—	—	0.845	0.902	0.892	0.937	0.917	0.924
Strontium (Sr)-dissolved	—	—	—	0.236	237	0.239	0.228	0.253	0.27
Thallium (Tl)-dissolved	—	—	—	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Tin (Sn)-dissolved	—	—	—	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Titanium (Ti)-dissolved	—	—	—	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Uranium (U)-dissolved	—	—	—	0.000711	0.00069	0.000618	0.000644	0.000714	0.000732
Vanadium (V)-dissolved	—	—	—	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Zinc (Zn)-dissolved	—	—	—	<0.001	<0.001	<0.001	<0.001	0.0016	0.0011
Zirconium (Zr)-dissolved	—	—	—	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

NOTE:
Values in bold and underlined exceed the BC 30-day mean water quality guideline for
Values shaded yellow exceed the BC maximum water quality guideline for the protecti
Blanks and #N/A no data available

Station **MH-29**
Location

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jul	Aug	Sep	Oct	Nov	Dec
	Max	Working Mean	30-day Mean	7/30/2016	8/20/2016	9/20/2016	10/22/2016	11/27/2016	12/17/2016

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month	Jul	Aug	Sep	Oct	Nov	Dec
	Hardness (as CaCO3 mg/L)	**201**	**216**	**195**	**192**	**243**	**235**
BC Approved Maximum Guideline (Short Term)	Ammonia	2.4	2.0	2.5	3.3	1.7	6.6
	Dissolved Cadmium	0.00121	0.00130	0.00117	0.00115	0.00147	0.00142
	Copper	0.021	0.022	0.020	0.020	0.025	0.024
	Lead	0.20	0.22	0.19	0.19	0.25	0.24
	Manganese	2.8	2.9	2.7	2.7	3.2	3.1
	Silver	0.003	0.003	0.003	0.003	0.003	0.003
	Zinc	0.11625	0.1275	0.11175	0.1095	0.14775	0.14175
BC Working Maximum Guideline	Nickel	0.15	0.15	0.15	0.15	0.15	0.15
BC Approved 30-day Average Guideline	Ammonia	0.47	0.38	0.48	0.64	0.32	1.26
	Dissolved Cadmium	0.00035	0.00037	0.00035	0.00034	0.00041	0.00040
	Copper	0.0080	0.0086	0.0078	0.0077	0.0097	0.0094
	Lead	0.0111	0.0118	0.0108	0.0106	0.0132	0.0128
	Manganese	1.5	1.6	1.5	1.4	1.7	1.6
	Silver	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
	Sulphate	429	429	429	429	429	429
	Zinc	0.091	0.102	0.086	0.084	0.122	0.116

Station MH-30
Location

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jan	Feb	Mar	Apr	May	Jun
	Max	Working Mean	30-day Mean	--	--	--	--	--	6/10/2016
pH - Lab	6.5 to 9	—	—						8.17
pH - Field	—	—	—						8.1
Conductivity (µS/cm) - Lab	—	—	—						235
Conductivity (µS/cm) - Field	—	—	—						247
Temperature (°C) - Field	—	—	—						11.1
Turbidity (NTU) - Lab	see table	—	see table						0.39
Turbidity (NTU) - Field	see table	—	see table						
Flow (L/min)	—	—	—						5280
TSS	see table	—	see table						<1
TDS	—	—	—						118
Alkalinity, Total (as CaCO3)	see table	—	—						125
Sulphate (SO4)	—	—	hardness dep						4.65
Hardness (as CaCO3)	—	—	—						125
Bromide (Br)	—	—	—						
Chloride (Cl)	600	—	150						0.89
Total Cyanide (SAD-CN)	—	—	—						
WAD Cyanide	0.01	—	0.005						
Nitrate (NO3)	32.8	—	3						<0.02
Nitrite (NO2)	0.06	—	0.02 (see table)						<0.005
Ammonia, Total (NH3)	see table	—	see table						0.041
Colour, True (Col. units)	—	—	see table						13.2
DOC	see table	—	—						3.81
Aluminum (Al)-total	—	—	—						0.0105
Antimony (Sb)-total	—	0.009	—						0.000083
Arsenic (As)-total	0.005	—	—						0.000192
Barium (Ba)-total	—	—	1						0.169
Beryllium (Be)-total	—	0.00013	—						<0.00001
Bismuth (Bi)-total	—	—	—						<5E-06
Boron (B)-total	1.2	—	—						<0.01
Cadmium (Cd)-total	—	—	—						0.000023
Calcium (Ca)-total	see table	—	—						34
Chromium (Cr)-total	0.001	—	—						<0.0001
Chromium (Cr6+)-total	0.001	0.001	—						
Chromium (Cr3+)-total	—	0.0089	—						
Cobalt (Co)-total	0.11	—	0.004						0.00004
Copper (Cu)-total	hardness dep	—	hardness dep						0.00033
Iron (Fe)-total	1	—	—						0.149
Lead (Pb)-total	hardness dep	—	hardness dep						0.000027
Lithium (Li)-total	—	—	0.096						0.00076
Magnesium (Mg)-total	—	—	—						11
Manganese (Mn)-total	hardness dep	—	hardness dep						0.00497
Mercury (Hg)-total	—	—	0.00002						<0.00001
Molybdenum (Mo)-total	2	—	1						0.00102
Nickel (Ni)-total	—	hardness dep	—						0.00056
Potassium (K)-total	—	—	—						0.289
Selenium (Se)-total	—	—	0.002						0.000562
Silicon (Si)-total	—	—	—						2.76
Silver (Ag)-total	hardness dep	—	hardness dep						<5E-06
Sodium (Na)-total	—	—	—						0.616
Strontium (Sr)-total	—	—	—						0.103
Sulphur (S)-total	—	—	—						<3
Thallium (Tl)-total	—	0.0008	—						<2E-06
Tin (Sn)-total	—	—	—						<0.0002
Titanium (Ti)-total	—	—	—						<0.0005
Uranium (U)-total	—	0.0085	—						0.000923
Vanadium (V)-total	—	—	0.02						<0.0002
Zinc (Zn)-total	hardness dep	—	hardness dep						<0.001
Zirconium (Zr)-total	—	—	—						<0.0001
Aluminum (Al)-dissolved	0.1	—	0.05						0.0052
Antimony (Sb)-dissolved	—	—	—						0.000075
Arsenic (As)-dissolved	—	—	—						0.00016
Barium (Ba)-dissolved	—	—	—						0.155
Beryllium (Be)-dissolved	—	—	—						<0.00001
Bismuth (Bi)-dissolved	—	—	—						<5E-06
Boron (B)-dissolved	—	—	—						<0.01
Cadmium (Cd)-dissolved	hardness dep	—	hardness dep						1.66E-05
Calcium (Ca)-dissolved	—	—	—						33.1
Chromium (Cr)-dissolved	—	—	—						<0.0001
Cobalt (Co)-dissolved	—	—	—						3.32E-05
Copper (Cu)-dissolved	—	—	—						0.00035
Iron (Fe)-dissolved	0.35	—	—						0.107

Station **MH-30**
Location

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jan	Feb	Mar	Apr	May	Jun
	Max	Working Mean	30-day Mean	--	--	--	--	--	6/10/2016
Lead (Pb)-dissolved	—	—	—						<0.00002
Lithium (Li)-dissolved	—	—	—						0.00068
Magnesium (Mg)-dissolved	—	—	—						10.3
Manganese (Mn)-dissolved	—	—	—						0.00445
Mercury (Hg)-dissolved	—	—	—						<0.00001
Molybdenum (Mo)-dissolved	—	—	—						0.000949
Nickel (Ni)-dissolved	—	—	—						0.00052
Potassium (K)-dissolved	—	—	—						0.282
Selenium (Se)-dissolved	—	—	—						0.000538
Silicon (Si)-dissolved	—	—	—						2.46
Silver (Ag)-dissolved	—	—	—						<5E-06
Sodium (Na)-dissolved	—	—	—						0.57
Strontium (Sr)-dissolved	—	—	—						0.0931
Thallium (Tl)-dissolved	—	—	—						<2E-06
Tin (Sn)-dissolved	—	—	—						<0.0002
Titanium (Ti)-dissolved	—	—	—						<0.0005
Uranium (U)-dissolved	—	—	—						0.000857
Vanadium (V)-dissolved	—	—	—						<0.0002
Zinc (Zn)-dissolved	—	—	—						<0.001
Zirconium (Zr)-dissolved	—	—	—						<0.0001

NOTE:
Values in bold and underlined exceed the BC 30-day mean water quality guideline for the protection of
Values shaded yellow exceed the BC maximum water quality guideline for the protection of aquatic life
Blanks and #N/A no data available

Station MH-30
Location

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jan	Feb	Mar	Apr	May	Jun
	Max	Working Mean	30-day Mean	--	--	--	--	--	6/10/2016

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month	Jan	Feb	Mar	Apr	May	Jun
	Hardness (as CaCO3 mg/L)						125
BC Approved Maximum Guideline (Short Term)	Ammonia						4.6
	Dissolved Cadmium						0.00074
	Copper						0.014
	Lead						0.11
	Manganese						1.9
	Silver						0.003
	Zinc						0.05925
BC Working Maximum Guideline	Nickel						0.113241
BC Approved 30-day Average Guideline	Ammonia						0.89
	Dissolved Cadmium						0.00025
	Copper						0.0050
	Lead						0.0075
	Manganese						1.2
	Silver						0.0015
	Sulphate						309
	Zinc						0.034

Station MH-30
Location

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jul	Aug	Sep	Oct	Nov	Dec
	Max	Working Mean	30-day Mean	--	--	9/23/2016	--	--	12/21/2016
pH - Lab	6.5 to 9	—	—			8.15			8.1
pH - Field	—	—	—			8			7.2
Conductivity (µS/cm) - Lab	—	—	—			304			379
Conductivity (µS/cm) - Field	—	—	—			298			417
Temperature (°C) - Field	—	—	—			5.6			0.7
Turbidity (NTU) - Lab	see table	—	see table			1.22			3.94
Turbidity (NTU) - Field	see table	—	see table			1.44			3.28
Flow (L/min)	—	—	—			30			
TSS	see table	—	see table			<1			1.7
TDS	—	—	—			154			202
Alkalinity, Total (as CaCO3)	see table	—	—			154			207
Sulphate (SO4)	—	—	hardness dep			6			5.43
Hardness (as CaCO3)	—	—	—			158			213
Bromide (Br)	—	—	—						
Chloride (Cl)	600	—	150			<1			<0.5
Total Cyanide (SAD-CN)	—	—	—						
WAD Cyanide	0.01	—	0.005						
Nitrate (NO3)	32.8	—	3			<0.02			0.064
Nitrite (NO2)	0.06	—	0.02 (see table)			<0.005			<0.005
Ammonia, Total (NH3)	see table	—	see table			0.018			0.023
Colour, True (Col. units)	—	—	see table			17.9			7.8
DOC	see table	—	—			4.38			2.89
Aluminum (Al)-total	—	—	—			0.0066			0.0054
Antimony (Sb)-total	—	0.009	—			0.000063			0.000082
Arsenic (As)-total	0.005	—	—			0.000275			0.00028
Barium (Ba)-total	—	—	1			0.192			0.252
Beryllium (Be)-total	—	0.00013	—			<0.00001			<0.00001
Bismuth (Bi)-total	—	—	—			<0.000005			<0.000005
Boron (B)-total	1.2	—	—			<0.01			<0.01
Cadmium (Cd)-total	—	—	—			0.000021			0.000031
Calcium (Ca)-total	see table	—	—			41			54.1
Chromium (Cr)-total	0.001	—	—			<0.0001			0.00011
Chromium (Cr6+)-total	0.001	0.001	—						
Chromium (Cr3+)-total	—	0.0089	—						
Cobalt (Co)-total	0.11	—	0.004			0.000064			0.000147
Copper (Cu)-total	hardness dep	—	hardness dep			0.00044			<0.0002
Iron (Fe)-total	1	—	—			0.433			0.608
Lead (Pb)-total	hardness dep	—	hardness dep			0.000049			<0.00002
Lithium (Li)-total	—	—	0.096			0.00095			0.00078
Magnesium (Mg)-total	—	—	—			13.6			18.6
Manganese (Mn)-total	hardness dep	—	hardness dep			0.0129			0.0516
Mercury (Hg)-total	—	—	0.00002			<0.00001			<0.00001
Molybdenum (Mo)-total	2	—	1			0.00129			0.00166
Nickel (Ni)-total	—	hardness dep	—			0.00056			0.00053
Potassium (K)-total	—	—	—			0.345			0.405
Selenium (Se)-total	—	—	0.002			0.000381			0.00063
Silicon (Si)-total	—	—	—			2.69			3.52
Silver (Ag)-total	hardness dep	—	hardness dep			<0.000005			<0.000005
Sodium (Na)-total	—	—	—			0.636			0.781
Strontium (Sr)-total	—	—	—			0.12			0.143
Sulphur (S)-total	—	—	—			<3			<3
Thallium (Tl)-total	—	0.0008	—			<0.000002			<0.000002
Tin (Sn)-total	—	—	—			<0.0002			<0.0002
Titanium (Ti)-total	—	—	—			<0.0005			<0.0005
Uranium (U)-total	—	0.0085	—			0.00122			0.00211
Vanadium (V)-total	—	—	0.02			<0.0002			<0.0002
Zinc (Zn)-total	hardness dep	—	hardness dep			0.001			0.0014
Zirconium (Zr)-total	—	—	—			<0.0001			<0.0001
Aluminum (Al)-dissolved	0.1	—	0.05			0.0032			0.0025
Antimony (Sb)-dissolved	—	—	—			0.000064			0.00008
Arsenic (As)-dissolved	—	—	—			0.000255			0.000203
Barium (Ba)-dissolved	—	—	—			0.191			0.245
Beryllium (Be)-dissolved	—	—	—			<0.00001			<0.00001
Bismuth (Bi)-dissolved	—	—	—			<0.000005			<0.000005
Boron (B)-dissolved	—	—	—			<0.01			<0.01
Cadmium (Cd)-dissolved	hardness dep	—	hardness dep			0.000015			0.00002
Calcium (Ca)-dissolved	—	—	—			41			54.2
Chromium (Cr)-dissolved	—	—	—			<0.0001			0.00011
Cobalt (Co)-dissolved	—	—	—			0.000059			0.000141
Copper (Cu)-dissolved	—	—	—			0.00021			<0.0002
Iron (Fe)-dissolved	0.35	—	—			0.259			0.106

Station **MH-30**
Location

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jul	Aug	Sep	Oct	Nov	Dec
	Max	Working Mean	30-day Mean	--	--	9/23/2016	--	--	12/21/2016
Lead (Pb)-dissolved	—	—	—			<0.00002			<0.00002
Lithium (Li)-dissolved	—	—	—			0.00071			0.00076
Magnesium (Mg)-dissolved	—	—	—			13.5			18.9
Manganese (Mn)-dissolved	—	—	—			0.0123			0.0505
Mercury (Hg)-dissolved	—	—	—			<0.00001			<0.00001
Molybdenum (Mo)-dissolved	—	—	—			0.00127			0.00166
Nickel (Ni)-dissolved	—	—	—			0.00053			0.00056
Potassium (K)-dissolved	—	—	—			0.338			0.387
Selenium (Se)-dissolved	—	—	—			0.000376			0.000613
Silicon (Si)-dissolved	—	—	—			2.67			3.48
Silver (Ag)-dissolved	—	—	—			<0.000005			<0.000005
Sodium (Na)-dissolved	—	—	—			0.642			0.766
Strontium (Sr)-dissolved	—	—	—			0.117			0.14
Thallium (Tl)-dissolved	—	—	—			<0.000002			0.000002
Tin (Sn)-dissolved	—	—	—			<0.0002			<0.0002
Titanium (Ti)-dissolved	—	—	—			<0.0005			<0.0005
Uranium (U)-dissolved	—	—	—			0.0012			0.00206
Vanadium (V)-dissolved	—	—	—			<0.0002			<0.0002
Zinc (Zn)-dissolved	—	—	—			<0.001			<0.001
Zirconium (Zr)-dissolved	—	—	—			<0.0001			<0.0001

NOTE:
Values in bold and underlined exceed the BC 30-day mean water quality guideline for
Values shaded yellow exceed the BC maximum water quality guideline for the protecti
Blanks and #N/A no data available

Station **MH-30**
Location

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jul	Aug	Sep	Oct	Nov	Dec
	Max	Working Mean	30-day Mean	--	--	9/23/2016	--	--	12/21/2016

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month	Jul	Aug	Sep	Oct	Nov	Dec
	Hardness (as CaCO3 mg/L)			**158**			**213**
BC Approved Maximum Guideline (Short Term)	**Ammonia**			6.1			19.6
	Dissolved Cadmium			0.00094			0.00128
	Copper			0.017			0.022
	Lead			0.15			0.21
	Manganese			2.3			2.9
	Silver			0.003			0.003
	Zinc			0.084			0.12525
BC Working Maximum Guideline	**Nickel**			0.1353105			0.15
BC Approved 30-day Average Guideline	**Ammonia**			1.17			2.05
	Dissolved Cadmium			0.00030			0.00037
	Copper			0.0063			0.0085
	Lead			0.0090			0.0116
	Manganese			1.3			1.5
	Silver			0.0015			0.0015
	Sulphate			309			429
	Zinc			0.059			0.100

Station SDH-S2
Location 1380 Portal Waste Rock Dump

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jan	Feb	Mar	Apr	May	Jun
	Max	Working Mean	30-day Mean	--	--	--	--	5/11/2016	6/8/2016
pH - Lab	6.5 to 9	—	—					7.55	7.56
pH - Field	—	—	—					7.3	7.1
Conductivity (µS/cm) - Lab	—	—	—					522	516
Conductivity (µS/cm) - Field	—	—	—					566	559
Temperature (°C) - Field	—	—	—					0.3	0.4
Turbidity (NTU) - Lab								48.5	2.32
Turbidity (NTU) - Field									
Flow (L/min)	—	—	—						0
TSS								269	38.1
TDS								364	358
Alkalinity, Total (as CaCO3)	see table	—	—					37	52.2
Sulphate (SO4)	—	—	hardness dep					201	204
Hardness (as CaCO3)	—	—	—					240	245
Bromide (Br)	—	—	—						
Chloride (Cl)	600		150					0.55	0.91
Total Cyanide (SAD-CN)									
WAD Cyanide									
Nitrate (NO3)	32.8	—	3					0.686	0.509
Nitrite (NO2)	0.06	—	0.02 (see table)					<0.005	<0.005
Ammonia, Total (NH3)	see table	—	see table					0.085	0.022
Colour, True (Col. units)								<5	<5
DOC									1.44
Note: dissolved metals presented twice for comparison to total metals WQGL									
Antimony (Sb)-dissolved	—	0.009	—					0.00032	0.000194
Arsenic (As)-dissolved	0.005	—	—					0.000034	0.000037
Barium (Ba)-dissolved	—	—	1					0.0153	0.0169
Beryllium (Be)-dissolved	—	0.00013	—					<0.00001	<0.00001
Boron (B)-dissolved	1.2	—	—					<0.01	<0.01
Calcium (Ca)-dissolved	see table	—	—					90.6	92.6
Chromium (Cr)-dissolved	0.001	—	—					<0.0001	<0.0001
Cobalt (Co)-dissolved	0.11	—	0.004					0.000279	0.00063
Copper (Cu)-dissolved	hardness dep	—	hardness dep					0.00042	0.00027
Iron (Fe)-dissolved	1	—	—					0.0035	<0.001
Lead (Pb)-dissolved	hardness dep	—	hardness dep					**0.408**	**0.0963**
Lithium (Li)-dissolved	—	—	0.096					0.00187	0.00183
Manganese (Mn)-dissolved	hardness dep	—	hardness dep					0.00909	0.0134
Mercury (Hg)-dissolved	—	—	0.00002					<0.00001	<0.00001
Molybdenum (Mo)-dissolved	2	—	1					0.000437	0.000574
Nickel (Ni)-dissolved	—	hardness dep	—					0.00072	0.00091
Selenium (Se)-dissolved	—	—	0.002					**0.00416**	**0.00446**
Silver (Ag)-dissolved	hardness dep	—	hardness dep					0.000012	0.000007
Thallium (Tl)-dissolved	—	0.0008	—					0.000028	2.49E-05
Titanium (Ti)-dissolved	—	—	—					<0.0005	<0.0005
Uranium (U)-dissolved	—	0.0085	—					0.000175	0.00021
Vanadium (V)-dissolved	—	—	0.02					<0.0002	<0.0002
Zinc (Zn)-dissolved	hardness dep	—	hardness dep					**7.64**	**12.2**
Aluminum (Al)-dissolved	0.1	—	0.05					0.0018	<0.001
Antimony (Sb)-dissolved	—	—	—					0.00032	0.000194
Arsenic (As)-dissolved	—	—	—					0.000034	0.000037
Barium (Ba)-dissolved	—	—	—					0.0153	0.0169
Beryllium (Be)-dissolved	—	—	—					<0.00001	<0.00001
Bismuth (Bi)-dissolved	—	—	—					<0.000005	<5E-06
Boron (B)-dissolved	—	—	—					<0.01	<0.01
Cadmium (Cd)-dissolved	hardness dep	—	hardness dep					**0.076**	**0.103**
Calcium (Ca)-dissolved	—	—	—					90.6	92.6
Chromium (Cr)-dissolved	—	—	—					<0.0001	<0.0001
Cobalt (Co)-dissolved	—	—	—					0.000279	0.00063
Copper (Cu)-dissolved	—	—	—					0.00042	0.00027
Iron (Fe)-dissolved	0.35	—	—					0.0035	<0.001
Lead (Pb)-dissolved	—	—	—					0.408	0.0963
Lithium (Li)-dissolved	—	—	—					0.00187	0.00183
Magnesium (Mg)-dissolved	—	—	—					3.36	3.34
Manganese (Mn)-dissolved	—	—	—					0.00909	0.0134
Mercury (Hg)-dissolved	—	—	—					<0.00001	<0.00001
Molybdenum (Mo)-dissolved	—	—	—					0.000437	0.000574
Nickel (Ni)-dissolved	—	—	—					0.00072	0.00091
Potassium (K)-dissolved	—	—	—					0.814	0.752
Selenium (Se)-dissolved	—	—	—					0.00416	0.00446
Silicon (Si)-dissolved	—	—	—					2.46	2.43
Silver (Ag)-dissolved	—	—	—					0.000012	0.000007

Station SDH-S2
Location 1380 Portal Waste Rock Dump

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jan	Feb	Mar	Apr	May	Jun
	Max	Working Mean	30-day Mean	--	--	--	--	5/11/2016	6/8/2016
Sodium (Na)-dissolved	—	—	—					0.571	0.513
Strontium (Sr)-dissolved	—	—	—					0.115	0.107
Thallium (Tl)-dissolved	—	—	—					0.000028	2.49E-05
Tin (Sn)-dissolved	—	—	—					<0.0002	<0.0002
Titanium (Ti)-dissolved	—	—	—					<0.0005	<0.0005
Uranium (U)-dissolved	—	—	—					0.000175	0.00021
Vanadium (V)-dissolved	—	—	—					<0.0002	<0.0002
Zinc (Zn)-dissolved	—	—	—					7.64	12.2
Zirconium (Zr)-dissolved	—	—	—					<0.0001	<0.0001

NOTE:
Values in bold and underlined exceed the BC 30-day mean water quality guideline for the protection of
Values shaded yellow exceed the BC maximum water quality guideline for the protection of aquatic life
Blanks and #N/A no data available

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month	Jan	Feb	Mar	Apr	May	Jun
	Hardness (as CaCO3 mg/L)					**240**	**245**
BC Approved Maximum Guideline (Short Term)	**Ammonia**					18.1	21.6
	Dissolved Cadmium					0.00145	0.00148
	Copper					0.025	0.025
	Lead					0.25	0.26
	Manganese					3.2	3.2
	Silver					0.003	0.003
	Zinc					0.1455	0.14925
BC Working Maximum Guideline	**Nickel**					0.15	0.15
BC Approved 30-day Average Guideline	**Ammonia**					2.08	2.08
	Dissolved Cadmium					0.000402826	0.00041
	Copper					0.0096	0.0098
	Lead					0.0130	0.0133
	Manganese					1.7	1.7
	Silver					0.0015	0.0015
	Sulphate					429	429
	Zinc					0.120	0.124

Station SDH-S2
Location 1380 Portal Waste Rock Dump

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jul	Aug	Sep	Oct	Nov	Dec
	Max	Working Mean	30-day Mean	--	--	--	--	--	--
pH - Lab	6.5 to 9	—	—						
pH - Field	—	—	—						
Conductivity (µS/cm) - Lab	—	—	—						
Conductivity (µS/cm) - Field	—	—	—						
Temperature (°C) - Field	—	—	—						
Turbidity (NTU) - Lab									
Turbidity (NTU) - Field									
Flow (L/min)	—	—	—						
TSS									
TDS									
Alkalinity, Total (as CaCO3)	see table	—	—						
Sulphate (SO4)	—	—	hardness dep						
Hardness (as CaCO3)	—	—	—						
Bromide (Br)	—	—	—						
Chloride (Cl)	600		150						
Total Cyanide (SAD-CN)									
WAD Cyanide									
Nitrate (NO3)	32.8	—	3						
Nitrite (NO2)	0.06	—	0.02 (see table)						
Ammonia, Total (NH3)	see table	—	see table						
Colour, True (Col. units)									
DOC									
Note: dissolved metals presented twice for comparison to total metals WQGL									
Antimony (Sb)-dissolved	—	0.009	—						
Arsenic (As)-dissolved	0.005	—	—						
Barium (Ba)-dissolved	—	—	1						
Beryllium (Be)-dissolved	—	0.00013	—						
Boron (B)-dissolved	1.2	—	—						
Calcium (Ca)-dissolved	see table	—	—						
Chromium (Cr)-dissolved	0.001	—	—						
Cobalt (Co)-dissolved	0.11	—	0.004						
Copper (Cu)-dissolved	hardness dep	—	hardness dep						
Iron (Fe)-dissolved	1	—	—						
Lead (Pb)-dissolved	hardness dep	—	hardness dep						
Lithium (Li)-dissolved	—	—	0.096						
Manganese (Mn)-dissolved	hardness dep	—	hardness dep						
Mercury (Hg)-dissolved	—	—	0.00002						
Molybdenum (Mo)-dissolved	2	—	1						
Nickel (Ni)-dissolved	—	hardness dep	—						
Selenium (Se)-dissolved	—	—	0.002						
Silver (Ag)-dissolved	hardness dep	—	hardness dep						
Thallium (Tl)-dissolved	—	0.0008	—						
Titanium (Ti)-dissolved	—	—	—						
Uranium (U)-dissolved	—	0.0085	—						
Vanadium (V)-dissolved	—	—	0.02						
Zinc (Zn)-dissolved	hardness dep	—	hardness dep						
Aluminum (Al)-dissolved	0.1	—	0.05						
Antimony (Sb)-dissolved	—	—	—						
Arsenic (As)-dissolved	—	—	—						
Barium (Ba)-dissolved	—	—	—						
Beryllium (Be)-dissolved	—	—	—						
Bismuth (Bi)-dissolved	—	—	—						
Boron (B)-dissolved	—	—	—						
Cadmium (Cd)-dissolved	hardness dep	—	hardness dep						
Calcium (Ca)-dissolved	—	—	—						
Chromium (Cr)-dissolved	—	—	—						
Cobalt (Co)-dissolved	—	—	—						
Copper (Cu)-dissolved	—	—	—						
Iron (Fe)-dissolved	0.35	—	—						
Lead (Pb)-dissolved	—	—	—						
Lithium (Li)-dissolved	—	—	—						
Magnesium (Mg)-dissolved	—	—	—						
Manganese (Mn)-dissolved	—	—	—						
Mercury (Hg)-dissolved	—	—	—						
Molybdenum (Mo)-dissolved	—	—	—						
Nickel (Ni)-dissolved	—	—	—						
Potassium (K)-dissolved	—	—	—						
Selenium (Se)-dissolved	—	—	—						
Silicon (Si)-dissolved	—	—	—						
Silver (Ag)-dissolved	—	—	—						

Station SDH-S2
Location 1380 Portal Waste Rock Dump

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jul	Aug	Sep	Oct	Nov	Dec
	Max	Working Mean	30-day Mean	--	--	--	--	--	--
Sodium (Na)-dissolved	—	—	—						
Strontium (Sr)-dissolved	—	—	—						
Thallium (Tl)-dissolved	—	—	—						
Tin (Sn)-dissolved	—	—	—						
Titanium (Ti)-dissolved	—	—	—						
Uranium (U)-dissolved	—	—	—						
Vanadium (V)-dissolved	—	—	—						
Zinc (Zn)-dissolved	—	—	—						
Zirconium (Zr)-dissolved	—	—	—						

NOTE:
Values in bold and underlined exceed the BC 30-day mean water quality guideline for
Values shaded yellow exceed the BC maximum water quality guideline for the protecti
Blanks and #N/A no data available

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month	Jul	Aug	Sep	Oct	Nov	Dec
	Hardness (as CaCO3 mg/L)						
BC Approved Maximum Guideline (Short Term)	**Ammonia Dissolved Cadmium Copper Lead Manganese Silver Zinc**						
BC Working Maximum Guideline	**Nickel**						
BC Approved 30-day Average Guideline	**Ammonia Dissolved Cadmium Copper Lead Manganese Silver Sulphate Zinc**						

Station MH-15
Location West Fork of Tributary E

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jan	Feb	Mar	Apr	May	Jun
	Max	Working Mean	30-day Mean	1/19/2016	2/22/2016	3/20/2016	4/17/2016	5/11/2016	6/10/2016
pH - Lab	6.5 to 9	—	—	8.28	8.15	8.16	8.36	8.34	8.28
pH - Field	—	—	—	8.4	8.1	8.3	8.3	8.3	8.2
Conductivity (µS/cm) - Lab	—	—	—	382	381	370	338	317	351
Conductivity (µS/cm) - Field	—	—	—	366	417	417	369	332	371
Temperature (°C) - Field	—	—	—	0.1	0.1	0.2	0.6	5.3	11.4
Turbidity (NTU) - Lab	see table	—	see table	2.14	2.24	1.68	1.27	1.02	0.33
Turbidity (NTU) - Field	see table	—	see table						
Flow (L/min)	—	—	—	1560	1380	1200	1860	2700	2040
TSS	see table	—	see table	<4	<4	<4	<4	2.6	<1
TDS	—	—	—	206	202	202	186	164	184
Alkalinity, Total (as CaCO3)	see table	—	—	208	211	204	185	173	196
Sulphate (SO4)	—	—	hardness dep	6.56	4.18	4.12	3.92	3.97	4.27
Hardness (as CaCO3)	—	—	—	201	202	199	195	180	201
Bromide (Br)	—	—	—						
Chloride (Cl)	600	—	150	0.7	0.55	<0.5	0.71	1	0.54
Total Cyanide (SAD-CN)	—	—	—	0.00065	0.00067	<0.0005	0.00095	0.00065	
WAD Cyanide	0.01	—	0.005						
Nitrate (NO3)	32.8	—	3	0.075	0.093	0.097	0.059	0.033	<0.02
Nitrite (NO2)	0.06	—	0.02 (see table)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ammonia, Total (NH3)	see table	—	see table	0.14	0.027	0.038	0.021	0.032	0.017
Colour, True (Col. units)	—	—	see table	12.9	5.9	6.8	15.7	14.6	12.7
DOC	see table	—	—		2.32	2.77	4.23	3.88	4.12
Aluminum (Al)-total	—	—	—	0.041	0.0075	0.005	0.0054	0.0155	0.0037
Antimony (Sb)-total	—	0.009	—	<0.0005	<0.0005	<0.0005	0.0001	0.00011	0.000107
Arsenic (As)-total	0.005	—	—	0.00044	0.00044	0.00037	0.000458	0.000414	0.00037
Barium (Ba)-total	—	—	1	0.175	0.189	0.207	0.164	0.142	0.183
Beryllium (Be)-total	—	0.00013	—	<0.0001	<0.0001	<0.0001	<0.00001	<0.00001	<0.00001
Bismuth (Bi)-total	—	—	—	<0.001	<0.001	<0.001	<5E-06	<0.00002	<5E-06
Boron (B)-total	1.2	—	—	<0.05	<0.05	<0.05	<0.01	<0.05	<0.01
Cadmium (Cd)-total	—	—	—	0.000011	0.00001	<0.00001	0.000015	0.000012	0.000008
Calcium (Ca)-total	see table	—	—	60.5	62.1	62.1	55.4	51.5	60.3
Chromium (Cr)-total	0.001	—	—	<0.001	<0.001	<0.0001	<0.0001	<0.0005	<0.0001
Chromium (Cr6+)-total	0.001	0.001	—		<0.001				
Chromium (Cr3+)-total	—	0.0089	—		<0.001				
Cobalt (Co)-total	0.11	—	0.004	<0.0005	<0.0005	<0.0005	0.00003	0.000035	0.000024
Copper (Cu)-total	hardness dep	—	hardness dep	<0.0005	<0.0005	<0.0005	<0.0002	0.00039	0.00036
Iron (Fe)-total	1	—	—	0.344	0.371	0.284	0.287	0.199	0.105
Lead (Pb)-total	hardness dep	—	hardness dep	<0.0002	<0.0002	<0.0002	0.000027	0.000069	0.000028
Lithium (Li)-total	—	—	0.096	<0.005	<0.005	<0.005	0.00112	0.00113	0.00161
Magnesium (Mg)-total	—	—	—	12.3	13.1	13	12.6	12	14.1
Manganese (Mn)-total	hardness dep	—	hardness dep	0.0288	0.0246	0.0206	0.016	0.02	0.00989
Mercury (Hg)-total	—	—	0.00002	<0.00001	<0.00001	<0.00005	<0.00001	<0.00001	<0.00001
Molybdenum (Mo)-total	2	—	1	0.0017	0.0019	0.002	0.00175	0.00161	0.00201
Nickel (Ni)-total	—	hardness dep	—	<0.001	<0.001	<0.001	0.00022	0.00032	0.0003
Potassium (K)-total	—	—	—	0.346	0.395	0.39	0.578	0.5	0.294
Selenium (Se)-total	—	—	0.002	0.00056	0.00071	0.00069	0.000542	0.000453	0.000389
Silicon (Si)-total	—	—	—	3.63	4.16	4.4	4.31	3.25	3.48
Silver (Ag)-total	hardness dep	—	hardness dep	<0.00002	<0.00002	<0.00002	<5E-06	<0.000005	<5E-06
Sodium (Na)-total	—	—	—	1.02	1.04	1.11	0.945	0.78	0.943
Strontium (Sr)-total	—	—	—	0.189	0.203	0.198	0.188	0.159	0.2
Sulphur (S)-total	—	—	—	<3	3.3	<3	<3	<15	<3
Thallium (Tl)-total	—	0.0008	—	<0.00005	<0.00005	<0.00005	<2E-06	<0.000002	<2E-06
Tin (Sn)-total	—	—	—	<0.005	<0.005	<0.005	<0.0002	<0.0002	<0.0002
Titanium (Ti)-total	—	—	—	<0.005	<0.005	<0.005	<0.0005	<0.005	<0.0005
Uranium (U)-total	—	0.0085	—	0.00088	0.00086	0.0009	0.000859	0.000752	0.000785
Vanadium (V)-total	—	—	0.02	<0.005	<0.005	<0.005	<0.0002	<0.0005	<0.0002
Zinc (Zn)-total	hardness dep	—	hardness dep	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001
Zirconium (Zr)-total	—	—	—	<0.0005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001
Aluminum (Al)-dissolved	0.1	—	0.05	0.0331	0.0045	0.0042	0.0024	0.0019	0.0024
Antimony (Sb)-dissolved	—	—	—	<0.0005	<0.0005	<0.0005	0.000097	0.000116	0.0001
Arsenic (As)-dissolved	—	—	—	0.00028	0.00027	0.00049	0.000362	0.000303	0.000323
Barium (Ba)-dissolved	—	—	—	0.185	0.2	0.178	0.165	0.143	0.189
Beryllium (Be)-dissolved	—	—	—	<0.0001	<0.0001	<0.0001	<0.00001	<0.00001	<0.00001
Bismuth (Bi)-dissolved	—	—	—	<0.001	<0.001	<0.001	<5E-06	<0.000005	<5E-06
Boron (B)-dissolved	—	—	—	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
Cadmium (Cd)-dissolved	hardness dep	—	hardness dep	0.00001	<0.00001	<0.00001	0.000007	0.000005	<5E-06
Calcium (Ca)-dissolved	—	—	—	58.9	59.9	59.3	57.2	52.5	58.8
Chromium (Cr)-dissolved	—	—	—	<0.001	<0.001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt (Co)-dissolved	—	—	—	<0.0005	<0.0005	<0.0005	0.000017	0.000016	0.000016
Copper (Cu)-dissolved	—	—	—	0.00057	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Iron (Fe)-dissolved	0.35	—	—	0.102	0.053	0.0858	0.165	0.0904	0.0454

Station MH-15
Location West Fork of Tributary E

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jan	Feb	Mar	Apr	May	Jun
	Max	Working Mean	30-day Mean	1/19/2016	2/22/2016	3/20/2016	4/17/2016	5/11/2016	6/10/2016
Lead (Pb)-dissolved	—	—	—	<0.0002	<0.0002	<0.0002	<0.00002	0.000028	<0.00002
Lithium (Li)-dissolved	—	—	—	<0.005	<0.005	<0.005	0.00133	<0.0005	0.00143
Magnesium (Mg)-dissolved	—	—	—	13	12.7	12.4	12.7	12	13
Manganese (Mn)-dissolved	—	—	—	0.0207	0.0155	0.015	0.00971	0.0049	0.00488
Mercury (Hg)-dissolved	—	—	—	<0.00001	<0.00001	<0.00005	<0.00001	<0.00001	<0.00001
Molybdenum (Mo)-dissolved	—	—	—	0.002	0.0021	0.0018	0.00179	0.0017	0.00181
Nickel (Ni)-dissolved	—	—	—	<0.001	<0.001	<0.001	0.00022	0.00025	0.00028
Potassium (K)-dissolved	—	—	—	0.375	0.435	0.452	0.577	0.545	0.283
Selenium (Se)-dissolved	—	—	—	0.00056	0.00062	0.0008	0.000556	0.000497	0.000357
Silicon (Si)-dissolved	—	—	—	3.64	4.6	4.3	4.38	3.14	3.35
Silver (Ag)-dissolved	—	—	—	<0.00002	<0.00002	<0.00002	<5E-06	<0.000005	<5E-06
Sodium (Na)-dissolved	—	—	—	1.02	1.05	0.962	0.963	0.803	0.945
Strontium (Sr)-dissolved	—	—	—	0.21	0.187	0.176	0.187	0.165	0.18
Thallium (Tl)-dissolved	—	—	—	<0.00005	<0.00005	<0.00005	<2E-06	<0.000002	<2E-06
Tin (Sn)-dissolved	—	—	—	<0.005	<0.005	<0.005	<0.0002	<0.0002	<0.0002
Titanium (Ti)-dissolved	—	—	—	<0.005	<0.005	<0.005	<0.0005	<0.0005	<0.0005
Uranium (U)-dissolved	—	—	—	0.00093	0.00086	0.00089	0.000858	0.000761	0.000809
Vanadium (V)-dissolved	—	—	—	<0.005	<0.005	<0.005	<0.0002	<0.0002	<0.0002
Zinc (Zn)-dissolved	—	—	—	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001
Zirconium (Zr)-dissolved	—	—	—	<0.0005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001

NOTE:
Values in bold and underlined exceed the BC 30-day mean water quality guideline for the protection of
Values shaded yellow exceed the BC maximum water quality guideline for the protection of aquatic life
Blanks and #N/A no data available

Station MH-15
Location West Fork of Tributary E

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jan	Feb	Mar	Apr	May	Jun
	Max	Working Mean	30-day Mean	1/19/2016	2/22/2016	3/20/2016	4/17/2016	5/11/2016	6/10/2016

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month	Jan	Feb	Mar	Apr	May	Jun
	Hardness (as CaCO3 mg/L)	**201**	**202**	**199**	**195**	**180**	**201**
BC Approved Maximum Guideline (Short Term)	Ammonia	2.6	5.2	3.3	3.3	3.1	3.7
	Dissolved Cadmium	0.00121	0.00121	0.00119	0.00117	0.00108	0.00121
	Copper	0.021	0.021	0.021	0.020	0.019	0.021
	Lead	0.20	0.20	0.20	0.19	0.17	0.20
	Manganese	2.8	2.8	2.7	2.7	2.5	2.8
	Silver	0.003	0.003	0.003	0.003	0.003	0.003
	Zinc	0.11625	0.117	0.11475	0.11175	0.1005	0.11625
BC Working Maximum Guideline	Nickel	0.15	0.15	0.15	0.15	0.15	0.15
BC Approved 30-day Average Guideline	Ammonia	0.51	1.00	0.64	0.63	0.60	0.71
	Dissolved Cadmium	0.000354	0.000355	0.000351	0.000346	0.000325959	0.00035
	Copper	0.0080	0.0081	0.0080	0.0078	0.0072	0.0080
	Lead	0.0111	0.0111	0.0110	0.0108	0.0100	0.0111
	Manganese	1.5	1.5	1.5	1.5	1.4	1.5
	Silver	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
	Sulphate	429	429	429	429	429	429
	Zinc	0.091	0.092	0.089	0.086	0.075	0.091

Station MH-15
Location West Fork of Tributary E

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jul	Aug	Sep	Oct	Nov	Dec
	Max	Working Mean	30-day Mean	-	-	9/23/2016	-	-	12/19/2016
pH - Lab	6.5 to 9	—	—			8.27			7.99
pH - Field	—	—	—			8.4			7.7
Conductivity (µS/cm) - Lab	—	—	—			369			385
Conductivity (µS/cm) - Field	—	—	—			364			420
Temperature (°C) - Field	—	—	—			5.9			0.2
Turbidity (NTU) - Lab	see table	—	see table			0.7			1.92
Turbidity (NTU) - Field	see table	—	see table			0.62			2.09
Flow (L/min)	—	—	—			1380			462
TSS	see table	—	see table			<1			1.8
TDS	—	—	—			202			190
Alkalinity, Total (as CaCO3)	see table	—	—			194			213
Sulphate (SO4)	—	—	hardness dep			3.5			4.41
Hardness (as CaCO3)	—	—	—			198			205
Bromide (Br)	—	—	—						
Chloride (Cl)	600	—	150			<1			0.51
Total Cyanide (SAD-CN)	—	—	—			0.00051			0.00056
WAD Cyanide	0.01	—	0.005						
Nitrate (NO3)	32.8	—	3			<0.02			0.069
Nitrite (NO2)	0.06	—	0.02 (see table)			<0.005			<0.005
Ammonia, Total (NH3)	see table	—	see table			0.052			0.028
Colour, True (Col. units)	—	—	see table			13.5			5.7
DOC	see table	—	—			4.68			2.04
Aluminum (Al)-total	—	—	—			0.0029			0.0049
Antimony (Sb)-total	—	0.009	—			0.000067			0.000098
Arsenic (As)-total	0.005	—	—			0.000398			0.000418
Barium (Ba)-total	—	—	1			0.167			0.182
Beryllium (Be)-total	—	0.00013	—			<0.00001			<0.00001
Bismuth (Bi)-total	—	—	—			<0.000005			0.000012
Boron (B)-total	1.2	—	—			<0.01			<0.01
Cadmium (Cd)-total	—	—	—			0.000006			0.000015
Calcium (Ca)-total	see table	—	—			60.2			60.8
Chromium (Cr)-total	0.001	—	—			<0.0001			<0.0001
Chromium (Cr6+)-total	0.001	0.001	—						
Chromium (Cr3+)-total	—	0.0089	—						
Cobalt (Co)-total	0.11	—	0.004			0.000021			0.000049
Copper (Cu)-total	hardness dep	—	hardness dep			<0.0002			<0.0002
Iron (Fe)-total	1	—	—			0.164			0.372
Lead (Pb)-total	hardness dep	—	hardness dep			<0.00002			0.000023
Lithium (Li)-total	—	—	0.096			0.00089			0.00125
Magnesium (Mg)-total	—	—	—			12.8			13.4
Manganese (Mn)-total	hardness dep	—	hardness dep			0.0137			0.0456
Mercury (Hg)-total	—	—	0.00002			<0.00001			<0.00001
Molybdenum (Mo)-total	2	—	1			0.00148			0.00166
Nickel (Ni)-total	—	hardness dep	—			0.00025			0.00025
Potassium (K)-total	—	—	—			0.446			0.39
Selenium (Se)-total	—	—	0.002			0.000243			0.000577
Silicon (Si)-total	—	—	—			3.81			4.33
Silver (Ag)-total	hardness dep	—	hardness dep			<0.000005			<0.000005
Sodium (Na)-total	—	—	—			0.928			0.995
Strontium (Sr)-total	—	—	—			0.19			0.196
Sulphur (S)-total	—	—	—			<3			<3
Thallium (Tl)-total	—	0.0008	—			<0.000002			<0.000002
Tin (Sn)-total	—	—	—			<0.0002			<0.0002
Titanium (Ti)-total	—	—	—			<0.0005			<0.0005
Uranium (U)-total	—	0.0085	—			0.000608			0.000802
Vanadium (V)-total	—	—	0.02			<0.0002			<0.0002
Zinc (Zn)-total	hardness dep	—	hardness dep			<0.001			<0.001
Zirconium (Zr)-total	—	—	—			<0.0001			<0.0001
Aluminum (Al)-dissolved	0.1	—	0.05			0.0018			0.0023
Antimony (Sb)-dissolved	—	—	—			0.00007			0.000098
Arsenic (As)-dissolved	—	—	—			0.000339			0.000289
Barium (Ba)-dissolved	—	—	—			0.166			0.183
Beryllium (Be)-dissolved	—	—	—			<0.00001			<0.00001
Bismuth (Bi)-dissolved	—	—	—			<0.000005			<0.000005
Boron (B)-dissolved	—	—	—			<0.01			<0.01
Cadmium (Cd)-dissolved	hardness dep	—	hardness dep			0.000005			0.000011
Calcium (Ca)-dissolved	—	—	—			58.6			59.8
Chromium (Cr)-dissolved	—	—	—			<0.0001			<0.0001
Cobalt (Co)-dissolved	—	—	—			0.000018			0.000033
Copper (Cu)-dissolved	—	—	—			<0.0002			0.00024
Iron (Fe)-dissolved	0.35	—	—			0.0762			0.074

Station MH-15
Location West Fork of Tributary E

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jul	Aug	Sep	Oct	Nov	Dec
	Max	Working Mean	30-day Mean	-	-	9/23/2016	-	-	12/19/2016
Lead (Pb)-dissolved	—	—	—			<0.00002			<0.00002
Lithium (Li)-dissolved	—	—	—			0.00117			0.00126
Magnesium (Mg)-dissolved	—	—	—			12.7			13.5
Manganese (Mn)-dissolved	—	—	—			0.0084			0.0336
Mercury (Hg)-dissolved	—	—	—			<0.00001			<0.00001
Molybdenum (Mo)-dissolved	—	—	—			0.00149			0.00173
Nickel (Ni)-dissolved	—	—	—			0.00024			<0.0002
Potassium (K)-dissolved	—	—	—			0.446			0.4
Selenium (Se)-dissolved	—	—	—			0.00025			0.000569
Silicon (Si)-dissolved	—	—	—			3.75			4.44
Silver (Ag)-dissolved	—	—	—			<0.000005			<0.000005
Sodium (Na)-dissolved	—	—	—			0.938			1.01
Strontium (Sr)-dissolved	—	—	—			0.186			0.202
Thallium (Tl)-dissolved	—	—	—			<0.000002			<0.000002
Tin (Sn)-dissolved	—	—	—			<0.0002			<0.0002
Titanium (Ti)-dissolved	—	—	—			<0.0005			<0.0005
Uranium (U)-dissolved	—	—	—			0.000607			0.000831
Vanadium (V)-dissolved	—	—	—			<0.0002			<0.0002
Zinc (Zn)-dissolved	—	—	—			<0.001			<0.001
Zirconium (Zr)-dissolved	—	—	—			<0.0001			<0.0001

NOTE:
Values in bold and underlined exceed the BC 30-day mean water quality guideline for
Values shaded yellow exceed the BC maximum water quality guideline for the protecti
Blanks and #N/A no data available

Station MH-15
Location West Fork of Tributary E

Parameter (mg/L unless otherwise noted)	BC Water Quality Guidelines			Jul	Aug	Sep	Oct	Nov	Dec
	Max	Working Mean	30-day Mean	-	-	9/23/2016	-	-	12/19/2016

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month	Jul	Aug	Sep	Oct	Nov	Dec
	Hardness (as CaCO3 mg/L)	**-**	**-**	**198**	**-**	**-**	**205**
BC Approved Maximum Guideline (Short Term)	**Ammonia**			2.5			10.8
	Dissolved Cadmium			0.00119			0.00123
	Copper			0.021			0.021
	Lead			0.19			0.20
	Manganese			2.7			2.8
	Silver			0.003			0.003
	Zinc			0.114			0.11925
BC Working Maximum Guideline	**Nickel**			0.15			0.15
BC Approved 30-day Average Guideline	**Ammonia**			0.48			2.09
	Dissolved Cadmium			0.00035			0.00036
	Copper			0.0079			0.0082
	Lead			0.0109			0.0113
	Manganese			1.5			1.5
	Silver			0.0015			0.0015
	Sulphate			429			429
	Zinc			0.089			0.094

Attachment B – 2016 Landfill Groundwater Monitoring Results and Guidelines

2016 Landfill Groundwater Monitoring Results and Guidelines

Station MW14-01
Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Jan	Feb	Mar	Apr	May	Jun 6/11/2016	Jul 7/30/2016
pH - Lab	—						8.12	
pH - Field	—						7.45	
Conductivity (µS/cm) - Lab	—						459	
Conductivity (µS/cm) - Field	—						263.3	
Temperature (°C) - Field	—						4	
Turbidity (NTU) - Lab	—						35.9	
Turbidity (NTU) - Field	—							
Piezometric Depth (m)	—						13.97	14.05
TSS	—							
TDS	—						276	
Alkalinity, Total (as CaCO3)	—						216	
Sulphate (SO4)	1000						18.6	
Hardness (as CaCO3)	—						250	
Bromide (Br)	—							
Chloride (Cl)	—						1.2	
Fluoride (F)	hardness dep							
Total Cyanide (SAD-CN)	—							
WAD Cyanide	0.05							
Nitrate as N (NO3)	400						0.61	
Nitrite as N (NO2)	Cl dep						<0.005	
Nitrate plus Nitrite (N)	400						0.61	
Ammonia, Total (NH3)	pH dep						0.014	
Colour, True (Col. units)	—						<5	
DOC	—						0.55	
Aluminum (Al)-dissolved	—						0.0046	
Antimony (Sb)-dissolved	0.2						0.000149	
Arsenic (As)-dissolved	0.05						0.000346	
Barium (Ba)-dissolved	10						0.0899	
Beryllium (Be)-dissolved	0.053						<0.00001	
Bismuth (Bi)-dissolved	—						<5E-06	
Boron (B)-dissolved	—						<0.01	
Cadmium (Cd)-dissolved	hardness dep						3.12E-05	
Calcium (Ca)-dissolved	—						82.7	
Chromium (Cr)-dissolved	0.01						0.00056	
Cobalt (Co)-dissolved	0.009						1.93E-05	
Copper (Cu)-dissolved	hardness dep						0.00028	
Iron (Fe)-dissolved	—						0.0033	
Lead (Pb)-dissolved	hardness dep						0.000031	
Lithium (Li)-dissolved	—						<0.0005	
Magnesium (Mg)-dissolved	—						10.5	
Manganese (Mn)-dissolved	—						0.00078	
Mercury (Hg)-dissolved	0.001						<2E-06	
Molybdenum (Mo)-dissolved	10						0.00189	
Nickel (Ni)-dissolved	hardness dep						0.00036	
Potassium (K)-dissolved	—						1.08	
Selenium (Se)-dissolved	0.01						0.000758	
Silicon (Si)-dissolved	—						4.85	
Silver (Ag)-dissolved	hardness dep						<5E-06	
Sodium (Na)-dissolved	—						6.17	
Strontium (Sr)-dissolved	—						0.253	
Thallium (Tl)-dissolved	0.003						6.4E-06	
Tin (Sn)-dissolved	—						<0.0002	
Titanium (Ti)-dissolved	1						<0.0005	
Uranium (U)-dissolved	3						0.000915	
Vanadium (V)-dissolved	—						<0.0002	
Zinc (Zn)-dissolved	hardness dep						0.0012	
Zirconium (Zr)-dissolved	—						<0.0001	

2016 Landfill Groundwater Monitoring Results and Guidelines

Station	**MW14-01**
Location	**Landfill Monitoring**

Parameter (mg/L unless otherwise noted)	CSR	Jan	Feb	Mar	Apr	May	Jun 6/11/2016	Jul 7/30/2016
Polycyclic Aromatics								
Low Molecular Weight PAH`s	—						<0.00024	
High Molecular Weight PAH`s	—						<0.00005	
Total PAH	—						<0.00024	
Naphthalene	0.01	0.01					<0.0001	
2-Methylnaphthalene	—						<0.0001	
Quinoline	0.034	0.034					<0.00024	
Acenaphthylene	—						<0.00005	
Acenaphthene	0.06	0.06					<0.00005	
Fluorene	0.12	0.12					<0.00005	
Phenanthrene	0.003	0.003					<0.00005	
Anthracene	0.001	0.001					<0.00001	
Acridine	0.0005	0.0005					<0.00005	
Fluoranthene	0.12	0.002					<0.00002	
Pyrene	0.0002	0.0002					<0.00002	
Benzo(a)anthracene	0.001	0.001					<0.00001	
Chrysene	—	0.001					<0.00005	
Benzo(b&j)fluoranthene	—						<0.00005	
Benzo(k)fluoranthene	—						<0.00005	
Benzo(a)pyrene	0.0001	0.0001					<9E-06	
Indeno(1,2,3-cd)pyrene	—						<0.00005	
Dibenz(a,h)anthracene	—						<0.00005	
Benzo(g,h,i)perylene	—						<0.00005	
Calculated Parameters								
LEPH (C10-C19 less PAH)	0.5						<0.2	
HEPH (C19-C32 less PAH)	—						<0.2	
Ext. Pet. Hydrocarbon								
EPH (C10-C19)	5						<0.2	
EPH (C19-C32)	—						<0.2	
Volatiles								
VPH (VH6 to 10 - BTEX)	15						<0.3	
Chloromethane	—						<0.001	
Vinyl chloride	—						<0.0005	
Chloroethane	—						<0.001	
Trichlorofluoromethane	—						<0.004	
1,1,2Trichloro-1,2,2Trifluoroetha	0.2						<0.002	
Dichlorodifluoromethane	—						<0.002	
1,1-dichloroethene	—						<0.0005	
Dichloromethane	0.98						<0.002	
trans-1,2-dichloroethene	—						<0.001	
1,1-dichloroethane	—						<0.0005	
cis-1,2-dichloroethene	—						<0.001	
Chloroform	0.02						<0.001	
1,1,1-trichloroethane	—						<0.0005	
1,2-dichloroethane	1						<0.0005	
Carbon tetrachloride	0.13						<0.0005	
Benzene	4						<0.0004	
Methyl-tert-butylether (MTBE)	—						<0.004	
1,2-dichloropropane	—						<0.0005	
cis-1,3-dichloropropene	—						<0.001	
trans-1,3-dichloropropene	—						<0.001	
Bromomethane	—						<0.001	
1,1,2-trichloroethane	—						<0.0005	
Trichloroethene	0.2						<0.0005	
Chlorodibromomethane	—						<0.001	
1,2-dibromoethane	—						<0.0002	

2016 Landfill Groundwater Monitoring Results and Guidelines

Station **MW14-01**

Location **Landfill Monitoring**

Parameter (mg/L unless otherwise noted)	CSR	Jan	Feb	Mar	Apr	May	Jun 6/11/2016	Jul 7/30/2016
Tetrachloroethene	1.1						<0.0005	
Bromodichloromethane	—						<0.001	
Toluene	0.39						<0.0004	
Ethylbenzene	2						<0.0004	
m & p-Xylene	—						<0.0004	
Bromoform	—						<0.001	
Styrene	0.72						<0.0005	
o-Xylene	—						<0.0004	
Xylenes (Total)	—						<0.0004	
1,1,1,2-tetrachloroethane	—						<0.0005	
1,1,2,2-tetrachloroethane	—						<0.0005	
1,2-dichlorobenzene	—						<0.0005	
1,3-dichlorobenzene	1.5						<0.0005	
1,4-dichlorobenzene	0.26						<0.0005	
Chlorobenzene	0.013						<0.0005	
1,2,3-trichlorobenzene	0.08						<0.002	
1,2,4-trichlorobenzene	0.24						<0.002	
Hexachlorobutadiene	0.001						<0.0005	
VH C6-C10	15						<0.3	

NOTE:
Values shaded yellow exceed the Yukon regulations for freshwater aquatic life.
Blanks and #N/A no data available

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month Hardness (as CaCO3 mg/L)	Jan	Feb	Mar	Apr	May	Jun 250	Jul
Yukon Regulations Guideline (Schedule 3, Aquatic Life, Freshwater)	**Flouride**						3	
	Nitrite						0.2	
	Ammonia						18.5	
	Cadmium						0.0006	
	Copper						0.09	
	Lead						0.11	
	Nickel						1.5	
	Silver						0.015	
	Zinc						1.65	

2016 Landfill Groundwater Monitoring Results and Guidelines

Station MW14-01
Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Aug 8/21/2016	Sep 9/24/2016	Oct 10/23/2016	Nov 11/27/2016	Dec 12/18/2016
pH - Lab	—		8.1			
pH - Field	—		7.5			
Conductivity (µS/cm) - Lab	—		426			
Conductivity (µS/cm) - Field	—		425			
Temperature (°C) - Field	—		4.6			
Turbidity (NTU) - Lab	—					
Turbidity (NTU) - Field	—					
Piezometric Depth (m)	—	14.43	14.78	15.16	15.51	15.7
TSS	—					
TDS	—		214			
Alkalinity, Total (as CaCO3)	—		220			
Sulphate (SO4)	1000		6			
Hardness (as CaCO3)	—		220			
Bromide (Br)	—					
Chloride (Cl)	—		<1			
Fluoride (F)	hardness dep					
Total Cyanide (SAD-CN)	—					
WAD Cyanide	0.05					
Nitrate as N (NO3)	400		0.23			
Nitrite as N (NO2)	Cl dep		<0.005			
Nitrate plus Nitrite (N)	400		0.23			
Ammonia, Total (NH3)	pH dep		0.029			
Colour, True (Col. units)	—					
DOC	—		2.5			
Aluminum (Al)-dissolved	—		0.0059			
Antimony (Sb)-dissolved	0.2		0.000782			
Arsenic (As)-dissolved	0.05		0.00032			
Barium (Ba)-dissolved	10		0.101			
Beryllium (Be)-dissolved	0.053		<0.00001			
Bismuth (Bi)-dissolved	—		<5E-06			
Boron (B)-dissolved	—		<0.01			
Cadmium (Cd)-dissolved	hardness dep		0.000089			
Calcium (Ca)-dissolved	—		71.4			
Chromium (Cr)-dissolved	0.01		0.00077			
Cobalt (Co)-dissolved	0.009		0.000051			
Copper (Cu)-dissolved	hardness dep		0.00328			
Iron (Fe)-dissolved	—		0.0094			
Lead (Pb)-dissolved	hardness dep		0.000684			
Lithium (Li)-dissolved	—		0.00068			
Magnesium (Mg)-dissolved	—		10.1			
Manganese (Mn)-dissolved	—		0.00169			
Mercury (Hg)-dissolved	0.001		<2E-06			
Molybdenum (Mo)-dissolved	10		0.00211			
Nickel (Ni)-dissolved	hardness dep		0.0011			
Potassium (K)-dissolved	—		1.12			
Selenium (Se)-dissolved	0.01		0.000785			
Silicon (Si)-dissolved	—		4.61			
Silver (Ag)-dissolved	hardness dep		<5E-06			
Sodium (Na)-dissolved	—		2.6			
Strontium (Sr)-dissolved	—		0.231			
Thallium (Tl)-dissolved	0.003		0.000004			
Tin (Sn)-dissolved	—		0.00366			
Titanium (Ti)-dissolved	1		<0.0005			
Uranium (U)-dissolved	3		0.000818			
Vanadium (V)-dissolved	—		<0.0002			
Zinc (Zn)-dissolved	hardness dep		0.0091			
Zirconium (Zr)-dissolved	—		<0.0001			

2016 Landfill Groundwater Monitoring Results and Guidelines

Station MW14-01
Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Aug 8/21/2016	Sep 9/24/2016	Oct 10/23/2016	Nov 11/27/2016	Dec 12/18/2016
Polycyclic Aromatics						
Low Molecular Weight PAH`s	—		<0.00024			
High Molecular Weight PAH`s	—		<0.00005			
Total PAH	—		<0.00024			
Naphthalene	0.01		<0.0001			
2-Methylnaphthalene	—		<0.0001			
Quinoline	0.034		<0.00024			
Acenaphthylene	—		<0.00005			
Acenaphthene	0.06		<0.00005			
Fluorene	0.12		<0.00005			
Phenanthrene	0.003		<0.00005			
Anthracene	0.001		<0.00001			
Acridine	0.0005		<0.00005			
Fluoranthene	0.12		<0.00002			
Pyrene	0.0002		<0.00002			
Benzo(a)anthracene	0.001		<0.00001			
Chrysene	—		<0.00005			
Benzo(b&j)fluoranthene	—		<0.00005			
Benzo(k)fluoranthene	—		<0.00005			
Benzo(a)pyrene	0.0001		<9E-06			
Indeno(1,2,3-cd)pyrene	—		<0.00005			
Dibenz(a,h)anthracene	—		<0.00005			
Benzo(g,h,i)perylene	—		<0.00005			
Calculated Parameters						
LEPH (C10-C19 less PAH)	0.5		<0.2			
HEPH (C19-C32 less PAH)	—		<0.2			
Ext. Pet. Hydrocarbon						
EPH (C10-C19)	5		<0.2			
EPH (C19-C32)	—		<0.2			
Volatiles						
VPH (VH6 to 10 - BTEX)	15		<0.3			
Chloromethane	—		<0.001			
Vinyl chloride	—		<0.0005			
Chloroethane	—		<0.001			
Trichlorofluoromethane	—		<0.004			
1,1,2Trichloro-1,2,2Trifluoroetha	0.2		<0.002			
Dichlorodifluoromethane	—		<0.002			
1,1-dichloroethene	—		<0.0005			
Dichloromethane	0.98		<0.002			
trans-1,2-dichloroethene	—		<0.001			
1,1-dichloroethane	—		<0.0005			
cis-1,2-dichloroethene	—		<0.001			
Chloroform	0.02		<0.001			
1,1,1-trichloroethane	—		<0.0005			
1,2-dichloroethane	1		<0.0005			
Carbon tetrachloride	0.13		<0.0005			
Benzene	4		<0.0004			
Methyl-tert-butylether (MTBE)	—		<0.004			
1,2-dichloropropane	—		<0.0005			
cis-1,3-dichloropropene	—		<0.001			
trans-1,3-dichloropropene	—		<0.001			
Bromomethane	—		<0.001			
1,1,2-trichloroethane	—		<0.0005			
Trichloroethene	0.2		<0.0005			
Chlorodibromomethane	—		<0.001			
1,2-dibromoethane	—		<0.0002			

2016 Landfill Groundwater Monitoring Results and Guidelines

Station **MW14-01**

Location **Landfill Monitoring**

Parameter (mg/L unless otherwise noted)	CSR	Aug 8/21/2016	Sep 9/24/2016	Oct 10/23/2016	Nov 11/27/2016	Dec 12/18/2016
Tetrachloroethene	1.1		<0.0005			
Bromodichloromethane	—		<0.001			
Toluene	0.39		<0.0004			
Ethylbenzene	2		<0.0004			
m & p-Xylene	—		<0.0004			
Bromoform	—		<0.001			
Styrene	0.72		<0.0005			
o-Xylene	—		<0.0004			
Xylenes (Total)	—		<0.0004			
1,1,1,2-tetrachloroethane	—		<0.0005			
1,1,2,2-tetrachloroethane	—		<0.0005			
1,2-dichlorobenzene	—		<0.0005			
1,3-dichlorobenzene	1.5		<0.0005			
1,4-dichlorobenzene	0.26		<0.0005			
Chlorobenzene	0.013		<0.0005			
1,2,3-trichlorobenzene	0.08		<0.002			
1,2,4-trichlorobenzene	0.24		<0.002			
Hexachlorobutadiene	0.001		<0.0005			
VH C6-C10	15		<0.3			

NOTE:
Values shaded yellow exceed the Yukon regulat
Blanks and #N/A no data available

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month Hardness (as CaCO3 mg/L)	Aug	Sep 220	Oct	Nov	Dec
Yukon Regulations Guideline (Schedule 3, Aquatic Life, Freshwater)	Flouride		3			
	Nitrite		0.2			
	Ammonia		11.3			
	Cadmium		0.0006			
	Copper		0.09			
	Lead		0.11			
	Nickel		1.5			
	Silver		0.015			
	Zinc		1.65			

Station MW14-02

Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Jan	Feb	Mar	Apr	May	Jun	Jul
pH - Lab	—							
pH - Field	—							
Conductivity (µS/cm) - Lab	—							
Conductivity (µS/cm) - Field	—							
Temperature (°C) - Field	—							
Turbidity (NTU) - Lab	—							
Turbidity (NTU) - Field	—							
Piezometric Depth (m)	—							
TSS	—							
TDS	—							
Alkalinity, Total (as CaCO3)	—							
Sulphate (SO4)	1000							
Hardness (as CaCO3)	—							
Bromide (Br)	—							
Chloride (Cl)	—							
Fluoride (F)	hardness dep							
Total Cyanide (SAD-CN)	—							
WAD Cyanide	0.05							
Nitrate as N (NO3)	400							
Nitrite as N (NO2)	Cl dep							
Nitrate plus Nitrite (N)	400							
Ammonia, Total (NH3)	pH dep							
Colour, True (Col. units)	—							
DOC	—							
Aluminum (Al)-dissolved	—							
Antimony (Sb)-dissolved	0.2							
Arsenic (As)-dissolved	0.05							
Barium (Ba)-dissolved	10							
Beryllium (Be)-dissolved	0.053							
Bismuth (Bi)-dissolved	—							
Boron (B)-dissolved	—							
Cadmium (Cd)-dissolved	hardness dep							
Calcium (Ca)-dissolved	—							
Chromium (Cr)-dissolved	0.01							
Cobalt (Co)-dissolved	0.009							
Copper (Cu)-dissolved	hardness dep							
Iron (Fe)-dissolved	—							
Lead (Pb)-dissolved	hardness dep							
Lithium (Li)-dissolved	—							
Magnesium (Mg)-dissolved	—							
Manganese (Mn)-dissolved	—							
Mercury (Hg)-dissolved	0.001							
Molybdenum (Mo)-dissolved	10							
Nickel (Ni)-dissolved	hardness dep							
Potassium (K)-dissolved	—							
Selenium (Se)-dissolved	0.01							
Silicon (Si)-dissolved	—							
Silver (Ag)-dissolved	hardness dep							
Sodium (Na)-dissolved	—							
Strontium (Sr)-dissolved	—							
Thallium (Tl)-dissolved	0.003							
Tin (Sn)-dissolved	—							
Titanium (Ti)-dissolved	1							
Uranium (U)-dissolved	3							
Vanadium (V)-dissolved	—							
Zinc (Zn)-dissolved	hardness dep							
Zirconium (Zr)-dissolved	—							

Station MW14-02

Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Jan	Feb	Mar	Apr	May	Jun	Jul
Polycyclic Aromatics								
Low Molecular Weight PAH`s	—							
High Molecular Weight PAH`s	—							
Total PAH	—							
Naphthalene	0.01	0.01						
2-Methylnaphthalene	—							
Quinoline	0.034	0.034						
Acenaphthylene	—							
Acenaphthene	0.06	0.06						
Fluorene	0.12	0.12						
Phenanthrene	0.003	0.003						
Anthracene	0.001	0.001						
Acridine	0.0005	0.0005						
Fluoranthene	0.12	0.002						
Pyrene	0.0002	0.0002						
Benzo(a)anthracene	0.001	0.001						
Chrysene	—	0.001						
Benzo(b&j)fluoranthene	—							
Benzo(k)fluoranthene	—							
Benzo(a)pyrene	0.0001	0.0001						
Indeno(1,2,3-cd)pyrene	—							
Dibenz(a,h)anthracene	—							
Benzo(g,h,i)perylene	—							
Calculated Parameters								
LEPH (C10-C19 less PAH)	0.5							
HEPH (C19-C32 less PAH)	—							
Ext. Pet. Hydrocarbon								
EPH (C10-C19)	5							
EPH (C19-C32)	—							
Volatiles								
VPH (VH6 to 10 - BTEX)	15							
Chloromethane	—							
Vinyl chloride	—							
Chloroethane	—							
Trichlorofluoromethane	—							
1,1,2Trichloro-1,2,2Trifluoroetha	0.2							
Dichlorodifluoromethane	—							
1,1-dichloroethene	—							
Dichloromethane	0.98							
trans-1,2-dichloroethene	—							
1,1-dichloroethane	—							
cis-1,2-dichloroethene	—							
Chloroform	0.02							
1,1,1-trichloroethane	—							
1,2-dichloroethane	1							
Carbon tetrachloride	0.13							
Benzene	4							
Methyl-tert-butylether (MTBE)	—							
1,2-dichloropropane	—							
cis-1,3-dichloropropene	—							
trans-1,3-dichloropropene	—							
Bromomethane	—							
1,1,2-trichloroethane	—							
Trichloroethene	0.2							
Chlorodibromomethane	—							
1,2-dibromoethane	—							

2016 Landfill Groundwater Monitoring Results and Guidelines

Station MW14-02
Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Jan	Feb	Mar	Apr	May	Jun	Jul
Tetrachloroethene	1.1							
Bromodichloromethane	—							
Toluene	0.39							
Ethylbenzene	2							
m & p-Xylene	—							
Bromoform	—							
Styrene	0.72							
o-Xylene	—							
Xylenes (Total)	—							
1,1,1,2-tetrachloroethane	—							
1,1,2,2-tetrachloroethane	—							
1,2-dichlorobenzene	—							
1,3-dichlorobenzene	1.5							
1,4-dichlorobenzene	0.26							
Chlorobenzene	0.013							
1,2,3-trichlorobenzene	0.08							
1,2,4-trichlorobenzene	0.24							
Hexachlorobutadiene	0.001							
VH C6-C10	15							

NOTE:
Values shaded yellow exceed the Yukon regulations for freshwater aquatic life.
Blanks and #N/A no data available

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month Hardness (as CaCO3 mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul
Yukon Regulations Guideline (Schedule 3, Aquatic Life, Freshwater)	**Flouride** **Nitrite** **Ammonia** **Cadmium** **Copper** **Lead** **Nickel** **Silver** **Zinc**							

Station MW14-02

Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Aug	Sep 9/24/2016	Oct	Nov	Dec
pH - Lab	—		8.19			
pH - Field	—		7.99			
Conductivity (µS/cm) - Lab	—		392			
Conductivity (µS/cm) - Field	—		384			
Temperature (°C) - Field	—		5.7			
Turbidity (NTU) - Lab	—					
Turbidity (NTU) - Field	—					
Piezometric Depth (m)	—		15.86			
TSS	—					
TDS	—		216			
Alkalinity, Total (as CaCO3)	—		197			
Sulphate (SO4)	1000		1.8			
Hardness (as CaCO3)	—		209			
Bromide (Br)	—					
Chloride (Cl)	—		6.6			
Fluoride (F)	hardness dep					
Total Cyanide (SAD-CN)	—					
WAD Cyanide	0.05					
Nitrate as N (NO3)	400		0.11			
Nitrite as N (NO2)	Cl dep		<0.005			
Nitrate plus Nitrite (N)	400		0.11			
Ammonia, Total (NH3)	pH dep		0.033			
Colour, True (Col. units)	—					
DOC	—		2.47			
Aluminum (Al)-dissolved	—		0.0065			
Antimony (Sb)-dissolved	0.2		0.00024			
Arsenic (As)-dissolved	0.05		0.000525			
Barium (Ba)-dissolved	10		0.288			
Beryllium (Be)-dissolved	0.053		<0.00001			
Bismuth (Bi)-dissolved	—		<5E-06			
Boron (B)-dissolved	—		<0.01			
Cadmium (Cd)-dissolved	hardness dep		0.000017			
Calcium (Ca)-dissolved	—		68.6			
Chromium (Cr)-dissolved	0.01		0.00084			
Cobalt (Co)-dissolved	0.009		0.00003			
Copper (Cu)-dissolved	hardness dep		0.00074			
Iron (Fe)-dissolved	—		0.0029			
Lead (Pb)-dissolved	hardness dep		0.000138			
Lithium (Li)-dissolved	—		0.00158			
Magnesium (Mg)-dissolved	—		9.19			
Manganese (Mn)-dissolved	—		0.00081			
Mercury (Hg)-dissolved	0.001		<2E-06			
Molybdenum (Mo)-dissolved	10		0.00101			
Nickel (Ni)-dissolved	hardness dep		0.00025			
Potassium (K)-dissolved	—		0.655			
Selenium (Se)-dissolved	0.01		0.000098			
Silicon (Si)-dissolved	—		4.14			
Silver (Ag)-dissolved	hardness dep		<5E-06			
Sodium (Na)-dissolved	—		1.1			
Strontium (Sr)-dissolved	—		0.205			
Thallium (Tl)-dissolved	0.003		0.000004			
Tin (Sn)-dissolved	—		<0.0002			
Titanium (Ti)-dissolved	1		<0.0005			
Uranium (U)-dissolved	3		0.000987			
Vanadium (V)-dissolved	—		<0.0002			
Zinc (Zn)-dissolved	hardness dep		0.0015			
Zirconium (Zr)-dissolved	—		<0.0001			

Station	**MW14-02**
Location	**Landfill Monitoring**

Parameter (mg/L unless otherwise noted)	CSR	Aug	Sep 9/24/2016	Oct	Nov	Dec
Polycyclic Aromatics						
Low Molecular Weight PAH`s	—		<0.00024			
High Molecular Weight PAH`s	—		<0.00005			
Total PAH	—		<0.00024			
Naphthalene	0.01		<0.0001			
2-Methylnaphthalene	—		<0.0001			
Quinoline	0.034		<0.00024			
Acenaphthylene	—		<0.00005			
Acenaphthene	0.06		<0.00005			
Fluorene	0.12		<0.00005			
Phenanthrene	0.003		<0.00005			
Anthracene	0.001		<0.00001			
Acridine	0.0005		<0.00005			
Fluoranthene	0.12		<0.00002			
Pyrene	0.0002		<0.00002			
Benzo(a)anthracene	0.001		<0.00001			
Chrysene	—		<0.00005			
Benzo(b&j)fluoranthene	—		<0.00005			
Benzo(k)fluoranthene	—		<0.00005			
Benzo(a)pyrene	0.0001		<9E-06			
Indeno(1,2,3-cd)pyrene	—		<0.00005			
Dibenz(a,h)anthracene	—		<0.00005			
Benzo(g,h,i)perylene	—		<0.00005			
Calculated Parameters						
LEPH (C10-C19 less PAH)	0.5		<0.2			
HEPH (C19-C32 less PAH)	—		<0.2			
Ext. Pet. Hydrocarbon						
EPH (C10-C19)	5		<0.2			
EPH (C19-C32)	—		<0.2			
Volatiles						
VPH (VH6 to 10 - BTEX)	15		<0.3			
Chloromethane	—		<0.001			
Vinyl chloride	—		<0.0005			
Chloroethane	—		<0.001			
Trichlorofluoromethane	—		<0.004			
1,1,2Trichloro-1,2,2Trifluoroetha	0.2		<0.002			
Dichlorodifluoromethane	—		<0.002			
1,1-dichloroethene	—		<0.0005			
Dichloromethane	0.98		<0.002			
trans-1,2-dichloroethene	—		<0.001			
1,1-dichloroethane	—		<0.0005			
cis-1,2-dichloroethene	—		<0.001			
Chloroform	0.02		<0.001			
1,1,1-trichloroethane	—		<0.0005			
1,2-dichloroethane	1		<0.0005			
Carbon tetrachloride	0.13		<0.0005			
Benzene	4		<0.0004			
Methyl-tert-butylether (MTBE)	—		<0.004			
1,2-dichloropropane	—		<0.0005			
cis-1,3-dichloropropene	—		<0.001			
trans-1,3-dichloropropene	—		<0.001			
Bromomethane	—		<0.001			
1,1,2-trichloroethane	—		<0.0005			
Trichloroethene	0.2		<0.0005			
Chlorodibromomethane	—		<0.001			
1,2-dibromoethane	—		<0.0002			

2016 Landfill Groundwater Monitoring Results and Guidelines

Station **MW14-02**

Location **Landfill Monitoring**

Parameter (mg/L unless otherwise noted)	CSR	Aug	Sep 9/24/2016	Oct	Nov	Dec
Tetrachloroethene	1.1		<0.0005			
Bromodichloromethane	—		<0.001			
Toluene	0.39		<0.0004			
Ethylbenzene	2		<0.0004			
m & p-Xylene	—		<0.0004			
Bromoform	—		<0.001			
Styrene	0.72		<0.0005			
o-Xylene	—		<0.0004			
Xylenes (Total)	—		<0.0004			
1,1,1,2-tetrachloroethane	—		<0.0005			
1,1,2,2-tetrachloroethane	—		<0.0005			
1,2-dichlorobenzene	—		<0.0005			
1,3-dichlorobenzene	1.5		<0.0005			
1,4-dichlorobenzene	0.26		<0.0005			
Chlorobenzene	0.013		<0.0005			
1,2,3-trichlorobenzene	0.08		<0.002			
1,2,4-trichlorobenzene	0.24		<0.002			
Hexachlorobutadiene	0.001		<0.0005			
VH C6-C10	15		<0.3			

NOTE:
Values shaded yellow exceed the Yukon regulat
Blanks and #N/A no data available

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month Hardness (as CaCO3 mg/L)	Aug	Sep 209	Oct	Nov	Dec
Yukon Regulations Guideline (Schedule 3, Aquatic Life, Freshwater)	**Flouride**		3			
	Nitrite		0.8			
	Ammonia		11.3			
	Cadmium		0.0006			
	Copper		0.09			
	Lead		0.11			
	Nickel		1.5			
	Silver		0.015			
	Zinc		1.65			

Station MW14-03

Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Jan	Feb	Mar	Apr	May	Jun	Jul
pH - Lab	—							
pH - Field	—							
Conductivity (µS/cm) - Lab	—							
Conductivity (µS/cm) - Field	—							
Temperature (°C) - Field	—							
Turbidity (NTU) - Lab	—							
Turbidity (NTU) - Field	—							
Piezometric Depth (m)	—							
TSS	—							
TDS	—							
Alkalinity, Total (as CaCO3)	—							
Sulphate (SO4)	1000							
Hardness (as CaCO3)	—							
Bromide (Br)	—							
Chloride (Cl)	—							
Fluoride (F)	hardness dep							
Total Cyanide (SAD-CN)	—							
WAD Cyanide	0.05							
Nitrate as N (NO3)	400							
Nitrite as N (NO2)	Cl dep							
Nitrate plus Nitrite (N)	400							
Ammonia, Total (NH3)	pH dep							
Colour, True (Col. units)	—							
DOC	—							
Aluminum (Al)-dissolved	—							
Antimony (Sb)-dissolved	0.2							
Arsenic (As)-dissolved	0.05							
Barium (Ba)-dissolved	10							
Beryllium (Be)-dissolved	0.053							
Bismuth (Bi)-dissolved	—							
Boron (B)-dissolved	—							
Cadmium (Cd)-dissolved	hardness dep							
Calcium (Ca)-dissolved	—							
Chromium (Cr)-dissolved	0.01							
Cobalt (Co)-dissolved	0.009							
Copper (Cu)-dissolved	hardness dep							
Iron (Fe)-dissolved	—							
Lead (Pb)-dissolved	hardness dep							
Lithium (Li)-dissolved	—							
Magnesium (Mg)-dissolved	—							
Manganese (Mn)-dissolved	—							
Mercury (Hg)-dissolved	0.001							
Molybdenum (Mo)-dissolved	10							
Nickel (Ni)-dissolved	hardness dep							
Potassium (K)-dissolved	—							
Selenium (Se)-dissolved	0.01							
Silicon (Si)-dissolved	—							
Silver (Ag)-dissolved	hardness dep							
Sodium (Na)-dissolved	—							
Strontium (Sr)-dissolved	—							
Thallium (Tl)-dissolved	0.003							
Tin (Sn)-dissolved	—							
Titanium (Ti)-dissolved	1							
Uranium (U)-dissolved	3							
Vanadium (V)-dissolved	—							
Zinc (Zn)-dissolved	hardness dep							
Zirconium (Zr)-dissolved	—							
Polycyclic Aromatics								
Low Molecular Weight PAH`s	—							
High Molecular Weight PAH`s	—							
Total PAH	—							

Station MW14-03

Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Jan	Feb	Mar	Apr	May	Jun	Jul
Naphthalene	0.01	0.01						
2-Methylnaphthalene	—							
Quinoline	0.034	0.034						
Acenaphthylene	—							
Acenaphthene	0.06	0.06						
Fluorene	0.12	0.12						
Phenanthrene	0.003	0.003						
Anthracene	0.001	0.001						
Acridine	0.0005	0.0005						
Fluoranthene	0.12	0.002						
Pyrene	0.0002	0.0002						
Benzo(a)anthracene	0.001	0.001						
Chrysene	—	0.001						
Benzo(b&j)fluoranthene	—							
Benzo(k)fluoranthene	—							
Benzo(a)pyrene	0.0001	0.0001						
Indeno(1,2,3-cd)pyrene	—							
Dibenz(a,h)anthracene	—							
Benzo(g,h,i)perylene	—							
Calculated Parameters								
LEPH (C10-C19 less PAH)	0.5							
HEPH (C19-C32 less PAH)	—							
Ext. Pet. Hydrocarbon								
EPH (C10-C19)	5							
EPH (C19-C32)	—							
Volatiles								
VPH (VH6 to 10 - BTEX)	15							
Chloromethane	—							
Vinyl chloride	—							
Chloroethane	—							
Trichlorofluoromethane	—							
1,1,2Trichloro-1,2,2Trifluoroetha	0.2							
Dichlorodifluoromethane	—							
1,1-dichloroethene	—							
Dichloromethane	0.98							
trans-1,2-dichloroethene	—							
1,1-dichloroethane	—							
cis-1,2-dichloroethene	—							
Chloroform	0.02							
1,1,1-trichloroethane	—							
1,2-dichloroethane	1							
Carbon tetrachloride	0.13							
Benzene	4							
Methyl-tert-butylether (MTBE)	—							
1,2-dichloropropane	—							
cis-1,3-dichloropropene	—							
trans-1,3-dichloropropene	—							
Bromomethane	—							
1,1,2-trichloroethane	—							
Trichloroethene	0.2							
Chlorodibromomethane	—							
1,2-dibromoethane	—							
Tetrachloroethene	1.1							
Bromodichloromethane	—							
Toluene	0.39							
Ethylbenzene	2							

Station **MW14-03**

Location **Landfill Monitoring**

Parameter (mg/L unless otherwise noted)	CSR	Jan	Feb	Mar	Apr	May	Jun	Jul
m & p-Xylene	—							
Bromoform	—							
Styrene	0.72							
o-Xylene	—							
Xylenes (Total)	—							
1,1,1,2-tetrachloroethane	—							
1,1,2,2-tetrachloroethane	—							
1,2-dichlorobenzene	—							
1,3-dichlorobenzene	1.5							
1,4-dichlorobenzene	0.26							
Chlorobenzene	0.013							
1,2,3-trichlorobenzene	0.08							
1,2,4-trichlorobenzene	0.24							
Hexachlorobutadiene	0.001							
VH C6-C10	15							

NOTE:
Values shaded yellow exceed the Yukon regulations for freshwater aquatic life.
Blanks and #N/A no data available

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month Hardness (as CaCO3 mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul
Yukon Regulations Guideline (Schedule 3, Aquatic Life, Freshwater)	**Flouride** **Nitrite** **Ammonia** **Cadmium** **Copper** **Lead** **Nickel** **Silver** **Zinc**							

Station MW14-03

Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Aug	Sep 9/24/2016	Oct	Nov	Dec
pH - Lab	—		7.81			
pH - Field	—		6.87			
Conductivity (µS/cm) - Lab	—		726			
Conductivity (µS/cm) - Field	—		731			
Temperature (°C) - Field	—		7.1			
Turbidity (NTU) - Lab	—					
Turbidity (NTU) - Field	—					
Piezometric Depth (m)	—		6.38			
TSS	—					
TDS	—		406			
Alkalinity, Total (as CaCO3)	—		367			
Sulphate (SO4)	1000		27			
Hardness (as CaCO3)	—		389			
Bromide (Br)	—					
Chloride (Cl)	—		1.4			
Fluoride (F)	hardness dep					
Total Cyanide (SAD-CN)	—					
WAD Cyanide	0.05					
Nitrate as N (NO3)	400		0.279			
Nitrite as N (NO2)	Cl dep		<0.005			
Nitrate plus Nitrite (N)	400		0.279			
Ammonia, Total (NH3)	pH dep		0.049			
Colour, True (Col. units)	—					
DOC	—		2.28			
Aluminum (Al)-dissolved	—		0.0016			
Antimony (Sb)-dissolved	0.2		0.000259			
Arsenic (As)-dissolved	0.05		0.000165			
Barium (Ba)-dissolved	10		0.176			
Beryllium (Be)-dissolved	0.053		<0.00001			
Bismuth (Bi)-dissolved	—		<5E-06			
Boron (B)-dissolved	—		<0.01			
Cadmium (Cd)-dissolved	hardness dep		0.00131			
Calcium (Ca)-dissolved	—		135			
Chromium (Cr)-dissolved	0.01		0.0006			
Cobalt (Co)-dissolved	0.009		0.000426			
Copper (Cu)-dissolved	hardness dep		0.00288			
Iron (Fe)-dissolved	—		0.0024			
Lead (Pb)-dissolved	hardness dep		0.00106			
Lithium (Li)-dissolved	—		0.00113			
Magnesium (Mg)-dissolved	—		12.8			
Manganese (Mn)-dissolved	—		0.00056			
Mercury (Hg)-dissolved	0.001		<2E-06			
Molybdenum (Mo)-dissolved	10		0.000872			
Nickel (Ni)-dissolved	hardness dep		0.00112			
Potassium (K)-dissolved	—		0.818			
Selenium (Se)-dissolved	0.01		0.000276			
Silicon (Si)-dissolved	—		4.69			
Silver (Ag)-dissolved	hardness dep		<5E-06			
Sodium (Na)-dissolved	—		2.12			
Strontium (Sr)-dissolved	—		0.476			
Thallium (Tl)-dissolved	0.003		0.000003			
Tin (Sn)-dissolved	—		<0.0002			
Titanium (Ti)-dissolved	1		<0.0005			
Uranium (U)-dissolved	3		0.00154			
Vanadium (V)-dissolved	—		0.00026			
Zinc (Zn)-dissolved	hardness dep		0.0079			
Zirconium (Zr)-dissolved	—		<0.0001			
Polycyclic Aromatics						
Low Molecular Weight PAH`s	—		<0.00024			
High Molecular Weight PAH`s	—		<0.00005			
Total PAH	—		<0.00024			

Station	**MW14-03**
Location	**Landfill Monitoring**

Parameter (mg/L unless otherwise noted)	CSR	Aug	Sep 9/24/2016	Oct	Nov	Dec
Naphthalene	0.01		<0.0001			
2-Methylnaphthalene	—		<0.0001			
Quinoline	0.034		<0.00024			
Acenaphthylene	—		<0.00005			
Acenaphthene	0.06		<0.00005			
Fluorene	0.12		<0.00005			
Phenanthrene	0.003		<0.00005			
Anthracene	0.001		<0.00001			
Acridine	0.0005		<0.00005			
Fluoranthene	0.12		<0.00002			
Pyrene	0.0002		<0.00002			
Benzo(a)anthracene	0.001		<0.00001			
Chrysene	—		<0.00005			
Benzo(b&j)fluoranthene	—		<0.00005			
Benzo(k)fluoranthene	—		<0.00005			
Benzo(a)pyrene	0.0001		<9E-06			
Indeno(1,2,3-cd)pyrene	—		<0.00005			
Dibenz(a,h)anthracene	—		<0.00005			
Benzo(g,h,i)perylene	—		<0.00005			
Calculated Parameters						
LEPH (C10-C19 less PAH)	0.5		<0.2			
HEPH (C19-C32 less PAH)	—		<0.2			
Ext. Pet. Hydrocarbon						
EPH (C10-C19)	5		<0.2			
EPH (C19-C32)	—		<0.2			
Volatiles						
VPH (VH6 to 10 - BTEX)	15		<0.3			
Chloromethane	—		<0.001			
Vinyl chloride	—		<0.0005			
Chloroethane	—		<0.001			
Trichlorofluoromethane	—		<0.004			
1,1,2Trichloro-1,2,2Trifluoroetha	0.2		<0.002			
Dichlorodifluoromethane	—		0.012			
1,1-dichloroethene	—		<0.0005			
Dichloromethane	0.98		<0.002			
trans-1,2-dichloroethene	—		<0.001			
1,1-dichloroethane	—		<0.0005			
cis-1,2-dichloroethene	—		<0.001			
Chloroform	0.02		<0.001			
1,1,1-trichloroethane	—		0.0028			
1,2-dichloroethane	1		<0.0005			
Carbon tetrachloride	0.13		<0.0005			
Benzene	4		<0.0004			
Methyl-tert-butylether (MTBE)	—		<0.004			
1,2-dichloropropane	—		<0.0005			
cis-1,3-dichloropropene	—		<0.001			
trans-1,3-dichloropropene	—		<0.001			
Bromomethane	—		<0.001			
1,1,2-trichloroethane	—		<0.0005			
Trichloroethene	0.2		<0.0005			
Chlorodibromomethane	—		<0.001			
1,2-dibromoethane	—		<0.0002			
Tetrachloroethene	1.1		<0.0005			
Bromodichloromethane	—		<0.001			
Toluene	0.39		<0.0004			
Ethylbenzene	2		<0.0004			

2016 Landfill Groundwater Monitoring Results and Guidelines

Station MW14-03
Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Aug	Sep 9/24/2016	Oct	Nov	Dec
m & p-Xylene	—		<0.0004			
Bromoform	—		<0.001			
Styrene	0.72		<0.0005			
o-Xylene	—		<0.0004			
Xylenes (Total)	—		<0.0004			
1,1,1,2-tetrachloroethane	—		<0.0005			
1,1,2,2-tetrachloroethane	—		<0.0005			
1,2-dichlorobenzene	—		<0.0005			
1,3-dichlorobenzene	1.5		<0.0005			
1,4-dichlorobenzene	0.26		<0.0005			
Chlorobenzene	0.013		<0.0005			
1,2,3-trichlorobenzene	0.08		<0.002			
1,2,4-trichlorobenzene	0.24		<0.002			
Hexachlorobutadiene	0.001		<0.0005			
VH C6-C10	15		<0.3			

NOTE:
Values shaded yellow exceed the Yukon regulat
Blanks and #N/A no data available

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month Hardness (as CaCO3 mg/L)	Aug	Sep 389	Oct	Nov	Dec
Yukon Regulations Guideline (Schedule 3, Aquatic Life, Freshwater)	Flouride		3			
	Nitrite		0.2			
	Ammonia		18.4			
	Cadmium		0.0006			
	Copper		0.09			
	Lead		0.16			
	Nickel		1.5			
	Silver		0.015			
	Zinc		2.4			

Station	**MW14-04**
Location	**Landfill Monitoring**

Parameter (mg/L unless otherwise noted)	CSR	Jan	Feb	Mar 3/20/2016	Apr	May	Jun 6/12/2016	Jul
pH - Lab	—			8.1			8.16	
pH - Field	—			7.02				
Conductivity (µS/cm) - Lab	—			336			315	
Conductivity (µS/cm) - Field	—			253.2				
Temperature (°C) - Field	—			3.4				
Turbidity (NTU) - Lab	—						1210	
Turbidity (NTU) - Field	—							
Piezometric Depth (m)	—			13.12			12.41	
TSS	—							
TDS	—			194			198	
Alkalinity, Total (as CaCO3)	—			179			153	
Sulphate (SO4)	1000			5.44			6.29	
Hardness (as CaCO3)	—			188			171	
Bromide (Br)	—							
Chloride (Cl)	—			0.85			1.4	
Fluoride (F)	hardness dep							
Total Cyanide (SAD-CN)	—							
WAD Cyanide	0.05							
Nitrate as N (NO3)	400			0.08			0.178	
Nitrite as N (NO2)	Cl dep			0.0075			0.0163	
Nitrate plus Nitrite (N)	400			0.088			0.194	
Ammonia, Total (NH3)	pH dep						0.055	
Colour, True (Col. units)	—						<5	
DOC	—						1.39	
Aluminum (Al)-dissolved	—			0.0172			0.0072	
Antimony (Sb)-dissolved	0.2			<0.0005			0.000197	
Arsenic (As)-dissolved	0.05			0.00034			0.00049	
Barium (Ba)-dissolved	10			0.107			0.054	
Beryllium (Be)-dissolved	0.053			<0.0001			<0.00001	
Bismuth (Bi)-dissolved	—			<0.001			<5E-06	
Boron (B)-dissolved	—			<0.05			<0.01	
Cadmium (Cd)-dissolved	hardness dep			0.00002			2.59E-05	
Calcium (Ca)-dissolved	—			64.6			59.3	
Chromium (Cr)-dissolved	0.01			0.0012			0.00095	
Cobalt (Co)-dissolved	0.009			<0.0005			3.43E-05	
Copper (Cu)-dissolved	hardness dep			0.00053			0.00087	
Iron (Fe)-dissolved	—			<0.005			0.0031	
Lead (Pb)-dissolved	hardness dep			<0.0002			0.000101	
Lithium (Li)-dissolved	—			<0.005			0.00095	
Magnesium (Mg)-dissolved	—			6.35			5.54	
Manganese (Mn)-dissolved	—			0.0015			0.00137	
Mercury (Hg)-dissolved	0.001			<0.00001			<2E-06	
Molybdenum (Mo)-dissolved	10			<0.001			0.000765	
Nickel (Ni)-dissolved	hardness dep			0.0014			0.00058	
Potassium (K)-dissolved	—			0.641			0.808	
Selenium (Se)-dissolved	0.01			0.00015			0.000206	
Silicon (Si)-dissolved	—			3.76			4.11	
Silver (Ag)-dissolved	hardness dep			<0.00002			<5E-06	
Sodium (Na)-dissolved	—			1.07			1.02	
Strontium (Sr)-dissolved	—			0.226			0.175	
Thallium (Tl)-dissolved	0.003			<0.00005			7.4E-06	
Tin (Sn)-dissolved	—			<0.005			<0.0002	
Titanium (Ti)-dissolved	1			<0.005			<0.0005	
Uranium (U)-dissolved	3			0.00067			0.000875	
Vanadium (V)-dissolved	—			<0.005			<0.0002	
Zinc (Zn)-dissolved	hardness dep			0.0125			0.0016	
Zirconium (Zr)-dissolved	—			<0.0005			<0.0001	
Polycyclic Aromatics								
Low Molecular Weight PAH`s	—			<0.00024			<0.00024	
High Molecular Weight PAH`s	—			<0.00005			<0.00005	
Total PAH	—			<0.00024			<0.00024	

Station MW14-04

Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Jan	Feb	Mar 3/20/2016	Apr	May	Jun 6/12/2016	Jul
Naphthalene	0.01	0.01		<0.0001			<0.0001	
2-Methylnaphthalene	—			<0.0001			<0.0001	
Quinoline	0.034	0.034		<0.00024			<0.00024	
Acenaphthylene	—			<0.00005			<0.00005	
Acenaphthene	0.06	0.06		<0.00005			<0.00005	
Fluorene	0.12	0.12		<0.00005			<0.00005	
Phenanthrene	0.003	0.003		<0.00005			<0.00005	
Anthracene	0.001	0.001		<0.00001			<0.00001	
Acridine	0.0005	0.0005		<0.00005			<0.00005	
Fluoranthene	0.12	0.002		<0.00002			<0.00002	
Pyrene	0.0002	0.0002		<0.00002			<0.00002	
Benzo(a)anthracene	0.001	0.001		<0.00001			<0.00001	
Chrysene	—	0.001		<0.00005			<0.00005	
Benzo(b&j)fluoranthene	—			<0.00005			<0.00005	
Benzo(k)fluoranthene	—			<0.00005			<0.00005	
Benzo(a)pyrene	0.0001	0.0001		<9E-06			<9E-06	
Indeno(1,2,3-cd)pyrene	—			<0.00005			<0.00005	
Dibenz(a,h)anthracene	—			<0.00005			<0.00005	
Benzo(g,h,i)perylene	—			<0.00005			<0.00005	
Calculated Parameters								
LEPH (C10-C19 less PAH)	0.5			<0.2			<0.2	
HEPH (C19-C32 less PAH)	—			<0.2			<0.2	
Ext. Pet. Hydrocarbon								
EPH (C10-C19)	5			<0.2			<0.2	
EPH (C19-C32)	—			<0.2			<0.2	
Volatiles								
VPH (VH6 to 10 - BTEX)	15			<0.3			<0.3	
Chloromethane	—			<0.001			<0.001	
Vinyl chloride	—			<0.0005			<0.0005	
Chloroethane	—			<0.001			<0.001	
Trichlorofluoromethane	—			<0.004			<0.004	
1,1,2Trichloro-1,2,2Trifluoroetha	0.2			<0.002			<0.002	
Dichlorodifluoromethane	—			<0.002			<0.002	
1,1-dichloroethene	—			<0.0005			<0.0005	
Dichloromethane	0.98			<0.002			<0.002	
trans-1,2-dichloroethene	—			<0.001			<0.001	
1,1-dichloroethane	—			<0.0005			<0.0005	
cis-1,2-dichloroethene	—			<0.001			<0.001	
Chloroform	0.02			<0.001			<0.001	
1,1,1-trichloroethane	—			<0.0005			<0.0005	
1,2-dichloroethane	1			<0.0005			<0.0005	
Carbon tetrachloride	0.13			<0.0005			<0.0005	
Benzene	4			<0.0004			<0.0004	
Methyl-tert-butylether (MTBE)	—			<0.004			<0.004	
1,2-dichloropropane	—			<0.0005			<0.0005	
cis-1,3-dichloropropene	—			<0.001			<0.001	
trans-1,3-dichloropropene	—			<0.001			<0.001	
Bromomethane	—			<0.001			<0.001	
1,1,2-trichloroethane	—			<0.0005			<0.0005	
Trichloroethene	0.2			<0.0005			<0.0005	
Chlorodibromomethane	—			<0.001			<0.001	
1,2-dibromoethane	—			<0.0002			<0.0002	
Tetrachloroethene	1.1			<0.0005			<0.0005	
Bromodichloromethane	—			<0.001			<0.001	
Toluene	0.39			<0.0004			<0.0004	
Ethylbenzene	2			<0.0004			<0.0004	

2016 Landfill Groundwater Monitoring Results and Guidelines

Station MW14-04
Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Jan	Feb	Mar 3/20/2016	Apr	May	Jun 6/12/2016	Jul
m & p-Xylene	—			<0.0004			<0.0004	
Bromoform	—			<0.001			<0.001	
Styrene	0.72			<0.0005			<0.0005	
o-Xylene	—			<0.0004			<0.0004	
Xylenes (Total)	—			<0.0004			<0.0004	
1,1,1,2-tetrachloroethane	—			<0.0005			<0.0005	
1,1,2,2-tetrachloroethane	—			<0.0005			<0.0005	
1,2-dichlorobenzene	—			<0.0005			<0.0005	
1,3-dichlorobenzene	1.5			<0.0005			<0.0005	
1,4-dichlorobenzene	0.26			<0.0005			<0.0005	
Chlorobenzene	0.013			<0.0005			<0.0005	
1,2,3-trichlorobenzene	0.08			<0.002			<0.002	
1,2,4-trichlorobenzene	0.24			<0.002			<0.002	
Hexachlorobutadiene	0.001			<0.0005			<0.0005	
VH C6-C10	15			<0.3			<0.3	

NOTE:
Values shaded yellow exceed the Yukon regulations for freshwater aquatic life.
Blanks and #N/A no data available

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month Hardness (as CaCO3 mg/L)	Jan	Feb	Mar 188	Apr	May	Jun 171	Jul
Yukon Regulations Guideline (Schedule 3, Aquatic Life, Freshwater)	Flouride			3			3	
	Nitrite			0.2			0.2	
	Ammonia			18.5				
	Cadmium			0.0006			0.0006	
	Copper			0.08			0.07	
	Lead			0.06			0.06	
	Nickel			1.5			1.1	
	Silver			0.015			0.015	
	Zinc			0.9			0.9	

Station MW14-04

Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Aug	Sep 9/24/2016	Oct 10/23/2016	Nov 11/27/2016	Dec 12/19/2016
pH - Lab	—		8.09			8.05
pH - Field	—		8			8.2
Conductivity (µS/cm) - Lab	—		318			293
Conductivity (µS/cm) - Field	—		313			339
Temperature (°C) - Field	—		5.3			2.4
Turbidity (NTU) - Lab	—					
Turbidity (NTU) - Field	—					
Piezometric Depth (m)	—		11.3	11.42	11.5	11.63
TSS	—					
TDS	—		174			160
Alkalinity, Total (as CaCO3)	—		147			153
Sulphate (SO4)	1000		17			6.88
Hardness (as CaCO3)	—		173			157
Bromide (Br)	—					
Chloride (Cl)	—		<1			0.78
Fluoride (F)	hardness dep					
Total Cyanide (SAD-CN)	—					
WAD Cyanide	0.05					
Nitrate as N (NO3)	400		0.369			0.204
Nitrite as N (NO2)	Cl dep		<0.005			<0.005
Nitrate plus Nitrite (N)	400		0.369			0.204
Ammonia, Total (NH3)	pH dep		0.067			<0.005
Colour, True (Col. units)	—					
DOC	—		2.26			0.65
Aluminum (Al)-dissolved	—		0.0061			0.006
Antimony (Sb)-dissolved	0.2		0.000263			0.000167
Arsenic (As)-dissolved	0.05		0.00055			0.000486
Barium (Ba)-dissolved	10		0.0326			0.0411
Beryllium (Be)-dissolved	0.053		<0.00001			<0.00001
Bismuth (Bi)-dissolved	—		<5E-06			<0.000005
Boron (B)-dissolved	—		<0.01			<0.01
Cadmium (Cd)-dissolved	hardness dep		0.000027			0.000014
Calcium (Ca)-dissolved	—		59.6			53.2
Chromium (Cr)-dissolved	0.01		0.00147			0.00144
Cobalt (Co)-dissolved	0.009		0.000021			0.000011
Copper (Cu)-dissolved	hardness dep		0.00124			0.00122
Iron (Fe)-dissolved	—		0.002			0.0014
Lead (Pb)-dissolved	hardness dep		0.00108			0.000033
Lithium (Li)-dissolved	—		0.00099			0.00114
Magnesium (Mg)-dissolved	—		5.93			5.85
Manganese (Mn)-dissolved	—		0.00053			0.00058
Mercury (Hg)-dissolved	0.001		<2E-06			0.0000069
Molybdenum (Mo)-dissolved	10		0.000582			0.000529
Nickel (Ni)-dissolved	hardness dep		0.00044			0.00028
Potassium (K)-dissolved	—		0.762			0.708
Selenium (Se)-dissolved	0.01		0.000568			0.000346
Silicon (Si)-dissolved	—		3.65			3.86
Silver (Ag)-dissolved	hardness dep		0.000021			<0.000005
Sodium (Na)-dissolved	—		1.37			0.952
Strontium (Sr)-dissolved	—		0.192			0.189
Thallium (Tl)-dissolved	0.003		0.000003			0.000006
Tin (Sn)-dissolved	—		<0.0002			<0.0002
Titanium (Ti)-dissolved	1		<0.0005			<0.0005
Uranium (U)-dissolved	3		0.00079			0.000634
Vanadium (V)-dissolved	—		<0.0002			<0.0002
Zinc (Zn)-dissolved	hardness dep		0.0026			0.0014
Zirconium (Zr)-dissolved	—		<0.0001			<0.0001
Polycyclic Aromatics						
Low Molecular Weight PAH`s	—		<0.00024			<0.00024
High Molecular Weight PAH`s	—		<0.00005			<0.00005
Total PAH	—		<0.00024			<0.00024

Station	**MW14-04**
Location	**Landfill Monitoring**

Parameter (mg/L unless otherwise noted)	CSR	Aug	Sep 9/24/2016	Oct 10/23/2016	Nov 11/27/2016	Dec 12/19/2016
Naphthalene	0.01		<0.0001			<0.0001
2-Methylnaphthalene	—		<0.0001			<0.0001
Quinoline	0.034		<0.00024			<0.00024
Acenaphthylene	—		<0.00005			<0.00005
Acenaphthene	0.06		<0.00005			<0.00005
Fluorene	0.12		<0.00005			<0.00005
Phenanthrene	0.003		<0.00005			<0.00005
Anthracene	0.001		<0.00001			<0.00001
Acridine	0.0005		<0.00005			<0.00005
Fluoranthene	0.12		<0.00002			<0.00002
Pyrene	0.0002		<0.00002			<0.00002
Benzo(a)anthracene	0.001		<0.00001			<0.00001
Chrysene	—		<0.00005			<0.00005
Benzo(b&j)fluoranthene	—		<0.00005			<0.00005
Benzo(k)fluoranthene	—		<0.00005			<0.00005
Benzo(a)pyrene	0.0001		<9E-06			<0.000009
Indeno(1,2,3-cd)pyrene	—		<0.00005			<0.00005
Dibenz(a,h)anthracene	—		<0.00005			<0.00005
Benzo(g,h,i)perylene	—		<0.00005			<0.00005
Calculated Parameters						
LEPH (C10-C19 less PAH)	0.5		<0.2			<0.2
HEPH (C19-C32 less PAH)	—		<0.2			<0.2
Ext. Pet. Hydrocarbon						
EPH (C10-C19)	5		<0.2			<0.2
EPH (C19-C32)	—		<0.2			<0.2
Volatiles						
VPH (VH6 to 10 - BTEX)	15		<0.3			<0.3
Chloromethane	—		<0.001			<0.001
Vinyl chloride	—		<0.0005			<0.0005
Chloroethane	—		<0.001			<0.001
Trichlorofluoromethane	—		<0.004			<0.004
1,1,2Trichloro-1,2,2Trifluoroetha	0.2		<0.002			<0.002
Dichlorodifluoromethane	—		<0.002			<0.002
1,1-dichloroethene	—		<0.0005			<0.0005
Dichloromethane	0.98		<0.002			<0.002
trans-1,2-dichloroethene	—		<0.001			<0.001
1,1-dichloroethane	—		<0.0005			<0.0005
cis-1,2-dichloroethene	—		<0.001			<0.001
Chloroform	0.02		<0.001			<0.001
1,1,1-trichloroethane	—		<0.0005			<0.0005
1,2-dichloroethane	1		<0.0005			<0.0005
Carbon tetrachloride	0.13		<0.0005			<0.0005
Benzene	4		<0.0004			<0.0004
Methyl-tert-butylether (MTBE)	—		<0.004			<0.004
1,2-dichloropropane	—		<0.0005			<0.0005
cis-1,3-dichloropropene	—		<0.001			<0.001
trans-1,3-dichloropropene	—		<0.001			<0.001
Bromomethane	—		<0.001			<0.001
1,1,2-trichloroethane	—		<0.0005			<0.0005
Trichloroethene	0.2		<0.0005			<0.0005
Chlorodibromomethane	—		<0.001			<0.001
1,2-dibromoethane	—		<0.0002			<0.0002
Tetrachloroethene	1.1		<0.0005			<0.0005
Bromodichloromethane	—		<0.001			<0.001
Toluene	0.39		<0.0004			<0.0004
Ethylbenzene	2		<0.0004			<0.0004

2016 Landfill Groundwater Monitoring Results and Guidelines

Station **MW14-04**

Location **Landfill Monitoring**

Parameter (mg/L unless otherwise noted)	CSR	Aug	Sep 9/24/2016	Oct 10/23/2016	Nov 11/27/2016	Dec 12/19/2016
m & p-Xylene	—		<0.0004			<0.0004
Bromoform	—		<0.001			<0.001
Styrene	0.72		<0.0005			<0.0005
o-Xylene	—		<0.0004			<0.0004
Xylenes (Total)	—		<0.0004			<0.0004
1,1,1,2-tetrachloroethane	—		<0.0005			<0.0005
1,1,2,2-tetrachloroethane	—		<0.0005			<0.0005
1,2-dichlorobenzene	—		<0.0005			<0.0005
1,3-dichlorobenzene	1.5		<0.0005			<0.0005
1,4-dichlorobenzene	0.26		<0.0005			<0.0005
Chlorobenzene	0.013		<0.0005			<0.0005
1,2,3-trichlorobenzene	0.08		<0.002			<0.002
1,2,4-trichlorobenzene	0.24		<0.002			<0.002
Hexachlorobutadiene	0.001		<0.0005			<0.0005
VH C6-C10	15		<0.3			<0.3

NOTE:
Values shaded yellow exceed the Yukon regulat
Blanks and #N/A no data available

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month Hardness (as CaCO3 mg/L)	Aug	Sep 173	Oct	Nov	Dec 157
Yukon Regulations Guideline (Schedule 3, Aquatic Life, Freshwater)	Flouride		3			3
	Nitrite		0.2			0.2
	Ammonia		3.7			3.7
	Cadmium		0.0006			0.0006
	Copper		0.07			0.07
	Lead		0.06			0.06
	Nickel		1.1			1.1
	Silver		0.015			0.015
	Zinc		0.9			0.9

Attachment C – 2016 Contaminated Sites and Mine Source Groundwater Monitoring Results and Guidelines

2016 Contaminated Sites Groundwater Monitoring Results and Guidelines

Station MW13-01
Location Landfill
Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Jan	Feb	Mar	Apr	May	Jun 6/11/2016	Jul	Aug
pH - Lab	—						8.11		
pH - Field	—						7.76		
Conductivity (µS/cm) - Lab	—						300		
Conductivity (µS/cm) - Field	—						221.8		
Temperature (°C) - Field	—						6.8		
Turbidity (NTU) - Lab	—						0.16		
Turbidity (NTU) - Field	—								
Piezometric Depth (m)	—						18.4		
TSS	—								
TDS	—						184		
Alkalinity, Total (as CaCO3)	—						135		
Sulphate (SO4)	1000						13.6		
Hardness (as CaCO3)	—						161		
Bromide (Br)	—						<0.01		
Chloride (Cl)	—						1.1		
Total Cyanide (SAD-CN)	—								
WAD Cyanide	0.05								
Nitrate as N (NO3)	400						0.298		
Nitrite as N (NO2)	Cl dep						<0.005		
Nitrate plus Nitrite (N)	400						0.298		
Ammonia, Total (NH3)	pH dep						0.038		
Colour, True (Col. units)	—						<5		
DOC	—						<0.5		
Aluminum (Al)-dissolved	—						0.0015		
Antimony (Sb)-dissolved	0.2						0.000218		
Arsenic (As)-dissolved	0.05						0.00131		
Barium (Ba)-dissolved	10						0.0153		
Beryllium (Be)-dissolved	0.053						<0.00001		
Bismuth (Bi)-dissolved	—						<5E-06		
Boron (B)-dissolved	—						<0.01		
Cadmium (Cd)-dissolved	hardness dep						0.000078		
Calcium (Ca)-dissolved	—						56.9		
Chromium (Cr)-dissolved	0.01						0.00025		
Cobalt (Co)-dissolved	0.009						5.6E-06		
Copper (Cu)-dissolved	hardness dep						0.0009		
Iron (Fe)-dissolved	—						<0.001		
Lead (Pb)-dissolved	hardness dep						0.000236		
Lithium (Li)-dissolved	—						0.00291		
Magnesium (Mg)-dissolved	—						4.59		
Manganese (Mn)-dissolved	—						0.00024		
Mercury (Hg)-dissolved	0.001						<2E-06		
Molybdenum (Mo)-dissolved	10						0.00143		
Nickel (Ni)-dissolved	hardness dep						<0.0002		
Potassium (K)-dissolved	—						0.503		
Selenium (Se)-dissolved	0.01						0.00121		
Silicon (Si)-dissolved	—						4.1		
Silver (Ag)-dissolved	hardness dep						<5E-06		
Sodium (Na)-dissolved	—						0.916		
Strontium (Sr)-dissolved	—						0.249		
Thallium (Tl)-dissolved	0.003						<2E-06		
Tin (Sn)-dissolved	—						<0.0002		
Titanium (Ti)-dissolved	1						<0.0005		
Uranium (U)-dissolved	3						0.00188		
Vanadium (V)-dissolved	—						<0.0002		
Zinc (Zn)-dissolved	hardness dep						0.0018		
Zirconium (Zr)-dissolved	—						<0.0001		

Station MW13-01

Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Jan	Feb	Mar	Apr	May	Jun 6/11/2016	Jul	Aug
Polycyclic Aromatics									
Low Molecular Weight PAH`s	—						<0.00024		
High Molecular Weight PAH`s	—						<0.00005		
Total PAH	—						<0.00024		
Naphthalene	0.01						<0.0001		
2-Methylnaphthalene	—						<0.0001		
Quinoline	0.034						<0.00024		
Acenaphthylene	—						<0.00005		
Acenaphthene	0.06						<0.00005		
Fluorene	0.12						<0.00005		
Phenanthrene	0.003						<0.00005		
Anthracene	0.001						<0.00001		
Acridine	0.0005						<0.00005		
Fluoranthene	0.12						<0.00002		
Pyrene	0.0002						<0.00002		
Benzo(a)anthracene	0.001						<0.00001		
Chrysene	—						<0.00005		
Benzo(b&j)fluoranthene	—						<0.00005		
Benzo(k)fluoranthene	—						<0.00005		
Benzo(a)pyrene	0.0001						<9E-06		
Indeno(1,2,3-cd)pyrene	—						<0.00005		
Dibenz(a,h)anthracene	—						<0.00005		
Benzo(g,h,i)perylene	—						<0.00005		
Calculated Parameters									
LEPH (C10-C19 less PAH)	0.5						<0.2		
HEPH (C19-C32 less PAH)	—						<0.2		
Ext. Pet. Hydrocarbon									
EPH (C10-C19)	5						<0.2		
EPH (C19-C32)	—						<0.2		
Volatiles									
VPH (VH6 to 10 - BTEX)	15						<0.3		
Chloromethane	—						<0.001		
Vinyl chloride	—						<0.0005		
Chloroethane	—						<0.001		
Trichlorofluoromethane	—						<0.004		
1,1,2Trichloro-1,2,2Trifluoroetha	0.2						<0.002		
Dichlorodifluoromethane	—						<0.002		
1,1-dichloroethene	—						<0.0005		
Dichloromethane	0.98						<0.002		
trans-1,2-dichloroethene	—						<0.001		
1,1-dichloroethane	—						<0.0005		
cis-1,2-dichloroethene	—						<0.001		
Chloroform	0.02						<0.001		
1,1,1-trichloroethane	—						<0.0005		
1,2-dichloroethane	1						<0.0005		
Carbon tetrachloride	0.13						<0.0005		
Benzene	4						<0.0004		
Methyl-tert-butylether (MTBE)	—						<0.004		
1,2-dichloropropane	—						<0.0005		
cis-1,3-dichloropropene	—						<0.001		
trans-1,3-dichloropropene	—						<0.001		
Bromomethane	—						<0.001		
1,1,2-trichloroethane	—						<0.0005		
Trichloroethene	0.2						<0.0005		
Chlorodibromomethane	—						<0.001		
1,2-dibromoethane	—						<0.0002		
Tetrachloroethene	1.1						<0.0005		

Station **MW13-01**

Location **Landfill Monitoring**

Parameter (mg/L unless otherwise noted)	CSR	Jan	Feb	Mar	Apr	May	Jun 6/11/2016	Jul	Aug
Bromodichloromethane	—						<0.001		
Toluene	0.39						<0.0004		
Ethylbenzene	2						<0.0004		
m & p-Xylene	—						<0.0004		
Bromoform	—						<0.001		
Styrene	0.72						<0.0005		
o-Xylene	—						<0.0004		
Xylenes (Total)	—						<0.0004		
1,1,1,2-tetrachloroethane	—						<0.0005		
1,1,2,2-tetrachloroethane	—						<0.0005		
1,2-dichlorobenzene	—						<0.0005		
1,3-dichlorobenzene	1.5						<0.0005		
1,4-dichlorobenzene	0.26						<0.0005		
Chlorobenzene	0.013						<0.0005		
1,2,3-trichlorobenzene	0.08						<0.002		
1,2,4-trichlorobenzene	0.24						<0.002		
Hexachlorobutadiene	0.001						<0.0005		
VH C6-C10	15						<0.3		

NOTE:

Values shaded yellow exceed the Yukon regulations for freshwater aquatic life.

Blanks and #N/A no data available

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month Hardness (as CaCO3 mg/L)	Jan	Feb	Mar	Apr	May	Jun 161	Jul	Aug
	Nitrite						0.2		
	Ammonia						11.3		
	Cadmium						0.0006		
	Copper						0.07		
	Lead						0.06		
	Nickel						1.1		
	Silver						0.015		
	Zinc						0.9		

2016 Contaminated Sites Groundwater Monitoring Results and Guidelines

Station MW13-01
Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Sep 9/22/2016	Oct	Nov	Dec
pH - Lab	—	7.89			
pH - Field	—	7.16			
Conductivity (µS/cm) - Lab	—	296			
Conductivity (µS/cm) - Field	—	293			
Temperature (°C) - Field	—	3.8			
Turbidity (NTU) - Lab	—				
Turbidity (NTU) - Field	—				
Piezometric Depth (m)	—	19.15			
TSS	—				
TDS	—	156			
Alkalinity, Total (as CaCO3)	—	140			
Sulphate (SO4)	1000	12			
Hardness (as CaCO3)	—	154			
Bromide (Br)	—	<0.01			
Chloride (Cl)	—	<1			
Total Cyanide (SAD-CN)	—				
WAD Cyanide	0.05				
Nitrate as N (NO3)	400	0.357			
Nitrite as N (NO2)	Cl dep	<0.005			
Nitrate plus Nitrite (N)	400	0.357			
Ammonia, Total (NH3)	pH dep	0.014			
Colour, True (Col. units)	—				
DOC	—	1.73			
Aluminum (Al)-dissolved	—	0.0016			
Antimony (Sb)-dissolved	0.2	0.000108			
Arsenic (As)-dissolved	0.05	0.000181			
Barium (Ba)-dissolved	10	0.0206			
Beryllium (Be)-dissolved	0.053	<0.00001			
Bismuth (Bi)-dissolved	—	<5E-06			
Boron (B)-dissolved	—	<0.01			
Cadmium (Cd)-dissolved	hardness dep	0.000811			
Calcium (Ca)-dissolved	—	56.4			
Chromium (Cr)-dissolved	0.01	0.00021			
Cobalt (Co)-dissolved	0.009	0.000009			
Copper (Cu)-dissolved	hardness dep	0.0004			
Iron (Fe)-dissolved	—	0.001			
Lead (Pb)-dissolved	hardness dep	0.000613			
Lithium (Li)-dissolved	—	0.00141			
Magnesium (Mg)-dissolved	—	3.26			
Manganese (Mn)-dissolved	—	0.00041			
Mercury (Hg)-dissolved	0.001	2.5E-06			
Molybdenum (Mo)-dissolved	10	0.000591			
Nickel (Ni)-dissolved	hardness dep	0.00024			
Potassium (K)-dissolved	—	0.602			
Selenium (Se)-dissolved	0.01	0.00127			
Silicon (Si)-dissolved	—	3.23			
Silver (Ag)-dissolved	hardness dep	<5E-06			
Sodium (Na)-dissolved	—	0.703			
Strontium (Sr)-dissolved	—	0.145			
Thallium (Tl)-dissolved	0.003	0.000003			
Tin (Sn)-dissolved	—	<0.0002			
Titanium (Ti)-dissolved	1	<0.0005			
Uranium (U)-dissolved	3	0.000824			
Vanadium (V)-dissolved	—	<0.0002			
Zinc (Zn)-dissolved	hardness dep	0.0297			
Zirconium (Zr)-dissolved	—	<0.0001			

Station	**MW13-01**
Location	**Landfill Monitoring**

Parameter (mg/L unless otherwise noted)	CSR	Sep 9/22/2016	Oct	Nov	Dec
Polycyclic Aromatics					
Low Molecular Weight PAH`s	—	<0.00024			
High Molecular Weight PAH`s	—	<0.00005			
Total PAH	—	<0.00024			
Naphthalene	0.01	<0.0001			
2-Methylnaphthalene	—	<0.0001			
Quinoline	0.034	<0.00024			
Acenaphthylene	—	<0.00005			
Acenaphthene	0.06	<0.00005			
Fluorene	0.12	<0.00005			
Phenanthrene	0.003	<0.00005			
Anthracene	0.001	<0.00001			
Acridine	0.0005	<0.00005			
Fluoranthene	0.12	<0.00002			
Pyrene	0.0002	<0.00002			
Benzo(a)anthracene	0.001	<0.00001			
Chrysene	—	<0.00005			
Benzo(b&j)fluoranthene	—	<0.00005			
Benzo(k)fluoranthene	—	<0.00005			
Benzo(a)pyrene	0.0001	<9E-06			
Indeno(1,2,3-cd)pyrene	—	<0.00005			
Dibenz(a,h)anthracene	—	<0.00005			
Benzo(g,h,i)perylene	—	<0.00005			
Calculated Parameters					
LEPH (C10-C19 less PAH)	0.5	<0.2			
HEPH (C19-C32 less PAH)	—	<0.2			
Ext. Pet. Hydrocarbon					
EPH (C10-C19)	5	<0.2			
EPH (C19-C32)	—	<0.2			
Volatiles					
VPH (VH6 to 10 - BTEX)	15	<0.3			
Chloromethane	—	<0.001			
Vinyl chloride	—	<0.0005			
Chloroethane	—	<0.001			
Trichlorofluoromethane	—	<0.004			
1,1,2Trichloro-1,2,2Trifluoroetha	0.2	<0.002			
Dichlorodifluoromethane	—	<0.002			
1,1-dichloroethene	—	<0.0005			
Dichloromethane	0.98	<0.002			
trans-1,2-dichloroethene	—	<0.001			
1,1-dichloroethane	—	<0.0005			
cis-1,2-dichloroethene	—	<0.001			
Chloroform	0.02	<0.001			
1,1,1-trichloroethane	—	<0.0005			
1,2-dichloroethane	1	<0.0005			
Carbon tetrachloride	0.13	<0.0005			
Benzene	4	<0.0004			
Methyl-tert-butylether (MTBE)	—	<0.004			
1,2-dichloropropane	—	<0.0005			
cis-1,3-dichloropropene	—	<0.001			
trans-1,3-dichloropropene	—	<0.001			
Bromomethane	—	<0.001			
1,1,2-trichloroethane	—	<0.0005			
Trichloroethene	0.2	<0.0005			
Chlorodibromomethane	—	<0.001			
1,2-dibromoethane	—	<0.0002			
Tetrachloroethene	1.1	<0.0005			

Station	**MW13-01**
Location	**Landfill Monitoring**

Parameter (mg/L unless otherwise noted)	CSR	Sep 9/22/2016	Oct	Nov	Dec
Bromodichloromethane	—	<0.001			
Toluene	0.39	<0.0004			
Ethylbenzene	2	<0.0004			
m & p-Xylene	—	<0.0004			
Bromoform	—	<0.001			
Styrene	0.72	<0.0005			
o-Xylene	—	<0.0004			
Xylenes (Total)	—	<0.0004			
1,1,1,2-tetrachloroethane	—	<0.0005			
1,1,2,2-tetrachloroethane	—	<0.0005			
1,2-dichlorobenzene	—	<0.0005			
1,3-dichlorobenzene	1.5	<0.0005			
1,4-dichlorobenzene	0.26	<0.0005			
Chlorobenzene	0.013	<0.0005			
1,2,3-trichlorobenzene	0.08	<0.002			
1,2,4-trichlorobenzene	0.24	<0.002			
Hexachlorobutadiene	0.001	<0.0005			
VH C6-C10	15	<0.3			

NOTE:
Values shaded yellow exceed the Yukon regula
Blanks and #N/A no data available

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month	Sep	Oct	Nov	Dec
	Hardness (as CaCO3 mg/L)	**154**			
	Nitrite	0.2			
	Ammonia	18.5			
	Cadmium	0.0006			
	Copper	0.07			
	Lead	0.06			
	Nickel	1.1			
	Silver	0.015			
	Zinc	0.9			

Station MW13-06

Location Landfill
Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Jan	Feb	Mar	Apr	May	Jun 6/12/2016	Jul
pH - Lab	—						7.66	
pH - Field	—							
Conductivity (µS/cm) - Lab	—						618	
Conductivity (µS/cm) - Field	—							
Temperature (°C) - Field	—							
Turbidity (NTU) - Lab	—						6.18	
Turbidity (NTU) - Field	—							
Piezometric Depth (m)	—						26.6	
TSS	—							
TDS	—						418	
Alkalinity, Total (as CaCO3)	—						196	
Sulphate (SO4)	1000						127	
Hardness (as CaCO3)	—						331	
Bromide (Br)	—							
Chloride (Cl)	—						0.71	
Total Cyanide (SAD-CN)	—							
WAD Cyanide	0.05							
Nitrate as N (NO3)	400						<0.02	
Nitrite as N (NO2)	Cl dep						<0.005	
Nitrate plus Nitrite (N)	400						<0.02	
Ammonia, Total (NH3)	pH dep						0.085	
Colour, True (Col. units)	—						<5	
DOC	—						1.2	
Aluminum (Al)-dissolved	—						0.0018	
Antimony (Sb)-dissolved	0.2						0.000057	
Arsenic (As)-dissolved	0.05						0.0199	
Barium (Ba)-dissolved	10						0.024	
Beryllium (Be)-dissolved	0.053						<0.00001	
Bismuth (Bi)-dissolved	—						<5E-06	
Boron (B)-dissolved	—						0.011	
Cadmium (Cd)-dissolved	hardness dep						0.000213	
Calcium (Ca)-dissolved	—						121	
Chromium (Cr)-dissolved	0.01						<0.0001	
Cobalt (Co)-dissolved	0.009						0.00326	
Copper (Cu)-dissolved	hardness dep						0.00045	
Iron (Fe)-dissolved	—						0.0606	
Lead (Pb)-dissolved	hardness dep						0.000331	
Lithium (Li)-dissolved	—						0.00925	
Magnesium (Mg)-dissolved	—						7.14	
Manganese (Mn)-dissolved	—						0.351	
Mercury (Hg)-dissolved	0.001						<2E-06	
Molybdenum (Mo)-dissolved	10						0.0387	
Nickel (Ni)-dissolved	hardness dep						0.0256	
Potassium (K)-dissolved	—						1.86	
Selenium (Se)-dissolved	0.01						0.000132	
Silicon (Si)-dissolved	—						17.3	
Silver (Ag)-dissolved	hardness dep						<5E-06	
Sodium (Na)-dissolved	—						7.67	
Strontium (Sr)-dissolved	—						0.414	
Thallium (Tl)-dissolved	0.003						0.000016	
Tin (Sn)-dissolved	—						<0.0002	
Titanium (Ti)-dissolved	1						<0.0005	
Uranium (U)-dissolved	3						0.012	
Vanadium (V)-dissolved	—						<0.0002	
Zinc (Zn)-dissolved	hardness dep						0.181	

Station **MW13-06**

Location **Landfill Monitoring**

Parameter (mg/L unless otherwise noted)	CSR	Jan	Feb	Mar	Apr	May	Jun 6/12/2016	Jul
Zirconium (Zr)-dissolved	—						<0.0001	
Polycyclic Aromatics								
Low Molecular Weight PAH`s	—						<0.00024	
High Molecular Weight PAH`s	—						<0.00005	
Total PAH	—						<0.00024	
Naphthalene	0.01	0.01					<0.0001	
2-Methylnaphthalene	—						<0.0001	
Quinoline	0.034	0.034					<0.00024	
Acenaphthylene	—						<0.00005	
Acenaphthene	0.06	0.06					<0.00005	
Fluorene	0.12	0.12					<0.00005	
Phenanthrene	0.003	0.003					<0.00005	
Anthracene	0.001	0.001					<0.00001	
Acridine	0.0005	0.0005					<0.00005	
Fluoranthene	0.12	0.002					<0.00002	
Pyrene	0.0002	0.0002					<0.00002	
Benzo(a)anthracene	0.001	0.001					<0.00001	
Chrysene	—	0.001					<0.00005	
Benzo(b&j)fluoranthene	—						<0.00005	
Benzo(k)fluoranthene	—						<0.00005	
Benzo(a)pyrene	0.0001	0.0001					<9E-06	
Indeno(1,2,3-cd)pyrene	—						<0.00005	
Dibenz(a,h)anthracene	—						<0.00005	
Benzo(g,h,i)perylene	—						<0.00005	
Calculated Parameters								
LEPH (C10-C19 less PAH)	0.5						<0.2	
HEPH (C19-C32 less PAH)	—						<0.2	
Ext. Pet. Hydrocarbon								
EPH (C10-C19)	5						<0.2	
EPH (C19-C32)	—						<0.2	
Volatiles								
VPH (VH6 to 10 - BTEX)	15						<0.3	
Chloromethane	—						<0.001	
Vinyl chloride	—						<0.0005	
Chloroethane	—						<0.001	
Trichlorofluoromethane	—						<0.004	
1,1,2Trichloro-1,2,2Trifluoroetha	0.2						<0.002	
Dichlorodifluoromethane	—						<0.002	
1,1-dichloroethene	—						<0.0005	
Dichloromethane	0.98						<0.002	
trans-1,2-dichloroethene	—						<0.001	
1,1-dichloroethane	—						<0.0005	
cis-1,2-dichloroethene	—						<0.001	
Chloroform	0.02						<0.001	
1,1,1-trichloroethane	—						<0.0005	
1,2-dichloroethane	1						<0.0005	
Carbon tetrachloride	0.13						<0.0005	
Benzene	4						<0.0004	
Methyl-tert-butylether (MTBE)	—						<0.004	
1,2-dichloropropane	—						<0.0005	
cis-1,3-dichloropropene	—						<0.001	

Station MW13-06
Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Jan	Feb	Mar	Apr	May	Jun 6/12/2016	Jul
trans-1,3-dichloropropene	—						<0.001	
Bromomethane	—						<0.001	
1,1,2-trichloroethane	—						<0.0005	
Trichloroethene	0.2						<0.0005	
Chlorodibromomethane	—						<0.001	
1,2-dibromoethane	—						<0.0002	
Tetrachloroethene	1.1						<0.0005	
Bromodichloromethane	—						<0.001	
Toluene	0.39						0.00047	
Ethylbenzene	2						<0.0004	
m & p-Xylene	—						<0.0004	
Bromoform	—						<0.001	
Styrene	0.72						<0.0005	
o-Xylene	—						<0.0004	
Xylenes (Total)	—						<0.0004	
1,1,1,2-tetrachloroethane	—						<0.0005	
1,1,2,2-tetrachloroethane	—						<0.0005	
1,2-dichlorobenzene	—						<0.0005	
1,3-dichlorobenzene	1.5						<0.0005	
1,4-dichlorobenzene	0.26						<0.0005	
Chlorobenzene	0.013						<0.0005	
1,2,3-trichlorobenzene	0.08						<0.002	
1,2,4-trichlorobenzene	0.24						<0.002	
Hexachlorobutadiene	0.001						<0.0005	
VH C6-C10	15						<0.3	

NOTE:
Values shaded yellow exceed the Yukon regulations for freshwater aquatic life.
Blanks and #N/A no data available

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month Hardness (as CaCO3 mg/L)	Jan	Feb	Mar	Apr	May	Jun 331	Jul
	Nitrite						0.2	
	Ammonia						11.3	
	Cadmium						0.0006	
	Copper						0.09	
	Lead						0.16	
	Nickel						1.5	
	Silver						0.015	
	Zinc						2.4	

Station MW13-06

Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Aug	Sep 9/27/2016	Oct	Nov	Dec
pH - Lab	—		7.71			
pH - Field	—		6.88			
Conductivity (µS/cm) - Lab	—		698			
Conductivity (µS/cm) - Field	—		663			
Temperature (°C) - Field	—		2.1			
Turbidity (NTU) - Lab	—					
Turbidity (NTU) - Field	—					
Piezometric Depth (m)	—		28.05			
TSS	—					
TDS	—		466			
Alkalinity, Total (as CaCO3)	—		211			
Sulphate (SO4)	1000		170			
Hardness (as CaCO3)	—		334			
Bromide (Br)	—					
Chloride (Cl)	—		<1			
Total Cyanide (SAD-CN)	—					
WAD Cyanide	0.05					
Nitrate as N (NO3)	400		<0.02			
Nitrite as N (NO2)	Cl dep		<0.005			
Nitrate plus Nitrite (N)	400		<0.02			
Ammonia, Total (NH3)	pH dep		0.042			
Colour, True (Col. units)	—					
DOC	—		1.6			
Aluminum (Al)-dissolved	—		0.0023			
Antimony (Sb)-dissolved	0.2		0.000032			
Arsenic (As)-dissolved	0.05		0.0393			
Barium (Ba)-dissolved	10		0.0271			
Beryllium (Be)-dissolved	0.053		<0.00001			
Bismuth (Bi)-dissolved	—		<5E-06			
Boron (B)-dissolved	—		0.014			
Cadmium (Cd)-dissolved	hardness dep		0.000031			
Calcium (Ca)-dissolved	—		122			
Chromium (Cr)-dissolved	0.01		<0.0001			
Cobalt (Co)-dissolved	0.009		0.00351			
Copper (Cu)-dissolved	hardness dep		<0.0002			
Iron (Fe)-dissolved	—		0.497			
Lead (Pb)-dissolved	hardness dep		0.000079			
Lithium (Li)-dissolved	—		0.00822			
Magnesium (Mg)-dissolved	—		7.18			
Manganese (Mn)-dissolved	—		0.386			
Mercury (Hg)-dissolved	0.001		<2E-06			
Molybdenum (Mo)-dissolved	10		0.0399			
Nickel (Ni)-dissolved	hardness dep		0.0254			
Potassium (K)-dissolved	—		1.88			
Selenium (Se)-dissolved	0.01		<0.00004			
Silicon (Si)-dissolved	—		15.6			
Silver (Ag)-dissolved	hardness dep		<5E-06			
Sodium (Na)-dissolved	—		9.72			
Strontium (Sr)-dissolved	—		0.415			
Thallium (Tl)-dissolved	0.003		0.000008			
Tin (Sn)-dissolved	—		<0.0002			
Titanium (Ti)-dissolved	1		<0.0005			
Uranium (U)-dissolved	3		0.0136			
Vanadium (V)-dissolved	—		<0.0002			
Zinc (Zn)-dissolved	hardness dep		0.0509			

Station **MW13-06**

Location **Landfill Monitoring**

Parameter (mg/L unless otherwise noted)	CSR	Aug	Sep 9/27/2016	Oct	Nov	Dec
Zirconium (Zr)-dissolved	—		<0.0001			
Polycyclic Aromatics						
Low Molecular Weight PAH`s	—		<0.00024			
High Molecular Weight PAH`s	—		<0.00005			
Total PAH	—		<0.00024			
Naphthalene	0.01		<0.0001			
2-Methylnaphthalene	—		<0.0001			
Quinoline	0.034		<0.00024			
Acenaphthylene	—		<0.00005			
Acenaphthene	0.06		<0.00005			
Fluorene	0.12		<0.00005			
Phenanthrene	0.003		<0.00005			
Anthracene	0.001		<0.00001			
Acridine	0.0005		<0.00005			
Fluoranthene	0.12		<0.00002			
Pyrene	0.0002		<0.00002			
Benzo(a)anthracene	0.001		<0.00001			
Chrysene	—		<0.00005			
Benzo(b&j)fluoranthene	—		<0.00005			
Benzo(k)fluoranthene	—		<0.00005			
Benzo(a)pyrene	0.0001		<9E-06			
Indeno(1,2,3-cd)pyrene	—		<0.00005			
Dibenz(a,h)anthracene	—		<0.00005			
Benzo(g,h,i)perylene	—		<0.00005			
Calculated Parameters						
LEPH (C10-C19 less PAH)	0.5		<0.2			
HEPH (C19-C32 less PAH)	—		<0.2			
Ext. Pet. Hydrocarbon						
EPH (C10-C19)	5		<0.2			
EPH (C19-C32)	—		<0.2			
Volatiles						
VPH (VH6 to 10 - BTEX)	15		<0.3			
Chloromethane	—		<0.001			
Vinyl chloride	—		<0.0005			
Chloroethane	—		<0.001			
Trichlorofluoromethane	—		<0.004			
1,1,2Trichloro-1,2,2Trifluoroetha	0.2		<0.002			
Dichlorodifluoromethane	—		<0.002			
1,1-dichloroethene	—		<0.0005			
Dichloromethane	0.98		<0.002			
trans-1,2-dichloroethene	—		<0.001			
1,1-dichloroethane	—		<0.0005			
cis-1,2-dichloroethene	—		<0.001			
Chloroform	0.02		<0.001			
1,1,1-trichloroethane	—		<0.0005			
1,2-dichloroethane	1		<0.0005			
Carbon tetrachloride	0.13		<0.0005			
Benzene	4		<0.0004			
Methyl-tert-butylether (MTBE)	—		<0.004			
1,2-dichloropropane	—		<0.0005			
cis-1,3-dichloropropene	—		<0.001			

2016 Contaminated Sites Groundwater Monitoring Results and Guidelines

Station MW13-06

Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Aug	Sep 9/27/2016	Oct	Nov	Dec
trans-1,3-dichloropropene	—		<0.001			
Bromomethane	—		<0.001			
1,1,2-trichloroethane	—		<0.0005			
Trichloroethene	0.2		<0.0005			
Chlorodibromomethane	—		<0.001			
1,2-dibromoethane	—		<0.0002			
Tetrachloroethene	1.1		<0.0005			
Bromodichloromethane	—		<0.001			
Toluene	0.39		<0.0004			
Ethylbenzene	2		<0.0004			
m & p-Xylene	—		<0.0004			
Bromoform	—		<0.001			
Styrene	0.72		<0.0005			
o-Xylene	—		<0.0004			
Xylenes (Total)	—		<0.0004			
1,1,1,2-tetrachloroethane	—		<0.0005			
1,1,2,2-tetrachloroethane	—		<0.0005			
1,2-dichlorobenzene	—		<0.0005			
1,3-dichlorobenzene	1.5		<0.0005			
1,4-dichlorobenzene	0.26		<0.0005			
Chlorobenzene	0.013		<0.0005			
1,2,3-trichlorobenzene	0.08		<0.002			
1,2,4-trichlorobenzene	0.24		<0.002			
Hexachlorobutadiene	0.001		<0.0005			
VH C6-C10	15		<0.3			

NOTE:
Values shaded yellow exceed the Yukon regulati
Blanks and #N/A no data available

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month Hardness (as CaCO3 mg/L)	Aug	Sep 334	Oct	Nov	Dec
	Nitrite		0.2			
	Ammonia		18.4			
	Cadmium		0.0006			
	Copper		0.09			
	Lead		0.16			
	Nickel		1.5			
	Silver		0.015			
	Zinc		2.4			

Station MW13-13

Location Landfill
Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Jan	Feb	Mar	Apr	May	Jun 6/12/2016	Jul
pH - Lab	—						8.04	
pH - Field	—						7.83	
Conductivity (µS/cm) - Lab	—						225	
Conductivity (µS/cm) - Field	—						143.4	
Temperature (°C) - Field	—						2.1	
Turbidity (NTU) - Lab	—						2.52	
Turbidity (NTU) - Field	—							
Piezometric Depth (m)	—						5.37	
TSS	—							
TDS	—						158	
Alkalinity, Total (as CaCO3)	—						79.7	
Sulphate (SO4)	1000						27.8	
Hardness (as CaCO3)	—						115	
Bromide (Br)	—						<0.01	
Chloride (Cl)	—						1	
Total Cyanide (SAD-CN)	—							
WAD Cyanide	0.05							
Nitrate as N (NO3)	400						0.278	
Nitrite as N (NO2)	Cl dep						<0.005	
Nitrate plus Nitrite (N)	400						0.278	
Ammonia, Total (NH3)	pH dep						0.034	
Colour, True (Col. units)	—						<5	
DOC	—						1.93	
Aluminum (Al)-dissolved	—						0.013	
Antimony (Sb)-dissolved	0.2						0.000185	
Arsenic (As)-dissolved	0.05						0.000521	
Barium (Ba)-dissolved	10						0.0172	
Beryllium (Be)-dissolved	0.053						<0.00001	
Bismuth (Bi)-dissolved	—						<5E-06	
Boron (B)-dissolved	—						<0.01	
Cadmium (Cd)-dissolved	hardness dep						0.00232	
Calcium (Ca)-dissolved	—						43.4	
Chromium (Cr)-dissolved	0.01						0.00025	
Cobalt (Co)-dissolved	0.009						9.22E-05	
Copper (Cu)-dissolved	hardness dep						0.00352	
Iron (Fe)-dissolved	—						0.0083	
Lead (Pb)-dissolved	hardness dep						0.00119	
Lithium (Li)-dissolved	—						0.00099	
Magnesium (Mg)-dissolved	—						1.68	
Manganese (Mn)-dissolved	—						0.00252	
Mercury (Hg)-dissolved	0.001						<2E-06	
Molybdenum (Mo)-dissolved	10						0.000201	
Nickel (Ni)-dissolved	hardness dep						0.00064	
Potassium (K)-dissolved	—						0.926	
Selenium (Se)-dissolved	0.01						0.000724	
Silicon (Si)-dissolved	—						2.06	
Silver (Ag)-dissolved	hardness dep						<5E-06	
Sodium (Na)-dissolved	—						1.93	
Strontium (Sr)-dissolved	—						0.0678	
Thallium (Tl)-dissolved	0.003						4.1E-06	
Tin (Sn)-dissolved	—						0.00038	
Titanium (Ti)-dissolved	1						<0.0005	
Uranium (U)-dissolved	3						0.000304	
Vanadium (V)-dissolved	—						<0.0002	
Zinc (Zn)-dissolved	hardness dep						0.0938	

Station MW13-13
Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Jan	Feb	Mar	Apr	May	Jun 6/12/2016	Jul
Zirconium (Zr)-dissolved	—						<0.0001	
Polycyclic Aromatics								
Low Molecular Weight PAH`s	—						<0.00024	
High Molecular Weight PAH`s	—						<0.00005	
Total PAH	—						<0.00024	
Naphthalene	0.01	0.01					<0.0001	
2-Methylnaphthalene	—						<0.0001	
Quinoline	0.034	0.034					<0.00024	
Acenaphthylene	—						<0.00005	
Acenaphthene	0.06	0.06					<0.00005	
Fluorene	0.12	0.12					<0.00005	
Phenanthrene	0.003	0.003					<0.00005	
Anthracene	0.001	0.001					<0.00001	
Acridine	0.0005	0.0005					<0.00005	
Fluoranthene	0.12	0.002					<0.00002	
Pyrene	0.0002	0.0002					<0.00002	
Benzo(a)anthracene	0.001	0.001					<0.00001	
Chrysene	—	0.001					<0.00005	
Benzo(b&j)fluoranthene	—						<0.00005	
Benzo(k)fluoranthene	—						<0.00005	
Benzo(a)pyrene	0.0001	0.0001					<9E-06	
Indeno(1,2,3-cd)pyrene	—						<0.00005	
Dibenz(a,h)anthracene	—						<0.00005	
Benzo(g,h,i)perylene	—						<0.00005	
Calculated Parameters								
LEPH (C10-C19 less PAH)	0.5						<0.2	
HEPH (C19-C32 less PAH)	—						<0.2	
Ext. Pet. Hydrocarbon								
EPH (C10-C19)	5						<0.2	
EPH (C19-C32)	—						<0.2	
Volatiles								
VPH (VH6 to 10 - BTEX)	15						<0.3	
Chloromethane	—						<0.001	
Vinyl chloride	—						<0.0005	
Chloroethane	—						<0.001	
Trichlorofluoromethane	—						<0.004	
1,1,2Trichloro-1,2,2Trifluoroetha	0.2						<0.002	
Dichlorodifluoromethane	—						<0.002	
1,1-dichloroethene	—						<0.0005	
Dichloromethane	0.98						<0.002	
trans-1,2-dichloroethene	—						<0.001	
1,1-dichloroethane	—						<0.0005	
cis-1,2-dichloroethene	—						<0.001	
Chloroform	0.02						<0.001	
1,1,1-trichloroethane	—						<0.0005	
1,2-dichloroethane	1						<0.0005	
Carbon tetrachloride	0.13						<0.0005	
Benzene	4						<0.0004	
Methyl-tert-butylether (MTBE)	—						<0.004	
1,2-dichloropropane	—						<0.0005	
cis-1,3-dichloropropene	—						<0.001	

Station MW13-13
Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Jan	Feb	Mar	Apr	May	Jun 6/12/2016	Jul
trans-1,3-dichloropropene	—						<0.001	
Bromomethane	—						<0.001	
1,1,2-trichloroethane	—						<0.0005	
Trichloroethene	0.2						<0.0005	
Chlorodibromomethane	—						<0.001	
1,2-dibromoethane	—						<0.0002	
Tetrachloroethene	1.1						<0.0005	
Bromodichloromethane	—						<0.001	
Toluene	0.39						<0.0004	
Ethylbenzene	2						<0.0004	
m & p-Xylene	—						<0.0004	
Bromoform	—						<0.001	
Styrene	0.72						<0.0005	
o-Xylene	—						<0.0004	
Xylenes (Total)	—						<0.0004	
1,1,1,2-tetrachloroethane	—						<0.0005	
1,1,2,2-tetrachloroethane	—						<0.0005	
1,2-dichlorobenzene	—						<0.0005	
1,3-dichlorobenzene	1.5						<0.0005	
1,4-dichlorobenzene	0.26						<0.0005	
Chlorobenzene	0.013						<0.0005	
1,2,3-trichlorobenzene	0.08						<0.002	
1,2,4-trichlorobenzene	0.24						<0.002	
Hexachlorobutadiene	0.001						<0.0005	
VH C6-C10	15						<0.3	

NOTE:
Values shaded yellow exceed the Yukon regulations for freshwater aquatic life.
Blanks and #N/A no data available

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month Hardness (as CaCO3 mg/L)	Jan	Feb	Mar	Apr	May	Jun 115	Jul
	Nitrite						0.2	
	Ammonia						11.3	
	Cadmium						0.0005	
	Copper						0.05	
	Lead						0.06	
	Nickel						0.65	
	Silver						0.015	
	Zinc						0.9	

2016 Contaminated Sites Groundwater Monitoring Results and Guidelines

Station MW13-13

Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Aug	Sep 9/27/2016	Oct	Nov	Dec
pH - Lab	—		7.96			
pH - Field	—		7.58			
Conductivity (µS/cm) - Lab	—		325			
Conductivity (µS/cm) - Field	—		304			
Temperature (°C) - Field	—		4.1			
Turbidity (NTU) - Lab	—					
Turbidity (NTU) - Field	—					
Piezometric Depth (m)	—		8.34			
TSS	—					
TDS	—		188			
Alkalinity, Total (as CaCO3)	—		86.1			
Sulphate (SO4)	1000		71			
Hardness (as CaCO3)	—		154			
Bromide (Br)	—					
Chloride (Cl)	—		<1			
Total Cyanide (SAD-CN)	—					
WAD Cyanide	0.05					
Nitrate as N (NO3)	400		0.935			
Nitrite as N (NO2)	Cl dep		<0.005			
Nitrate plus Nitrite (N)	400		0.935			
Ammonia, Total (NH3)	pH dep		0.16			
Colour, True (Col. units)	—					
DOC	—		2.09			
Aluminum (Al)-dissolved	—		0.0031			
Antimony (Sb)-dissolved	0.2		0.000129			
Arsenic (As)-dissolved	0.05		0.000367			
Barium (Ba)-dissolved	10		0.0179			
Beryllium (Be)-dissolved	0.053		<0.00001			
Bismuth (Bi)-dissolved	—		<5E-06			
Boron (B)-dissolved	—		<0.01			
Cadmium (Cd)-dissolved	hardness dep		0.00279			
Calcium (Ca)-dissolved	—		58			
Chromium (Cr)-dissolved	0.01		0.00083			
Cobalt (Co)-dissolved	0.009		0.000027			
Copper (Cu)-dissolved	hardness dep		0.00049			
Iron (Fe)-dissolved	—		0.0023			
Lead (Pb)-dissolved	hardness dep		0.000629			
Lithium (Li)-dissolved	—		0.00112			
Magnesium (Mg)-dissolved	—		2.15			
Manganese (Mn)-dissolved	—		0.00036			
Mercury (Hg)-dissolved	0.001		<2E-06			
Molybdenum (Mo)-dissolved	10		0.000278			
Nickel (Ni)-dissolved	hardness dep		0.00031			
Potassium (K)-dissolved	—		0.602			
Selenium (Se)-dissolved	0.01		0.00134			
Silicon (Si)-dissolved	—		2.22			
Silver (Ag)-dissolved	hardness dep		<5E-06			
Sodium (Na)-dissolved	—		0.686			
Strontium (Sr)-dissolved	—		0.0969			
Thallium (Tl)-dissolved	0.003		0.000002			
Tin (Sn)-dissolved	—		<0.0002			
Titanium (Ti)-dissolved	1		<0.0005			
Uranium (U)-dissolved	3		0.000472			
Vanadium (V)-dissolved	—		<0.0002			
Zinc (Zn)-dissolved	hardness dep		0.0855			

Station **MW13-13**

Location **Landfill Monitoring**

Parameter (mg/L unless otherwise noted)	CSR	Aug	Sep 9/27/2016	Oct	Nov	Dec
Zirconium (Zr)-dissolved	—		<0.0001			
Polycyclic Aromatics						
Low Molecular Weight PAH`s	—		<0.00024			
High Molecular Weight PAH`s	—		<0.00005			
Total PAH	—		<0.00024			
Naphthalene	0.01		<0.0001			
2-Methylnaphthalene	—		<0.0001			
Quinoline	0.034		<0.00024			
Acenaphthylene	—		<0.00005			
Acenaphthene	0.06		<0.00005			
Fluorene	0.12		<0.00005			
Phenanthrene	0.003		<0.00005			
Anthracene	0.001		<0.00001			
Acridine	0.0005		<0.00005			
Fluoranthene	0.12		<0.00002			
Pyrene	0.0002		<0.00002			
Benzo(a)anthracene	0.001		<0.00001			
Chrysene	—		<0.00005			
Benzo(b&j)fluoranthene	—		<0.00005			
Benzo(k)fluoranthene	—		<0.00005			
Benzo(a)pyrene	0.0001		<9E-06			
Indeno(1,2,3-cd)pyrene	—		<0.00005			
Dibenz(a,h)anthracene	—		<0.00005			
Benzo(g,h,i)perylene	—		<0.00005			
Calculated Parameters						
LEPH (C10-C19 less PAH)	0.5		<0.2			
HEPH (C19-C32 less PAH)	—		<0.2			
Ext. Pet. Hydrocarbon						
EPH (C10-C19)	5		<0.2			
EPH (C19-C32)	—		<0.2			
Volatiles						
VPH (VH6 to 10 - BTEX)	15		<0.3			
Chloromethane	—		<0.001			
Vinyl chloride	—		<0.0005			
Chloroethane	—		<0.001			
Trichlorofluoromethane	—		<0.004			
1,1,2Trichloro-1,2,2Trifluoroetha	0.2		<0.002			
Dichlorodifluoromethane	—		<0.002			
1,1-dichloroethene	—		<0.0005			
Dichloromethane	0.98		<0.002			
trans-1,2-dichloroethene	—		<0.001			
1,1-dichloroethane	—		<0.0005			
cis-1,2-dichloroethene	—		<0.001			
Chloroform	0.02		<0.001			
1,1,1-trichloroethane	—		<0.0005			
1,2-dichloroethane	1		<0.0005			
Carbon tetrachloride	0.13		<0.0005			
Benzene	4		<0.0004			
Methyl-tert-butylether (MTBE)	—		<0.004			
1,2-dichloropropane	—		<0.0005			
cis-1,3-dichloropropene	—		<0.001			

Station **MW13-13**

Location **Landfill Monitoring**

Parameter (mg/L unless otherwise noted)	CSR	Aug	Sep 9/27/2016	Oct	Nov	Dec
trans-1,3-dichloropropene	—		<0.001			
Bromomethane	—		<0.001			
1,1,2-trichloroethane	—		<0.0005			
Trichloroethene	0.2		<0.0005			
Chlorodibromomethane	—		<0.001			
1,2-dibromoethane	—		<0.0002			
Tetrachloroethene	1.1		<0.0005			
Bromodichloromethane	—		<0.001			
Toluene	0.39		0.0024			
Ethylbenzene	2		<0.0004			
m & p-Xylene	—		<0.0004			
Bromoform	—		<0.001			
Styrene	0.72		<0.0005			
o-Xylene	—		<0.0004			
Xylenes (Total)	—		<0.0004			
1,1,1,2-tetrachloroethane	—		<0.0005			
1,1,2,2-tetrachloroethane	—		<0.0005			
1,2-dichlorobenzene	—		<0.0005			
1,3-dichlorobenzene	1.5		<0.0005			
1,4-dichlorobenzene	0.26		<0.0005			
Chlorobenzene	0.013		<0.0005			
1,2,3-trichlorobenzene	0.08		<0.002			
1,2,4-trichlorobenzene	0.24		<0.002			
Hexachlorobutadiene	0.001		<0.0005			
VH C6-C10	15		<0.3			

NOTE:

Values shaded yellow exceed the Yukon regulati

Blanks and #N/A no data available

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month Hardness (as CaCO3 mg/L)	Aug	Sep 154	Oct	Nov	Dec
	Nitrite		0.2			
	Ammonia		11.3			
	Cadmium		0.0006			
	Copper		0.07			
	Lead		0.06			
	Nickel		1.1			
	Silver		0.015			
	Zinc		0.9			

Station MW13-04
Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Jan	Feb	Mar	Apr	May	Jun	Jul
pH - Lab	—							
pH - Field	—							
Conductivity (µS/cm) - Lab	—							
Conductivity (µS/cm) - Field	—							
Temperature (°C) - Field	—							
Turbidity (NTU) - Lab	—							
Turbidity (NTU) - Field	—							
Piezometric Depth (m)	—							
TSS	—							
TDS	—							
Alkalinity, Total (as CaCO3)	—							
Sulphate (SO4)	1000							
Hardness (as CaCO3)	—							
Bromide (Br)	—							
Chloride (Cl)	—							
Total Cyanide (SAD-CN)	—							
WAD Cyanide	0.05							
Nitrate as N (NO3)	400							
Nitrite as N (NO2)	Cl dep							
Nitrate plus Nitrite (N)	400							
Ammonia, Total (NH3)	pH dep							
Colour, True (Col. units)	—							
DOC	—							
Aluminum (Al)-dissolved	—							
Antimony (Sb)-dissolved	0.2							
Arsenic (As)-dissolved	0.05							
Barium (Ba)-dissolved	10							
Beryllium (Be)-dissolved	0.053							
Bismuth (Bi)-dissolved	—							
Boron (B)-dissolved	—							
Cadmium (Cd)-dissolved	hardness dep							
Calcium (Ca)-dissolved	—							
Chromium (Cr)-dissolved	0.01							
Cobalt (Co)-dissolved	0.009							
Copper (Cu)-dissolved	hardness dep							
Iron (Fe)-dissolved	—							
Lead (Pb)-dissolved	hardness dep							
Lithium (Li)-dissolved	—							
Magnesium (Mg)-dissolved	—							
Manganese (Mn)-dissolved	—							
Mercury (Hg)-dissolved	0.001							
Molybdenum (Mo)-dissolved	10							
Nickel (Ni)-dissolved	hardness dep							
Potassium (K)-dissolved	—							
Selenium (Se)-dissolved	0.01							
Silicon (Si)-dissolved	—							
Silver (Ag)-dissolved	hardness dep							
Sodium (Na)-dissolved	—							
Strontium (Sr)-dissolved	—							
Thallium (Tl)-dissolved	0.003							
Tin (Sn)-dissolved	—							
Titanium (Ti)-dissolved	1							
Uranium (U)-dissolved	3							
Vanadium (V)-dissolved	—							
Zinc (Zn)-dissolved	hardness dep							

Station MW13-04
Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Jan	Feb	Mar	Apr	May	Jun	Jul
Zirconium (Zr)-dissolved	—							
Polycyclic Aromatics								
Low Molecular Weight PAH`s	—							
High Molecular Weight PAH`s	—							
Total PAH	—							
Naphthalene	0.01	0.01						
2-Methylnaphthalene	—							
Quinoline	0.034	0.034						
Acenaphthylene	—							
Acenaphthene	0.06	0.06						
Fluorene	0.12	0.12						
Phenanthrene	0.003	0.003						
Anthracene	0.001	0.001						
Acridine	0.0005	0.0005						
Fluoranthene	0.12	0.002						
Pyrene	0.0002	0.0002						
Benzo(a)anthracene	0.001	0.001						
Chrysene	—	0.001						
Benzo(b&j)fluoranthene	—							
Benzo(k)fluoranthene	—							
Benzo(a)pyrene	0.0001	0.0001						
Indeno(1,2,3-cd)pyrene	—							
Dibenz(a,h)anthracene	—							
Benzo(g,h,i)perylene	—							
Calculated Parameters								
LEPH (C10-C19 less PAH)	0.5							
HEPH (C19-C32 less PAH)	—							
Ext. Pet. Hydrocarbon								
EPH (C10-C19)	5							
EPH (C19-C32)	—							
Volatiles								
VPH (VH6 to 10 - BTEX)	15							
Chloromethane	—							
Vinyl chloride	—							
Chloroethane	—							
Trichlorofluoromethane	—							
1,1,2Trichloro-1,2,2Trifluoroetha	0.2							
Dichlorodifluoromethane	—							
1,1-dichloroethene	—							
Dichloromethane	0.98							
trans-1,2-dichloroethene	—							
1,1-dichloroethane	—							
cis-1,2-dichloroethene	—							
Chloroform	0.02							
1,1,1-trichloroethane	—							
1,2-dichloroethane	1							
Carbon tetrachloride	0.13							
Benzene	4							
Methyl-tert-butylether (MTBE)	—							
1,2-dichloropropane	—							
cis-1,3-dichloropropene	—							

Station MW13-04
Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Jan	Feb	Mar	Apr	May	Jun	Jul
trans-1,3-dichloropropene	—							
Bromomethane	—							
1,1,2-trichloroethane	—							
Trichloroethene	0.2							
Chlorodibromomethane	—							
1,2-dibromoethane	—							
Tetrachloroethene	1.1							
Bromodichloromethane	—							
Toluene	0.39							
Ethylbenzene	2							
m & p-Xylene	—							
Bromoform	—							
Styrene	0.72							
o-Xylene	—							
Xylenes (Total)	—							
1,1,1,2-tetrachloroethane	—							
1,1,2,2-tetrachloroethane	—							
1,2-dichlorobenzene	—							
1,3-dichlorobenzene	1.5							
1,4-dichlorobenzene	0.26							
Chlorobenzene	0.013							
1,2,3-trichlorobenzene	0.08							
1,2,4-trichlorobenzene	0.24							
Hexachlorobutadiene	0.001							
VH C6-C10	15							

NOTE:
Values shaded yellow exceed the Yukon regulations for freshwater aquatic life.
Blanks and #N/A no data available

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month Hardness (as CaCO3 mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul
	Nitrite **Ammonia** **Cadmium** **Copper** **Lead** **Nickel** **Silver** **Zinc**							

Station MW13-04

Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Aug	Sep 9/29/2016	Oct	Nov	Dec
pH - Lab	—		7.97			
pH - Field	—		7.62			
Conductivity (µS/cm) - Lab	—		310			
Conductivity (µS/cm) - Field	—		322			
Temperature (°C) - Field	—		1.8			
Turbidity (NTU) - Lab	—					
Turbidity (NTU) - Field	—					
Piezometric Depth (m)	—		20			
TSS	—					
TDS	—		170			
Alkalinity, Total (as CaCO3)	—		155			
Sulphate (SO4)	1000		5.1			
Hardness (as CaCO3)	—		158			
Bromide (Br)	—					
Chloride (Cl)	—		2.6			
Total Cyanide (SAD-CN)	—					
WAD Cyanide	0.05					
Nitrate as N (NO3)	400		0.736			
Nitrite as N (NO2)	Cl dep		<0.005			
Nitrate plus Nitrite (N)	400		0.736			
Ammonia, Total (NH3)	pH dep		0.0077			
Colour, True (Col. units)	—					
DOC	—		3.25			
Aluminum (Al)-dissolved	—		0.0032			
Antimony (Sb)-dissolved	0.2		0.000222			
Arsenic (As)-dissolved	0.05		0.000713			
Barium (Ba)-dissolved	10		0.0355			
Beryllium (Be)-dissolved	0.053		<0.00001			
Bismuth (Bi)-dissolved	—		<5E-06			
Boron (B)-dissolved	—		<0.01			
Cadmium (Cd)-dissolved	hardness dep		0.000492			
Calcium (Ca)-dissolved	—		57.6			
Chromium (Cr)-dissolved	0.01		0.00027			
Cobalt (Co)-dissolved	0.009		0.000013			
Copper (Cu)-dissolved	hardness dep		0.00042			
Iron (Fe)-dissolved	—		0.0017			
Lead (Pb)-dissolved	hardness dep		0.000159			
Lithium (Li)-dissolved	—		0.00127			
Magnesium (Mg)-dissolved	—		3.39			
Manganese (Mn)-dissolved	—		0.00062			
Mercury (Hg)-dissolved	0.001		<2E-06			
Molybdenum (Mo)-dissolved	10		0.000561			
Nickel (Ni)-dissolved	hardness dep		0.00029			
Potassium (K)-dissolved	—		0.43			
Selenium (Se)-dissolved	0.01		0.000955			
Silicon (Si)-dissolved	—		3.59			
Silver (Ag)-dissolved	hardness dep		<5E-06			
Sodium (Na)-dissolved	—		0.64			
Strontium (Sr)-dissolved	—		0.141			
Thallium (Tl)-dissolved	0.003		<2E-06			
Tin (Sn)-dissolved	—		<0.0002			
Titanium (Ti)-dissolved	1		<0.0005			
Uranium (U)-dissolved	3		0.000655			
Vanadium (V)-dissolved	—		<0.0002			
Zinc (Zn)-dissolved	hardness dep		0.013			

Station **MW13-04**

Location **Landfill Monitoring**

Parameter (mg/L unless otherwise noted)	CSR	Aug	Sep 9/29/2016	Oct	Nov	Dec
Zirconium (Zr)-dissolved	—		<0.0001			
Polycyclic Aromatics						
Low Molecular Weight PAH`s	—		<0.00024			
High Molecular Weight PAH`s	—		<0.00005			
Total PAH	—		<0.00024			
Naphthalene	0.01		<0.0001			
2-Methylnaphthalene	—		<0.0001			
Quinoline	0.034		<0.00024			
Acenaphthylene	—		<0.00005			
Acenaphthene	0.06		<0.00005			
Fluorene	0.12		<0.00005			
Phenanthrene	0.003		<0.00005			
Anthracene	0.001		<0.00001			
Acridine	0.0005		<0.00005			
Fluoranthene	0.12		<0.00002			
Pyrene	0.0002		<0.00002			
Benzo(a)anthracene	0.001		<0.00001			
Chrysene	—		<0.00005			
Benzo(b&j)fluoranthene	—		<0.00005			
Benzo(k)fluoranthene	—		<0.00005			
Benzo(a)pyrene	0.0001		<9E-06			
Indeno(1,2,3-cd)pyrene	—		<0.00005			
Dibenz(a,h)anthracene	—		<0.00005			
Benzo(g,h,i)perylene	—		<0.00005			
Calculated Parameters						
LEPH (C10-C19 less PAH)	0.5		<0.2			
HEPH (C19-C32 less PAH)	—		<0.2			
Ext. Pet. Hydrocarbon						
EPH (C10-C19)	5		<0.2			
EPH (C19-C32)	—		<0.2			
Volatiles						
VPH (VH6 to 10 - BTEX)	15		<0.3			
Chloromethane	—		<0.001			
Vinyl chloride	—		<0.0005			
Chloroethane	—		<0.001			
Trichlorofluoromethane	—		<0.004			
1,1,2Trichloro-1,2,2Trifluoroetha	0.2		<0.002			
Dichlorodifluoromethane	—		<0.002			
1,1-dichloroethene	—		<0.0005			
Dichloromethane	0.98		<0.002			
trans-1,2-dichloroethene	—		<0.001			
1,1-dichloroethane	—		<0.0005			
cis-1,2-dichloroethene	—		<0.001			
Chloroform	0.02		<0.001			
1,1,1-trichloroethane	—		<0.0005			
1,2-dichloroethane	1		<0.0005			
Carbon tetrachloride	0.13		<0.0005			
Benzene	4		<0.0004			
Methyl-tert-butylether (MTBE)	—		<0.004			
1,2-dichloropropane	—		<0.0005			
cis-1,3-dichloropropene	—		<0.001			

Station **MW13-04**

Location **Landfill Monitoring**

Parameter (mg/L unless otherwise noted)	CSR	Aug	Sep 9/29/2016	Oct	Nov	Dec
trans-1,3-dichloropropene	—		<0.001			
Bromomethane	—		<0.001			
1,1,2-trichloroethane	—		<0.0005			
Trichloroethene	0.2		<0.0005			
Chlorodibromomethane	—		<0.001			
1,2-dibromoethane	—		<0.0002			
Tetrachloroethene	1.1		<0.0005			
Bromodichloromethane	—		<0.001			
Toluene	0.39		<0.0004			
Ethylbenzene	2		<0.0004			
m & p-Xylene	—		<0.0004			
Bromoform	—		<0.001			
Styrene	0.72		<0.0005			
o-Xylene	—		<0.0004			
Xylenes (Total)	—		<0.0004			
1,1,1,2-tetrachloroethane	—		<0.0005			
1,1,2,2-tetrachloroethane	—		<0.0005			
1,2-dichlorobenzene	—		<0.0005			
1,3-dichlorobenzene	1.5		<0.0005			
1,4-dichlorobenzene	0.26		<0.0005			
Chlorobenzene	0.013		<0.0005			
1,2,3-trichlorobenzene	0.08		<0.002			
1,2,4-trichlorobenzene	0.24		<0.002			
Hexachlorobutadiene	0.001		<0.0005			
VH C6-C10	15		<0.3			

NOTE:

Values shaded yellow exceed the Yukon regulati

Blanks and #N/A no data available

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month	Aug	Sep	Oct	Nov	Dec
	Hardness (as CaCO3 mg/L)		**158**			
	Nitrite		0.4			
	Ammonia		11.3			
	Cadmium		0.0006			
	Copper		0.07			
	Lead		0.06			
	Nickel		1.1			
	Silver		0.015			
	Zinc		0.9			

Station MW13-05
Location Landfill
Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Jan	Feb	Mar	Apr	May	Jun	Jul
pH - Lab	—							
pH - Field	—							
Conductivity (µS/cm) - Lab	—							
Conductivity (µS/cm) - Field	—							
Temperature (°C) - Field	—							
Turbidity (NTU) - Lab	—							
Turbidity (NTU) - Field	—							
Piezometric Depth (m)	—							
TSS	—							
TDS	—							
Alkalinity, Total (as CaCO3)	—							
Sulphate (SO4)	1000							
Hardness (as CaCO3)	—							
Bromide (Br)	—							
Chloride (Cl)	—							
Total Cyanide (SAD-CN)	—							
WAD Cyanide	0.05							
Nitrate as N (NO3)	400							
Nitrite as N (NO2)	Cl dep							
Nitrate plus Nitrite (N)	400							
Ammonia, Total (NH3)	pH dep							
Colour, True (Col. units)	—							
DOC	—							
Aluminum (Al)-dissolved	—							
Antimony (Sb)-dissolved	0.2							
Arsenic (As)-dissolved	0.05							
Barium (Ba)-dissolved	10							
Beryllium (Be)-dissolved	0.053							
Bismuth (Bi)-dissolved	—							
Boron (B)-dissolved	—							
Cadmium (Cd)-dissolved	hardness dep							
Calcium (Ca)-dissolved	—							
Chromium (Cr)-dissolved	0.01							
Cobalt (Co)-dissolved	0.009							
Copper (Cu)-dissolved	hardness dep							
Iron (Fe)-dissolved	—							
Lead (Pb)-dissolved	hardness dep							
Lithium (Li)-dissolved	—							
Magnesium (Mg)-dissolved	—							
Manganese (Mn)-dissolved	—							
Mercury (Hg)-dissolved	0.001							
Molybdenum (Mo)-dissolved	10							
Nickel (Ni)-dissolved	hardness dep							
Potassium (K)-dissolved	—							
Selenium (Se)-dissolved	0.01							
Silicon (Si)-dissolved	—							
Silver (Ag)-dissolved	hardness dep							
Sodium (Na)-dissolved	—							
Strontium (Sr)-dissolved	—							
Thallium (Tl)-dissolved	0.003							
Tin (Sn)-dissolved	—							
Titanium (Ti)-dissolved	1							
Uranium (U)-dissolved	3							
Vanadium (V)-dissolved	—							
Zinc (Zn)-dissolved	hardness dep							

Station MW13-05
Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Jan	Feb	Mar	Apr	May	Jun	Jul
Zirconium (Zr)-dissolved	—							
Polycyclic Aromatics								
Low Molecular Weight PAH`s	—							
High Molecular Weight PAH`s	—							
Total PAH	—							
Naphthalene	0.01							
2-Methylnaphthalene	—							
Quinoline	0.034							
Acenaphthylene	—							
Acenaphthene	0.06							
Fluorene	0.12							
Phenanthrene	0.003							
Anthracene	0.001							
Acridine	0.0005							
Fluoranthene	0.12							
Pyrene	0.0002							
Benzo(a)anthracene	0.001							
Chrysene	—							
Benzo(b&j)fluoranthene	—							
Benzo(k)fluoranthene	—							
Benzo(a)pyrene	0.0001							
Indeno(1,2,3-cd)pyrene	—							
Dibenz(a,h)anthracene	—							
Benzo(g,h,i)perylene	—							
Calculated Parameters								
LEPH (C10-C19 less PAH)	0.5							
HEPH (C19-C32 less PAH)	—							
Ext. Pet. Hydrocarbon								
EPH (C10-C19)	5							
EPH (C19-C32)	—							
Volatiles								
VPH (VH6 to 10 - BTEX)	15							
Chloromethane	—							
Vinyl chloride	—							
Chloroethane	—							
Trichlorofluoromethane	—							
1,1,2Trichloro-1,2,2Trifluoroetha	0.2							
Dichlorodifluoromethane	—							
1,1-dichloroethene	—							
Dichloromethane	0.98							
trans-1,2-dichloroethene	—							
1,1-dichloroethane	—							
cis-1,2-dichloroethene	—							
Chloroform	0.02							
1,1,1-trichloroethane	—							
1,2-dichloroethane	1							
Carbon tetrachloride	0.13							
Benzene	4							
Methyl-tert-butylether (MTBE)	—							
1,2-dichloropropane	—							
cis-1,3-dichloropropene	—							

Station MW13-05
Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Jan	Feb	Mar	Apr	May	Jun	Jul
trans-1,3-dichloropropene	—							
Bromomethane	—							
1,1,2-trichloroethane	—							
Trichloroethene	0.2							
Chlorodibromomethane	—							
1,2-dibromoethane	—							
Tetrachloroethene	1.1							
Bromodichloromethane	—							
Toluene	0.39							
Ethylbenzene	2							
m & p-Xylene	—							
Bromoform	—							
Styrene	0.72							
o-Xylene	—							
Xylenes (Total)	—							
1,1,1,2-tetrachloroethane	—							
1,1,2,2-tetrachloroethane	—							
1,2-dichlorobenzene	—							
1,3-dichlorobenzene	1.5							
1,4-dichlorobenzene	0.26							
Chlorobenzene	0.013							
1,2,3-trichlorobenzene	0.08							
1,2,4-trichlorobenzene	0.24							
Hexachlorobutadiene	0.001							
VH C6-C10	15							

NOTE:
Values shaded yellow exceed the Yukon regulations for freshwater aquatic life.
Blanks and #N/A no data available

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month Hardness (as CaCO3 mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul
	Nitrite **Ammonia** **Cadmium** **Copper** **Lead** **Nickel** **Silver** **Zinc**							

Station MW13-05
Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Aug	Sep	Oct	Nov	Dec
pH - Lab	—					
pH - Field	—					
Conductivity (µS/cm) - Lab	—					
Conductivity (µS/cm) - Field	—					
Temperature (°C) - Field	—					
Turbidity (NTU) - Lab	—					
Turbidity (NTU) - Field	—					
Piezometric Depth (m)	—					
TSS	—					
TDS	—					
Alkalinity, Total (as CaCO3)	—					
Sulphate (SO4)	1000					
Hardness (as CaCO3)	—					
Bromide (Br)	—					
Chloride (Cl)	—					
Total Cyanide (SAD-CN)	—					
WAD Cyanide	0.05					
Nitrate as N (NO3)	400					
Nitrite as N (NO2)	Cl dep					
Nitrate plus Nitrite (N)	400					
Ammonia, Total (NH3)	pH dep					
Colour, True (Col. units)	—					
DOC	—					
Aluminum (Al)-dissolved	—					
Antimony (Sb)-dissolved	0.2					
Arsenic (As)-dissolved	0.05					
Barium (Ba)-dissolved	10					
Beryllium (Be)-dissolved	0.053					
Bismuth (Bi)-dissolved	—					
Boron (B)-dissolved	—					
Cadmium (Cd)-dissolved	hardness dep					
Calcium (Ca)-dissolved	—					
Chromium (Cr)-dissolved	0.01					
Cobalt (Co)-dissolved	0.009					
Copper (Cu)-dissolved	hardness dep					
Iron (Fe)-dissolved	—					
Lead (Pb)-dissolved	hardness dep					
Lithium (Li)-dissolved	—					
Magnesium (Mg)-dissolved	—					
Manganese (Mn)-dissolved	—					
Mercury (Hg)-dissolved	0.001					
Molybdenum (Mo)-dissolved	10					
Nickel (Ni)-dissolved	hardness dep					
Potassium (K)-dissolved	—					
Selenium (Se)-dissolved	0.01					
Silicon (Si)-dissolved	—					
Silver (Ag)-dissolved	hardness dep					
Sodium (Na)-dissolved	—					
Strontium (Sr)-dissolved	—					
Thallium (Tl)-dissolved	0.003					
Tin (Sn)-dissolved	—					
Titanium (Ti)-dissolved	1					
Uranium (U)-dissolved	3					
Vanadium (V)-dissolved	—					
Zinc (Zn)-dissolved	hardness dep					

Station MW13-05
Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Aug	Sep	Oct	Nov	Dec
Zirconium (Zr)-dissolved	—					
Polycyclic Aromatics						
Low Molecular Weight PAH`s	—					
High Molecular Weight PAH`s	—					
Total PAH	—					
Naphthalene	0.01					
2-Methylnaphthalene	—					
Quinoline	0.034					
Acenaphthylene	—					
Acenaphthene	0.06					
Fluorene	0.12					
Phenanthrene	0.003					
Anthracene	0.001					
Acridine	0.0005					
Fluoranthene	0.12					
Pyrene	0.0002					
Benzo(a)anthracene	0.001					
Chrysene	—					
Benzo(b&j)fluoranthene	—					
Benzo(k)fluoranthene	—					
Benzo(a)pyrene	0.0001					
Indeno(1,2,3-cd)pyrene	—					
Dibenz(a,h)anthracene	—					
Benzo(g,h,i)perylene	—					
Calculated Parameters						
LEPH (C10-C19 less PAH)	0.5					
HEPH (C19-C32 less PAH)	—					
Ext. Pet. Hydrocarbon						
EPH (C10-C19)	5					
EPH (C19-C32)	—					
Volatiles						
VPH (VH6 to 10 - BTEX)	15					
Chloromethane	—					
Vinyl chloride	—					
Chloroethane	—					
Trichlorofluoromethane	—					
1,1,2Trichloro-1,2,2Trifluoroetha	0.2					
Dichlorodifluoromethane	—					
1,1-dichloroethene	—					
Dichloromethane	0.98					
trans-1,2-dichloroethene	—					
1,1-dichloroethane	—					
cis-1,2-dichloroethene	—					
Chloroform	0.02					
1,1,1-trichloroethane	—					
1,2-dichloroethane	1					
Carbon tetrachloride	0.13					
Benzene	4					
Methyl-tert-butylether (MTBE)	—					
1,2-dichloropropane	—					
cis-1,3-dichloropropene	—					

Station **MW13-05**

Location **Landfill Monitoring**

Parameter (mg/L unless otherwise noted)	CSR	Aug	Sep	Oct	Nov	Dec
trans-1,3-dichloropropene	—					
Bromomethane	—					
1,1,2-trichloroethane	—					
Trichloroethene	0.2					
Chlorodibromomethane	—					
1,2-dibromoethane	—					
Tetrachloroethene	1.1					
Bromodichloromethane	—					
Toluene	0.39					
Ethylbenzene	2					
m & p-Xylene	—					
Bromoform	—					
Styrene	0.72					
o-Xylene	—					
Xylenes (Total)	—					
1,1,1,2-tetrachloroethane	—					
1,1,2,2-tetrachloroethane	—					
1,2-dichlorobenzene	—					
1,3-dichlorobenzene	1.5					
1,4-dichlorobenzene	0.26					
Chlorobenzene	0.013					
1,2,3-trichlorobenzene	0.08					
1,2,4-trichlorobenzene	0.24					
Hexachlorobutadiene	0.001					
VH C6-C10	15					

NOTE:

Values shaded yellow exceed the Yukon regulati

Blanks and #N/A no data available

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month Hardness (as CaCO3 mg/L)	Aug	Sep	Oct	Nov	Dec
	Nitrite **Ammonia** **Cadmium** **Copper** **Lead** **Nickel** **Silver** **Zinc**					

Station MW13-07
Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Jan	Feb	Mar	Apr	May	Jun	Jul
pH - Lab	—							
pH - Field	—							
Conductivity (µS/cm) - Lab	—							
Conductivity (µS/cm) - Field	—							
Temperature (°C) - Field	—							
Turbidity (NTU) - Lab	—							
Turbidity (NTU) - Field	—							
Piezometric Depth (m)	—							
TSS	—							
TDS	—							
Alkalinity, Total (as CaCO3)	—							
Sulphate (SO4)	1000							
Hardness (as CaCO3)	—							
Bromide (Br)	—							
Chloride (Cl)	—							
Total Cyanide (SAD-CN)	—							
WAD Cyanide	0.05							
Nitrate as N (NO3)	400							
Nitrite as N (NO2)	Cl dep							
Nitrate plus Nitrite (N)	400							
Ammonia, Total (NH3)	pH dep							
Colour, True (Col. units)	—							
DOC	—							
Aluminum (Al)-dissolved	—							
Antimony (Sb)-dissolved	0.2							
Arsenic (As)-dissolved	0.05							
Barium (Ba)-dissolved	10							
Beryllium (Be)-dissolved	0.053							
Bismuth (Bi)-dissolved	—							
Boron (B)-dissolved	—							
Cadmium (Cd)-dissolved	hardness dep							
Calcium (Ca)-dissolved	—							
Chromium (Cr)-dissolved	0.01							
Cobalt (Co)-dissolved	0.009							
Copper (Cu)-dissolved	hardness dep							
Iron (Fe)-dissolved	—							
Lead (Pb)-dissolved	hardness dep							
Lithium (Li)-dissolved	—							
Magnesium (Mg)-dissolved	—							
Manganese (Mn)-dissolved	—							
Mercury (Hg)-dissolved	0.001							
Molybdenum (Mo)-dissolved	10							
Nickel (Ni)-dissolved	hardness dep							
Potassium (K)-dissolved	—							
Selenium (Se)-dissolved	0.01							
Silicon (Si)-dissolved	—							
Silver (Ag)-dissolved	hardness dep							
Sodium (Na)-dissolved	—							
Strontium (Sr)-dissolved	—							
Thallium (Tl)-dissolved	0.003							
Tin (Sn)-dissolved	—							
Titanium (Ti)-dissolved	1							
Uranium (U)-dissolved	3							
Vanadium (V)-dissolved	—							
Zinc (Zn)-dissolved	hardness dep							

Station MW13-07
Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Jan	Feb	Mar	Apr	May	Jun	Jul
Zirconium (Zr)-dissolved	—							
Polycyclic Aromatics								
Low Molecular Weight PAH`s	—							
High Molecular Weight PAH`s	—							
Total PAH	—							
Naphthalene	0.01							
2-Methylnaphthalene	—							
Quinoline	0.034							
Acenaphthylene	—							
Acenaphthene	0.06							
Fluorene	0.12							
Phenanthrene	0.003							
Anthracene	0.001							
Acridine	0.0005							
Fluoranthene	0.12							
Pyrene	0.0002							
Benzo(a)anthracene	0.001							
Chrysene	—							
Benzo(b&j)fluoranthene	—							
Benzo(k)fluoranthene	—							
Benzo(a)pyrene	0.0001							
Indeno(1,2,3-cd)pyrene	—							
Dibenz(a,h)anthracene	—							
Benzo(g,h,i)perylene	—							
Calculated Parameters								
LEPH (C10-C19 less PAH)	0.5							
HEPH (C19-C32 less PAH)	—							
Ext. Pet. Hydrocarbon								
EPH (C10-C19)	5							
EPH (C19-C32)	—							
Volatiles								
VPH (VH6 to 10 - BTEX)	15							
Chloromethane	—							
Vinyl chloride	—							
Chloroethane	—							
Trichlorofluoromethane	—							
1,1,2Trichloro-1,2,2Trifluoroetha	0.2							
Dichlorodifluoromethane	—							
1,1-dichloroethene	—							
Dichloromethane	0.98							
trans-1,2-dichloroethene	—							
1,1-dichloroethane	—							
cis-1,2-dichloroethene	—							
Chloroform	0.02							
1,1,1-trichloroethane	—							
1,2-dichloroethane	1							
Carbon tetrachloride	0.13							
Benzene	4							
Methyl-tert-butylether (MTBE)	—							
1,2-dichloropropane	—							
cis-1,3-dichloropropene	—							

Station MW13-07
Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Jan	Feb	Mar	Apr	May	Jun	Jul
trans-1,3-dichloropropene	—							
Bromomethane	—							
1,1,2-trichloroethane	—							
Trichloroethene	0.2							
Chlorodibromomethane	—							
1,2-dibromoethane	—							
Tetrachloroethene	1.1							
Bromodichloromethane	—							
Toluene	0.39							
Ethylbenzene	2							
m & p-Xylene	—							
Bromoform	—							
Styrene	0.72							
o-Xylene	—							
Xylenes (Total)	—							
1,1,1,2-tetrachloroethane	—							
1,1,2,2-tetrachloroethane	—							
1,2-dichlorobenzene	—							
1,3-dichlorobenzene	1.5							
1,4-dichlorobenzene	0.26							
Chlorobenzene	0.013							
1,2,3-trichlorobenzene	0.08							
1,2,4-trichlorobenzene	0.24							
Hexachlorobutadiene	0.001							
VH C6-C10	15							

NOTE:
Values shaded yellow exceed the Yukon regulations for freshwater aquatic life.
Blanks and #N/A no data available

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month Hardness (as CaCO3 mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul
	Nitrite **Ammonia** **Cadmium** **Copper** **Lead** **Nickel** **Silver** **Zinc**							

Station MW13-07

Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Aug	Sep 9/28/2016	Oct	Nov	Dec
pH - Lab	—		7.75			
pH - Field	—		7.35			
Conductivity (µS/cm) - Lab	—		514			
Conductivity (µS/cm) - Field	—		495			
Temperature (°C) - Field	—		3.8			
Turbidity (NTU) - Lab	—					
Turbidity (NTU) - Field	—					
Piezometric Depth (m)	—		5.09			
TSS	—					
TDS	—		288			
Alkalinity, Total (as CaCO3)	—		216			
Sulphate (SO4)	1000		47			
Hardness (as CaCO3)	—		229			
Bromide (Br)	—					
Chloride (Cl)	—		2.4			
Total Cyanide (SAD-CN)	—					
WAD Cyanide	0.05					
Nitrate as N (NO3)	400		<0.02			
Nitrite as N (NO2)	Cl dep		<0.005			
Nitrate plus Nitrite (N)	400		<0.02			
Ammonia, Total (NH3)	pH dep		0.21			
Colour, True (Col. units)	—					
DOC	—		3.31			
Aluminum (Al)-dissolved	—		0.0037			
Antimony (Sb)-dissolved	0.2		0.000022			
Arsenic (As)-dissolved	0.05		0.00344			
Barium (Ba)-dissolved	10		0.0219			
Beryllium (Be)-dissolved	0.053		<0.00001			
Bismuth (Bi)-dissolved	—		<5E-06			
Boron (B)-dissolved	—		0.022			
Cadmium (Cd)-dissolved	hardness dep		<5E-06			
Calcium (Ca)-dissolved	—		67.5			
Chromium (Cr)-dissolved	0.01		<0.0001			
Cobalt (Co)-dissolved	0.009		0.000853			
Copper (Cu)-dissolved	hardness dep		<0.0002			
Iron (Fe)-dissolved	—		2.71			
Lead (Pb)-dissolved	hardness dep		0.000034			
Lithium (Li)-dissolved	—		0.00675			
Magnesium (Mg)-dissolved	—		14.7			
Manganese (Mn)-dissolved	—		1.53			
Mercury (Hg)-dissolved	0.001		0.000002			
Molybdenum (Mo)-dissolved	10		0.00365			
Nickel (Ni)-dissolved	hardness dep		0.00193			
Potassium (K)-dissolved	—		3.05			
Selenium (Se)-dissolved	0.01		<0.00004			
Silicon (Si)-dissolved	—		7.18			
Silver (Ag)-dissolved	hardness dep		<5E-06			
Sodium (Na)-dissolved	—		13.4			
Strontium (Sr)-dissolved	—		0.456			
Thallium (Tl)-dissolved	0.003		<2E-06			
Tin (Sn)-dissolved	—		<0.0002			
Titanium (Ti)-dissolved	1		<0.0005			
Uranium (U)-dissolved	3		0.00727			
Vanadium (V)-dissolved	—		<0.0002			
Zinc (Zn)-dissolved	hardness dep		0.0012			

Station MW13-07

Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Aug	Sep 9/28/2016	Oct	Nov	Dec
Zirconium (Zr)-dissolved	—		<0.0001			
Polycyclic Aromatics						
Low Molecular Weight PAH`s	—		<0.00024			
High Molecular Weight PAH`s	—		<0.00005			
Total PAH	—		<0.00024			
Naphthalene	0.01		<0.0001			
2-Methylnaphthalene	—		<0.0001			
Quinoline	0.034		<0.00024			
Acenaphthylene	—		<0.00005			
Acenaphthene	0.06		<0.00005			
Fluorene	0.12		<0.00005			
Phenanthrene	0.003		<0.00005			
Anthracene	0.001		<0.00001			
Acridine	0.0005		<0.00005			
Fluoranthene	0.12		<0.00002			
Pyrene	0.0002		<0.00002			
Benzo(a)anthracene	0.001		<0.00001			
Chrysene	—		<0.00005			
Benzo(b&j)fluoranthene	—		<0.00005			
Benzo(k)fluoranthene	—		<0.00005			
Benzo(a)pyrene	0.0001		<9E-06			
Indeno(1,2,3-cd)pyrene	—		<0.00005			
Dibenz(a,h)anthracene	—		<0.00005			
Benzo(g,h,i)perylene	—		<0.00005			
Calculated Parameters						
LEPH (C10-C19 less PAH)	0.5		<0.2			
HEPH (C19-C32 less PAH)	—		<0.2			
Ext. Pet. Hydrocarbon						
EPH (C10-C19)	5		<0.2			
EPH (C19-C32)	—		<0.2			
Volatiles						
VPH (VH6 to 10 - BTEX)	15		<0.3			
Chloromethane	—		<0.001			
Vinyl chloride	—		<0.0005			
Chloroethane	—		<0.001			
Trichlorofluoromethane	—		<0.004			
1,1,2Trichloro-1,2,2Trifluoroetha	0.2		<0.002			
Dichlorodifluoromethane	—		<0.002			
1,1-dichloroethene	—		<0.0005			
Dichloromethane	0.98		<0.002			
trans-1,2-dichloroethene	—		<0.001			
1,1-dichloroethane	—		<0.0005			
cis-1,2-dichloroethene	—		<0.001			
Chloroform	0.02		<0.001			
1,1,1-trichloroethane	—		<0.0005			
1,2-dichloroethane	1		<0.0005			
Carbon tetrachloride	0.13		<0.0005			
Benzene	4		<0.0004			
Methyl-tert-butylether (MTBE)	—		<0.004			
1,2-dichloropropane	—		<0.0005			
cis-1,3-dichloropropene	—		<0.001			

Station **MW13-07**

Location **Landfill Monitoring**

Parameter (mg/L unless otherwise noted)	CSR	Aug	Sep 9/28/2016	Oct	Nov	Dec
trans-1,3-dichloropropene	—		<0.001			
Bromomethane	—		<0.001			
1,1,2-trichloroethane	—		<0.0005			
Trichloroethene	0.2		<0.0005			
Chlorodibromomethane	—		<0.001			
1,2-dibromoethane	—		<0.0002			
Tetrachloroethene	1.1		<0.0005			
Bromodichloromethane	—		<0.001			
Toluene	0.39		<0.0004			
Ethylbenzene	2		<0.0004			
m & p-Xylene	—		<0.0004			
Bromoform	—		<0.001			
Styrene	0.72		<0.0005			
o-Xylene	—		<0.0004			
Xylenes (Total)	—		<0.0004			
1,1,1,2-tetrachloroethane	—		<0.0005			
1,1,2,2-tetrachloroethane	—		<0.0005			
1,2-dichlorobenzene	—		<0.0005			
1,3-dichlorobenzene	1.5		<0.0005			
1,4-dichlorobenzene	0.26		<0.0005			
Chlorobenzene	0.013		<0.0005			
1,2,3-trichlorobenzene	0.08		<0.002			
1,2,4-trichlorobenzene	0.24		<0.002			
Hexachlorobutadiene	0.001		<0.0005			
VH C6-C10	15		<0.3			

NOTE:

Values shaded yellow exceed the Yukon regulati

Blanks and #N/A no data available

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month Hardness (as CaCO3 mg/L)	Aug	Sep 229	Oct	Nov	Dec
	Nitrite		0.4			
	Ammonia		18.5			
	Cadmium		0.0006			
	Copper		0.09			
	Lead		0.11			
	Nickel		1.5			
	Silver		0.015			
	Zinc		1.65			

Station MW13-10
Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Jan	Feb	Mar	Apr	May	Jun	Jul
pH - Lab	—							
pH - Field	—							
Conductivity (µS/cm) - Lab	—							
Conductivity (µS/cm) - Field	—							
Temperature (°C) - Field	—							
Turbidity (NTU) - Lab	—							
Turbidity (NTU) - Field	—							
Piezometric Depth (m)	—							
TSS	—							
TDS	—							
Alkalinity, Total (as CaCO3)	—							
Sulphate (SO4)	1000							
Hardness (as CaCO3)	—							
Bromide (Br)	—							
Chloride (Cl)	—							
Total Cyanide (SAD-CN)	—							
WAD Cyanide	0.05							
Nitrate as N (NO3)	400							
Nitrite as N (NO2)	Cl dep							
Nitrate plus Nitrite (N)	400							
Ammonia, Total (NH3)	pH dep							
Colour, True (Col. units)	—							
DOC	—							
Aluminum (Al)-dissolved	—							
Antimony (Sb)-dissolved	0.2							
Arsenic (As)-dissolved	0.05							
Barium (Ba)-dissolved	10							
Beryllium (Be)-dissolved	0.053							
Bismuth (Bi)-dissolved	—							
Boron (B)-dissolved	—							
Cadmium (Cd)-dissolved	hardness dep							
Calcium (Ca)-dissolved	—							
Chromium (Cr)-dissolved	0.01							
Cobalt (Co)-dissolved	0.009							
Copper (Cu)-dissolved	hardness dep							
Iron (Fe)-dissolved	—							
Lead (Pb)-dissolved	hardness dep							
Lithium (Li)-dissolved	—							
Magnesium (Mg)-dissolved	—							
Manganese (Mn)-dissolved	—							
Mercury (Hg)-dissolved	0.001							
Molybdenum (Mo)-dissolved	10							
Nickel (Ni)-dissolved	hardness dep							
Potassium (K)-dissolved	—							
Selenium (Se)-dissolved	0.01							
Silicon (Si)-dissolved	—							
Silver (Ag)-dissolved	hardness dep							
Sodium (Na)-dissolved	—							
Strontium (Sr)-dissolved	—							
Thallium (Tl)-dissolved	0.003							
Tin (Sn)-dissolved	—							
Titanium (Ti)-dissolved	1							
Uranium (U)-dissolved	3							
Vanadium (V)-dissolved	—							
Zinc (Zn)-dissolved	hardness dep							

Station MW13-10
Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Jan	Feb	Mar	Apr	May	Jun	Jul
Zirconium (Zr)-dissolved	—							
Polycyclic Aromatics								
Low Molecular Weight PAH`s	—							
High Molecular Weight PAH`s	—							
Total PAH	—							
Naphthalene	0.01							
2-Methylnaphthalene	—							
Quinoline	0.034							
Acenaphthylene	—							
Acenaphthene	0.06							
Fluorene	0.12							
Phenanthrene	0.003							
Anthracene	0.001							
Acridine	0.0005							
Fluoranthene	0.12							
Pyrene	0.0002							
Benzo(a)anthracene	0.001							
Chrysene	—							
Benzo(b&j)fluoranthene	—							
Benzo(k)fluoranthene	—							
Benzo(a)pyrene	0.0001							
Indeno(1,2,3-cd)pyrene	—							
Dibenz(a,h)anthracene	—							
Benzo(g,h,i)perylene	—							
Calculated Parameters								
LEPH (C10-C19 less PAH)	0.5							
HEPH (C19-C32 less PAH)	—							
Ext. Pet. Hydrocarbon								
EPH (C10-C19)	5							
EPH (C19-C32)	—							
Volatiles								
VPH (VH6 to 10 - BTEX)	15							
Chloromethane	—							
Vinyl chloride	—							
Chloroethane	—							
Trichlorofluoromethane	—							
1,1,2Trichloro-1,2,2Trifluoroetha	0.2							
Dichlorodifluoromethane	—							
1,1-dichloroethene	—							
Dichloromethane	0.98							
trans-1,2-dichloroethene	—							
1,1-dichloroethane	—							
cis-1,2-dichloroethene	—							
Chloroform	0.02							
1,1,1-trichloroethane	—							
1,2-dichloroethane	1							
Carbon tetrachloride	0.13							
Benzene	4							
Methyl-tert-butylether (MTBE)	—							
1,2-dichloropropane	—							
cis-1,3-dichloropropene	—							

Station MW13-10
Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Jan	Feb	Mar	Apr	May	Jun	Jul
trans-1,3-dichloropropene	—							
Bromomethane	—							
1,1,2-trichloroethane	—							
Trichloroethene	0.2							
Chlorodibromomethane	—							
1,2-dibromoethane	—							
Tetrachloroethene	1.1							
Bromodichloromethane	—							
Toluene	0.39							
Ethylbenzene	2							
m & p-Xylene	—							
Bromoform	—							
Styrene	0.72							
o-Xylene	—							
Xylenes (Total)	—							
1,1,1,2-tetrachloroethane	—							
1,1,2,2-tetrachloroethane	—							
1,2-dichlorobenzene	—							
1,3-dichlorobenzene	1.5							
1,4-dichlorobenzene	0.26							
Chlorobenzene	0.013							
1,2,3-trichlorobenzene	0.08							
1,2,4-trichlorobenzene	0.24							
Hexachlorobutadiene	0.001							
VH C6-C10	15							

NOTE:
Values shaded yellow exceed the Yukon regulations for freshwater aquatic life.
Blanks and #N/A no data available

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month Hardness (as CaCO3 mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul
	Nitrite **Ammonia** **Cadmium** **Copper** **Lead** **Nickel** **Silver** **Zinc**							

Station MW13-10

Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Aug	Sep 9/28/2016	Oct	Nov	Dec
pH - Lab	—		8.03			
pH - Field	—		7.43			
Conductivity (µS/cm) - Lab	—		455			
Conductivity (µS/cm) - Field	—		434			
Temperature (°C) - Field	—		2.7			
Turbidity (NTU) - Lab	—					
Turbidity (NTU) - Field	—					
Piezometric Depth (m)	—		9.86			
TSS	—					
TDS	—		262			
Alkalinity, Total (as CaCO3)	—		209			
Sulphate (SO4)	1000		36			
Hardness (as CaCO3)	—		228			
Bromide (Br)	—					
Chloride (Cl)	—		<1			
Total Cyanide (SAD-CN)	—					
WAD Cyanide	0.05					
Nitrate as N (NO3)	400		0.583			
Nitrite as N (NO2)	Cl dep		<0.005			
Nitrate plus Nitrite (N)	400		0.583			
Ammonia, Total (NH3)	pH dep		<0.005			
Colour, True (Col. units)	—					
DOC	—		1.72			
Aluminum (Al)-dissolved	—		0.0035			
Antimony (Sb)-dissolved	0.2		0.0001			
Arsenic (As)-dissolved	0.05		0.000967			
Barium (Ba)-dissolved	10		0.00791			
Beryllium (Be)-dissolved	0.053		<0.00001			
Bismuth (Bi)-dissolved	—		<5E-06			
Boron (B)-dissolved	—		<0.01			
Cadmium (Cd)-dissolved	hardness dep		0.000017			
Calcium (Ca)-dissolved	—		79.2			
Chromium (Cr)-dissolved	0.01		0.00037			
Cobalt (Co)-dissolved	0.009		0.000025			
Copper (Cu)-dissolved	hardness dep		<0.0002			
Iron (Fe)-dissolved	—		0.0013			
Lead (Pb)-dissolved	hardness dep		0.000353			
Lithium (Li)-dissolved	—		0.00163			
Magnesium (Mg)-dissolved	—		7.42			
Manganese (Mn)-dissolved	—		<0.0002			
Mercury (Hg)-dissolved	0.001		<2E-06			
Molybdenum (Mo)-dissolved	10		0.00188			
Nickel (Ni)-dissolved	hardness dep		0.00025			
Potassium (K)-dissolved	—		1.01			
Selenium (Se)-dissolved	0.01		0.00165			
Silicon (Si)-dissolved	—		3.83			
Silver (Ag)-dissolved	hardness dep		<5E-06			
Sodium (Na)-dissolved	—		1.6			
Strontium (Sr)-dissolved	—		0.362			
Thallium (Tl)-dissolved	0.003		<2E-06			
Tin (Sn)-dissolved	—		<0.0002			
Titanium (Ti)-dissolved	1		<0.0005			
Uranium (U)-dissolved	3		0.00286			
Vanadium (V)-dissolved	—		<0.0002			
Zinc (Zn)-dissolved	hardness dep		0.0012			

Station MW13-10

Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Aug	Sep 9/28/2016	Oct	Nov	Dec
Zirconium (Zr)-dissolved	—		<0.0001			
Polycyclic Aromatics						
Low Molecular Weight PAH`s	—		<0.00024			
High Molecular Weight PAH`s	—		<0.00005			
Total PAH	—		<0.00024			
Naphthalene	0.01		<0.0001			
2-Methylnaphthalene	—		<0.0001			
Quinoline	0.034		<0.00024			
Acenaphthylene	—		<0.00005			
Acenaphthene	0.06		<0.00005			
Fluorene	0.12		<0.00005			
Phenanthrene	0.003		<0.00005			
Anthracene	0.001		<0.00001			
Acridine	0.0005		<0.00005			
Fluoranthene	0.12		<0.00002			
Pyrene	0.0002		<0.00002			
Benzo(a)anthracene	0.001		<0.00001			
Chrysene	—		<0.00005			
Benzo(b&j)fluoranthene	—		<0.00005			
Benzo(k)fluoranthene	—		<0.00005			
Benzo(a)pyrene	0.0001		<9E-06			
Indeno(1,2,3-cd)pyrene	—		<0.00005			
Dibenz(a,h)anthracene	—		<0.00005			
Benzo(g,h,i)perylene	—		<0.00005			
Calculated Parameters						
LEPH (C10-C19 less PAH)	0.5		<0.2			
HEPH (C19-C32 less PAH)	—		<0.2			
Ext. Pet. Hydrocarbon						
EPH (C10-C19)	5		<0.2			
EPH (C19-C32)	—		<0.2			
Volatiles						
VPH (VH6 to 10 - BTEX)	15		<0.3			
Chloromethane	—		<0.001			
Vinyl chloride	—		<0.0005			
Chloroethane	—		<0.001			
Trichlorofluoromethane	—		<0.004			
1,1,2Trichloro-1,2,2Trifluoroetha	0.2		<0.002			
Dichlorodifluoromethane	—		<0.002			
1,1-dichloroethene	—		<0.0005			
Dichloromethane	0.98		<0.002			
trans-1,2-dichloroethene	—		<0.001			
1,1-dichloroethane	—		<0.0005			
cis-1,2-dichloroethene	—		<0.001			
Chloroform	0.02		<0.001			
1,1,1-trichloroethane	—		<0.0005			
1,2-dichloroethane	1		<0.0005			
Carbon tetrachloride	0.13		<0.0005			
Benzene	4		<0.0004			
Methyl-tert-butylether (MTBE)	—		<0.004			
1,2-dichloropropane	—		<0.0005			
cis-1,3-dichloropropene	—		<0.001			

2016 Contaminated Sites Groundwater Monitoring Results and Guidelines

Station MW13-10

Location Landfill Monitoring

Parameter (mg/L unless otherwise noted)	CSR	Aug	Sep 9/28/2016	Oct	Nov	Dec
trans-1,3-dichloropropene	—		<0.001			
Bromomethane	—		<0.001			
1,1,2-trichloroethane	—		<0.0005			
Trichloroethene	0.2		<0.0005			
Chlorodibromomethane	—		<0.001			
1,2-dibromoethane	—		<0.0002			
Tetrachloroethene	1.1		<0.0005			
Bromodichloromethane	—		<0.001			
Toluene	0.39		<0.0004			
Ethylbenzene	2		<0.0004			
m & p-Xylene	—		<0.0004			
Bromoform	—		<0.001			
Styrene	0.72		<0.0005			
o-Xylene	—		<0.0004			
Xylenes (Total)	—		<0.0004			
1,1,1,2-tetrachloroethane	—		<0.0005			
1,1,2,2-tetrachloroethane	—		<0.0005			
1,2-dichlorobenzene	—		<0.0005			
1,3-dichlorobenzene	1.5		<0.0005			
1,4-dichlorobenzene	0.26		<0.0005			
Chlorobenzene	0.013		<0.0005			
1,2,3-trichlorobenzene	0.08		<0.002			
1,2,4-trichlorobenzene	0.24		<0.002			
Hexachlorobutadiene	0.001		<0.0005			
VH C6-C10	15		<0.3			

NOTE:
Values shaded yellow exceed the Yukon regulati
Blanks and #N/A no data available

Calculated Guidelines

Guideline in mg/L (unless otherwise noted)	Month Hardness (as CaCO3 mg/L)	Aug	Sep 228	Oct	Nov	Dec
	Nitrite		0.2			
	Ammonia		18.5			
	Cadmium		0.0006			
	Copper		0.09			
	Lead		0.11			
	Nickel		1.5			
	Silver		0.015			
	Zinc		1.65			