MORRISON HERSHFIELD

Resort Municipality of Whistler
Landfill Annual Monitoring Report
2019

Presented to:

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WHISTLER

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1. INTRODUCTION

This annual report incorporates monitoring data collected in 2019 for the Resort Municipality of Whistler (RMOW) former landfill site, located approximately 8 km west of Whistler Village and accessed off Highway 99 on Cheakamus Lake Road. The location of the site is illustrated in Figure 1.

The Whistler landfill opened in 1977 and initially accepted residential, industrial, commercial and institutional waste. This continued until the landfill's operating permit was amended in 1988 to also accept construction and demolition waste. The landfill site was closed in October, 2005, to accommodate plans to use the area east of the site as the location of the Athletes' Village for the 2010 Winter Olympic Games. Between 1977 and 2005 approximately 350,000 tonnes of waste was disposed of at the Whistler Landfill (CH2M Hill, 2008a).

Construction of residential and commercial buildings in the area commenced in 2007 following the installation of a cover system and landfill gas (LFG) collection system in 2006.

Morrison Hershfield was retained by RMOW to complete the annual environmental monitoring and fulfill reporting requirements as set out in Section 3.31 of the 2005 Whistler Landfill Operational Certificate (MR-04693) and the Whistler Landfill Closure Plan (CH2M Hill, 2006a).

This report documents the 2019 monitoring program and presents a summary of its findings.

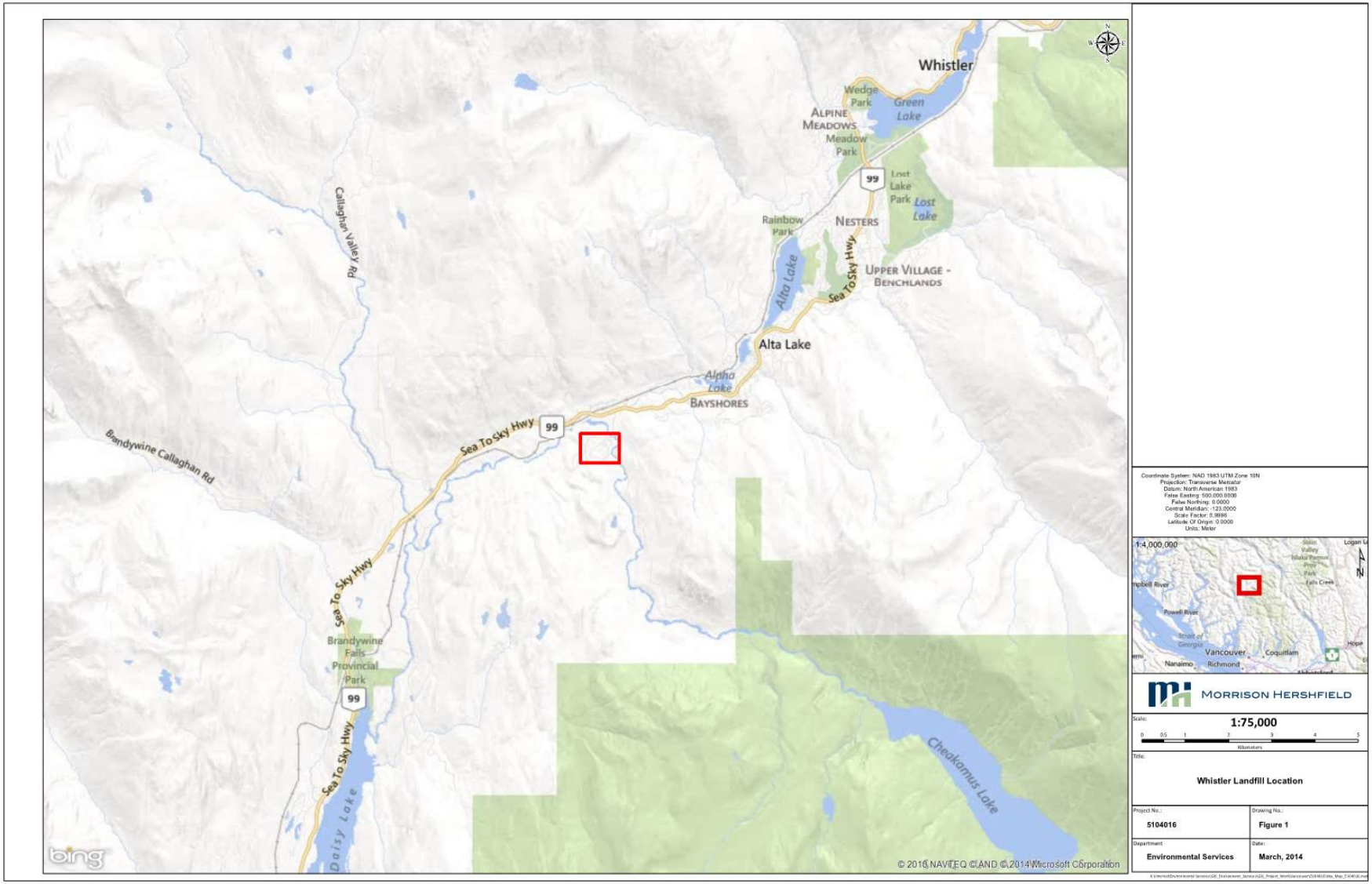

Figure 1: Former Whistler Landfill Location

1.1 Program Objectives

The overall objective of the Whistler landfill monitoring program is to help ensure and confirm that the closed landfill is not causing effects to the surrounding environment. Three distinct facets of the former landfill site were assessed: on-site surface water, groundwater and migration of landfill gas (LFG).

The objectives of the Surface Water and Groundwater Monitoring Program are as follows:

- Determine if the landfill is negatively affecting local groundwater and surface water quality; and
- Apply corrective measures as necessary to minimize landfill effects on groundwater and surface water.

The objectives of the LFG monitoring program are as follows:

- Monitor levels of LFG generation;
- Assess the overall collection performance of the Landfill Gas Collection System (LFGCS)
- Identify the composition of LFG within the soil at monitoring probe locations; and
- Adjust LFGCS as necessary based on monitoring data results to prevent off-site gas migration.

Specific monitoring requirements for surface water, groundwater and LFG are outlined in Section 3.

1.2 Report Purpose

The purpose of this report is to address the reporting requirements of the facility's Landfill Operational Certificate (MR-04692) and the following requirements included in the Whistler Landfill Closure Plan:

- Reporting of monitoring data collected in 2019; and
- Summary of maintenance activities that were completed on site in 2019, as well as any planned activities in 2020.

2. SITE DESCRIPTION

2.1 Landfill

The former landfill contains three distinct cells that were developed at different times over its lifespan.

- The northeast cell commenced in 1977 and contains residential waste in addition to industrial, commercial and institutional (ICI) waste. This material is not contained in a lined cell and relies on natural attenuation, coupled with a perimeter collection system, to manage leachate.
- Operations within the southwest cell began in 1988. Only construction and demolition (C & D) waste was accepted within this cell. This cell also relies on natural attenuation and a perimeter collection system to manage leachate.
- A central cell was developed in 1988 between the northeast and southwest cells for residential and ICI waste. This area was developed with a high-density polyethylene (HDPE) liner and an engineered leachate collection system.

In addition to the three cells, a biosolids storage area was installed at the south end of the landfill, covering a portion of the old southwest cell. Based on CH2M Hill (2006a) preliminary survey information from 2005, there was an estimated 6,000 m^3 of biosolids stockpiled there.

2.2 Hydrological Conditions

The former landfill site is located within the Cheakamus River watershed. The Cheakamus River itself is located approximately 300 metres north of the waste mass and flows along the eastern boundary of the Athletes' Village (CH2M Hill, 2006a). The surface water features are concentrated mainly on the perimeter of the site, due to a combination of the natural and constructed topography of the area.

2.3 Geological Conditions

The geological conditions associated with the site are described by CH2M Hill (2008a).

> *In general, the site topography slopes from south to north. As described in the Whistler Landfill Closure Plan, within areas on the site and within adjacent lands, aggregate extraction activities have removed much of the natural overburden materials for use as industrial aggregates and replaced them with imported fill materials. As a result, the present ground surface associated with the landfill has likely been altered by industrial activities. As part of historical aggregate extraction activities conducted at the site, much of the natural overburden materials had been removed from the area and replaced with imported fill, resulting in a disturbance of the natural topography of the site. Exposed bedrock surface, characterized by glaciated surfaces and steep inclines, are present throughout the site. Areas between the exposed bedrock are infilled by coarse and medium grain sediments.*

Based on the results of the borehole investigation conducted by CH2M Hill in January 2006, the top layer of the site stratigraphy is composed of sand, gravel, cobbles, and boulders (fill material), followed by a gravel-sand layer. The subsurface includes a poorly graded fine sand layer with some silt, followed by still sandy silt located above the bedrock (green basalt) (CH2M Hill, 2006a).

Overburden at the site was generally found to be consistent across the advanced boreholes and is characterized by progressively finer particle size of the sediments with increasing depth. Overburden thickness is highly variable, ranging from 0 to greater than 21 m. The overburden is consistent with fluvial or near-shore lacustrine deposition environments.

2.4 Hydrogeological Conditions

The hydrogeological conditions associated with the site are described by CH2M Hill (2006a) as follows:

A single unconfined aquifer is within the overburden on the site. The saturated zone in most locations extends from the bedrock surface at depth to within less than one metre of the ground surface. Bedrock in the area was found to be relatively dry and presented no visual indication of water bearing fractures. Groundwater flow is generally in a south to north direction, consistent with the surface topography.

Interpreted groundwater flow at the site is illustrated in Figure 2 (from CH2M Hill, 2006a).

2.5 Climate

The long-term average climatic conditions (1981 – 2010) recorded at the Whistler meteorological station (approximately 8 km from the site) indicate the daily average annual temperature in the area is 6.7^{o}C, and the mean annual precipitation is 1,228 mm per year. The precipitation can be further divided into an average of 856 mm of rainfall, and 419 cm of snowfall.

2.6 Potential Receptors

The receptors within the local area of the landfill include both natural and human aspects. Potential receptors and their distance from the landfill mass include:

- Cheakamus River – 250 m - 450 m
- Unnamed Creek – 10 m
- Residential and commercial development – immediately adjacent to and on top of the landfill mass

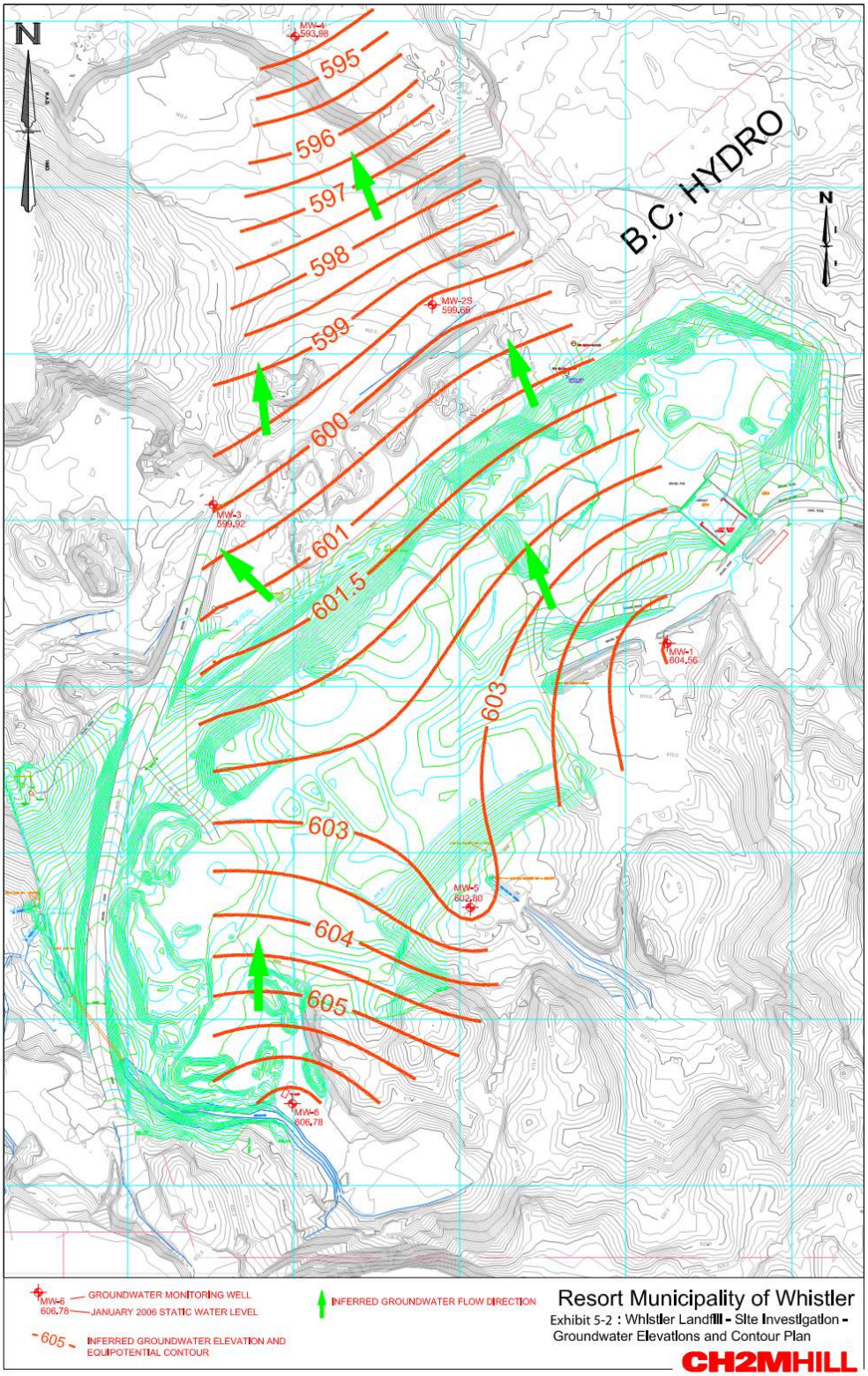

Figure 2: Groundwater Elevations and Flow Pattern at the Former Whistler Landfill Site (from CH2M Hill. 2006a)

3. MONITORING REQUIREMENTS

The following documents form the basis of the post-closure monitoring program and associated requirements, including parameters to be monitored. They are frequently referenced throughout this report.

- Whistler Landfill Closure Plan, Final Report (CH2M HILL, 2006a)
- Whistler Landfill Gas Pre-Design Memorandum (CH2M HILL, 2006b)
- Landfill Operational Certificate MR-04692 (B.C. Ministry of Environment, 2005)
- Mitigation and Safety Measures for Reduction of Landfill Gas Migration Risks (CH2M HILL, 2008a)
- Landfill Gas Collection System Operation and Maintenance Manual (CH2M HILL, 2008b)
- Monitoring and Reporting Requirements (CH2M HILL, 2008c)
- Resort Municipality of Whistler Landfill Annual Monitoring Report – 2011 & Revised Monitoring Program Recommendations (Morrison Hershfield, 2012).

Monitoring and reporting requirements established in the Closure Plan (CH2MHill 2008c) were amended in 2012 (Morrison Hershfield, 2012) based on a review of monitoring data.

4. METHODOLOGY

4.1 Overview of Sampling Locations, Schedule and Applicable Standards & Guidelines

The various leachate, groundwater, surface water and landfill gas (LFG) monitoring locations are shown in Figure 3. Groundwater monitoring locations are identified as MW (monitoring well) followed by a number or number / letter combination (e.g. MW-3, MW-2S), a letter is added when both a shallow (S) and a deep (D) well were installed within a single borehole. Surface water sample locations are identified as SFC (surface), followed by a number or number / letter combination (e.g. SFC-2, SFC-2B), where the letter is used to indicate a second surface water sample on the same watercourse. L1 is the single leachate collection point.

The LFG collection system consists of the following components:

- Thirteen vertical LFG extraction wells connected to horizontal LFG collection trenches covering the landfill cell footprint;
- A 200 mm diameter header approximately 800 m in length that carries the LFG from the vertical well and horizontal trench network to a flare station;
- A LFG abstraction plant on the north side of the property that burns the collected LFG in a candle-stick flare;
- Twenty-one monitoring probes (MP) located around the perimeter of the landfill cell; and
- Approximately 91 test ports within selected buildings and residences in close proximity to the landfill.

The landfill gas monitoring probes around the circumference of the landfill mass are identified as MP followed by a number (e.g. MP 14). Also identified in Figure 3 are several components of the LFG collection system, including: thirteen LFG extraction wells (labeled as “W” followed by a number [e.g. W11]), the flare station, and header valves. A new monitoring probe was installed in November 2012 to the west of MP17 (identified as MP17A). As of December 2012, sampling commenced at MP17A and was omitted at MP17.

As per the requirements outlined in CH2M Hill (2008c) and confirmed by the MOE in 2012, groundwater and surface water monitoring have been conducted quarterly. Quarterly monitoring is tracked and reported based on a calendar year.

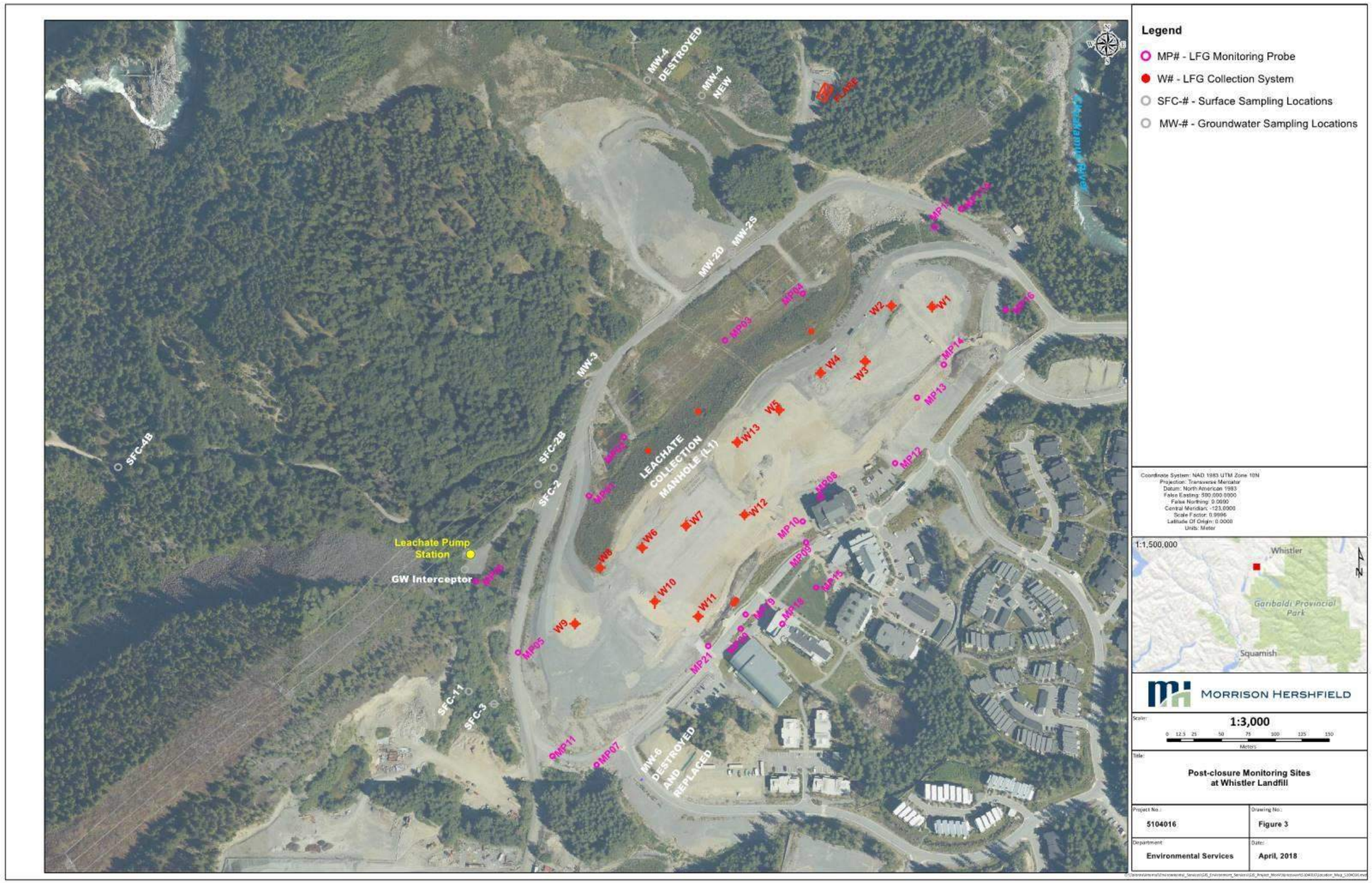

Figure 3: Post-Closure Monitoring Sites at the Former Whistler Landfill

The 2019 leachate, groundwater and surface water monitoring program was completed by Morrison Hershfield. Samples were collected on the dates shown in Table 1. The LFG monitoring program that has been in effect since 2009 has been conducted by Norseman Engineering Ltd. on a minimum monthly basis. During the winter months monitoring occurs on a weekly basis (November through April) when there is snow cover on the landfill or frozen ground (i.e. conditions that could facilitate subsurface LFG migration).

Table 1: 2019 Quarterly Sample Collection Dates

Sample Collection Dates 2019	
Quarter 1 (Q1 2019)	March 13, 2019
Quarter 2 (Q2 2019)	June 20, 2019
Quarter 3 (Q3 2019)	September 26, 2019
Quarter 4 (Q4 2019)	December 17, 2019

4.1.1 Leachate Monitoring

Leachate is captured and treated by the Whistler Wastewater Treatment Plant. For monitoring purposes, the leachate quality is tested as part of this monitoring program. The monitoring results help to determine when in the future leachate treatment will no longer be required.

A leachate collection point (Leachate Manhole) located on the down gradient side of the landfill mass (Figure 3) was sampled to provide an indicator of the concentrations of target parameters within the landfill cell. Leachate samples were obtained using a plastic pail rinsed three times with the leachate water.

A leachate sample was collected during the first and third quarter sampling events. In addition to the sample for laboratory analysis, standard leachate field parameters were measured during the sampling event. The field parameters measured include pH, temperature, dissolved oxygen, and conductivity. Field parameters were measured using an YSI model 556 multi-probe meter.

Sampling is also conducted at the Groundwater (GW) Interceptor, adjacent to the Leachate Pump Station to the west and north of the landfill mass (Figure 3). The GW Interceptor is located adjacent to the existing leachate pump station in the southwest area of the closed landfill. The interceptor consists of 24 metres of perforated HDPE pipe (60 cm diameter). A new leachate collection wet well and pump station were constructed in 2009 in close proximity to the GW Interceptor. Intercepted groundwater is piped to the new leachate pump station wet well, where it is pumped along with landfill leachate, to the RMOW Wastewater Treatment Plant (WWTP) for treatment.

The GW Interceptor is located downgradient from the unlined Construction and Demolition (C&D) waste cell and was (presumably) installed to minimize the potential for off-site effects associated with groundwater influenced by the C&D waste cell.

Samples were obtained using a plastic pail rinsed three times with the liquid in the manhole. One sample was collected during each quarterly sampling event in 2019.

A summary of the leachate monitoring results in comparison to the applicable standards and guidelines are provided in Table 7 and Table 8. Complete laboratory results can be found in Appendix A.

4.1.2 Groundwater Monitoring

CH2M Hill originally installed six monitoring wells (MW-1 to MW-6), one of which (MW-2) was constructed with a shallow and a deep screen, for a total of seven groundwater sampling points. The monitoring wells were constructed with 50 mm (2”) diameter new PVC pipe. Screen intervals were constructed with 50 mm (2”) diameter #10 slot PVC screen. The depth and screen length of each well was selected in the field based on observations made during drilling. Bentonite surface seals were installed (as required) to prevent infiltration of surface water into the well (CH2M Hill, 2006a).

The groundwater monitoring locations are situated both up- and down-gradient of the landfill to monitor the potential migration of leachate, and to be able to separate potential groundwater effects of residential and commercial development from effects of the landfill. MW-6 is up gradient of the landfill mass and is used to represent the local background conditions for the area. All of the other wells are down gradient of the landfill footprint. Table 2 provides a summary of groundwater wells monitored in 2019.

Table 2: 2019 Groundwater Monitoring Events and Locations

Site	Site Description	Q1	Q2	Q3	Q4
MW-2S & 2D	Immediately down gradient of the landfill footprint	✔	✔	✔	✔
MW-3	Down gradient of the landfill mass		✔	✔	✔
MW-4	Down gradient of the landfill mass	✔	✔	✔	
MW-6	Up gradient of the landfill mass (background)		✔	✔	✔

In Q1, MW-3 was not sampled because the well was buried in snow and could not be located, and MW-6 was not sampled because the cap was frozen due to surface water infiltration. In Q4, MW-4 was not sampled because bentonite has seeped into the well through a crack in the casing and formed a blockage.

Groundwater samples were collected using dedicated HDPE tubing and foot valves. The procedure for the collection of all groundwater samples follows that described in CH2M Hill (2008c). Laboratory analyses for all of the samples were performed by ALS Environmental in Burnaby, BC. Appendix A provides a summary of the analytical results associated with groundwater quality monitoring.

All groundwater samples collected for dissolved metals analysis were filtered and preserved in the field. In addition to the samples for laboratory analysis, field parameters were also measured using a YSI model 556 multi-probe meter (or similar). The static water level depth in each well was also measured prior to sample collection.

Applicable Standards & Guidelines

The regulatory framework that applies to this project for groundwater water quality include the provincial standard for landfill closure: Schedule 3.2 (Generic Numerical Water Standards for Aquatic Life) of the B.C. Contaminated Sites Regulation (BCCSR). The BCCSR standards were updated as of January 2019 to reflect contemporary science as well as a number of other revisions; this 2019 report is the first year using the revised standards. As outlined in section 9.2.1 of the Closure Plan, exceedance of any compliance criteria for a period of two consecutive sampling events at any one monitoring location will trigger contingency planning.

In addition to the comparison to the regulatory standards, the tables showing the groundwater results also include a comparison to the B.C. Working and Approved Water Quality Guidelines to provide MoE with additional information for year to year comparison. These guidelines are more restrictive since they generally apply to receiving water conditions and not to groundwater within the landfill site. The guidelines provide concentrations to prevent detrimental effects in water bodies that support aquatic life. Unlike the B.C. Contaminated Sites regulation there is no dilution factor incorporated; thus the values represented in the BC Ambient Water Quality guidelines are more stringent for many parameters. Therefore, while not directly applicable to monitoring locations at the landfill site, these guidelines provide a point of reference for assessing contaminant levels over time.

A summary of the groundwater quality results is provided in Section 5.1. Detailed laboratory results can be found in Appendix A.

4.1.3 Surface Water Monitoring

Table 3 provides a summary of the surface water sites sampled in 2019. The sample collected from SFC-4B in Q4 was lost in transit, and only field test results are available. Sample station SFC-11 is located cross-gradient from the landfill and the tributary extends southwest away from the landfill; therefore the watershed for this tributary does not include the landfill area (Figure 3). Sample station SFC-2B is located in a watercourse which originates in the wetland feature immediately adjacent to the leachate collection point. It is also located immediately down gradient of the lined ICI and Residential Waste Cell and the historic biosolids and wood chip storage area. SFC-2 is located approximately 10 m downstream of SFC-2B. The source of the water in SFC-2 is assumed to be from a collapsed culvert that extends under the landfill towards Athlete's Village. A groundwater drainage well was constructed immediately upstream of the collapsed culvert and landfill during site servicing for the Athlete's Village development. The well was intended to maintain the groundwater table at pre-development elevations. Therefore, it is suspected that the culvert is collecting groundwater, and potentially leachate, which is being transported downgradient to the outlet at SFC-2. Although the source of water in SFC-2 is expected to be groundwater, the site is still considered a surface water site since samples are collected from the location where the water daylights into a creek. SFC-3 is located in a perimeter watercourse cross gradient of the furthest south section of the landfill. SFC-3 and SFC-11 are up gradient of the landfill and provide indicators of natural background surface water conditions.

Monitoring of the nearest receiving waterbody (Cheakamus River) is not incorporated within this monitoring program (as defined by the provincially-approved Landfill Closure Plan). Sampling

results from the furthest down gradient surface water monitoring location, and the one nearest the Cheakamus River, at SFC-4B, provide the best indication of potential effects to receiving water quality resulting from the site.

Surface water samples were collected using the techniques outlined in CH2M Hill (2008c). Field parameters were also measured using a YSI model 556 multi-probe meter (or similar). Appendix B provides a summary of the field data that was collected. Similar to the groundwater samples, all surface water samples were sent to ALS Environmental in Burnaby, BC for analysis.

Table 3: 2019 Surface Water Monitoring Events and Locations

Site	Site Description	Q1	Q2	Q3	Q4
SFC-2	Down stream of landfill	✔	✔	✔	✔
SFC-2B	Immediately adjacent to the leachate collection point	✔	✔	✔	✔
SFC-3	Located in a perimeter watercourse (background)	✔	✔	✔	✔
SFC-4B	Furthest down gradient and the closest monitoring point to the Cheakamus River	✔	✔	✔	
SFC-11	Cross gradient from the landfill (background)	✔	✔	✔	✔

Applicable Standards & Guidelines

The regulatory framework that applies to this project for surface water quality is the same as for groundwater, the applicable standards are the Schedule 3.2 (Generic Numerical Water Standards for Aquatic Life) of the B.C. Contaminated Sites Regulation. As outlined in section 9.2.1 of the Closure Plan, exceedance of any compliance criteria for a period of two consecutive sampling events at any one monitoring location will trigger contingency planning.

Surface water results are also compared to the B.C. Working and Approved Water Quality Guidelines to provide MoE with additional information for year to year comparison, in the same manner as groundwater results. These guidelines are more restrictive since they generally apply to receiving water conditions and not to locations within the landfill site. The guidelines provide concentrations to prevent detrimental effects in water bodies that support aquatic life. Unlike the B.C. Contaminated Sites Regulation there is no dilution factor incorporated; thus the values represented in the BC Ambient Water Quality guidelines are more stringent for many parameters. Therefore, while not directly applicable to monitoring locations at the landfill site, these guidelines provide a point of reference for assessing contaminant levels over time.

A summary of the surface water quality results is presented in Section 5.2. Appendix A provides the detailed analytical results associated with surface water quality monitoring.

4.1.4 Landfill Gas Monitoring

Landfill gas monitoring was completed by Norseman Engineering Ltd. on a weekly (winter months) to monthly basis throughout the year. Monitoring at the building ports is conducted twice per year during months when there is snow pack, at least one month apart. Standard monitoring procedures were followed for LFG monitoring.

The following data was collected:

- Methane content at the subsurface probes;
- Methane and oxygen contents, flow rate, and inlet suction at the flare station; and
- Valve position (percent open), methane content and suction at each of the extraction wells (monitored for assessing the operational efficiency of the LFGCS).

Pressure at the wells is measured using 0 – 5” water column (w.c.) or 0 – 0.5” w.c. magnahelic pressure gauges. Methane content, as a percent of the Lower Explosive Limit (LEL), is detected using a Gastech device, model NP204. A concentration of 5% methane in the air is "the lower explosive limit" (LEL), and concentrations equal to or greater than the LEL are considered hazardous (BC Ministry of Environment, 1996). Other parameters measured at the flare station are obtained from the programmable logic controller associated with the LFGCS. The data gathered are important for assessing the overall function of the LFGCS, particularly the concentration of methane present in the landfill for flaring and to determine if the gas is escaping into the atmosphere and/or migrating off-site.

As per Morrison Hershfield (2012), the frequency of LFG monitoring should increase from monthly or weekly to daily in the event of LFGCS malfunction or maintenance requirements, or if detection of methane in excess of the trigger level (10% LEL) is observed. Morrison Hershfield (2012) also notes that, following detection of methane in excess of the trigger levels, monitoring frequency should be increased to daily at all of the monitoring probes and any buildings within 100 m of the MP. Monitoring at a daily frequency should continue until there are two consecutive days of undetectable methane content in the monitoring probes. If gas concentrations at the property boundaries remain above recommended trigger limits for more than 2 days, additional measures are outlined in the revised LFG monitoring program.

4.2 Quality Assurance and Quality Control

In addition to using an accredited laboratory, Quality Assurance/Quality Control (QA/QC) measures were applied to the monitoring program to determine the accuracy and precision of the field results and the laboratory testing procedures.

For each surface and groundwater sampling event a sample duplicate and a travel blank were submitted for analysis. Duplicate samples were also collected from one monitoring location. Travel blanks are used to confirm that the samples have not been contaminated during transportation from the site to the laboratory. The samples are transported in laboratory supplied coolers, remain closed, and are only reopened in the laboratory for analyses.

5. RESULTS AND DISCUSSION

Water quality monitoring at Whistler Landfill has included a broad suite of parameters, including the following groups of parameters:

- Dissolved & total metals
- Hardness
- Alkalinity
- Total Dissolved Solids
- Ammonia
- Volatile Organic Compounds (VOCs)
- Chemical Oxygen Demand (COD)
- Extractable and Volatile Hydrocarbons (EPH & VH)
- BTEX
- Polycyclic Aromatic Hydrocarbons (PAHs)

There are a limited number of key parameters that have been reviewed as both landfill related *indicator* parameters and parameters of potential concern:

Indicator parameters are compounds that are reliable indicators of groundwater effect from waste disposal, but in of themselves may not be a compound of concern. For the purposes of this water quality review, the landfill-related indicator parameters assessed include:

- chloride,
- conductivity,
- hardness,
- sulfate, and
- iron and manganese.

Parameters of potential concern at landfill sites consist primarily of ammonia (which can be toxic to aquatic life if it reaches an aquatic receptor at high enough concentrations). Other parameters of concern, may include presence of:

- hydrocarbons and/or volatile organic compounds, and
- possibly elevated concentration of heavy metals.

5.1 Groundwater

Monitoring locations up gradient provide a method to identify parameters that occur at natural or background elevated levels in the local groundwater environment. MW-6 is up gradient of the landfill and is used to represent the local background conditions for the area, whereas MW-4 is down gradient of the landfill and the closest groundwater monitoring point to the Cheakamus River.

A summary of the groundwater quality results in comparison to the applicable standards and guidelines are provided in Table 4 and Table 5. Detailed laboratory results can be found in Appendix A.

The following summarizes the groundwater exceedances of the standards and the guidelines for 2019.

BC Contaminated Sites Regulation, Schedule 3.2 Aquatic Life

- No parameters exceeded the standards in 2019.

BC Ambient Water Quality Guidelines

- pH was outside the range of the guidelines at MW-3 in Q4.
- Arsenic concentrations exceeded the guideline at MW-2D and MW-2S in all quarters, and at MW-4 in Q1 and Q3.
- Cobalt concentrations exceeded the guideline at MW-2D in all quarters, at MW-3 in Q3 and Q4, and at MW-4 in Q1, Q2 and Q3.
- Iron concentrations exceeded the guideline in all samples collected, except for MW-3 in Q2 and Q3.
- Manganese concentrations exceeded the guideline at MW-3 in Q3 and Q4, and at MW-4 in Q1 and one of the two samples collected in Q3.
- Silver concentration exceeded the guideline at MW-2D in Q1.
- Zinc concentrations exceeded the guideline at MW-2D in Q1, at MW-2S in Q3, and at MW-4 in Q2.
- Chlorobenzene concentrations exceeded the guideline at MW-2D in all quarters.

5.1.1 Discussion

Indicator metals, iron and manganese, were elevated at the wells downgradient of the landfill (MW-2D, MW-2S, MW-3 and MW-4), but did not exceeded the BCCSR standards in 2019. These indicator parameters were consistently elevated relative to background concentrations, which suggests MW-2D, MW-2S, MW-3 and MW-4 have been influenced by landfill leachate.

5.2 Surface Water

Similarly to groundwater, there are surface water monitoring locations both up gradient and down gradient of the landfill. Sample locations SFC-3 and SFC-11 are up gradient of the landfill and provide indicators of natural background surface water conditions. SFC-4B is the furthest down gradient and the closest monitoring point to the Cheakamus River.

A summary of the surface water monitoring results in comparison to the applicable standards and guidelines are provided in Table 6. Detailed laboratory results can be found in Appendix A.

The following summarizes the surface water exceedances of the standards and the guidelines for 2019.

BC Contaminated Sites Regulation, Schedule 3.2 Aquatic Life

- No parameters exceeded the standards in 2019.

BC Ambient Water Quality Guidelines

- pH was outside the range of the guidelines at SFC-2B in all quarters.
- Fluoride exceeded guidelines at SFC-2B in Q1, Q2 and Q3.
- Nitrate exceeded guidelines at SFC-2B in Q4.
- Nitrite exceeded guidelines at SFC-2B in Q4.
- Sulfate exceeded guidelines at SFC-2B in Q1 and Q3.
- Aluminum exceeded guidelines at SFC-2 and SFC-2B in all quarters, at SFC-3 and SFC-11 in Q1, Q3 and Q4, and at SFC-4B in Q1 and Q3.
- Beryllium exceeded guidelines at SFC-2B in all quarters.
- Chromium exceeded guidelines at SFC-2B in all quarters.
- Cobalt exceeded guidelines at SFC-2 and SFC-2B for all quarters, and at SFC-4B in Q4.
- Copper exceeded guidelines at SFC-2 in Q4, at SFC-2B in all quarters, and SCF-3 and in Q3 and Q4.
- Iron exceeded guidelines at SFC-2 and SFC-2B in all quarters, and at SFC-3 in Q3 and Q4.
- Manganese exceeded guidelines at SFC-2B in Q1, and Q2.
- Nickel exceeded guidelines at SFC-2B in Q1, Q2 and Q3.
- Zinc exceeded guidelines at SFC-2 in Q3 and Q4, at SFC-2B in all quarters, at SFC-3 in Q3 and Q4, and at SFC-4B in Q1.

5.2.1 Discussion

Indicators of leachate influenced groundwater quality are regularly above the guidelines in the locations down gradient of the landfill footprint,SFC-2, SFC-2B and occasionally at SFC-4B.

Hardness, conductivity, sulfate, iron and manganese were consistently elevated at SFC-2, SFC-2B and SFC-4B relative to background concentrations. The levels of these parameters were generally greatest at SFC-2B and decreased incrementally further downstream at SFC-2 and SFC-4B. These locations appear to be influenced by landfill leachate.

5.3 Leachate & Groundwater Interceptor

A summary of the leachate monitoring results in comparison to the applicable standards and guidelines are provided in Table 7 and Table 8. Detailed laboratory results can be found in Appendix A.

The following summarizes the leachate exceedances of the standards and the guidelines for 2019.

BC Contaminated Sites Regulation, Schedule 3.2 Aquatic Life

- No parameters exceeded the standards in 2019.

BC Ambient Water Quality Guidelines

- pH was outside the range of the guidelines at the Groundwater Interceptor in Q4.
- Nitrate concentrations exceeded guidelines at the Leachate Manhole in Q1 and Q3 (all sampled quarters).
- Iron concentrations exceeded guidelines at the Groundwater Interceptor in all quarters.
- Zinc concentrations exceeded guidelines at the Leachate Manhole in Q1 and Q3 (all sampled quarters) and at the Groundwater Interceptor in all quarters.
- Pyrene concentrations exceeded guidelines at the Groundwater Interceptor in all quarters.

5.3.1 Discussion

The concentration of the indicator parameters were generally higher at the Groundwater Interceptor than at the Leachate Manhole. Similarly, concentrations of some potential parameters of concern were also higher at the Groundwater Interceptor than at the Leachate Manhole. In particular, measurable concentrations of pyrene were found in all quarters in the Groundwater Interceptor.

5.4 Landfill Gas

Testing was performed monthly during the months with no snow cover (May – October). During the months with snow pack (January – April and November – December) sampling was completed weekly. A summary of the landfill gas monitoring results is provided in Table 9.

Methane was detected at MP #14 on September 28, with a measured concentration of 5% methane in air. This occurred after the first fall steady rainfall event, which has also happened in the past. The rains provide moisture deficient methane producing bacteria with water to increase methane production and at the same time seals the surface of the landfill and increases the propensity for horizontal migration. Adjustments were made to the extraction wells and the methane level at MP #14 immediately started to decrease. A follow-up visit was conducted on October 2, when the measured methane content in air was 0% at MP #14 (Norseman Engineering, 2019e).

In November, problems with air intrusion at the flare caused flare intake gas to be diluted with air to the point where the flare would no longer burn continuously. As a result, the flare flow had to be reduced so that the methane levels could recover. The reduced vacuum to the LFGCS resulted in trace quantities of methane measured in MP #12 and MP #14 on November 8 and November 20. The air leak was tracked down and located on November 22 and was isolated by closing a valve in the South Condensate drain manhole. Subsequent testing showed no measurable concentrations of methane at any monitoring points (Norseman Engineering, 2019g).

Methane was not detected at any other monitoring points in 2019. Based on 2019 data, the operation and maintenance of the landfill gas system ensured that landfill gas is effectively

extracted from the landfill area and lateral migration was prevented, with the exception of the September 28 event.

5.4.1 Maintenance Activities

Routine maintenance of monitoring probes were completed on as needed basis during monitoring activities by Norseman Engineering.

- In February, the methane content at the flare dropped steadily by a percent per week, going from 23 % on February 1 to 20 % on March 1, probably due to the cold weather slowing down the metabolism of the methane producing bacteria in the landfill. During the extraction well testing it was found that wells #11 and #12 had good quality methane and were opened up to increase methane at the flare. Opening wells #11 and 12 increased methane content at the flare to 21% (from 20%). It is not desirable to allow the methane content at the flare to decrease below 20% since 18% is the operating threshold for the flare (Norseman Engineering, 2019a).
- On March 29 the alarm record at the flare showed several low temperature and flame fail alarms, possibly due to low methane content. In response, the wells were adjusted and the methane content at the flare rose to 24% from 22% (Norseman Engineering, 2019b).
- On June 15 the landfill gas transmission line was found to be filled with condensate. RMOW staff were notified that the flare would be turned off to allow for condensate pump out. Following completion of condensate pumping, the flare was returned to service (Norseman Engineering, 2019c).
- On July 25, the methane readings of the southern wells were lower due to the increase in vacuum to that area as a result of pumping out the condensate in the landfill gas transmission line in June. The methane readings in wells #11 and #12 were below the lower combustion limit of 18% so the vacuum to those wells was reduced. This had the result of increasing the flare methane level by 1% to 25% (Norseman Engineering, 2019d).
- Off-site landfill gas migration was discovered in MP #14 during regular testing on September 28. This prompted the adjustment of the flare and some of the extraction wells in order to increase the flow to the problem area. Wells #4 and #5 were opened up to direct more vacuum to the south end of the landfill and also the flare flow was increased to increase the flow in general. By the time of the follow-up visit on October 2, the methane concentration at MP #14 had returned to zero (Norseman Engineering, 2019e).
- After opening up wells #4 and #5 all the way to control off site migration on September 28, they were throttled back on October 25 in order to keep the methane in each well in the combustible range of over 18%. The vacuum to extraction well #11 at the south end was increased, and the vacuum to well #12 was decreased. This raised the methane content at the flare from 26% to 27% (Norseman Engineering, 2019f).

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Groundwater, Surface Water & Leachate

6.1.1 Monitoring

Data from the 2019 monitoring results are generally consistent with the results from previous years' monitoring. There were no new or extraordinary issues noted in the groundwater, surface water or leachate monitoring results.

Groundwater

- No standards were exceeded in 2019.
- Indicators of leachate influenced groundwater quality appear at this time in locations down gradient of the landfill footprint (MW-2S / MW-2D and MW-3), and further down gradient of the landfill (MW-4).
- Metals such as arsenic, cobalt, copper, iron and manganese continue to exceed the guidelines.
- Down gradient of the landfill there are no groundwater points of diversion / users.

Based on the elements noted above, continued monitoring of groundwater in 2020 is recommended and required as per the Closure Plan.

Surface Water

- Surface water samples have exceeded the standards in the past for metals, however this was not observed in 2019 results, only the guidelines were exceeded.
- Hardness, conductivity, sulfate, iron and manganese were consistently elevated at SFC-2, SFC-2B and SFC-4B relative to background concentrations; this is consistent with historic sampling events. These locations appear to be influenced by landfill leachate.
- Surface water sampling location SFC-4B is the nearest to the Cheakamus River, therefore this location provides the best indication of potential effects to receiving water quality resulting from the site, and all BCCSR standards were met at this location. In 2019 the SFC-4B samples exceeded the guidelines for aluminum (Q1 and Q3), cobalt (Q3) and zinc (Q1).

Continued surface water monitoring in 2020 is recommended and required as per the Closure Plan.

Leachate

Continued monitoring is recommended in 2020 for leachate to assist in determining when in the future leachate treatment will no longer be required.

6.1.2 Maintenance

The following are recommended for 2020 maintenance activities:

- Repair or replace MW4 as there has been a failure in the well casing approximately 1 - 2 m below surface that is allowing bentonite into the well and prevented re-installing the HDPE tubing for sampling.
- Add a sample site up gradient of the landfill to provide a baseline for comparing water quality concentrations downgradient of the landfill.

6.2 Landfill Gas

6.2.1 Monitoring

Monitoring data from 2019 indicates that in general, the LFG Collection System continues to operate effectively and prevent LFG migration. Continued monitoring for LFG as prescribed in the methodology (Morrison Hershfield 2012) is recommended.

6.2.2 Maintenance

The Collection System was adjusted as necessary throughout the year (see section 5.4). Continued maintenance and operation for the Collection System as prescribed in the methodology (Morrison Hershfield 2012) is recommended.

7. DISCLAIMER

RMOW retained Morrison Hershfield to conduct the work described in this report, and this report has been prepared solely for this purpose.

Morrison Hershfield does not accept responsibility for the use of this report for any purpose other than that stated above and does not accept responsibility to any third party for the use, in whole or in part, of the contents of this document. This report should be understood in its entirety, since sections taken out of context could lead to misinterpretation.

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8. CLOSURE

We trust the information presented in this report meets your requirements. If you have any further questions or need addition details, please do not hesitate to contact one of the undersigned.

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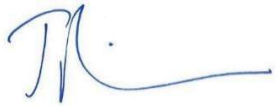

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Norseman Engineering, 2019g. Whistler Monitoring Report # 127.

MORRISON HERSHFIELD

TABLE 4: 2019 GROUNDWATER QUALITY - GENERAL CHEMISTRY AND DISSOLVED METALS

				Sample ID	MW-2D				MW-2S				MW-3				MW-4						MW-6			
				Date Sampled	13-Mar-19	20-Jun-19	26-Sep-19	17-Dec-19	13-Mar-19	20-Jun-19	26-Sep-19	17-Dec-19	13-Mar-19	20-Jun-19	26-Sep-19	17-Dec-19	13-Mar-19	20-Jun-19	20-Jun-19	26-Sep-19	26-Sep-19	17-Dec-19	13-Mar-19	20-Jun-19	26-Sep-19	17-Dec-19
				Quarter	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q2	Q3	Q3	Q4	Q1	Q2	Q3	Q4
Analyte	**Units**	**LOR**	**Sch. 3.2 Water FAW***	**BCAWWQG-FAL****									not sampled						duplicate sample		duplicate sample	not sampled	not sampled			
Field Parameters																										
Field Conductivity	uS/cm	-	-	-	1032	1084	718	665	357	377	275	313		215	172	144	517	418		187				638	397	96
Temperature	C	-	-	-	6.0	8.4	8.4	7.0	6.4	8.4	7.9	6.3		8.9	10.4	7.9	7.6	8.6		8.7				9.4	10.5	8.6
pH	-	-	-	-	6.43	4.85	6.50	6.54	6.15	6.32	6.55	6.67		5.28	6.01	5.73	6.52	5.52		6.57				6.28	6.21	6.46
Dissolved Oxygen	mg/L	-	-	-	4.21	1.62	1.71	1.93	2.88	1.08	1.29	3.25		3.58	6.19	1.90	6.61	1.35		4.19				6.24	2.81	3.88
Oxidation Reduction Potential	-	-	-	-	90.5	77.4	127.6	71.5	151.4	104.2	141.2	60.2		229.1	184.7	62.9	79.9	82.5		88.0				82.1	215.4	60.8
General Chemistry																										
Conductivity	uS/cm	2	-	-	961	927	886	921	288	278	287	424		180	226	220	414	311	314	228	231			635	502	485
Hardness (as CaCO3)	mg/L	0.5	-	-	327	322	335	362	84.3	98.4	108	161		43.1	55.1	51.0	133	120	117	79.8	78.7			123	109	91.8
pH	pH	0.1	-	6.5 - 9.0	7.04	6.87	6.77	6.54	6.92	7.30	7.04	6.62		7.17	7.48	6.33	6.85	7.19	7.37	7.19	7.14			7.17	6.93	6.82
Total Suspended Solids	mg/L	3	-	-	777	76	92	84	42	73.8	92	65		69.6	24.60	39.6	475	1990	606	621	512			100	163	178
COD	mg/L	20	-	-	54	32	34	37	<20	<20	<20	29		<20	<20	<20	25	722	60	22	<20			<20	34	26
Anions and Nutrients																										
Alkalinity, Total (as CaCO3)	mg/L	1.0	-	-	262	274	297	301	69.4	76.4	76.4	111		26.8	27.6	27.3	122	104	104	67.1	66.2			26.8	78.9	41.9
Ammonia, Total (as N)	mg/L	0.0050	pH & Temp based	pH & Temp based	10.1	10.2	9.7	11.6	4.21	2.89	2.40	3.44		0.418	0.475	0.491	2.69	1.88	2.07	1.27	1.32			0.037	0.047	0.0434
Bromide (Br)	mg/L	0.050	-	-	<0.25	<0.25	<0.25	<0.250	<0.050	<0.050	<0.050	0.076		<0.050	<0.050	<0.050	0.064	<0.050	<0.050	<0.050	<0.050			<0.050	<0.050	<0.050
Chloride (Cl)	mg/L	0.50	1500	600	45	45.3	44.3	44	10.3	6.76	7.05	18.1		24.5	29.4	25.5	27.2	18.7	18.8	13.8	14			120	63.6	53.2
Fluoride (F)	mg/L	0.020	2 @ H < 50 3 @ H >= 05	0.4	<0.10	<0.10	<0.10	<0.100	0.107	0.095	0.114	0.132		0.026	0.04	0.032	0.092	0.059	0.051	0.066	0.067			0.07	0.078	0.072
Nitrate and Nitrite (as N)	mg/L	0.0051	400	-	<0.025	<0.025	<0.025	0.0419	0.0119	0.0052	0.015	0.0053		0.6620	0.0196	0.135	<0.0051	0.0263	0.0138	0.0134	0.0183			0.1400	0.1080	0.115
Nitrate (as N)	mg/L	0.0050	400	3	<0.025	<0.025	<0.025	<0.50	0.0119	0.0052	0.015	<0.50		0.6620	0.0196	<0.50	<0.0050	0.0237	0.0119	0.0134	0.0171			0.1400	0.1080	<0.50
Nitrite (as N)	mg/L	0.0010	0.2	0.02	<0.0050	<0.0050	<0.0050	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010		<0.0010	<0.0010	0.0014	<0.0010	0.0025	0.0019	<0.0010	0.0012			<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	0.050	-	-	11.4	12.8	10.0	11.6	4.28	3.32	3.05	3.40		0.806	0.581	0.555	2.77	2.35	2.82	1.65	1.71			0.39	0.46	0.536
Total Nitrogen	mg/L	0.030	-	-	11.8	11.3	10.6	9.86	4.37	3.34	3.06	3.11		1.23	0.587	0.660	2.83	4.39	3.14	1.72	1.48			0.49	0.72	0.565
Phosphorus (P)-Total	mg/L	0.0020	-	-	0.5100	0.1100	0.1280	0.153	0.0414	0.0783	0.0975	0.0366		0.0313	0.0066	0.0244	0.3060	5.2800	0.3220	0.4080	0.2640			0.463	0.984	0.888
Sulfate (SO4)	mg/L	0.30	1280 @ H <= 30 2180 @ H 31-75 3090 @ H 76-180 4290 @ H >180	128 @ H <= 30 218 @ H 31-75 309 @ H 76-180 429 @ H >180	181	173	150	138	48.2	51.8	56.4	74.4		19.2	34.6	32.2	46.7	38.3	38.3	26.3	26.9			100.0	76.7	103.0
Dissolved Metals																										
Aluminum (Al)-Dissolved	mg/L	0.0010	-	0.1	0.0045	0.0036	0.0045	0.0027	0.0016	0.003	0.0038	0.0033		0.0115	0.0165	0.0285	0.0079	0.0072	0.0083	0.0138	0.0163			0.0213	0.0223	0.0128
Antimony (Sb)-Dissolved	mg/L	0.00010	0.09	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010			<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	mg/L	0.00010	0.05	0.005	0.0122	0.0132	0.0166	0.014	0.0061	0.0065	0.0069	0.0079		<0.00010	<0.00010	<0.00010	0.0074	0.0037	0.0043	0.0072	0.0063			<0.00010	0.00042	0.00012
Barium (Ba)-Dissolved	mg/L	0.00010	10	1	0.0334	0.0378	0.0367	0.0392	0.0724	0.0681	0.0734	0.118		0.0735	0.0891	0.0866	0.1990	0.1140	0.1140	0.0943	0.0897			0.0400	0.0347	0.0297
Beryllium (Be)-Dissolved	mg/L	0.00010	0.0015	0.00013	<0.00010	<0.00010	<0.00010	<0.000100	<0.00010	<0.00010	<0.00010	<0.000100		<0.00010	<0.00010	<0.000100	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010			<0.00010	<0.00010	<0.000100
Bismuth (Bi)-Dissolved	mg/L	0.000050	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050			<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved	mg/L	0.010	12	1.2	0.239	0.255	0.238	0.254	0.095	0.096	0.088	0.113		<0.010	<0.010	<0.010	0.059	0.048	0.046	0.032	0.031			0.012	0.016	0.014
Cadmium (Cd)-Dissolved	mg/L	0.0000050	0.0005 @ H <30 0.0015 @ H 30-<90 0.0025 @ H 90-<150 0.0035 @ H 150-<210 0.004 @ H >= 210	As per guideline calculation	0.0000088	<0.0000050	<0.0000050	<0.0000100	<0.0000050	<0.0000050	0.0000054	<0.0000050		0.000136	0.000411	0.000314	0.00015	0.000258	0.000244	0.0000992	0.0000786			0.0000968	0.0000529	0.0000466
Calcium (Ca)-Dissolved	mg/L	0.050	-	-	108	108	109	120	27.5	31.1	32.8	50.2		13.8	16.3	15.0	43.5	41.6	40.2	26.1	26.4			41.2	37.2	31.0
Cesium (Cs)-Dissolved	mg/L	0.000010	-	-	0.000015	0.000019	0.000022	0.000018	0.000019	0.000014	0.000015	0.000018		0.000047	0.000059	0.000057	0.000042	0.000071	0.000069	0.000036	0.00003			<0.000010	0.000013	0.000011
Chromium (Cr)-Dissolved	mg/L	0.00010	0.01	0.001	0.00014	0.00033	0.00018	0.00013	<0.00010	<0.00010	0.00013	<0.00010		<0.00010	0.00011	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010			<0.00010	0.0001	<0.00010
Cobalt (Co)-Dissolved	mg/L	0.00010	0.04	0.004	0.0107	0.0107	0.0113	0.0113	0.0010	0.0015	0.0021	0.00301		0.0020	0.012	0.00960	0.0247	0.0119	0.0121	0.0142	0.0137			0.0019	0.00234	0.00049
Copper (Cu)-Dissolved	mg/L	0.00020	0.02 @ H < 50 0.03 @ H 50 - <75 0.04 @ H 75 - <100 0.05 @ H 100 - < 125 0.06 @ H 125 - <150 0.07 @ H 150 - < 175 0.08 @ H 175 - <200 0.09 @ H >= 200	(0.094(H)+2) / 1000	0.00724	0.00466	0.00033	0.00043	<0.00020	0.0042	0.00115	0.00025		0.00189	0.00272	0.00438	0.00322	0.00117	0.00565	0.00125	0.00069			0.00404	0.00309	0.00155
Iron (Fe)-Dissolved	mg/L	0.010	-	0.35	48.9	48.2	52.0	53.3	24.4	29.6	33.7	51.2		0.02	0.041	0.547	39.2	13.6	15.0	25.4	23.0			2.16	2.22	0.444
Lead (Pb)-Dissolved	mg/L	0.000050	0.04 @ H <50 0.05 @ H 50 - <100 0.06 @ H 100 - <200 110 @ H 200 - <300 160 @ H h >= 300	0.003	0.000304	0.000091	<0.000050	<0.000050	<0.000050	0.000112	<0.000050	<0.000050		<0.000050	<0.000050	<0.000050	0.000095	<0.000050	0.000136	0.00011	<0.000050			0.000098	<0.000050	<0.000050
Lithium (Li)-Dissolved	mg/L	0.0010	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010			<0.0010	<0.0010	<0.0010
Magnesium (Mg)-Dissolved	mg/L	0.0050	-	-	13.7	13.0	15.4	14.7	3.82	5.02	6.29	8.64		2.07	3.51	3.28	6.02	3.99	4.16	3.55	3.11			4.9	4.04	3.52
Manganese (Mn)-Dissolved	mg/L	0.00010	-	0.01102*H +0.54	3.21	3.08	3.66	3.76	1.22	1.37	1.64	2.29		0.93	2.63	2.32	2.25	1.35	1.39	1.45	1.38			0.188	0.182	0.0743
Mercury (Hg)-Dissolved	mg/L	0.0000050	0.00025	0.00001	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050			<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved	mg/L	0.000050	10	2	0.01220	0.01280	0.01190	0.0126	0.00309	0.00441	0.00488	0.00502		0.00065	0.00075	0.000492	0.01150	0.00967	0.01080	0.01580	0.01590			0.00060	0.00104	0.000796
Nickel (Ni)-Dissolved	mg/L	0.00050	0.25 @ H < 60 0.65 @ H 60 - <120 1.1 @ H 120 - < 180 1.5 @ H >= 180	0.025	0.00216	0.0021	0.00208	0.00208	<0.00050	0.00057	0.00063	0.00086		<0.00050	0.00245	0.00160	0.00352	0.0038	0.00383	0.00195	0.00189			<0.00050	<0.00050	<0.00050
Phosphorus (P)-Dissolved	mg/L	0.050	-	-	0.09	0.088	0.088	0.119	<0.050	<0.050	<0.050	<0.050		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050			<0.050	<0.050	<0.050
Potassium (K)-Dissolved	mg/L	0.050	-	373	17.5	17.5	20.8	20.7	7.12	6.04	6.95	9.31		3.36	3.98	3.18	5.86	4.9	4.92	3.96	3.87			3.49	3.4	2.87
Rubidium (Rb)-Dissolved	mg/L	0.00020	-	-	0.00994	0.00998	0.01160	0.0109	0.00472	0.00397	0.00429	0.00531		0.00859	0.01080	0.00972	0.0044	0.00431	0.00458	0.00297	0.00286			0.00519	0.00459	0.00460
Selenium (Se)-Dissolved	mg/L	0.000050	0.02	0.001	0.000055	0.00006	0.00008	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050			0.000053	0.000057	<0.000050
Silicon (Si)-Dissolved	mg/L	0.050	-	-	13.1	14.4	14.1	14.7	7.83	8.91	8.53	9.7		6.92	7.36	7.28	10.5	10.0	10.1	9.33	9.85			5.91	6.96	5.59
Silver (Ag)-Dissolved	mg/L	0.000010	0.0005 @ H <= 100 0.015 @ H > 100	0.00005	0.000575	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010			<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L	0.050	-	-	32.5	33.7	39.4	39.4	8.08	7.08	7.94	13		13.4	17.6	16.8	16.5	14.5	14.7	11.9	11.0			73.4	61.4	66.4
Strontium (Sr)-Dissolved	mg/L	0.00020	-	-	0.519	0.503	0.525	0.588	0.175	0.183	0.205	0.312		0.132	0.153	0.138	0.311	0.274	0.283	0.162	0.156			0.388	0.295	0.348
Sulfur (S)-Dissolved	mg/L	0.50	-	-	58.8	62.2	51.9	50.9	15.3	18.3	19.2	24.9		6.71	10.8	10.3	15.6	13.5	13.5	8.95	8.68			33.1	29.4	37.4
Tellurium (Te)-Dissolved	mg/L	0.00020	-	-	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020			<0.00020	<0.00020	<0.00020
Thallium (Tl)-Dissolved	mg/L	0.000010	0.003	0.0008	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		0.000068	0.000087	0.000114	0.000031	0.000046	0.000044	0.000015	0.000018			0.000045	0.000036	0.000026
Thorium (Th)-Dissolved	mg/L	0.00010	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010			<0.00010	<0.00010	<0.00010

MORRISON HERSHFIELD

TABLE 4: 2019 GROUNDWATER QUALITY - GENERAL CHEMISTRY AND DISSOLVED METALS

				Sample ID	MW-2D				MW-2S				MW-3				MW-4						MW-6			
				Date Sampled	13-Mar-19	20-Jun-19	26-Sep-19	17-Dec-19	13-Mar-19	20-Jun-19	26-Sep-19	17-Dec-19	13-Mar-19	20-Jun-19	26-Sep-19	17-Dec-19	13-Mar-19	20-Jun-19	20-Jun-19	26-Sep-19	26-Sep-19	17-Dec-19	13-Mar-19	20-Jun-19	26-Sep-19	17-Dec-19
				Quarter	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q2	Q3	Q3	Q4	Q1	Q2	Q3	Q4
Analyte	**Units**	**LOR**	**Sch. 3.2 Water FAW***	**BCAWWQG-FAL****									not sampled						duplicate sample		duplicate sample	not sampled	not sampled			
Tin (Sn)-Dissolved	mg/L	0.00010	-	-	<0.00010	0.00011	<0.00010	0.00015	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010			<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L	0.00030	1	2	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030			<0.00030	<0.00030	<0.00030
Tungsten (W)-Dissolved	mg/L	0.00010	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010			<0.00010	<0.00010	<0.00010
Uranium (U)-Dissolved	mg/L	0.000010	0.085	0.0085	0.000153	0.000161	0.000145	0.000137	0.000011	0.000015	0.000015	0.000032		<0.000010	<0.000010	<0.000010	0.000187	0.000176	0.000196	0.000078	0.000085			0.000019	0.000042	0.000021
Vanadium (V)-Dissolved	mg/L	0.00050	-	0.006	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050			<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved	mg/L	0.0010	0.075 @ H <90 0.15 @ H 90 -<100 0.9 @ H 100 - <200 1.65 @ H 200 - <300 2.4 @ H 300 - <400	0.0075	0.0094	0.006	0.0013	0.0015	0.005	0.0055	0.0217	0.0054		0.0026	0.0038	0.0042	0.0061	0.0182	0.0196	0.0053	0.0039			0.0042	0.0017	0.0011
Zirconium (Zr)-Dissolved	mg/L	0.000060	-	-	<0.000060	<0.00020	<0.00020	<0.00020	<0.000060	<0.00020	<0.00020	<0.00020		<0.00020	<0.00020	<0.00020	<0.000060	<0.00020	<0.00020	<0.00020	<0.00020			<0.00020	<0.00020	<0.00020

***Standard: British Columbia Contaminated Sites Regulation (January, 2019) - Schedule 3.2 Water Standards Freshwater Aquatic Life**

****Guideline: British Columbia Approved and Working Water Quality Guidelines (August, 2019) - BCAWWQG - Freshwater Aquatic Life**

Color Key: Exceeds Standard and Guideline | Exceeds Guideline

MORRISON HERSHFIELD

TABLE 5: 2019 GROUNDWATER QUALITY - PETROLEUM HYDROCARBONS

				Sample ID	MW-2D				MW-2S				MW-3				MW-4						MW-9			
				Date Sampled	13-Mar-19	20-Jun-19	26-Sep-19	17-Dec-19	13-Mar-19	20-Jun-19	26-Sep-19	17-Dec-19	13-Mar-19	20-Jun-19	26-Sep-19	17-Dec-19	13-Mar-19	20-Jun-19	20-Jun-19	26-Sep-19	26-Sep-19	17-Dec-19	13-Mar-19	20-Jun-19	26-Sep-19	17-Dec-19
				Quarter	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q2	Q3	Q3	Q4	Q1	Q2	Q3	Q4
Analyte	**Units**	**LOR**	**Sch. 3.2 Water FAW***	**BCAWWQG-FAL****									not sampled						duplicate sample		duplicate sample	not sampled	not sampled			
Volatile Organic Compounds																										
Benzene	mg/L	0.00050	0.4	0.04	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050			<0.00050	<0.00050	<0.00050
Bromodichloromethane	mg/L	0.0010	-	-	<0.0010	<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.00050		<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010			<0.0010	<0.0010	<0.00050
Bromoform	mg/L	0.0010	-	-	<0.0010	<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.00050		<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010			<0.0010	<0.0010	<0.00050
Carbon Tetrachloride	mg/L	0.00050	0.13	0.0133	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050			<0.00050	<0.00050	<0.00050
Chlorobenzene	mg/L	0.0010	0.013	0.0013	0.0017	0.0021	0.002	0.0022	<0.0010	<0.0010	<0.0010	0.0008		<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010			<0.0010	<0.0010	<0.00050
Dibromochloromethane	mg/L	0.0010	-	-	<0.0010	<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.00050		<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010			<0.0010	<0.0010	<0.00050
Chloroethane	mg/L	0.0010	-	-	<0.0010	<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.00050		<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010			<0.0010	<0.0010	<0.00050
Chloroform	mg/L	0.0010	0.02	0.0018	<0.0010	<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.00050		<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010			<0.0010	<0.0010	<0.00050
Chloromethane	mg/L	0.0050	-	-	<0.0050	<0.0050	<0.0050	<0.00050	<0.0050	<0.0050	<0.0050	<0.00050		<0.0050	<0.0050	<0.00050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.0050	<0.0050	<0.00050
1,2-Dichlorobenzene	mg/L	0.00050	0.007	0.0007	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050			<0.00050	<0.00050	<0.00050
1,3-Dichlorobenzene	mg/L	0.0010	1.5	0.15	<0.0010	<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.00050		<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010			<0.0010	<0.0010	<0.00050
1,4-Dichlorobenzene	mg/L	0.0010	0.26	0.026	<0.0010	<0.0010	<0.0010	0.00054	<0.0010	<0.0010	<0.0010	<0.0005		<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010			<0.0010	<0.0010	<0.00050
1,1-Dichloroethane	mg/L	0.0010	-	-	<0.0010	<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.00050		<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010			<0.0010	<0.0010	<0.00050
1,2-Dichloroethane	mg/L	0.0010	1	0.1	<0.0010	<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.00050		<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010			<0.0010	<0.0010	<0.00050
1,1-Dichloroethylene	mg/L	0.0010	-	-	<0.0010	<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.00050		<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010			<0.0010	<0.0010	<0.00050
cis-1,2-Dichloroethylene	mg/L	0.0010	-	-	<0.0010	<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.00050		<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010			<0.0010	<0.0010	<0.00050
trans-1,2-Dichloroethylene	mg/L	0.0010	-	-	<0.0010	<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.00050		<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010			<0.0010	<0.0010	<0.00050
Dichloromethane	mg/L	0.0050	0.98	0.0981	<0.0050	<0.0050	<0.0050	<0.00050	<0.0050	<0.0050	<0.0050	<0.00050		<0.0050	<0.0050	<0.00050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			<0.0050	<0.0050	<0.00050
1,2-Dichloropropane	mg/L	0.0010	-	-	<0.0010	<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.00050		<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010			<0.0010	<0.0010	<0.00050
cis-1,3-Dichloropropylene	mg/L	0.00050	-	-	<0.00050	<0.00050	<0.00050	<0.00075	<0.00050	<0.00050	<0.00050	<0.00075		<0.00050	<0.00050	<0.00075	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050			<0.00050	<0.00050	<0.00075
trans-1,3-Dichloropropylene	mg/L	0.00050	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050			<0.00050	<0.00050	<0.00050
1,3-Dichloropropene (cis & trans)	mg/L	0.0010	-	-	<0.0010	<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.00050		<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010			<0.0010	<0.0010	<0.00050
Ethylbenzene	mg/L	0.00050	2	0.2	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050			<0.00050	<0.00050	<0.00050
Methyl t-butyl ether (MTBE)	mg/L	0.00050	34	3.4	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050			<0.00050	<0.00050	<0.00050
Styrene	mg/L	0.00050	0.72	0.072	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050			<0.00050	<0.00050	<0.00050
1,1,1,2-Tetrachloroethane	mg/L	0.0010	-	-	<0.0010	<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.00050		<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010			<0.0010	<0.0010	<0.00050
1,1,2,2-Tetrachloroethane	mg/L	0.00020	-	-	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020			<0.00020	<0.00020	<0.00020
Tetrachloroethylene	mg/L	0.0010	1.1	0.11	<0.0010	<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.00050		<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010			<0.0010	<0.0010	<0.00050
Toluene	mg/L	0.00045	0.005	0.0005	<0.00045	<0.00045	<0.00045	<0.00050	<0.00045	<0.00045	<0.00045	<0.00050		<0.00045	<0.00045	<0.00050	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045			<0.00045	<0.00045	<0.00050
1,1,1-Trichloroethane	mg/L	0.0010	-	11.1	<0.0010	<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.00050		<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010			<0.0010	<0.0010	<0.00050
1,1,2-Trichloroethane	mg/L	0.00050	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050			<0.00050	<0.00050	<0.00050
Trichloroethylene	mg/L	0.0010	0.2	0.021	<0.0010	<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.00050		<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010			<0.0010	<0.0010	<0.00050
Trichlorofluoromethane	mg/L	0.0010	-	-	<0.0010	<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.00050		<0.0010	<0.0010	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010			<0.0010	<0.0010	<0.00050
Vinyl Chloride	mg/L	0.00040	-	-	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040		<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040			<0.00040	<0.00040	<0.00040
ortho-Xylene	mg/L	0.00050	-	0.03	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050			<0.00050	<0.00050	<0.00050
meta- & para-Xylene	mg/L	0.00050	-	0.03	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050			<0.00050	<0.00050	<0.00050
Xylenes	mg/L	0.00075	0.3	0.03	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075		<0.00075	<0.00075	<0.75	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075			<0.00075	<0.00075	<0.00075
4-Bromofluorobenzene (SS)	%	Surrogate	-	-	90.7	90.8	90.3	97.7	92.9	91.8	91.4	100		89.6	88	95.4	88.7	92.4	92	90.8	90.7			88.5	91.9	97.9
1,4-Difluorobenzene (SS)	%	Surrogate	-	-	103.6	104.1	95.1	99.8	101.3	103.5	80.5	100		103	104.9	99.9	100.3	102.3	102.7	69.3	102.7			104.7	95	101
Hydrocarbons																										
EPH10-19	mg/L	0.25	5	-	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25		<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25			<0.25	<0.25	<0.25
EPH19-32	mg/L	0.25	-	-	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25		<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25			<0.25	<0.25	<0.25
LEPH	mg/L	0.25	0.5	-	<0.25	<0.25	<0.25	<0.1	<0.25	<0.25	<0.25	<0.1		<0.25	<0.25	<0.1	<0.25	<0.25	<0.25	<0.25	<0.25			<0.25	<0.25	<0.1
HEPH	mg/L	0.25	-	-	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25		<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25			<0.25	<0.25	<0.25
Volatile Hydrocarbons (VH6-10)	mg/L	0.10	15	-	<0.10	<0.10	<0.10	<0.1	<0.10	<0.10	<0.10	<0.1		<0.10	<0.10	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10			<0.10	<0.10	<0.1
VPH (C6-C10)	mg/L	0.10	1.5	-	<0.10	<0.10	<0.10	<0.25	<0.10	<0.10	<0.10	<0.25		<0.10	<0.10	<0.25	<0.10	<0.10	<0.10	<0.10	<0.10			<0.10	<0.10	<0.25
2-Bromobenzotrifluoride	%	Surrogate	-	-	91.7	94.4	87.9	100.00	88.0	89.3	91	92.7		93	64.0	99.9	83.5	84.9	87.3	68	77.5			88.8	70.9	104
3,4-Dichlorotoluene (SS)	%	Surrogate	-	-	97.2	86.1	72.6	95.2	106.8	97.7	86.5	115		98	76.5	107	87.8	102.3	101.9	86.3	87.7			99.4	88.2	109
Polycyclic Aromatic Hydrocarbons																										
Acenaphthene	mg/L	0.000010	0.06	0.006	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010			<0.000010	<0.000010	<0.000010
Acenaphthylene	mg/L	0.000010	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010			<0.000010	<0.000010	<0.000010
Acridine	mg/L	0.000010	0.0005	0.00005	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010			<0.000010	<0.000010	<0.000010
Anthracene	mg/L	0.000010	0.001	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010			<0.000010	<0.000010	<0.000010
Benz(a)anthracene	mg/L	0.000010	0.001	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010			<0.000010	<0.000010	<0.000010
Benzo(a)pyrene	mg/L	0.0000050	0.0001	0.00001	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050			<0.0000050	<0.0000050	<0.0000050
Benzo(b&j)fluoranthene	mg/L	0.000010	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010			<0.000010	<0.000010	<0.000010
Benzo(b+j+k)fluoranthene	mg/L	0.000015	-	-	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015		<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015			<0.000015	<0.000015	<0.000015
Benzo(g,h,i)perylene	mg/L	0.000010	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010			<0.000010	<0.000010	<0.000010
Benzo(k)fluoranthene	mg/L	0.000010	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010			<0.000010	<0.000010	<0.000010
Chrysene	mg/L	0.000010	0.001	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010			<0.000010	<0.000010	<0.000010
Dibenz(a,h)anthracene	mg/L	0.0000050	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050			<0.0000050	<0.0000050	<0.0000050
Fluoranthene	mg/L	0.000010	0.002	0.0002	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010			<0.000010	<0.000010	<0.000010
Fluorene	mg/L	0.000010	0.12	0.012	0.000011	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010			<0.000010	<0.000010	<0.000010
Indeno(1,2,3-c,d)pyrene	mg/L	0.000010	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010			<0.000010	<0.000010	<0.000010
1-Methylnaphthalene	mg/L	0.000050	-	-	<0.000050	<0.000050	<0.000050	<0.000010	<0.000050	<0.000050	<0.000050	<0.000010		<0.000050	<0.000050	<0.000010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050			<0.000050	<0.000050	<0.000010
2-Methylnaphthalene	mg/L	0.000050	-	-	<0.000050	<0.000050	<0.000050	<0.000010	<0.000050	<0.000050	<0.000050	<0.000010		<0.000050	<0.000050	<0.000010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050			<0.000050	<0.000050	<0.000010
Naphthalene	mg/L	0.000050	0.01	0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050			<0.000050	<0.000050	<0.000050
Phenanthrene	mg/L	0.000020	0.003	0.0003	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020			<0.000020	<0.000020	<0.000020
Pyrene	mg/L	0.000010	0.0002	0.00002	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010			<0.000010	<0.000010	<0.000010
Quinoline	mg/L	0.000050	0.034	0.0034	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050			<0.000050	<0.000050	<0.000050
Acridine d9	%	Surrogate	-	-	118.2	97.8	89.7	96.0	76.1	84.3	87	95.2		99.1	95.9	93.1	67.4	2.6	62	22	42.6			109.3	72.9	88.7
Chrysene d12	%	Surrogate	-	-	121	119.4	93.1	109	124	105.1	94.8	106		124	96.3	107	84	115.3	129.5	86.8	100.4			130	95.2	108
Naphthalene d8	%	Surrogate	-	-	111.7	94.5	93	117	84.4	81.2	91.7	107		97.1	94.1	104	109.9	105.8	96.1	84.4	93.8			101.5	89.9	111
Phenanthrene d10	%	Surrogate	-	-	115.9	101.6	99.4	109	62.9	87.6	96.9	106		103.5	101.8	102	128.6	109.5	108.1	92.5	102.7			111.6	99.8	104

***Standard: British Columbia Contaminated Sites Regulation (January, 2019) - Schedule 3.2 Water Standards Freshwater Aquatic Life**

****Guideline: British Columbia Approved and Working Water Quality Guidelines (August, 2019) - BCAWWQG - Freshwater Aquatic Life**

Color Key: Exceeds Standard and Guideline | Exceeds Guideline | Exceeds Guideline

MORRISON HERSHFIELD

TABLE 6: 2019 SURFACE WATER QUALITY GENERAL CHEMISTRY AND METALS

				Sample ID	SFC-2				SFC-2B				SFC-3					SFC-4B				SFC-11			
				Date Sampled	13-Mar-19	20-Jun-19	26-Sep-19	17-Dec-19	13-Mar-19	20-Jun-19	26-Sep-19	17-Dec-19	13-Mar-19	20-Jun-19	26-Sep-19	17-Dec-19	17-Dec-19	13-Mar-19	20-Jun-19	26-Sep-19	17-Dec-19	13-Mar-19	20-Jun-19	26-Sep-19	17-Dec-19
				Quarter	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Analyte	Units	LOR	Sch. 3.2 Water FAW*	BCAWWQG-FAL**													duplicate sample				sample lost in transit				
Field Parameters																									
Field Conductivity	uS/cm	-	-	-	329	317	302	221	1156	1273	835	312	664	152	203	112		279	265	153	176	137	146	70	64
Temperature	C	-	-	-	7.9	8.7	10.0	7.8	1.8	11.2	10.6	1.9	2.7	7.0	9.7	3.9		1.8	9.9	9.5	4.0	4.6	6.2	7.6	4.7
pH	-	-	-	-	5.55	6.53	6.75	6.20	3.21	2.13	3.14	5.54	6.94	6.65	6.60	6.70		7.20	5.07	7.08	5.62	7.12	6.30	6.47	6.77
Dissolved Oxygen	mg/L	-	-	-	5.40	6.65	7.17	8.20	5.01	1.08	2.96	7.93	13.31	8.66	8.72	11.7		14.29	8.67	8.44	11.34	10.00	7.70	8.93	10.23
Oxidation Reduction Potential	-	-	-	-	228.6	29.5	95.2	62.3	306.1	413.5	369.7	65.7	75.9	11.5	219.8	102.1		62.9	53.3	181.4	107.7	51.5	26.9	205.6	75.2
General Chemistry																									
Conductivity	uS/cm	2	-	-	306	306	401	339	1110	1390	1220	548	650	143	278	190	192	275	259	208		135	145	132	106
Hardness (as CaCO3)	mg/L	0.5	-	-	103	104	151	121	303	385	320	236	61.4	45.2	63.8	32.6	31.8	75.6	80.8	65.7		40.8	45.5	42.5	33.1
pH	pH	0.1	-	6.5 - 9.0	7.14	7.43	7.53	7.13	3.16	3.02	3.1	5.53	7.34	7.44	7.13	7.00	7.13	7.54	7.75	7.36		7.14	7.4	7.24	7.09
Total Suspended Solids	mg/L	3	-	-	16	10.00	9.20	8.6	47	35.6	24.6	63.2	3.0	4.0	18.2	12.8	14.8	3.2	<3.0	37.4		<3.0	<3.0	3	5.8
COD	mg/L	20	-	-	<20	<20	<20	<20	23	27	<20	23	<20	<20	<20	<20	<20	<20	<20	<20		<20	<20	<20	<20
Anions and Nutrients																									
Alkalinity, Total (as CaCO3)	mg/L	1.0	-	-	60.5	60.1	88.8	62.2	<1.0	<1.0	<1.0	7.3	28.5	31.7	31.9	21.3	21.1	32.3	38.8	35.8		25.8	31.9	34.2	23.6
Ammonia, Total (as N)	mg/L	0.0050	pH & Temp based	pH & Temp based	0.57	0.46	0.15	0.299	2.25	2.30	1.24	0.323	0.02	<0.0050	0.04	0.0144	0.0152	0.03	<0.0050	0.01		<0.0050	<0.0050	<0.0050	<0.0050
Bromide (Br)	mg/L	0.050	-	-	<0.050	<0.050	<0.050	<0.050	<0.25	<0.25	<0.25	<0.050	<0.25	<0.050	<0.050	<0.050	<0.050	<0.050	0.06	<0.050		<0.050	<0.050	<0.050	<0.050
Chloride (Cl)	mg/L	0.50	1500	600	21.4	21.2	25.8	17.0	11.70	6.8	9.4	5.00	165.0	14.4	41.4	33.3	33.3	37.4	31.3	23.8		14.6	14.8	9.49	6.88
Fluoride (F)	mg/L	0.020	2 @ H < 50 3 @ H >= 05	0.4	0.046	0.049	0.062	0.067	0.63	0.50	0.87	0.238	<0.10	0.051	0.056	0.038	0.037	0.049	0.054	0.044		0.044	0.048	0.044	0.047
Nitrate and Nitrite (as N)	mg/L	0.0051	400	-	0.23	0.159	1.29	1.61	0.06	<0.025	0.064	5.71	0.212	0.148	0.811	0.302	0.304	0.288	0.189	0.417		0.242	0.18	0.304	0.504
Nitrate (as N)	mg/L	0.0050	400	3	0.23	0.158	1.29	1.62	0.06	<0.025	0.064	5.73	0.212	0.148	0.808	<0.50	<0.50	0.288	0.189	0.417		0.242	0.18	0.304	0.50
Nitrite (as N)	mg/L	0.0010	0.2	0.02	0.0010	0.0011	<0.0010	0.0024	<0.0050	<0.0050	<0.0050	0.0220	<0.0050	<0.0010	0.0034	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010		<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	0.050	-	-	0.693	0.603	0.355	0.519	2.44	3.10	1.70	1.07	0.152	0.096	0.287	0.102	0.116	0.134	0.131	0.144		0.085	0.089	0.065	0.051
Total Nitrogen	mg/L	0.030	-	-	0.84	0.67	1.50	1.83	2.44	3.13	1.69	6.83	0.312	0.222	1.01	0.397	0.402	0.354	0.239	0.559		0.255	0.209	0.352	0.534
Phosphorus (P)-Total	mg/L	0.0020	-	-	0.0066	0.0021	0.0093	0.0045	<0.011	0.0377	0.0126	0.0343	0.0143	0.0072	0.126	0.0568	0.0567	0.0113	<0.0020	0.0298		0.0116	0.0044	0.0094	0.0168
Sulfate (SO4)	mg/L	0.30	1280 @ H <= 30 2180 @ H 31-75 3090 @ H 76-180 4290 @ H >180	128 @ H <= 30 218 @ H 31-75 309 @ H 76-180 429 @ H >180	51.40	52.30	74.30	68.4	497	342	561	227	20.6	14.0	36.8	14.1	14.1	37.5	34.3	30.1		14.7	15.0	16.7	13.3
Total Metals																									
Aluminum (Al)-Dissolved	mg/L	0.0010	-	0.1	0.72	0.389	0.771	1.06	16.8	22.9	22.2	9.72	0.121	0.063	1.650	0.694	0.669	0.122	0.028	0.153		0.113	0.038	0.183	0.340
Antimony (Sb)-Dissolved	mg/L	0.00010	0.09	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020	<0.00020	<0.00010	0.00012	<0.00010	0.00011	0.00011	0.00011	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	mg/L	0.00010	0.05	0.005	0.00042	0.00018	0.00018	0.00016	0.00067	0.00088	0.00204	0.00077	0.0002	0.00011	0.00047	0.00023	0.00020	0.0002	<0.00010	<0.00010		0.00024	<0.00010	<0.00010	0.00013
Barium (Ba)-Dissolved	mg/L	0.00010	10	1	0.0619	0.0569	0.0575	0.0473	0.0271	0.0379	0.0291	0.0343	0.043	0.0109	0.0411	0.0207	0.0208	0.0198	0.0194	0.0181		0.0113	0.0104	0.0140	0.0120
Beryllium (Be)-Dissolved	mg/L	0.00010	0.0015	0.00013	<0.00010	<0.00010	<0.00010	<0.000100	0.00045	0.00071	0.00081	0.000246	<0.00010	<0.00010	<0.00010	<0.000100	<0.000100	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.000100
Bismuth (Bi)-Dissolved	mg/L	0.000050	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.00010	<0.00010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050		<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved	mg/L	0.010	12	1.2	0.048	0.042	0.025	0.024	0.021	0.026	0.027	0.027	<0.010	<0.010	<0.010	<0.010	<0.010	0.023	0.029	0.016		<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved	mg/L	0.0000050	0.0005 @ H <30 0.0015 @ H 30-<90 0.0025 @ H 90-<150 0.0035 @ H 150-<210 0.004 @ H >= 210	As per guideline calculation	0.0000418	0.0000343	0.0000487	0.0000577	0.000534	0.00067	0.000789	0.000346	0.000029	0.0000266	0.0000688	0.0000266	0.0000270	0.0000115	0.0000056	0.0000097		0.0000198	0.0000189	0.0000179	0.0000142
Calcium (Ca)-Dissolved	mg/L	0.050	-	-	35.2	35.9	52.5	41.4	78.2	103	89	76.5	21	14.6	21.1	10.6	10.2	25.4	27.6	22.4		12.8	14.5	13.7	10.4
Cesium (Cs)-Dissolved	mg/L	0.000010	-	-	0.000012	0.00001	0.000011	<0.000010	0.000076	0.000111	0.000118	0.000020	0.00001	<0.000010	0.000043	0.000020	0.000019	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010
Chromium (Cr)-Dissolved	mg/L	0.00010	0.01	0.001	0.00066	0.00032	0.00012	0.00022	0.0013	0.00179	0.0025	0.00147	0.00024	0.00012	0.00085	0.00045	0.00043	0.00013	<0.00010	<0.00010		0.00036	0.0001	0.00023	0.00014
Cobalt (Co)-Dissolved	mg/L	0.00010	0.04	0.004	0.00583	0.00625	0.00572	0.00546	0.10200	0.14100	0.10300	0.0347	0.00018	0.0002	0.00313	0.00051	0.00052	0.00055	0.00016	0.00045		<0.00010	<0.00010	0.00011	0.00016
Copper (Cu)-Dissolved	mg/L	0.00020	0.02 @ H < 50 0.03 @ H 50 - <75 0.04 @ H 75 - <100 0.05 @ H 100 - < 125 0.06 @ H 125 - <150 0.07 @ H 150 - < 175 0.08 @ H 175 - <200 0.09 @ H >= 200	(0.094(H)+2) / 1000	0.0117	0.0062	0.0149	0.0201	0.2000	0.2340	0.3790	0.144	0.0027	0.0007	0.0193	0.00591	0.00588	0.0018	0.0010	0.0030		0.0010	<0.00050	0.0014	0.00246
Iron (Fe)-Dissolved	mg/L	0.010	-	0.35	9.12	4.74	2.36	1.89	37.7	62.4	32.9	16.3	0.208	0.167	1.82	0.710	0.675	0.23	0.094	0.343		0.111	0.037	0.16	0.261
Lead (Pb)-Dissolved	mg/L	0.000050	0.04 @ H <50 0.05 @ H 50 - <100 0.06 @ H 100 - <200 110 @ H 200 - <300 160 @ H h >= 300	0.003	<0.000050	<0.000050	<0.000050	<0.000050	0.000055	0.00016	0.00013	0.000058	<0.000050	<0.000050	0.000679	0.000246	0.000247	0.000052	<0.000050	0.000053		<0.000050	<0.000050	0.000089	0.000153
Lithium (Li)-Dissolved	mg/L	0.0010	-	-	<0.0010	<0.0010	<0.0010	<0.0010	0.0051	0.0082	0.0093	0.0028	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010		<0.0010	<0.0010	<0.0010	<0.0010
Magnesium (Mg)-Dissolved	mg/L	0.0050	-	-	3.65	3.5	4.9	4.21	26.2	31.1	23.6	10.9	2.14	2.11	2.72	1.50	1.50	2.97	2.89	2.35		2.12	2.23	2.03	1.74
Manganese (Mn)-Dissolved	mg/L	0.00010	-	0.01102*H +0.54	1.52	1.42	0.616	0.500	6.24	7.47	3.98	1.07	0.015	0.025	0.071	0.0227	0.0221	0.130	0.071	0.117		0.007	0.007	0.013	0.0100
Mercury (Hg)-Dissolved	mg/L	0.0000050	0.00025	0.00001	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050		<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved	mg/L	0.000050	10	2	0.003620	0.002500	0.005440	0.00475	0.000118	0.00023	0.00013	0.000233	0.000509	0.000210	0.00165	0.000608	0.000649	0.000446	0.000462	0.000830		0.000196	0.000167	0.000261	0.000336
Nickel (Ni)-Dissolved	mg/L	0.00050	0.25 @ H < 60 0.65 @ H 60 - <120 1.1 @ H 120 - < 180 1.5 @ H >= 180	0.025	0.00125	0.00124	0.00238	0.00257	0.03840	0.05530	0.05710	0.0183	<0.00050	<0.00050	0.00229	0.00058	0.00056	0.00067	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Dissolved	mg/L	0.050	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.10	<0.10	0.078	<0.050	<0.050	0.102	0.067	0.083	<0.050	<0.050	<0.050		<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	mg/L	0.050	-	373	3.66	3.31	4.43	3.86	4.34	3.56	4.19	3.80	3.02	0.701	2.3	1.27	1.28	1.96	1.7	1.63		0.847	0.697	0.782	0.739
Rubidium (Rb)-Dissolved	mg/L	0.00020	-	-	0.00404	0.00374	0.0049	0.00368	0.00718	0.00758	0.0065	0.00347	0.00253	0.0004	0.00236	0.00116	0.00117	0.00183	0.00155	0.00166		0.00051	0.00036	0.00061	0.00055
Selenium (Se)-Dissolved	mg/L	0.000050	0.02	0.001	0.000063	0.000078	0.000079	0.000059	0.000065	0.00013	<0.00010	0.000084	<0.000050	<0.000050	0.000077	<0.000050	<0.000050	<0.000050	<0.000050	0.000053		<0.000050	<0.000050	<0.000050	<0.000050

				Sample ID	SFC-2				SFC-2B				SFC-3					SFC-4B				SFC-11			
				Date Sampled	13-Mar-19	20-Jun-19	26-Sep-19	17-Dec-19	13-Mar-19	20-Jun-19	26-Sep-19	17-Dec-19	13-Mar-19	20-Jun-19	26-Sep-19	17-Dec-19	17-Dec-19	13-Mar-19	20-Jun-19	26-Sep-19	17-Dec-19	13-Mar-19	20-Jun-19	26-Sep-19	17-Dec-19
				Quarter	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Analyte	**Units**	**LOR**	**Sch. 3.2 Water FAW***	**BCAWWQG-FAL****													duplicate sample				sample lost in transit				
Silicon (Si)-Dissolved	mg/L	0.050	-	-	5.25	4.92	5.9	5.12	13.2	16.2	18.3	11.2	6.32	10.1	10.3	6.44	6.44	7.03	7.62	7.29		9.51	10.7	10.5	8.61
Silver (Ag)-Dissolved	mg/L	0.000010	0.0005 @ H <= 100 0.015 @ H > 100	0.00005	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000020	<0.000020	<0.000010	<0.000010	<0.000010	0.000017	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L	0.050	-	-	13.3	12.6	19.5	14.5	11.7	12.2	10.6	8.90	100	8.02	28	23.0	23.2	18.9	14.6	13.8		8.38	8.23	8.66	6.76
Strontium (Sr)-Dissolved	mg/L	0.00020	-	-	0.237	0.240	0.330	0.233	0.346	0.412	0.355	0.285	0.171	0.188	0.183	0.0923	0.0954	0.267	0.301	0.224		0.177	0.192	0.169	0.126
Sulfur (S)-Dissolved	mg/L	0.50	-	-	18.1	17.8	30.3	23.0	175	230	217	84.6	7.82	4.38	13.7	4.42	4.65	12.7	11.3	11.2		4.79	4.76	6.01	4.27
Tellurium (Te)-Dissolved	mg/L	0.00020	-	-	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00040	<0.00040	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020		<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Dissolved	mg/L	0.000010	0.003	0.0008	0.000015	0.000012	0.00001	<0.000010	<0.000010	<0.000020	<0.000020	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010
Thorium (Th)-Dissolved	mg/L	0.00010	-	-	<0.00010	<0.00010	<0.00010	<0.00010	0.00069	0.00119	0.002	0.00083	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L	0.00010	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020	0.00021	0.00030	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L	0.00030	1	2	<0.0012	<0.00030	<0.00030	<0.00030	<0.00090	<0.0027	<0.00060	0.00252	0.00416	0.00182	0.0583	0.0222	0.0214	0.00299	0.00051	0.00306		0.00338	0.00093	0.00533	0.00998
Tungsten (W)-Dissolved	mg/L	0.00010	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Dissolved	mg/L	0.000010	0.085	0.0085	0.000056	0.000039	0.000155	0.000085	0.000589	0.000796	0.00117	0.000446	0.000016	<0.000010	0.000103	0.000026	0.000026	0.000015	<0.000010	0.000021		<0.000010	<0.000010	<0.000010	0.000012
Vanadium (V)-Dissolved	mg/L	0.00050	-	0.006	0.00051	<0.00050	<0.00050	<0.00050	<0.00050	<0.0010	<0.0010	<0.00050	0.00069	0.00069	0.0031	0.00141	0.00136	0.00077	<0.00050	<0.00050		0.00187	0.00065	0.00073	0.00108
Zinc (Zn)-Dissolved	mg/L	0.0010	0.075 @ H <90 0.15 @ H 90 -<100 0.9 @ H 100 - <200 1.65 @ H 200 - <300 2.4 @ H 300 - <400	0.0075	0.005	0.0034	0.0093	0.0102	0.0810	0.1090	0.1290	0.0528	0.0065	<0.0030	0.011	0.0081	0.0086	0.0234	0.0052	<0.0030		<0.0030	<0.0030	<0.0030	<0.0030
Zirconium (Zr)-Dissolved	mg/L	0.000060	-	-	0.000072	<0.00020	<0.00020	<0.00020	<0.000060	<0.00040	<0.00040	<0.00020	0.000105	<0.00020	0.0004	0.00024	0.00023	<0.000060	<0.00020	<0.00020		0.000074	<0.00020	<0.00020	0.00021

***Standard: British Columbia Contaminated Sites Regulation (January, 2019) - Schedule 3.2 Water Standards Freshwater Aquatic Life**

****Guideline: British Columbia Approved and Working Water Quality Guidelines (August, 2019) - BCAWWQG - Freshwater Aquatic Life**

Color Key: Exceeds Standard and Guideline | Exceeds Guideline

MORRISON HERSHFIELD

TABLE 7: 2019 LEACHATE MANHOLE/GW INTERCEPTOR WATER QUALITY - GENERAL CHEMISTRY AND METALS

				Sample ID	LEACHATE MANHOLE				GW INTERCEPTOR				
				Date Sampled	13-Mar-19	20-Jun-19	26-Sep-19	17-Dec-19	13-Mar-19	13-Mar-19	20-Jun-19	26-Sep-19	17-Dec-19
				Quarter	Q1	Q2	Q3	Q4	Q1	Q1	Q2	Q3	Q4
Analyte	**Units**	**LOR**	**Sch. 3.2 Water FAW***	**BCAWWQG-FAL****		not sampled		not sampled		duplicate sample			
Field Parameters													
Field Conductivity	uS/cm	-	-	-	420.9		594.0		914.0		906.0	520	94.1
Temperature	C	-	-	-	6.8		12.8		7.9		10.1	9.2	6.3
pH	-	-	-	-	6.61		6.37		6.39		4.42	6.05	6.22
Dissolved Oxygen	mg/L	-	-	-	0.50		5.93		2.31		1.86	0.83	3.57
Oxidation Reduction Potential	-	-	-	-	130.2		197.1		79.9		73.8	291	98.8
General Chemistry													
Conductivity	uS/cm	2	-	-	430		749		838	839	849	689	697
Hardness (as CaCO3)	mg/L	0.5	-	-	177		368		234	238	239	192	240
pH	pH	0.1	-	6.5 - 9.0	7.16		7.27		6.62	6.66	6.92	6.66	6.42
Total Suspended Solids	mg/L	3	-	-	<3.0		3.00		35.4	33	42.6	17.00	47.00
COD	mg/L	20	-	-	20		22		<20	<20	<20	<20	22
Anions and Nutrients													
Alkalinity, Total (as CaCO3)	mg/L	1.0	-	-	97.4		120		125	135	118	124	116
Ammonia, Total (as N)	mg/L	0.0050	pH & Temp based	pH & Temp based	0.0805		0.0895		1.180	1.210	1.130	0.855	0.864
Bromide (Br)	mg/L	0.050	-	-	0.06		<0.050		<0.25	<0.25	<0.25	<0.050	<0.250
Chloride (Cl)	mg/L	0.50	1500	600	7.34		6.12		117	117	124	92.5	57.2
Fluoride (F)	mg/L	0.020	2 @ H < 50 3 @ H >= 05	0.4	<0.020		0.042		<0.10	<0.10	0.1	0.119	<0.100
Nitrate and Nitrite (as N)	mg/L	0.0051	400	-	7.01		16.6		0.026	0.034	<0.025	0.0101	<0.0250
Nitrate (as N)	mg/L	0.0050	400	3	7.01		16.6		0.026	0.034	<0.025	0.0101	<0.50
Nitrite (as N)	mg/L	0.0010	0.2	0.02	0.0016		0.0056		<0.0050	<0.0050	<0.0050	<0.0010	<0.0050
Total Kjeldahl Nitrogen	mg/L	0.050	-	-	0.822		1.13		1.25	1.25	1.46	1.09	1.10
Total Nitrogen	mg/L	0.030	-	-	7.25		17.2		1.30	1.36	1.38	1.02	0.927
Phosphorus (P)-Total	mg/L	0.0020	-	-	0.0227		0.0630		0.0094	0.0211	0.0254	0.0145	0.0395
Sulfate (SO4)	mg/L	0.30	1280 @ H <= 30 2180 @ H 31-75 3090 @ H 76-180 4290 @ H >180	128 @ H <= 30 218 @ H 31-75 309 @ H 76-180 429 @ H >180	81.8		215		127	127	115	81.2	115
Dissolved Metals													
Aluminum (Al)-Dissolved	mg/L	0.0010	-	0.1	0.0216		0.0182		0.0317	0.0323	0.0337	0.0546	0.0478
Antimony (Sb)-Dissolved	mg/L	0.00010	0.09	-	<0.00010		0.00016		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	mg/L	0.00010	0.05	0.005	0.00012		0.00022		0.00057	0.00057	0.00058	0.00053	0.00043
Barium (Ba)-Dissolved	mg/L	0.00010	10	1	0.0417		0.0533		0.0814	0.0805	0.0834	0.0702	0.0735
Beryllium (Be)-Dissolved	mg/L	0.00010	0.0015	0.00013	<0.00010		<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.000100
Bismuth (Bi)-Dissolved	mg/L	0.000050	-	-	<0.000050		<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved	mg/L	0.010	12	1.2	0.035		0.034		0.127	0.126	0.13	0.117	0.105
Cadmium (Cd)-Dissolved	mg/L	0.0000050	0.0005 @ H <30 0.0015 @ H 30-<90 0.0025 @ H 90-<150 0.0035 @ H 150-<210 0.004 @ H >= 210	As per guideline calculation	0.000103		0.0000808		<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000063
Calcium (Ca)-Dissolved	mg/L	0.050	-	-	61.9		128		80	81.6	81.8	64.5	81.4
Cesium (Cs)-Dissolved	mg/L	0.000010	-	-	<0.000010		<0.000010		0.000015	0.000016	0.000014	0.000014	<0.000010
Chromium (Cr)-Dissolved	mg/L	0.00010	0.01	0.001	0.00035		0.0002		0.00038	0.00035	0.00031	0.0003	0.00026
Cobalt (Co)-Dissolved	mg/L	0.00010	0.04	0.004	0.00051		0.0005		0.00278	0.00285	0.00262	0.00148	0.00335

				Sample ID	LEACHATE MANHOLE				GW INTERCEPTOR				
				Date Sampled	13-Mar-19	20-Jun-19	26-Sep-19	17-Dec-19	13-Mar-19	13-Mar-19	20-Jun-19	26-Sep-19	17-Dec-19
				Quarter	Q1	Q2	Q3	Q4	Q1	Q1	Q2	Q3	Q4
Analyte	**Units**	**LOR**	**Sch. 3.2 Water FAW***	**BCAWWQG-FAL****		not sampled		not sampled		duplicate sample			
Copper (Cu)-Dissolved	mg/L	0.00020	0.02 @ H < 50 0.03 @ H 50 - <75 0.04 @ H 75 - <100 0.05 @ H 100 - < 125 0.06 @ H 125 - <150 0.07 @ H 150 - < 175 0.08 @ H 175 - <200 0.09 @ H >= 200	(0.094(H)+2) / 1000	0.0162		0.0208		<0.00020	<0.00020	<0.00020	<0.00020	0.00051
Iron (Fe)-Dissolved	mg/L	0.010	-	0.35	0.017		0.023		24.8	25.1	25.4	22.8	24.8
Lead (Pb)-Dissolved	mg/L	0.000050	0.04 @ H <50 0.05 @ H 50 - <100 0.06 @ H 100 - <200 110 @ H 200 - <300 160 @ H h >= 300	0.003	<0.000050		<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Dissolved	mg/L	0.0010	-	-	<0.0010		<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium (Mg)-Dissolved	mg/L	0.0050	-	-	5.43		11.5		8.4	8.4	8.56	7.41	8.98
Manganese (Mn)-Dissolved	mg/L	0.00010	-	0.01102*H +0.54	0.318		0.0451		2.34	2.42	2.58	2.26	2.28
Mercury (Hg)-Dissolved	mg/L	0.0000050	0.00025	0.00001	<0.0000050		<0.0000050		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved	mg/L	0.000050	10	2	0.000525		0.000605		0.00065	0.000612	0.000676	0.000531	0.000365
Nickel (Ni)-Dissolved	mg/L	0.00050	0.25 @ H < 60 0.65 @ H 60 - <120 1.1 @ H 120 - < 180 1.5 @ H >= 180	0.025	0.00168		0.00217		0.00158	0.00159	0.00147	0.00085	0.00259
Phosphorus (P)-Dissolved	mg/L	0.050	-	-	<0.050		0.065		<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	mg/L	0.050	-	373	3.54		4.66		6.22	6.44	7.15	6.44	5.77
Rubidium (Rb)-Dissolved	mg/L	0.00020	-	-	0.00253		0.00311		0.00485	0.00482	0.0050	0.0044	0.00419
Selenium (Se)-Dissolved	mg/L	0.000050	0.02	0.001	0.00012		0.000158		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon (Si)-Dissolved	mg/L	0.050	-	-	7.19		12.9		8.46	8.43	9.26	10.1	8.59
Silver (Ag)-Dissolved	mg/L	0.000010	0.0005 @ H <= 100 0.015 @ H > 100	0.00005	<0.000010		<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L	0.050	-	-	8.70		15.0		54.3	54.2	64.8	55.2	50.2
Strontium (Sr)-Dissolved	mg/L	0.00020	-	-	0.257		0.477		0.618	0.614	0.576	0.478	0.582
Sulfur (S)-Dissolved	mg/L	0.50	-	-	27.4		75.9		42.3	42.3	37.6	28.9	47.7
Tellurium (Te)-Dissolved	mg/L	0.00020	-	-	<0.00020		<0.00020		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Dissolved	mg/L	0.000010	0.003	0.0008	<0.000010		<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium (Th)-Dissolved	mg/L	0.00010	-	-	<0.00010		<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L	0.00010	-	-	<0.00010		0.00033		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L	0.00030	1	2	<0.00030		<0.00030		0.00032	0.00034	0.00039	0.00038	0.00067
Tungsten (W)-Dissolved	mg/L	0.00010	-	-	<0.00010		<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Dissolved	mg/L	0.000010	0.085	0.0085	0.000018		0.00006		0.000026	0.000025	0.000022	0.000015	0.000011
Vanadium (V)-Dissolved	mg/L	0.00050	-	0.006	<0.00050		<0.00050		0.00058	0.00058	0.00066	0.00076	<0.00050
Zinc (Zn)-Dissolved	mg/L	0.0010	0.075 @ H <90 0.15 @ H 90 -<100 0.9 @ H 100 - <200 1.65 @ H 200 - <300 2.4 @ H 300 - <400	0.0075	0.0313		0.0437		0.0081	0.0083	0.0106	0.0037	0.0181
Zirconium (Zr)-Dissolved	mg/L	0.000060	-	-	0.000137		<0.00020		0.000128	0.000117	<0.00020	<0.00020	<0.00020

***Standard: British Columbia Contaminated Sites Regulation (January, 2019) - Schedule 3.2 Water Standards Freshwater Aquatic Life**

****Guideline: British Columbia Approved and Working Water Quality Guidelines (August, 2019) - BCAWWQG - Freshwater Aquatic Life**

Color Key: Exceeds Standard and Guideline | Exceeds Guideline

MORRISON HERSHFIELD

TABLE 8: 2019 LEACHATE MANHOLE/GW INTERCEPTOR WATER QUALITY - PETROLEUM HYDROCARBONS

				Sample ID	LEACHATE MANHOLE				GW INTERCEPTOR				
				Date Sampled	13-Mar-19	20-Jun-19	26-Sep-19	17-Dec-19	13-Mar-19	13-Mar-19	20-Jun-19	26-Sep-19	17-Dec-19
				Quarter	Q1	Q2	Q3	Q4	Q1	Q1	Q2	Q3	Q4
Analyte	**Units**	**LOR**	**Sch. 3.2 Water FAW***	**BCAWWQG-FAL****		not sampled		not sampled		duplicate sample			
Volatile Organic Compounds													
Benzene	mg/L	0.00050	0.4	0.04	<0.00050		<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Bromodichloromethane	mg/L	0.0010	-	-	<0.0010		<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.00050
Bromoform	mg/L	0.0010	-	-	<0.0010		<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.00050
Carbon Tetrachloride	mg/L	0.00050	0.13	0.0133	<0.00050		<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Chlorobenzene	mg/L	0.0010	0.013	0.0013	<0.0010		<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.00050
Dibromochloromethane	mg/L	0.0010	-	-	<0.0010		<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.00050
Chloroethane	mg/L	0.0010	-	-	<0.0010		<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.00050
Chloroform	mg/L	0.0010	0.02	0.0018	<0.0010		<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.00050
Chloromethane	mg/L	0.0050	-	-	<0.0050		<0.0050		<0.0050	<0.0050	<0.0050	<0.0050	<0.00050
1,2-Dichlorobenzene	mg/L	0.00050	0.007	0.0007	<0.00050		<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
1,3-Dichlorobenzene	mg/L	0.0010	1.5	0.15	<0.0010		<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.00050
1,4-Dichlorobenzene	mg/L	0.0010	0.26	0.026	<0.0010		<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.00050
1,1-Dichloroethane	mg/L	0.0010	-	-	<0.0010		<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.00050
1,2-Dichloroethane	mg/L	0.0010	1	0.1	<0.0010		<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.00050
1,1-Dichloroethylene	mg/L	0.0010	-	-	<0.0010		<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.00050
cis-1,2-Dichloroethylene	mg/L	0.0010	-	-	<0.0010		<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.00050
trans-1,2-Dichloroethylene	mg/L	0.0010	-	-	<0.0010		<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.00050
Dichloromethane	mg/L	0.0050	0.98	0.0981	<0.0050		<0.0050		<0.0050	<0.0050	<0.0050	<0.0050	<0.00050
1,2-Dichloropropane	mg/L	0.0010	-	-	<0.0010		<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.00050
cis-1,3-Dichloropropylene	mg/L	0.00050	-	-	<0.00050		<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00075
trans-1,3-Dichloropropylene	mg/L	0.00050	-	-	<0.00050		<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
1,3-Dichloropropene (cis & trans)	mg/L	0.0010	-	-	<0.0010		<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.00050
Ethylbenzene	mg/L	0.00050	2	0.2	<0.00050		<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Methyl t-butyl ether (MTBE)	mg/L	0.00050	34	3.4	<0.00050		<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Styrene	mg/L	0.00050	0.72	0.072	<0.00050		<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
1,1,1,2-Tetrachloroethane	mg/L	0.0010	-	-	<0.0010		<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.00050
1,1,2,2-Tetrachloroethane	mg/L	0.00020	-	-	<0.00020		<0.00020		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Tetrachloroethylene	mg/L	0.0010	1.1	0.11	<0.0010		<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.00050
Toluene	mg/L	0.00045	0.005	0.0005	<0.00045		<0.00045		<0.00045	<0.00045	<0.00045	<0.00045	<0.00050
1,1,1-Trichloroethane	mg/L	0.0010	-	11.1	<0.0010		<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.00050
1,1,2-Trichloroethane	mg/L	0.00050	-	-	<0.00050		<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Trichloroethylene	mg/L	0.0010	0.2	0.021	<0.0010		<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.00050
Trichlorofluoromethane	mg/L	0.0010	-	-	<0.0010		<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.00050
Vinyl Chloride	mg/L	0.00040	-	-	<0.00040		<0.00040		<0.00040	<0.00040	<0.00040	<0.00040	<0.00040
ortho-Xylene	mg/L	0.00050	-	0.03	<0.00050		<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
meta- & para-Xylene	mg/L	0.00050	-	0.03	<0.00050		<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Xylenes	mg/L	0.00075	0.3	0.03	<0.00075		<0.00075		<0.00075	<0.00075	<0.00075	<0.00075	<0.00075
4-Bromofluorobenzene (SS)	%	Surrogate	-	-	91.1		88		90.0	88.2	92.1	87.1	95.3
1,4-Difluorobenzene (SS)	%	Surrogate	-	-	100		73.5		101	102	103.9	99.8	102
Hydrocarbons													
EPH10-19	mg/L	0.25	5	-	<0.25		<0.25		<0.25	<0.25	<0.25	<0.25	<0.25
EPH19-32	mg/L	0.25	-	-	<0.25		<0.25		<0.25	<0.25	<0.25	<0.25	<0.25
LEPH	mg/L	0.25	0.5	-	<0.25		<0.25		<0.25	<0.25	<0.25	<0.25	<0.10
HEPH	mg/L	0.25	-	-	<0.25		<0.25		<0.25	<0.25	<0.25	<0.25	<0.25
Volatile Hydrocarbons (VH6-10)	mg/L	0.10	15	-	<0.10		<0.10		<0.10	<0.10	<0.10	<0.10	<0.10
VPH (C6-C10)	mg/L	0.10	1.5	-	<0.10		<0.10		<0.10	<0.10	<0.10	<0.10	<0.25
2-Bromobenzotrifluoride	%	Surrogate	-	-	93.1		77.9		77.3	86.3	92	90	98.2
3,4-Dichlorotoluene (SS)	%	Surrogate	-	-	106.8		150		105	90	96.8	82	99.2
Polycyclic Aromatic Hydrocarbons													

				Sample ID	LEACHATE MANHOLE				GW INTERCEPTOR				
				Date Sampled	13-Mar-19	20-Jun-19	26-Sep-19	17-Dec-19	13-Mar-19	13-Mar-19	20-Jun-19	26-Sep-19	17-Dec-19
				Quarter	Q1	Q2	Q3	Q4	Q1	Q1	Q2	Q3	Q4
Analyte	**Units**	**LOR**	**Sch. 3.2 Water FAW***	**BCAWWQG-FAL****		not sampled		not sampled		duplicate sample			
Acenaphthene	mg/L	0.000010	0.06	0.006	<0.000010		<0.000010		0.000628	0.000583	0.000833	0.000693	0.000589
Acenaphthylene	mg/L	0.000010	-	-	<0.000010		<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Acridine	mg/L	0.000010	0.0005	0.00005	<0.000010		<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Anthracene	mg/L	0.000010	0.001	0.0001	<0.000010		<0.000010		0.000016	0.000014	<0.000020	0.000013	0.00002
Benz(a)anthracene	mg/L	0.000010	0.001	0.0001	<0.000010		<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	0.000012
Benzo(a)pyrene	mg/L	0.0000050	0.0001	0.00001	<0.0000050		<0.0000050		<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000092
Benzo(b&j)fluoranthene	mg/L	0.000010	-	-	<0.000010		<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	0.000013
Benzo(b+j+k)fluoranthene	mg/L	0.000015	-	-	<0.000015		<0.000015		<0.000015	<0.000015	<0.000015	<0.000015	<0.000015
Benzo(g,h,i)perylene	mg/L	0.000010	-	-	<0.000010		<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benzo(k)fluoranthene	mg/L	0.000010	-	-	<0.000010		<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chrysene	mg/L	0.000010	0.001	-	<0.000010		<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	0.000015
Dibenz(a,h)anthracene	mg/L	0.0000050	-	-	<0.0000050		<0.0000050		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.00000050
Fluoranthene	mg/L	0.000010	0.002	0.0002	<0.000010		<0.000010		0.000146	0.000133	0.000187	0.000155	0.000147
Fluorene	mg/L	0.000010	0.12	0.012	<0.000010		<0.000010		0.000155	0.000141	0.000203	0.000123	0.000223
Indeno(1,2,3-c,d)pyrene	mg/L	0.000010	-	-	<0.000010		<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
1-Methylnaphthalene	mg/L	0.000050	-	-	<0.000050		<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	<0.000010
2-Methylnaphthalene	mg/L	0.000050	-	-	<0.000050		<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	<0.000010
Naphthalene	mg/L	0.000050	0.01	0.001	<0.000050		<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	<0.0000050
Phenanthrene	mg/L	0.000020	0.003	0.0003	<0.000020		<0.000020		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Pyrene	mg/L	0.000010	0.0002	0.00002	<0.000010		<0.000010		0.000076	0.00007	0.0001	0.000084	0.000086
Quinoline	mg/L	0.000050	0.034	0.0034	<0.000050		<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Acridine d9	%	Surrogate	-	-	123.3		92.4		88.6	88.8	115.5	88	90.8
Chrysene d12	%	Surrogate	-	-	122.7		92.2		88.0	79.7	129.3	94	106
Naphthalene d8	%	Surrogate	-	-	119.3		89.1		79	82	100.4	90	107
Phenanthrene d10	%	Surrogate	-	-	104		98.2		94.0	97.3	110	96.7	101

***Standard: British Columbia Contaminated Sites Regulation (January, 2019) - Schedule 3.2 Water Standards Freshwater Aquatic Life**

****Guideline: British Columbia Approved and Working Water Quality Guidelines (August, 2019) - BCAWWQG - Freshwater Aquatic Life**

Color Key: Exceeds Standard and Guideline | Exceeds Guideline

MORRISON HERSHFIELD

TABLE 9: 2019 LANDFILL GAS METHANE MEASUREMENTS (% CH_4)

	Monitoring Probe																			
SAMPLE DATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17A	18	19	20	21
4-Jan-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11-Jan-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18-Jan-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-Jan-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-Feb-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7-Feb-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15-Feb-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-Feb-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-Mar-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8-Mar-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15-Mar-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-Mar-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-Mar-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5-Apr-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12-Apr-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19-Apr-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-Apr-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-May-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20-Jun-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-Jul-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-Aug-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-Sep-19	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
2-Oct-19	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-
25-Oct-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8-Nov-19	0	0	0	0	0	0	0	0	0	0	0	trace	0	trace	0	0	0	0	0	0	0
10-Nov-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15-Nov-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20-Nov-19	0	0	0	0	0	0	0	0	0	0	0	trace	0	trace	0	0	0	0	0	0	0
29-Nov-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6-Dec-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13-Dec-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20-Dec-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-Dec-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX A: Analytical Laboratory Results for Leachate, Groundwater & Surface Water

Morrison Hershfield Limited
ATTN: Josie Gilson
310 - 4321 Still Creek Drive
Burnaby BC V5C 6S7

Date Received: 14-MAR-19
Report Date: 26-MAR-19 15:14 (MT)
Version: FINAL

Client Phone: 778-837-9801

Certificate of Analysis

Lab Work Order #: L2244517

Project P.O. #: 726379
Job Reference: 18001536
C of C Numbers: 17-190313
Legal Site Desc:

Carla Fuginski
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2244517-1 Water 13-MAR-19 11:00 MW-2D	L2244517-2 Water 13-MAR-19 11:00 MW-2S	L2244517-3 Water 13-MAR-19 13:30 MW-4	L2244517-4 Water 13-MAR-19 10:00 SFC-2	L2244517-5 Water 13-MAR-19 10:15 SCF-2B
WATER						
Physical Tests	Conductivity (uS/cm)	961	288	414	306	1110
	Hardness (as CaCO3) (mg/L)	327	84.3	133	103 HTC	303 HTC
	pH (pH)	7.04	6.92	6.85	7.14	3.16
	Total Suspended Solids (mg/L)	777	42.2	475	16.0	47.0
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	262	69.4	122	60.5	<1.0
	Ammonia, Total (as N) (mg/L)	10.1	4.21	2.69	0.571	2.25
	Bromide (Br) (mg/L)	<0.25 DLDS	<0.050	0.064	<0.050	<0.25 DLDS
	Chloride (Cl) (mg/L)	45.0	10.3	27.2	21.4	11.7
	Fluoride (F) (mg/L)	<0.10 DLDS	0.107	0.092	0.046	0.63
	Nitrate and Nitrite (as N) (mg/L)	<0.025	0.0119	<0.0051	0.233	0.061
	Nitrate (as N) (mg/L)	<0.025 DLDS	0.0119	<0.0050	0.232	0.061
	Nitrite (as N) (mg/L)	<0.0050 DLDS	<0.0010	<0.0010	0.0010	<0.0050 DLDS
	Total Kjeldahl Nitrogen (mg/L)	11.4	4.28	2.77	0.693	2.44
	Total Nitrogen (mg/L)	11.8	4.37	2.83	0.840	2.44
	Phosphorus (P)-Total (mg/L)	0.510	0.0414	0.306	0.0066	<0.011 DLM
	Sulfate (SO4) (mg/L)	181	48.2	46.7	51.4	497
Total Metals	Aluminum (Al)-Total (mg/L)				0.716	16.8
	Antimony (Sb)-Total (mg/L)				<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)				0.00042	0.00067
	Barium (Ba)-Total (mg/L)				0.0619	0.0271
	Beryllium (Be)-Total (mg/L)				<0.00010	0.00045
	Bismuth (Bi)-Total (mg/L)				<0.000050	<0.000050
	Boron (B)-Total (mg/L)				0.048	0.021
	Cadmium (Cd)-Total (mg/L)				0.0000418	0.000534
	Calcium (Ca)-Total (mg/L)				35.2	78.2
	Cesium (Cs)-Total (mg/L)				0.000012	0.000076
	Chromium (Cr)-Total (mg/L)				0.00066	0.00130
	Cobalt (Co)-Total (mg/L)				0.00583	0.102
	Copper (Cu)-Total (mg/L)				0.0117	0.200
	Iron (Fe)-Total (mg/L)				9.12	37.7
	Lead (Pb)-Total (mg/L)				<0.000050	0.000055
	Lithium (Li)-Total (mg/L)				<0.0010	0.0051
	Magnesium (Mg)-Total (mg/L)				3.65	26.2
	Manganese (Mn)-Total (mg/L)				1.52	6.24
	Mercury (Hg)-Total (mg/L)				<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)				0.00362	0.000118
	Nickel (Ni)-Total (mg/L)				0.00125	0.0384

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2244517-6 Water 13-MAR-19 14:45 SFC-3	L2244517-7 Water 13-MAR-19 11:45 SFC-4B	L2244517-8 Water 13-MAR-19 14:45 SFC-11	L2244517-9 Water 13-MAR-19 14:00 GW INT.	L2244517-10 Water 13-MAR-19 14:00 DUPLICATE-GW INT.
WATER						
Physical Tests	Conductivity (uS/cm)	650	275	135	838	839
	Hardness (as CaCO3) (mg/L)	61.4 HTC	75.6 HTC	40.8 HTC	234	238
	pH (pH)	7.34	7.54	7.14	6.62	6.66
	Total Suspended Solids (mg/L)	3.0	3.2	<3.0	35.4	33.0
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	28.5	32.3	25.8	125	135
	Ammonia, Total (as N) (mg/L)	0.0189	0.0292	<0.0050	1.18	1.21
	Bromide (Br) (mg/L)	<0.25 DLDS	<0.050	<0.050	<0.25 DLDS	<0.25 DLDS
	Chloride (Cl) (mg/L)	165	37.4	14.6	117	117
	Fluoride (F) (mg/L)	<0.10 DLDS	0.049	0.044	<0.10 DLDS	<0.10 DLDS
	Nitrate and Nitrite (as N) (mg/L)	0.212	0.288	0.242	0.026	0.034
	Nitrate (as N) (mg/L)	0.212	0.288	0.242	0.026	0.034
	Nitrite (as N) (mg/L)	<0.0050 DLDS	<0.0010	<0.0010	<0.0050 DLDS	<0.0050 DLDS
	Total Kjeldahl Nitrogen (mg/L)	0.152	0.134	0.085	1.25	1.25
	Total Nitrogen (mg/L)	0.312	0.354	0.255	1.30	1.36
	Phosphorus (P)-Total (mg/L)	0.0143	0.0113	0.0116	0.0094	0.0211
	Sulfate (SO4) (mg/L)	20.6	37.5	14.7	127	127
Total Metals	Aluminum (Al)-Total (mg/L)	0.121	0.122	0.113		
	Antimony (Sb)-Total (mg/L)	0.00012	<0.00010	<0.00010		
	Arsenic (As)-Total (mg/L)	0.00020	0.00020	0.00024		
	Barium (Ba)-Total (mg/L)	0.0430	0.0198	0.0113		
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050		
	Boron (B)-Total (mg/L)	<0.010	0.023	<0.010		
	Cadmium (Cd)-Total (mg/L)	0.0000290	0.0000115	0.0000198		
	Calcium (Ca)-Total (mg/L)	21.0	25.4	12.8		
	Cesium (Cs)-Total (mg/L)	0.000010	<0.000010	<0.000010		
	Chromium (Cr)-Total (mg/L)	0.00024	0.00013	0.00036		
	Cobalt (Co)-Total (mg/L)	0.00018	0.00055	<0.00010		
	Copper (Cu)-Total (mg/L)	0.00271	0.00182	0.00095		
	Iron (Fe)-Total (mg/L)	0.208	0.232	0.111		
	Lead (Pb)-Total (mg/L)	<0.000050	0.000052	<0.000050		
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010		
	Magnesium (Mg)-Total (mg/L)	2.14	2.97	2.12		
	Manganese (Mn)-Total (mg/L)	0.0145	0.130	0.00655		
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050		
	Molybdenum (Mo)-Total (mg/L)	0.000509	0.000446	0.000196		
	Nickel (Ni)-Total (mg/L)	<0.00050	0.00067	<0.00050		

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2244517-11	L2244517-12			
	Description	Water	Water			
	Sampled Date	13-MAR-19	13-MAR-19			
	Sampled Time	15:30	15:30			
	Client ID	L1	FIELD BLANK			
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	430	<2.0			
	Hardness (as CaCO3) (mg/L)	177	<0.50			
	pH (pH)	7.16	5.44			
	Total Suspended Solids (mg/L)	<3.0	<3.0			
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	97.4	<1.0			
	Ammonia, Total (as N) (mg/L)	0.0805	<0.0050			
	Bromide (Br) (mg/L)	0.060	<0.050			
	Chloride (Cl) (mg/L)	7.34	<0.50			
	Fluoride (F) (mg/L)	<0.020	<0.020			
	Nitrate and Nitrite (as N) (mg/L)	7.01	<0.0051			
	Nitrate (as N) (mg/L)	7.01	<0.0050			
	Nitrite (as N) (mg/L)	0.0016	<0.0010			
	Total Kjeldahl Nitrogen (mg/L)	0.822	<0.050			
	Total Nitrogen (mg/L)	7.25	<0.030			
	Phosphorus (P)-Total (mg/L)	0.0227	<0.0020			
	Sulfate (SO4) (mg/L)	81.8	<0.30			
Total Metals	Aluminum (Al)-Total (mg/L)					
	Antimony (Sb)-Total (mg/L)					
	Arsenic (As)-Total (mg/L)					
	Barium (Ba)-Total (mg/L)					
	Beryllium (Be)-Total (mg/L)					
	Bismuth (Bi)-Total (mg/L)					
	Boron (B)-Total (mg/L)					
	Cadmium (Cd)-Total (mg/L)					
	Calcium (Ca)-Total (mg/L)					
	Cesium (Cs)-Total (mg/L)					
	Chromium (Cr)-Total (mg/L)					
	Cobalt (Co)-Total (mg/L)					
	Copper (Cu)-Total (mg/L)					
	Iron (Fe)-Total (mg/L)					
	Lead (Pb)-Total (mg/L)					
	Lithium (Li)-Total (mg/L)					
	Magnesium (Mg)-Total (mg/L)					
	Manganese (Mn)-Total (mg/L)					
	Mercury (Hg)-Total (mg/L)					
	Molybdenum (Mo)-Total (mg/L)					
	Nickel (Ni)-Total (mg/L)					

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2244517-1	L2244517-2	L2244517-3	L2244517-4	L2244517-5
Description	Water	Water	Water	Water	Water
Sampled Date	13-MAR-19	13-MAR-19	13-MAR-19	13-MAR-19	13-MAR-19
Sampled Time	11:00	11:00	13:30	10:00	10:15
Client ID	MW-2D	MW-2S	MW-4	SFC-2	SCF-2B
Grouping / **Analyte**					
WATER					
Total Metals Phosphorus (P)-Total (mg/L)				<0.050	<0.050
Potassium (K)-Total (mg/L)				3.66	4.34
Rubidium (Rb)-Total (mg/L)				0.00404	0.00718
Selenium (Se)-Total (mg/L)				0.000063	0.000065
Silicon (Si)-Total (mg/L)				5.25	13.2
Silver (Ag)-Total (mg/L)				0.000010	<0.000010
Sodium (Na)-Total (mg/L)				13.3	11.7
Strontium (Sr)-Total (mg/L)				0.237	0.346
Sulfur (S)-Total (mg/L)				18.1	175
Tellurium (Te)-Total (mg/L)				<0.00020	<0.00020
Thallium (Tl)-Total (mg/L)				0.000015	<0.000010
Thorium (Th)-Total (mg/L)				<0.00010	0.00069
Tin (Sn)-Total (mg/L)				<0.00010	<0.00010
Titanium (Ti)-Total (mg/L)				<0.0012 DLM	<0.00090 DLM
Tungsten (W)-Total (mg/L)				<0.00010	<0.00010
Uranium (U)-Total (mg/L)				0.000056	0.000589
Vanadium (V)-Total (mg/L)				0.00051	<0.00050
Zinc (Zn)-Total (mg/L)				0.0050	0.0810
Zirconium (Zr)-Total (mg/L)				0.000072	<0.000060
Dissolved Metals Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD		
Dissolved Metals Filtration Location	FIELD	FIELD	FIELD		
Aluminum (Al)-Dissolved (mg/L)	0.0045	0.0016	0.0079		
Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
Arsenic (As)-Dissolved (mg/L)	0.0122	0.00607	0.00735		
Barium (Ba)-Dissolved (mg/L)	0.0334	0.0724	0.199		
Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050		
Boron (B)-Dissolved (mg/L)	0.239	0.095	0.059		
Cadmium (Cd)-Dissolved (mg/L)	0.0000088	<0.0000050	0.000150		
Calcium (Ca)-Dissolved (mg/L)	108	27.5	43.5		
Cesium (Cs)-Dissolved (mg/L)	0.000015	0.000019	0.000042		
Chromium (Cr)-Dissolved (mg/L)	0.00014	<0.00010	<0.00010		
Cobalt (Co)-Dissolved (mg/L)	0.0107	0.00100	0.0247		
Copper (Cu)-Dissolved (mg/L)	0.00724	<0.00020	0.00322		
Iron (Fe)-Dissolved (mg/L)	48.9	24.4	39.2		
Lead (Pb)-Dissolved (mg/L)	0.000304	<0.000050	0.000095		
Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2244517-6	L2244517-7	L2244517-8	L2244517-9	L2244517-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	13-MAR-19	13-MAR-19	13-MAR-19	13-MAR-19	13-MAR-19
	Sampled Time	14:45	11:45	14:45	14:00	14:00
	Client ID	SFC-3	SFC-4B	SFC-11	GW INT.	DUPLICATE-GW INT.
Grouping	**Analyte**					
WATER						
Total Metals	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050		
	Potassium (K)-Total (mg/L)	3.02	1.96	0.847		
	Rubidium (Rb)-Total (mg/L)	0.00253	0.00183	0.00051		
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	<0.000050		
	Silicon (Si)-Total (mg/L)	6.32	7.03	9.51		
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010		
	Sodium (Na)-Total (mg/L)	100	18.9	8.38		
	Strontium (Sr)-Total (mg/L)	0.171	0.267	0.177		
	Sulfur (S)-Total (mg/L)	7.82	12.7	4.79		
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020		
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010		
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Titanium (Ti)-Total (mg/L)	0.00416	0.00299	0.00338		
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Uranium (U)-Total (mg/L)	0.000016	0.000015	<0.000010		
	Vanadium (V)-Total (mg/L)	0.00069	0.00077	0.00187		
	Zinc (Zn)-Total (mg/L)	0.0065	0.0234	<0.0030		
	Zirconium (Zr)-Total (mg/L)	0.000105	<0.000060	0.000074		
Dissolved Metals	Dissolved Mercury Filtration Location				FIELD	FIELD
	Dissolved Metals Filtration Location				FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)				0.0317	0.0323
	Antimony (Sb)-Dissolved (mg/L)				<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)				0.00057	0.00057
	Barium (Ba)-Dissolved (mg/L)				0.0814	0.0805
	Beryllium (Be)-Dissolved (mg/L)				<0.00010	<0.00010
	Bismuth (Bi)-Dissolved (mg/L)				<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)				0.127	0.126
	Cadmium (Cd)-Dissolved (mg/L)				<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)				80.0	81.6
	Cesium (Cs)-Dissolved (mg/L)				0.000015	0.000016
	Chromium (Cr)-Dissolved (mg/L)				0.00038	0.00035
	Cobalt (Co)-Dissolved (mg/L)				0.00278	0.00285
	Copper (Cu)-Dissolved (mg/L)				<0.00020	<0.00020
	Iron (Fe)-Dissolved (mg/L)				24.8	25.1
	Lead (Pb)-Dissolved (mg/L)				<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)				<0.0010	<0.0010

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2244517-11	L2244517-12			
	Description	Water	Water			
	Sampled Date	13-MAR-19	13-MAR-19			
	Sampled Time	15:30	15:30			
	Client ID	L1	FIELD BLANK			
Grouping	**Analyte**					
WATER						
Total Metals	Phosphorus (P)-Total (mg/L)					
	Potassium (K)-Total (mg/L)					
	Rubidium (Rb)-Total (mg/L)					
	Selenium (Se)-Total (mg/L)					
	Silicon (Si)-Total (mg/L)					
	Silver (Ag)-Total (mg/L)					
	Sodium (Na)-Total (mg/L)					
	Strontium (Sr)-Total (mg/L)					
	Sulfur (S)-Total (mg/L)					
	Tellurium (Te)-Total (mg/L)					
	Thallium (Tl)-Total (mg/L)					
	Thorium (Th)-Total (mg/L)					
	Tin (Sn)-Total (mg/L)					
	Titanium (Ti)-Total (mg/L)					
	Tungsten (W)-Total (mg/L)					
	Uranium (U)-Total (mg/L)					
	Vanadium (V)-Total (mg/L)					
	Zinc (Zn)-Total (mg/L)					
	Zirconium (Zr)-Total (mg/L)					
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD			
	Dissolved Metals Filtration Location	FIELD	FIELD			
	Aluminum (Al)-Dissolved (mg/L)	0.0216	<0.0010			
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010			
	Arsenic (As)-Dissolved (mg/L)	0.00012	<0.00010			
	Barium (Ba)-Dissolved (mg/L)	0.0417	<0.00010			
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010			
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050			
	Boron (B)-Dissolved (mg/L)	0.035	<0.010			
	Cadmium (Cd)-Dissolved (mg/L)	0.000103	<0.0000050			
	Calcium (Ca)-Dissolved (mg/L)	61.9	<0.050			
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010			
	Chromium (Cr)-Dissolved (mg/L)	0.00035	<0.00010			
	Cobalt (Co)-Dissolved (mg/L)	0.00051	<0.00010			
	Copper (Cu)-Dissolved (mg/L)	0.0162	<0.00020			
	Iron (Fe)-Dissolved (mg/L)	0.017	<0.010			
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050			
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010			

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2244517-1 Water 13-MAR-19 11:00 MW-2D	L2244517-2 Water 13-MAR-19 11:00 MW-2S	L2244517-3 Water 13-MAR-19 13:30 MW-4	L2244517-4 Water 13-MAR-19 10:00 SFC-2	L2244517-5 Water 13-MAR-19 10:15 SCF-2B
WATER						
Dissolved Metals	Magnesium (Mg)-Dissolved (mg/L)	13.7	3.82	6.02		
	Manganese (Mn)-Dissolved (mg/L)	3.21	1.22	2.25		
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050		
	Molybdenum (Mo)-Dissolved (mg/L)	0.0122	0.00309	0.0115		
	Nickel (Ni)-Dissolved (mg/L)	0.00216	<0.00050	0.00352		
	Phosphorus (P)-Dissolved (mg/L)	0.090	<0.050	<0.050		
	Potassium (K)-Dissolved (mg/L)	17.5	7.12	5.86		
	Rubidium (Rb)-Dissolved (mg/L)	0.00994	0.00472	0.00440		
	Selenium (Se)-Dissolved (mg/L)	0.000055	<0.000050	<0.000050		
	Silicon (Si)-Dissolved (mg/L)	13.1	7.83	10.5		
	Silver (Ag)-Dissolved (mg/L)	0.000575	<0.000010	<0.000010		
	Sodium (Na)-Dissolved (mg/L)	32.5	8.08	16.5		
	Strontium (Sr)-Dissolved (mg/L)	0.519	0.175	0.311		
	Sulfur (S)-Dissolved (mg/L)	58.8	15.3	15.6		
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020		
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	0.000031		
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030		
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Uranium (U)-Dissolved (mg/L)	0.000153	0.000011	0.000187		
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Zinc (Zn)-Dissolved (mg/L)	0.0094	0.0050	0.0061		
	Zirconium (Zr)-Dissolved (mg/L)	<0.000060	<0.000060	<0.000060		
Aggregate Organics	COD (mg/L)	54	<20	25	<20	23
Volatile Organic Compounds	Benzene (mg/L)	<0.00050	<0.00050	<0.00050		
	Bromodichloromethane (mg/L)	<0.0010	<0.0010	<0.0010		
	Bromoform (mg/L)	<0.0010	<0.0010	<0.0010		
	Carbon Tetrachloride (mg/L)	<0.00050	<0.00050	<0.00050		
	Chlorobenzene (mg/L)	0.0017	<0.0010	<0.0010		
	Dibromochloromethane (mg/L)	<0.0010	<0.0010	<0.0010		
	Chloroethane (mg/L)	<0.0010	<0.0010	<0.0010		
	Chloroform (mg/L)	<0.0010	<0.0010	<0.0010		
	Chloromethane (mg/L)	<0.0050	<0.0050	<0.0050		
	1,2-Dichlorobenzene (mg/L)	<0.00050	<0.00050	<0.00050		
	1,3-Dichlorobenzene (mg/L)	<0.0010	<0.0010	<0.0010		

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2244517-6	L2244517-7	L2244517-8	L2244517-9	L2244517-10
Description	Water	Water	Water	Water	Water
Sampled Date	13-MAR-19	13-MAR-19	13-MAR-19	13-MAR-19	13-MAR-19
Sampled Time	14:45	11:45	14:45	14:00	14:00
Client ID	SFC-3	SFC-4B	SFC-11	GW INT.	DUPLICATE-GW INT.
Grouping / **Analyte**					
WATER					
Dissolved Metals Magnesium (Mg)-Dissolved (mg/L)				8.42	8.35
Manganese (Mn)-Dissolved (mg/L)				2.34	2.42
Mercury (Hg)-Dissolved (mg/L)				<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)				0.000650	0.000612
Nickel (Ni)-Dissolved (mg/L)				0.00158	0.00159
Phosphorus (P)-Dissolved (mg/L)				<0.050	<0.050
Potassium (K)-Dissolved (mg/L)				6.22	6.44
Rubidium (Rb)-Dissolved (mg/L)				0.00485	0.00482
Selenium (Se)-Dissolved (mg/L)				<0.000050	<0.000050
Silicon (Si)-Dissolved (mg/L)				8.46	8.43
Silver (Ag)-Dissolved (mg/L)				<0.000010	<0.000010
Sodium (Na)-Dissolved (mg/L)				54.3	54.2
Strontium (Sr)-Dissolved (mg/L)				0.618	0.614
Sulfur (S)-Dissolved (mg/L)				42.3	42.3
Tellurium (Te)-Dissolved (mg/L)				<0.00020	<0.00020
Thallium (Tl)-Dissolved (mg/L)				<0.000010	<0.000010
Thorium (Th)-Dissolved (mg/L)				<0.00010	<0.00010
Tin (Sn)-Dissolved (mg/L)				<0.00010	<0.00010
Titanium (Ti)-Dissolved (mg/L)				0.00032	0.00034
Tungsten (W)-Dissolved (mg/L)				<0.00010	<0.00010
Uranium (U)-Dissolved (mg/L)				0.000026	0.000025
Vanadium (V)-Dissolved (mg/L)				0.00058	0.00058
Zinc (Zn)-Dissolved (mg/L)				0.0081	0.0083
Zirconium (Zr)-Dissolved (mg/L)				0.000128	0.000117
Aggregate Organics COD (mg/L)	<20	<20	<20	<20	<20
Volatile Organic Compounds Benzene (mg/L)				<0.00050	<0.00050
Bromodichloromethane (mg/L)				<0.0010	<0.0010
Bromoform (mg/L)				<0.0010	<0.0010
Carbon Tetrachloride (mg/L)				<0.00050	<0.00050
Chlorobenzene (mg/L)				<0.0010	<0.0010
Dibromochloromethane (mg/L)				<0.0010	<0.0010
Chloroethane (mg/L)				<0.0010	<0.0010
Chloroform (mg/L)				<0.0010	<0.0010
Chloromethane (mg/L)				<0.0050	<0.0050
1,2-Dichlorobenzene (mg/L)				<0.00050	<0.00050
1,3-Dichlorobenzene (mg/L)				<0.0010	<0.0010

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2244517-11	L2244517-12			
	Description	Water	Water			
	Sampled Date	13-MAR-19	13-MAR-19			
	Sampled Time	15:30	15:30			
	Client ID	L1	FIELD BLANK			
Grouping	**Analyte**					
WATER						
Dissolved Metals	Magnesium (Mg)-Dissolved (mg/L)	5.43	<0.0050			
	Manganese (Mn)-Dissolved (mg/L)	0.318	<0.00010			
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Dissolved (mg/L)	0.000525	<0.000050			
	Nickel (Ni)-Dissolved (mg/L)	0.00168	<0.00050			
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050			
	Potassium (K)-Dissolved (mg/L)	3.54	<0.050			
	Rubidium (Rb)-Dissolved (mg/L)	0.00253	<0.00020			
	Selenium (Se)-Dissolved (mg/L)	0.000120	<0.000050			
	Silicon (Si)-Dissolved (mg/L)	7.19	<0.050			
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Dissolved (mg/L)	8.70	<0.050			
	Strontium (Sr)-Dissolved (mg/L)	0.257	<0.00020			
	Sulfur (S)-Dissolved (mg/L)	27.4	<0.50			
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020			
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010			
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010			
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030			
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010			
	Uranium (U)-Dissolved (mg/L)	0.000018	<0.000010			
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Dissolved (mg/L)	0.0313	<0.0010			
	Zirconium (Zr)-Dissolved (mg/L)	0.000137	<0.000060			
Aggregate Organics	COD (mg/L)	20	<20			
Volatile Organic Compounds	Benzene (mg/L)	<0.00050	<0.00050			
	Bromodichloromethane (mg/L)	<0.0010	<0.0010			
	Bromoform (mg/L)	<0.0010	<0.0010			
	Carbon Tetrachloride (mg/L)	<0.00050	<0.00050			
	Chlorobenzene (mg/L)	<0.0010	<0.0010			
	Dibromochloromethane (mg/L)	<0.0010	<0.0010			
	Chloroethane (mg/L)	<0.0010	<0.0010			
	Chloroform (mg/L)	<0.0010	<0.0010			
	Chloromethane (mg/L)	<0.0050	<0.0050			
	1,2-Dichlorobenzene (mg/L)	<0.00050	<0.00050			
	1,3-Dichlorobenzene (mg/L)	<0.0010	<0.0010			

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2244517-1 Water 13-MAR-19 11:00 MW-2D	L2244517-2 Water 13-MAR-19 11:00 MW-2S	L2244517-3 Water 13-MAR-19 13:30 MW-4	L2244517-4 Water 13-MAR-19 10:00 SFC-2	L2244517-5 Water 13-MAR-19 10:15 SCF-2B
WATER						
Volatile Organic Compounds	1,4-Dichlorobenzene (mg/L)	<0.0010	<0.0010	<0.0010		
	1,1-Dichloroethane (mg/L)	<0.0010	<0.0010	<0.0010		
	1,2-Dichloroethane (mg/L)	<0.0010	<0.0010	<0.0010		
	1,1-Dichloroethylene (mg/L)	<0.0010	<0.0010	<0.0010		
	cis-1,2-Dichloroethylene (mg/L)	<0.0010	<0.0010	<0.0010		
	trans-1,2-Dichloroethylene (mg/L)	<0.0010	<0.0010	<0.0010		
	Dichloromethane (mg/L)	<0.0050	<0.0050	<0.0050		
	1,2-Dichloropropane (mg/L)	<0.0010	<0.0010	<0.0010		
	cis-1,3-Dichloropropylene (mg/L)	<0.00050	<0.00050	<0.00050		
	trans-1,3-Dichloropropylene (mg/L)	<0.00050	<0.00050	<0.00050		
	1,3-Dichloropropene (cis & trans) (mg/L)	<0.0010	<0.0010	<0.0010		
	Ethylbenzene (mg/L)	<0.00050	<0.00050	<0.00050		
	Methyl t-butyl ether (MTBE) (mg/L)	<0.00050	<0.00050	<0.00050		
	Styrene (mg/L)	<0.00050	<0.00050	<0.00050		
	1,1,1,2-Tetrachloroethane (mg/L)	<0.0010	<0.0010	<0.0010		
	1,1,2,2-Tetrachloroethane (mg/L)	<0.00020	<0.00020	<0.00020		
	Tetrachloroethylene (mg/L)	<0.0010	<0.0010	<0.0010		
	Toluene (mg/L)	<0.00045	<0.00045	<0.00045		
	1,1,1-Trichloroethane (mg/L)	<0.0010	<0.0010	<0.0010		
	1,1,2-Trichloroethane (mg/L)	<0.00050	<0.00050	<0.00050		
	Trichloroethylene (mg/L)	<0.0010	<0.0010	<0.0010		
	Trichlorofluoromethane (mg/L)	<0.0010	<0.0010	<0.0010		
	Vinyl Chloride (mg/L)	<0.00040	<0.00040	<0.00040		
	ortho-Xylene (mg/L)	<0.00050	<0.00050	<0.00050		
	meta- & para-Xylene (mg/L)	<0.00050	<0.00050	<0.00050		
	Xylenes (mg/L)	<0.00075	<0.00075	<0.00075		
	Surrogate: 4-Bromofluorobenzene (SS) (%)	90.7	92.9	88.7		
	Surrogate: 1,4-Difluorobenzene (SS) (%)	103.6	101.3	100.3		
Hydrocarbons	EPH10-19 (mg/L)	<0.25	<0.25	<0.25		
	EPH19-32 (mg/L)	<0.25	<0.25	<0.25		
	LEPH (mg/L)	<0.25	<0.25	<0.25		
	HEPH (mg/L)	<0.25	<0.25	<0.25		
	Volatile Hydrocarbons (VH6-10) (mg/L)	<0.10	<0.10	<0.10		
	VPH (C6-C10) (mg/L)	<0.10	<0.10	<0.10		
	Surrogate: 2-Bromobenzotrifluoride (%)	91.7	88.0	83.5		
	Surrogate: 3,4-Dichlorotoluene (SS) (%)	97.2	106.8	87.8		

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2244517-6	L2244517-7	L2244517-8	L2244517-9	L2244517-10
Description	Water	Water	Water	Water	Water
Sampled Date	13-MAR-19	13-MAR-19	13-MAR-19	13-MAR-19	13-MAR-19
Sampled Time	14:45	11:45	14:45	14:00	14:00
Client ID	SFC-3	SFC-4B	SFC-11	GW INT.	DUPLICATE-GW INT.
Grouping	**Analyte**				
WATER					
Volatile Organic Compounds	1,4-Dichlorobenzene (mg/L)			<0.0010	<0.0010
	1,1-Dichloroethane (mg/L)			<0.0010	<0.0010
	1,2-Dichloroethane (mg/L)			<0.0010	<0.0010
	1,1-Dichloroethylene (mg/L)			<0.0010	<0.0010
	cis-1,2-Dichloroethylene (mg/L)			<0.0010	<0.0010
	trans-1,2-Dichloroethylene (mg/L)			<0.0010	<0.0010
	Dichloromethane (mg/L)			<0.0050	<0.0050
	1,2-Dichloropropane (mg/L)			<0.0010	<0.0010
	cis-1,3-Dichloropropylene (mg/L)			<0.00050	<0.00050
	trans-1,3-Dichloropropylene (mg/L)			<0.00050	<0.00050
	1,3-Dichloropropene (cis & trans) (mg/L)			<0.0010	<0.0010
	Ethylbenzene (mg/L)			<0.00050	<0.00050
	Methyl t-butyl ether (MTBE) (mg/L)			<0.00050	<0.00050
	Styrene (mg/L)			<0.00050	<0.00050
	1,1,1,2-Tetrachloroethane (mg/L)			<0.0010	<0.0010
	1,1,2,2-Tetrachloroethane (mg/L)			<0.00020	<0.00020
	Tetrachloroethylene (mg/L)			<0.0010	<0.0010
	Toluene (mg/L)			<0.00045	<0.00045
	1,1,1-Trichloroethane (mg/L)			<0.0010	<0.0010
	1,1,2-Trichloroethane (mg/L)			<0.00050	<0.00050
	Trichloroethylene (mg/L)			<0.0010	<0.0010
	Trichlorofluoromethane (mg/L)			<0.0010	<0.0010
	Vinyl Chloride (mg/L)			<0.00040	<0.00040
	ortho-Xylene (mg/L)			<0.00050	<0.00050
	meta- & para-Xylene (mg/L)			<0.00050	<0.00050
	Xylenes (mg/L)			<0.00075	<0.00075
	Surrogate: 4-Bromofluorobenzene (SS) (%)			90.0	88.2
	Surrogate: 1,4-Difluorobenzene (SS) (%)			101.2	101.8
Hydrocarbons	EPH10-19 (mg/L)			<0.25	<0.25
	EPH19-32 (mg/L)			<0.25	<0.25
	LEPH (mg/L)			<0.25	<0.25
	HEPH (mg/L)			<0.25	<0.25
	Volatile Hydrocarbons (VH6-10) (mg/L)			<0.10	<0.10
	VPH (C6-C10) (mg/L)			<0.10	<0.10
	Surrogate: 2-Bromobenzotrifluoride (%)			77.3	86.3
	Surrogate: 3,4-Dichlorotoluene (SS) (%)			105.1	89.9

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2244517-11	L2244517-12			
	Description	Water	Water			
	Sampled Date	13-MAR-19	13-MAR-19			
	Sampled Time	15:30	15:30			
	Client ID	L1	FIELD BLANK			
Grouping	**Analyte**					
WATER						
Volatile Organic Compounds	1,4-Dichlorobenzene (mg/L)	<0.0010	<0.0010			
	1,1-Dichloroethane (mg/L)	<0.0010	<0.0010			
	1,2-Dichloroethane (mg/L)	<0.0010	<0.0010			
	1,1-Dichloroethylene (mg/L)	<0.0010	<0.0010			
	cis-1,2-Dichloroethylene (mg/L)	<0.0010	<0.0010			
	trans-1,2-Dichloroethylene (mg/L)	<0.0010	<0.0010			
	Dichloromethane (mg/L)	<0.0050	<0.0050			
	1,2-Dichloropropane (mg/L)	<0.0010	<0.0010			
	cis-1,3-Dichloropropylene (mg/L)	<0.00050	<0.00050			
	trans-1,3-Dichloropropylene (mg/L)	<0.00050	<0.00050			
	1,3-Dichloropropene (cis & trans) (mg/L)	<0.0010	<0.0010			
	Ethylbenzene (mg/L)	<0.00050	<0.00050			
	Methyl t-butyl ether (MTBE) (mg/L)	<0.00050	<0.00050			
	Styrene (mg/L)	<0.00050	<0.00050			
	1,1,1,2-Tetrachloroethane (mg/L)	<0.0010	<0.0010			
	1,1,2,2-Tetrachloroethane (mg/L)	<0.00020	<0.00020			
	Tetrachloroethylene (mg/L)	<0.0010	<0.0010			
	Toluene (mg/L)	<0.00045	<0.00045			
	1,1,1-Trichloroethane (mg/L)	<0.0010	<0.0010			
	1,1,2-Trichloroethane (mg/L)	<0.00050	<0.00050			
	Trichloroethylene (mg/L)	<0.0010	<0.0010			
	Trichlorofluoromethane (mg/L)	<0.0010	<0.0010			
	Vinyl Chloride (mg/L)	<0.00040	<0.00040			
	ortho-Xylene (mg/L)	<0.00050	<0.00050			
	meta- & para-Xylene (mg/L)	<0.00050	<0.00050			
	Xylenes (mg/L)	<0.00075	<0.00075			
	Surrogate: 4-Bromofluorobenzene (SS) (%)	91.1	87.5			
	Surrogate: 1,4-Difluorobenzene (SS) (%)	100.3	100.6			
Hydrocarbons	EPH10-19 (mg/L)	<0.25	<0.25			
	EPH19-32 (mg/L)	<0.25	<0.25			
	LEPH (mg/L)	<0.25	<0.25			
	HEPH (mg/L)	<0.25	<0.25			
	Volatile Hydrocarbons (VH6-10) (mg/L)	<0.10	<0.10			
	VPH (C6-C10) (mg/L)	<0.10	<0.10			
	Surrogate: 2-Bromobenzotrifluoride (%)	93.1	91.5			
	Surrogate: 3,4-Dichlorotoluene (SS) (%)	106.8	96.1			

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2244517-1 Water 13-MAR-19 11:00 MW-2D	L2244517-2 Water 13-MAR-19 11:00 MW-2S	L2244517-3 Water 13-MAR-19 13:30 MW-4	L2244517-4 Water 13-MAR-19 10:00 SFC-2	L2244517-5 Water 13-MAR-19 10:15 SCF-2B
WATER						
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)	<0.000010	<0.000010	<0.000010		
	Acenaphthylene (mg/L)	<0.000010	<0.000010	<0.000010		
	Acridine (mg/L)	<0.000010	<0.000010	<0.000010		
	Anthracene (mg/L)	<0.000010	<0.000010	<0.000010		
	Benz(a)anthracene (mg/L)	<0.000010	<0.000010	<0.000010		
	Benzo(a)pyrene (mg/L)	<0.0000050	<0.0000050	<0.0000050		
	Benzo(b&j)fluoranthene (mg/L)	<0.000010	<0.000010	<0.000010		
	Benzo(b+j+k)fluoranthene (mg/L)	<0.000015	<0.000015	<0.000015		
	Benzo(g,h,i)perylene (mg/L)	<0.000010	<0.000010	<0.000010		
	Benzo(k)fluoranthene (mg/L)	<0.000010	<0.000010	<0.000010		
	Chrysene (mg/L)	<0.000010	<0.000010	<0.000010		
	Dibenz(a,h)anthracene (mg/L)	<0.0000050	<0.0000050	<0.0000050		
	Fluoranthene (mg/L)	<0.000010	<0.000010	<0.000010		
	Fluorene (mg/L)	0.000011	<0.000010	<0.000010		
	Indeno(1,2,3-c,d)pyrene (mg/L)	<0.000010	<0.000010	<0.000010		
	1-Methylnaphthalene (mg/L)	<0.000050	<0.000050	<0.000050		
	2-Methylnaphthalene (mg/L)	<0.000050	<0.000050	<0.000050		
	Naphthalene (mg/L)	<0.000050	<0.000050	<0.000050		
	Phenanthrene (mg/L)	<0.000020	<0.000020	<0.000020		
	Pyrene (mg/L)	<0.000010	<0.000010	<0.000010		
	Quinoline (mg/L)	<0.000050	<0.000050	<0.000050		
	Surrogate: Acridine d9 (%)	118.2	76.1	67.4		
	Surrogate: Chrysene d12 (%)	121.0	124.0	84.0		
	Surrogate: Naphthalene d8 (%)	111.7	84.4	109.9		
	Surrogate: Phenanthrene d10 (%)	115.9	62.9	128.6		

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2244517-6	L2244517-7	L2244517-8	L2244517-9	L2244517-10
Description	Water	Water	Water	Water	Water
Sampled Date	13-MAR-19	13-MAR-19	13-MAR-19	13-MAR-19	13-MAR-19
Sampled Time	14:45	11:45	14:45	14:00	14:00
Client ID	SFC-3	SFC-4B	SFC-11	GW INT.	DUPLICATE-GW INT.
Grouping / **Analyte**					
WATER					
Polycyclic Aromatic Hydrocarbons					
Acenaphthene (mg/L)				0.000628	0.000583
Acenaphthylene (mg/L)				<0.000010	<0.000010
Acridine (mg/L)				<0.000010	<0.000010
Anthracene (mg/L)				0.000016	0.000014
Benz(a)anthracene (mg/L)				<0.000010	<0.000010
Benzo(a)pyrene (mg/L)				<0.0000050	<0.0000050
Benzo(b&j)fluoranthene (mg/L)				<0.000010	<0.000010
Benzo(b+j+k)fluoranthene (mg/L)				<0.000015	<0.000015
Benzo(g,h,i)perylene (mg/L)				<0.000010	<0.000010
Benzo(k)fluoranthene (mg/L)				<0.000010	<0.000010
Chrysene (mg/L)				<0.000010	<0.000010
Dibenz(a,h)anthracene (mg/L)				<0.0000050	<0.0000050
Fluoranthene (mg/L)				0.000146	0.000133
Fluorene (mg/L)				0.000155	0.000141
Indeno(1,2,3-c,d)pyrene (mg/L)				<0.000010	<0.000010
1-Methylnaphthalene (mg/L)				<0.000050	<0.000050
2-Methylnaphthalene (mg/L)				<0.000050	<0.000050
Naphthalene (mg/L)				<0.000050	<0.000050
Phenanthrene (mg/L)				<0.000020	<0.000020
Pyrene (mg/L)				0.000076	0.000070
Quinoline (mg/L)				<0.000050	<0.000050
Surrogate: Acridine d9 (%)				88.6	88.8
Surrogate: Chrysene d12 (%)				88.0	79.7
Surrogate: Naphthalene d8 (%)				79.2	81.5
Surrogate: Phenanthrene d10 (%)				94.0	97.3

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2244517-11	L2244517-12			
	Description	Water	Water			
	Sampled Date	13-MAR-19	13-MAR-19			
	Sampled Time	15:30	15:30			
	Client ID	L1	FIELD BLANK			
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)	<0.000010	<0.000010			
	Acenaphthylene (mg/L)	<0.000010	<0.000010			
	Acridine (mg/L)	<0.000010	<0.000010			
	Anthracene (mg/L)	<0.000010	<0.000010			
	Benz(a)anthracene (mg/L)	<0.000010	<0.000010			
	Benzo(a)pyrene (mg/L)	<0.0000050	<0.0000050			
	Benzo(b&j)fluoranthene (mg/L)	<0.000010	<0.000010			
	Benzo(b+j+k)fluoranthene (mg/L)	<0.000015	<0.000015			
	Benzo(g,h,i)perylene (mg/L)	<0.000010	<0.000010			
	Benzo(k)fluoranthene (mg/L)	<0.000010	<0.000010			
	Chrysene (mg/L)	<0.000010	<0.000010			
	Dibenz(a,h)anthracene (mg/L)	<0.0000050	<0.0000050			
	Fluoranthene (mg/L)	<0.000010	<0.000010			
	Fluorene (mg/L)	<0.000010	<0.000010			
	Indeno(1,2,3-c,d)pyrene (mg/L)	<0.000010	<0.000010			
	1-Methylnaphthalene (mg/L)	<0.000050	<0.000050			
	2-Methylnaphthalene (mg/L)	<0.000050	<0.000050			
	Naphthalene (mg/L)	<0.000050	<0.000050			
	Phenanthrene (mg/L)	<0.000020	<0.000020			
	Pyrene (mg/L)	<0.000010	<0.000010			
	Quinoline (mg/L)	<0.000050	<0.000050			
	Surrogate: Acridine d9 (%)	123.3	126.9			
	Surrogate: Chrysene d12 (%)	122.7	88.4			
	Surrogate: Naphthalene d8 (%)	119.3	111.9			
	Surrogate: Phenanthrene d10 (%)	104.0	104.8			

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

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Alkalinity, Total (as CaCO3)	B	L2244517-5
Matrix Spike	Mercury (Hg)-Total	MS-B	L2244517-4, -5, -6, -7, -8
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2244517-1, -10, -11, -12, -2, -3, -9
Matrix Spike	Boron (B)-Dissolved	MS-B	L2244517-1, -10, -11, -12, -2, -3, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2244517-1, -10, -11, -12, -2, -3, -9
Matrix Spike	Iron (Fe)-Dissolved	MS-B	L2244517-1, -10, -11, -12, -2, -3, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2244517-1, -10, -11, -12, -2, -3, -9
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2244517-1, -10, -11, -12, -2, -3, -9
Matrix Spike	Potassium (K)-Dissolved	MS-B	L2244517-1, -10, -11, -12, -2, -3, -9
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L2244517-1, -10, -11, -12, -2, -3, -9
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2244517-1, -10, -11, -12, -2, -3, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2244517-1, -10, -11, -12, -2, -3, -9
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2244517-1, -10, -11, -12, -2, -3, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L2244517-4, -5, -6, -7, -8
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2244517-4, -5, -6, -7, -8
Matrix Spike	Sodium (Na)-Total	MS-B	L2244517-4, -5, -6, -7, -8
Matrix Spike	Strontium (Sr)-Total	MS-B	L2244517-4, -5, -6, -7, -8
Matrix Spike	Uranium (U)-Total	MS-B	L2244517-4, -5, -6, -7, -8

Qualifiers for Individual Parameters Listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0
Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).			
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
COD-COL-VA	Water	Chemical Oxygen Demand by Colorimetric	APHA 5220 D. CHEMICAL OXYGEN DEMAND
This analysis is carried out using procedures adapted from APHA Method 5220 "Chemical Oxygen Demand (COD)". Chemical oxygen demand is determined using the closed reflux colourimetric method.			
EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.			
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.			
EPH-ME-FID-VA	Water	EPH in Water	BC Lab Manual
EPH is extracted from water using a hexane micro-extraction technique, with analysis by GC-FID, as per the BC Lab Manual. EPH results include PAHs and are therefore not equivalent to LEPH or HEPH.			
F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Reference Information

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

HARDNESS-CALC-VA Water Hardness APHA 2340B

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

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

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

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

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

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

LEPHw and HEPHw are measures of Light and Heavy Extractable Petroleum Hydrocarbons in water. Results are calculated by subtraction of applicable PAH concentrations from EPH10-19 and EPH19-32, as per the BC Lab Manual LEPH/HEPH calculation procedure.

LEPHw = EPH10-19 minus Acenaphthene, Acridine, Anthracene, Fluorene, Naphthalene and Phenanthrene.

HEPHw = EPH19-32 minus Benz(a)anthracene, Benzo(a)pyrene, Fluoranthene, and Pyrene.

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

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

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

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

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

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

N-T-COL-VA Water Total Nitrogen in water by Colour APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

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

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

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

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

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

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

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

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

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

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

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

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

Reference Information

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

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

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

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

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

VOC7-HSMS-VA	Water	BTEX/MTBE/Styrene by Headspace GCMS	EPA 5021A/8260C

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

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

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

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

Calculation of Total Xylenes

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

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

17-190313

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Morrison Hershfield Limited
ATTN: Josie Gilson
310 - 4321 Still Creek Drive
Burnaby BC V5C 6S7

Date Received: 21-JUN-19
Report Date: 05-JUL-19 14:46 (MT)
Version: FINAL

Client Phone: 604-454-0402

Certificate of Analysis

Lab Work Order #: L2296357

Project P.O. #: 726379
Job Reference: 18001536
C of C Numbers: 17-190313
Legal Site Desc:

Carla Fuginski
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2296357-1 Water 20-JUN-19 10:45 MW-2D	L2296357-2 Water 20-JUN-19 11:30 MW-2S	L2296357-3 Water 20-JUN-19 10:00 MW-3	L2296357-4 Water 20-JUN-19 13:30 MW-4	L2296357-5 Water 20-JUN-19 13:45 DUPLICATE - MW-4
WATER						
Physical Tests	Conductivity (uS/cm)	927	278	180	311	314
	Hardness (as CaCO3) (mg/L)	322	98.4	43.1	120	117
	pH (pH)	6.87	7.30	7.17	7.19	7.37
	Total Suspended Solids (mg/L)	76.0	73.8	69.6	1990	606
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	274	76.4	26.8	104	104
	Ammonia, Total (as N) (mg/L)	10.2	2.89	0.418	1.88	2.07
	Bromide (Br) (mg/L)	<0.25 DLDS	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	45.3	6.76	24.5	18.7	18.8
	Fluoride (F) (mg/L)	<0.10 DLDS	0.095	0.026	0.059	0.051
	Nitrate and Nitrite (as N) (mg/L)	<0.025	0.0052	0.662	0.0263	0.0138
	Nitrate (as N) (mg/L)	<0.025 DLDS	0.0052	0.662	0.0237	0.0119
	Nitrite (as N) (mg/L)	<0.0050 DLDS	<0.0010	<0.0010	0.0025	0.0019
	Total Kjeldahl Nitrogen (mg/L)	12.8	3.32	0.806	2.35	2.82
	Total Nitrogen (mg/L)	11.3	3.34	1.23	4.39	3.14
	Phosphorus (P)-Total (mg/L)	0.110	0.0783	0.0313	5.28 RRV	0.322 RRV
	Sulfate (SO4) (mg/L)	173	51.8	19.2	38.3	38.3
Total Metals	Aluminum (Al)-Total (mg/L)					
	Antimony (Sb)-Total (mg/L)					
	Arsenic (As)-Total (mg/L)					
	Barium (Ba)-Total (mg/L)					
	Beryllium (Be)-Total (mg/L)					
	Bismuth (Bi)-Total (mg/L)					
	Boron (B)-Total (mg/L)					
	Cadmium (Cd)-Total (mg/L)					
	Calcium (Ca)-Total (mg/L)					
	Cesium (Cs)-Total (mg/L)					
	Chromium (Cr)-Total (mg/L)					
	Cobalt (Co)-Total (mg/L)					
	Copper (Cu)-Total (mg/L)					
	Iron (Fe)-Total (mg/L)					
	Lead (Pb)-Total (mg/L)					
	Lithium (Li)-Total (mg/L)					
	Magnesium (Mg)-Total (mg/L)					
	Manganese (Mn)-Total (mg/L)					
	Mercury (Hg)-Total (mg/L)					
	Molybdenum (Mo)-Total (mg/L)					
	Nickel (Ni)-Total (mg/L)					

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2296357-6 Water 20-JUN-19 16:30 MW-6	L2296357-7 Water 20-JUN-19 12:00 SFC-2	L2296357-8 Water 20-JUN-19 12:15 SFC-2B	L2296357-9 Water 20-JUN-19 15:45 SFC-3	L2296357-10 Water 20-JUN-19 14:30 SFC-4B
WATER						
Physical Tests	Conductivity (uS/cm)	635	306	1390	143	259
	Hardness (as CaCO3) (mg/L)	123	104 HTC	385 HTC	45.2 HTC	80.8 HTC
	pH (pH)	7.17	7.43	3.02	7.44	7.75
	Total Suspended Solids (mg/L)	99.8	10.0	35.6	4.0	<3.0
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	26.8	60.1	<1.0	31.7	38.8
	Ammonia, Total (as N) (mg/L)	0.0369	0.461	2.30 DLDS	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.25	<0.050	0.060
	Chloride (Cl) (mg/L)	120	21.2	6.8	14.4	31.3
	Fluoride (F) (mg/L)	0.070	0.049	0.50	0.051	0.054
	Nitrate and Nitrite (as N) (mg/L)	0.140	0.159	<0.025 DLDS	0.148	0.189
	Nitrate (as N) (mg/L)	0.140	0.158	<0.025 DLDS	0.148	0.189
	Nitrite (as N) (mg/L)	<0.0010	0.0011	<0.0050	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.390	0.603	3.10	0.096	0.131
	Total Nitrogen (mg/L)	0.492	0.667	3.13	0.222	0.239
	Phosphorus (P)-Total (mg/L)	0.463	0.0021	0.0377	0.0072	<0.0020
	Sulfate (SO4) (mg/L)	100	52.3	342	14.0	34.3
Total Metals	Aluminum (Al)-Total (mg/L)		0.389	22.9 DLA	0.0628	0.0277
	Antimony (Sb)-Total (mg/L)		<0.00010	<0.00020	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)		0.00018	0.00088	0.00011	<0.00010
	Barium (Ba)-Total (mg/L)		0.0569	0.0379	0.0109	0.0194
	Beryllium (Be)-Total (mg/L)		<0.00010	0.00071	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)		<0.000050	<0.00010 DLA	<0.000050	<0.000050
	Boron (B)-Total (mg/L)		0.042	0.026	<0.010	0.029
	Cadmium (Cd)-Total (mg/L)		0.0000343	0.000670	0.0000266	0.0000056
	Calcium (Ca)-Total (mg/L)		35.9	103	14.6	27.6
	Cesium (Cs)-Total (mg/L)		0.000010	0.000111	<0.000010	<0.000010
	Chromium (Cr)-Total (mg/L)		0.00032	0.00179	0.00012	<0.00010
	Cobalt (Co)-Total (mg/L)		0.00625	0.141	0.00020	0.00016
	Copper (Cu)-Total (mg/L)		0.00623	0.234	0.00071	0.00095
	Iron (Fe)-Total (mg/L)		4.74	62.4	0.167	0.094
	Lead (Pb)-Total (mg/L)		<0.000050	0.00016	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)		<0.0010	0.0082	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)		3.50	31.1	2.11	2.89
	Manganese (Mn)-Total (mg/L)		1.42	7.47	0.0251	0.0708
	Mercury (Hg)-Total (mg/L)		<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)		0.00250	0.00023	0.000210	0.000462
	Nickel (Ni)-Total (mg/L)		0.00124	0.0553	<0.00050	<0.00050

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2296357-11	L2296357-12	L2296357-13		
Description	Water	Water	Water		
Sampled Date	20-JUN-19	20-JUN-19	20-JUN-19		
Sampled Time	16:00	15:15	15:15		
Client ID	SFC-11	GW INT.	FIELD BLANK		
Grouping / **Analyte**					
WATER					
Physical Tests Conductivity (uS/cm)	145	849	<2.0		
Hardness (as CaCO3) (mg/L)	45.5 HTC	239	<0.50		
pH (pH)	7.40	6.92	5.24		
Total Suspended Solids (mg/L)	<3.0	42.6	<3.0		
Anions and Nutrients Alkalinity, Total (as CaCO3) (mg/L)	31.9	118	<1.0		
Ammonia, Total (as N) (mg/L)	<0.0050	1.13	<0.0050		
Bromide (Br) (mg/L)	<0.050	<0.25 DLDS	<0.050		
Chloride (Cl) (mg/L)	14.8	124	<0.50		
Fluoride (F) (mg/L)	0.048	0.10	<0.020		
Nitrate and Nitrite (as N) (mg/L)	0.180	<0.025	<0.0051		
Nitrate (as N) (mg/L)	0.180	<0.025 DLDS	<0.0050		
Nitrite (as N) (mg/L)	<0.0010	<0.0050 DLDS	<0.0010		
Total Kjeldahl Nitrogen (mg/L)	0.089	1.46	<0.050		
Total Nitrogen (mg/L)	0.209	1.38	<0.030		
Phosphorus (P)-Total (mg/L)	0.0044	0.0254	<0.0020		
Sulfate (SO4) (mg/L)	15.0	115	<0.30		
Total Metals Aluminum (Al)-Total (mg/L)	0.0377				
Antimony (Sb)-Total (mg/L)	<0.00010				
Arsenic (As)-Total (mg/L)	<0.00010				
Barium (Ba)-Total (mg/L)	0.0104				
Beryllium (Be)-Total (mg/L)	<0.00010				
Bismuth (Bi)-Total (mg/L)	<0.000050				
Boron (B)-Total (mg/L)	<0.010				
Cadmium (Cd)-Total (mg/L)	0.0000189				
Calcium (Ca)-Total (mg/L)	14.5				
Cesium (Cs)-Total (mg/L)	<0.000010				
Chromium (Cr)-Total (mg/L)	0.00010				
Cobalt (Co)-Total (mg/L)	<0.00010				
Copper (Cu)-Total (mg/L)	<0.00050				
Iron (Fe)-Total (mg/L)	0.037				
Lead (Pb)-Total (mg/L)	<0.000050				
Lithium (Li)-Total (mg/L)	<0.0010				
Magnesium (Mg)-Total (mg/L)	2.23				
Manganese (Mn)-Total (mg/L)	0.00699				
Mercury (Hg)-Total (mg/L)	<0.0000050				
Molybdenum (Mo)-Total (mg/L)	0.000167				
Nickel (Ni)-Total (mg/L)	<0.00050				

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2296357-1 Water 20-JUN-19 10:45 MW-2D	L2296357-2 Water 20-JUN-19 11:30 MW-2S	L2296357-3 Water 20-JUN-19 10:00 MW-3	L2296357-4 Water 20-JUN-19 13:30 MW-4	L2296357-5 Water 20-JUN-19 13:45 DUPLICATE - MW-4
WATER						
Total Metals	Phosphorus (P)-Total (mg/L)					
	Potassium (K)-Total (mg/L)					
	Rubidium (Rb)-Total (mg/L)					
	Selenium (Se)-Total (mg/L)					
	Silicon (Si)-Total (mg/L)					
	Silver (Ag)-Total (mg/L)					
	Sodium (Na)-Total (mg/L)					
	Strontium (Sr)-Total (mg/L)					
	Sulfur (S)-Total (mg/L)					
	Tellurium (Te)-Total (mg/L)					
	Thallium (Tl)-Total (mg/L)					
	Thorium (Th)-Total (mg/L)					
	Tin (Sn)-Total (mg/L)					
	Titanium (Ti)-Total (mg/L)					
	Tungsten (W)-Total (mg/L)					
	Uranium (U)-Total (mg/L)					
	Vanadium (V)-Total (mg/L)					
	Zinc (Zn)-Total (mg/L)					
	Zirconium (Zr)-Total (mg/L)					
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0036	0.0030	0.0115	0.0072	0.0083
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.0132	0.00649	<0.00010	0.00368	0.00426
	Barium (Ba)-Dissolved (mg/L)	0.0378	0.0681	0.0735	0.114	0.114
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	0.255	0.096	<0.010	0.048	0.046
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	0.000136	0.000258	0.000244
	Calcium (Ca)-Dissolved (mg/L)	108	31.1	13.8	41.6	40.2
	Cesium (Cs)-Dissolved (mg/L)	0.000019	0.000014	0.000047	0.000071	0.000069
	Chromium (Cr)-Dissolved (mg/L)	0.00033	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	0.0107	0.00148	0.00195	0.0119	0.0121
	Copper (Cu)-Dissolved (mg/L)	0.00466	0.00420	0.00189	0.00117	0.00565
	Iron (Fe)-Dissolved (mg/L)	48.2	29.6	0.019	13.6	15.0
	Lead (Pb)-Dissolved (mg/L)	0.000091	0.000112	<0.000050	<0.000050	0.000136
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2296357-6 Water 20-JUN-19 16:30 MW-6	L2296357-7 Water 20-JUN-19 12:00 SFC-2	L2296357-8 Water 20-JUN-19 12:15 SFC-2B	L2296357-9 Water 20-JUN-19 15:45 SFC-3	L2296357-10 Water 20-JUN-19 14:30 SFC-4B
WATER						
Total Metals	Phosphorus (P)-Total (mg/L)		<0.050	<0.10 DLA	<0.050	<0.050
	Potassium (K)-Total (mg/L)		3.31	3.56	0.701	1.70
	Rubidium (Rb)-Total (mg/L)		0.00374	0.00758	0.00040	0.00155
	Selenium (Se)-Total (mg/L)		0.000078	0.00013	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)		4.92	16.2	10.1	7.62
	Silver (Ag)-Total (mg/L)		<0.000010	<0.000020 DLA	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)		12.6	12.2	8.02	14.6
	Strontium (Sr)-Total (mg/L)		0.240	0.412	0.188	0.301
	Sulfur (S)-Total (mg/L)		17.8	230	4.38	11.3
	Tellurium (Te)-Total (mg/L)		<0.00020	<0.00040 DLA	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)		0.000012	<0.000020 DLA	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)		<0.00010	0.00119	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)		<0.00010	<0.00020 DLA	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)		<0.00030	<0.0027 DLM	0.00182	0.00051
	Tungsten (W)-Total (mg/L)		<0.00010	<0.00020 DLA	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)		0.000039	0.000796	<0.000010	<0.000010
	Vanadium (V)-Total (mg/L)		<0.00050	<0.0010 DLA	0.00069	<0.00050
	Zinc (Zn)-Total (mg/L)		0.0034	0.109	<0.0030	0.0052
	Zirconium (Zr)-Total (mg/L)		<0.00020	<0.00040 DLA	<0.00020	<0.00020
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD				
	Dissolved Metals Filtration Location	FIELD				
	Aluminum (Al)-Dissolved (mg/L)	0.0213				
	Antimony (Sb)-Dissolved (mg/L)	<0.00010				
	Arsenic (As)-Dissolved (mg/L)	<0.00010				
	Barium (Ba)-Dissolved (mg/L)	0.0400				
	Beryllium (Be)-Dissolved (mg/L)	<0.00010				
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050				
	Boron (B)-Dissolved (mg/L)	0.012				
	Cadmium (Cd)-Dissolved (mg/L)	0.0000968				
	Calcium (Ca)-Dissolved (mg/L)	41.2				
	Cesium (Cs)-Dissolved (mg/L)	<0.000010				
	Chromium (Cr)-Dissolved (mg/L)	<0.00010				
	Cobalt (Co)-Dissolved (mg/L)	0.00192				
	Copper (Cu)-Dissolved (mg/L)	0.00404				
	Iron (Fe)-Dissolved (mg/L)	2.16				
	Lead (Pb)-Dissolved (mg/L)	0.000098				
	Lithium (Li)-Dissolved (mg/L)	<0.0010				

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2296357-11	L2296357-12	L2296357-13		
	Description	Water	Water	Water		
	Sampled Date	20-JUN-19	20-JUN-19	20-JUN-19		
	Sampled Time	16:00	15:15	15:15		
	Client ID	SFC-11	GW INT.	FIELD BLANK		
Grouping	**Analyte**					
WATER						
Total Metals	Phosphorus (P)-Total (mg/L)	<0.050				
	Potassium (K)-Total (mg/L)	0.697				
	Rubidium (Rb)-Total (mg/L)	0.00036				
	Selenium (Se)-Total (mg/L)	<0.000050				
	Silicon (Si)-Total (mg/L)	10.7				
	Silver (Ag)-Total (mg/L)	<0.000010				
	Sodium (Na)-Total (mg/L)	8.23				
	Strontium (Sr)-Total (mg/L)	0.192				
	Sulfur (S)-Total (mg/L)	4.76				
	Tellurium (Te)-Total (mg/L)	<0.00020				
	Thallium (Tl)-Total (mg/L)	<0.000010				
	Thorium (Th)-Total (mg/L)	<0.00010				
	Tin (Sn)-Total (mg/L)	<0.00010				
	Titanium (Ti)-Total (mg/L)	0.00093				
	Tungsten (W)-Total (mg/L)	<0.00010				
	Uranium (U)-Total (mg/L)	<0.000010				
	Vanadium (V)-Total (mg/L)	0.00065				
	Zinc (Zn)-Total (mg/L)	<0.0030				
	Zirconium (Zr)-Total (mg/L)	<0.00020				
Dissolved Metals	Dissolved Mercury Filtration Location		FIELD	FIELD		
	Dissolved Metals Filtration Location		FIELD	FIELD		
	Aluminum (Al)-Dissolved (mg/L)		0.0337	<0.0010		
	Antimony (Sb)-Dissolved (mg/L)		<0.00010	<0.00010		
	Arsenic (As)-Dissolved (mg/L)		0.00058	<0.00010		
	Barium (Ba)-Dissolved (mg/L)		0.0834	<0.00010		
	Beryllium (Be)-Dissolved (mg/L)		<0.00010	<0.00010		
	Bismuth (Bi)-Dissolved (mg/L)		<0.000050	<0.000050		
	Boron (B)-Dissolved (mg/L)		0.130	<0.010		
	Cadmium (Cd)-Dissolved (mg/L)		<0.0000050	<0.0000050		
	Calcium (Ca)-Dissolved (mg/L)		81.8	<0.050		
	Cesium (Cs)-Dissolved (mg/L)		0.000014	<0.000010		
	Chromium (Cr)-Dissolved (mg/L)		0.00031	<0.00010		
	Cobalt (Co)-Dissolved (mg/L)		0.00262	<0.00010		
	Copper (Cu)-Dissolved (mg/L)		<0.00020	<0.00020		
	Iron (Fe)-Dissolved (mg/L)		25.4	<0.010		
	Lead (Pb)-Dissolved (mg/L)		<0.000050	<0.000050		
	Lithium (Li)-Dissolved (mg/L)		<0.0010	<0.0010		

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2296357-1	L2296357-2	L2296357-3	L2296357-4	L2296357-5
Description	Water	Water	Water	Water	Water
Sampled Date	20-JUN-19	20-JUN-19	20-JUN-19	20-JUN-19	20-JUN-19
Sampled Time	10:45	11:30	10:00	13:30	13:45
Client ID	MW-2D	MW-2S	MW-3	MW-4	DUPLICATE - MW-4
Grouping / **Analyte**					
WATER					
Dissolved Metals Magnesium (Mg)-Dissolved (mg/L)	13.0	5.02	2.07	3.99	4.16
Manganese (Mn)-Dissolved (mg/L)	3.08	1.37	0.930	1.35	1.39
Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)	0.0128	0.00441	0.000646	0.00967	0.0108
Nickel (Ni)-Dissolved (mg/L)	0.00210	0.00057	<0.00050	0.00380	0.00383
Phosphorus (P)-Dissolved (mg/L)	0.088	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved (mg/L)	17.5	6.04	3.36	4.90	4.92
Rubidium (Rb)-Dissolved (mg/L)	0.00998	0.00397	0.00859	0.00431	0.00458
Selenium (Se)-Dissolved (mg/L)	0.000060	<0.000050	<0.000050	<0.000050	<0.000050
Silicon (Si)-Dissolved (mg/L)	14.4	8.91	6.92	9.98	10.1
Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved (mg/L)	33.7	7.08	13.4	14.5	14.7
Strontium (Sr)-Dissolved (mg/L)	0.503	0.183	0.132	0.274	0.283
Sulfur (S)-Dissolved (mg/L)	62.2	18.3	6.71	13.5	13.5
Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	0.000068	0.000046	0.000044
Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved (mg/L)	0.00011	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Dissolved (mg/L)	0.000161	0.000015	<0.000010	0.000176	0.000196
Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved (mg/L)	0.0060	0.0055	0.0026	0.0182	0.0196
Zirconium (Zr)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Aggregate Organics COD (mg/L)	32	<20	<20	722	60
Volatile Organic Compounds Benzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Bromodichloromethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Bromoform (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Carbon Tetrachloride (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Chlorobenzene (mg/L)	0.0021	<0.0010	<0.0010	<0.0010	<0.0010
Dibromochloromethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Chloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Chloroform (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Chloromethane (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
1,2-Dichlorobenzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
1,3-Dichlorobenzene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	Sample ID: L2296357-6 Description: Water Sampled Date: 20-JUN-19 Sampled Time: 16:30 Client ID: MW-6	L2296357-7 Water 20-JUN-19 12:00 SFC-2	L2296357-8 Water 20-JUN-19 12:15 SFC-2B	L2296357-9 Water 20-JUN-19 15:45 SFC-3	L2296357-10 Water 20-JUN-19 14:30 SFC-4B
WATER						
Dissolved Metals	Magnesium (Mg)-Dissolved (mg/L)	4.90				
	Manganese (Mn)-Dissolved (mg/L)	0.188				
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050				
	Molybdenum (Mo)-Dissolved (mg/L)	0.000595				
	Nickel (Ni)-Dissolved (mg/L)	<0.00050				
	Phosphorus (P)-Dissolved (mg/L)	<0.050				
	Potassium (K)-Dissolved (mg/L)	3.49				
	Rubidium (Rb)-Dissolved (mg/L)	0.00519				
	Selenium (Se)-Dissolved (mg/L)	0.000053				
	Silicon (Si)-Dissolved (mg/L)	5.91				
	Silver (Ag)-Dissolved (mg/L)	<0.000010				
	Sodium (Na)-Dissolved (mg/L)	73.4				
	Strontium (Sr)-Dissolved (mg/L)	0.388				
	Sulfur (S)-Dissolved (mg/L)	33.1				
	Tellurium (Te)-Dissolved (mg/L)	<0.00020				
	Thallium (Tl)-Dissolved (mg/L)	0.000045				
	Thorium (Th)-Dissolved (mg/L)	<0.00010				
	Tin (Sn)-Dissolved (mg/L)	<0.00010				
	Titanium (Ti)-Dissolved (mg/L)	<0.00030				
	Tungsten (W)-Dissolved (mg/L)	<0.00010				
	Uranium (U)-Dissolved (mg/L)	0.000019				
	Vanadium (V)-Dissolved (mg/L)	<0.00050				
	Zinc (Zn)-Dissolved (mg/L)	0.0042				
	Zirconium (Zr)-Dissolved (mg/L)	<0.00020				
Aggregate Organics	COD (mg/L)	<20	<20	27	<20	<20
Volatile Organic Compounds	Benzene (mg/L)	<0.00050				
	Bromodichloromethane (mg/L)	<0.0010				
	Bromoform (mg/L)	<0.0010				
	Carbon Tetrachloride (mg/L)	<0.00050				
	Chlorobenzene (mg/L)	<0.0010				
	Dibromochloromethane (mg/L)	<0.0010				
	Chloroethane (mg/L)	<0.0010				
	Chloroform (mg/L)	<0.0010				
	Chloromethane (mg/L)	<0.0050				
	1,2-Dichlorobenzene (mg/L)	<0.00050				
	1,3-Dichlorobenzene (mg/L)	<0.0010				

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2296357-11	L2296357-12	L2296357-13		
Description	Water	Water	Water		
Sampled Date	20-JUN-19	20-JUN-19	20-JUN-19		
Sampled Time	16:00	15:15	15:15		
Client ID	SFC-11	GW INT.	FIELD BLANK		
Grouping / **Analyte**					
WATER					
Dissolved Metals Magnesium (Mg)-Dissolved (mg/L)		8.56	<0.0050		
Manganese (Mn)-Dissolved (mg/L)		2.58	<0.00010		
Mercury (Hg)-Dissolved (mg/L)		<0.0000050	<0.0000050		
Molybdenum (Mo)-Dissolved (mg/L)		0.000676	<0.000050		
Nickel (Ni)-Dissolved (mg/L)		0.00147	<0.00050		
Phosphorus (P)-Dissolved (mg/L)		<0.050	<0.050		
Potassium (K)-Dissolved (mg/L)		7.15	<0.050		
Rubidium (Rb)-Dissolved (mg/L)		0.00501	<0.00020		
Selenium (Se)-Dissolved (mg/L)		<0.000050	<0.000050		
Silicon (Si)-Dissolved (mg/L)		9.26	<0.050		
Silver (Ag)-Dissolved (mg/L)		<0.000010	<0.000010		
Sodium (Na)-Dissolved (mg/L)		64.8	<0.050		
Strontium (Sr)-Dissolved (mg/L)		0.576	<0.00020		
Sulfur (S)-Dissolved (mg/L)		37.6	<0.50		
Tellurium (Te)-Dissolved (mg/L)		<0.00020	<0.00020		
Thallium (Tl)-Dissolved (mg/L)		<0.000010	<0.000010		
Thorium (Th)-Dissolved (mg/L)		<0.00010	<0.00010		
Tin (Sn)-Dissolved (mg/L)		<0.00010	<0.00010		
Titanium (Ti)-Dissolved (mg/L)		0.00039	<0.00030		
Tungsten (W)-Dissolved (mg/L)		<0.00010	<0.00010		
Uranium (U)-Dissolved (mg/L)		0.000022	<0.000010		
Vanadium (V)-Dissolved (mg/L)		0.00066	<0.00050		
Zinc (Zn)-Dissolved (mg/L)		0.0106	<0.0010		
Zirconium (Zr)-Dissolved (mg/L)		<0.00020	<0.00020		
Aggregate Organics COD (mg/L)	<20	<20	<20		
Volatile Organic Compounds Benzene (mg/L)		<0.00050	<0.00050		
Bromodichloromethane (mg/L)		<0.0010	<0.0010		
Bromoform (mg/L)		<0.0010	<0.0010		
Carbon Tetrachloride (mg/L)		<0.00050	<0.00050		
Chlorobenzene (mg/L)		<0.0010	<0.0010		
Dibromochloromethane (mg/L)		<0.0010	<0.0010		
Chloroethane (mg/L)		<0.0010	<0.0010		
Chloroform (mg/L)		<0.0010	0.0020 RRV		
Chloromethane (mg/L)		<0.0050	<0.0050		
1,2-Dichlorobenzene (mg/L)		<0.00050	<0.00050		
1,3-Dichlorobenzene (mg/L)		<0.0010	<0.0010		

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2296357-1	L2296357-2	L2296357-3	L2296357-4	L2296357-5
Description	Water	Water	Water	Water	Water
Sampled Date	20-JUN-19	20-JUN-19	20-JUN-19	20-JUN-19	20-JUN-19
Sampled Time	10:45	11:30	10:00	13:30	13:45
Client ID	MW-2D	MW-2S	MW-3	MW-4	DUPLICATE - MW-4
Grouping / **Analyte**					
WATER					
Volatile Organic Compounds 1,4-Dichlorobenzene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
1,1-Dichloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
1,2-Dichloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
1,1-Dichloroethylene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
cis-1,2-Dichloroethylene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
trans-1,2-Dichloroethylene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Dichloromethane (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
1,2-Dichloropropane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
cis-1,3-Dichloropropylene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
trans-1,3-Dichloropropylene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
1,3-Dichloropropene (cis & trans) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Ethylbenzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Methyl t-butyl ether (MTBE) (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Styrene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
1,1,1,2-Tetrachloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
1,1,2,2-Tetrachloroethane (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Tetrachloroethylene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Toluene (mg/L)	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045
1,1,1-Trichloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
1,1,2-Trichloroethane (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Trichloroethylene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Trichlorofluoromethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Vinyl Chloride (mg/L)	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040
ortho-Xylene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
meta- & para-Xylene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Xylenes (mg/L)	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075
Surrogate: 4-Bromofluorobenzene (SS) (%)	90.8	91.8	89.6	92.4	92.0
Surrogate: 1,4-Difluorobenzene (SS) (%)	104.1	103.5	103.0	102.3	102.7
Hydrocarbons EPH10-19 (mg/L)	<0.25	<0.25	<0.25	<0.25	<0.25
EPH19-32 (mg/L)	<0.25	<0.25	<0.25	<0.25	<0.25
LEPH (mg/L)	<0.25	<0.25	<0.25	<0.25	<0.25
HEPH (mg/L)	<0.25	<0.25	<0.25	<0.25	<0.25
Volatile Hydrocarbons (VH6-10) (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
VPH (C6-C10) (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
Surrogate: 2-Bromobenzotrifluoride (%)	94.4	89.3	93.0	84.9	87.3
Surrogate: 3,4-Dichlorotoluene (SS) (%)	86.1	97.7	98.0	102.3	101.9

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2296357-6	L2296357-7	L2296357-8	L2296357-9	L2296357-10
Description	Water	Water	Water	Water	Water
Sampled Date	20-JUN-19	20-JUN-19	20-JUN-19	20-JUN-19	20-JUN-19
Sampled Time	16:30	12:00	12:15	15:45	14:30
Client ID	MW-6	SFC-2	SFC-2B	SFC-3	SFC-4B
Grouping / **Analyte**					
WATER					
Volatile Organic Compounds					
1,4-Dichlorobenzene (mg/L)	<0.0010				
1,1-Dichloroethane (mg/L)	<0.0010				
1,2-Dichloroethane (mg/L)	<0.0010				
1,1-Dichloroethylene (mg/L)	<0.0010				
cis-1,2-Dichloroethylene (mg/L)	<0.0010				
trans-1,2-Dichloroethylene (mg/L)	<0.0010				
Dichloromethane (mg/L)	<0.0050				
1,2-Dichloropropane (mg/L)	<0.0010				
cis-1,3-Dichloropropylene (mg/L)	<0.00050				
trans-1,3-Dichloropropylene (mg/L)	<0.00050				
1,3-Dichloropropene (cis & trans) (mg/L)	<0.0010				
Ethylbenzene (mg/L)	<0.00050				
Methyl t-butyl ether (MTBE) (mg/L)	<0.00050				
Styrene (mg/L)	<0.00050				
1,1,1,2-Tetrachloroethane (mg/L)	<0.0010				
1,1,2,2-Tetrachloroethane (mg/L)	<0.00020				
Tetrachloroethylene (mg/L)	<0.0010				
Toluene (mg/L)	<0.00045				
1,1,1-Trichloroethane (mg/L)	<0.0010				
1,1,2-Trichloroethane (mg/L)	<0.00050				
Trichloroethylene (mg/L)	<0.0010				
Trichlorofluoromethane (mg/L)	<0.0010				
Vinyl Chloride (mg/L)	<0.00040				
ortho-Xylene (mg/L)	<0.00050				
meta- & para-Xylene (mg/L)	<0.00050				
Xylenes (mg/L)	<0.00075				
Surrogate: 4-Bromofluorobenzene (SS) (%)	88.5				
Surrogate: 1,4-Difluorobenzene (SS) (%)	104.7				
Hydrocarbons					
EPH10-19 (mg/L)	<0.25				
EPH19-32 (mg/L)	<0.25				
LEPH (mg/L)	<0.25				
HEPH (mg/L)	<0.25				
Volatile Hydrocarbons (VH6-10) (mg/L)	<0.10				
VPH (C6-C10) (mg/L)	<0.10				
Surrogate: 2-Bromobenzotrifluoride (%)	88.8				
Surrogate: 3,4-Dichlorotoluene (SS) (%)	99.4				

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2296357-11	L2296357-12	L2296357-13		
	Description	Water	Water	Water		
	Sampled Date	20-JUN-19	20-JUN-19	20-JUN-19		
	Sampled Time	16:00	15:15	15:15		
	Client ID	SFC-11	GW INT.	FIELD BLANK		
Grouping	**Analyte**					
WATER						
Volatile Organic Compounds	1,4-Dichlorobenzene (mg/L)		<0.0010	<0.0010		
	1,1-Dichloroethane (mg/L)		<0.0010	<0.0010		
	1,2-Dichloroethane (mg/L)		<0.0010	<0.0010		
	1,1-Dichloroethylene (mg/L)		<0.0010	<0.0010		
	cis-1,2-Dichloroethylene (mg/L)		<0.0010	<0.0010		
	trans-1,2-Dichloroethylene (mg/L)		<0.0010	<0.0010		
	Dichloromethane (mg/L)		<0.0050	<0.0050		
	1,2-Dichloropropane (mg/L)		<0.0010	<0.0010		
	cis-1,3-Dichloropropylene (mg/L)		<0.00050	<0.00050		
	trans-1,3-Dichloropropylene (mg/L)		<0.00050	<0.00050		
	1,3-Dichloropropene (cis & trans) (mg/L)		<0.0010	<0.0010		
	Ethylbenzene (mg/L)		<0.00050	<0.00050		
	Methyl t-butyl ether (MTBE) (mg/L)		<0.00050	<0.00050		
	Styrene (mg/L)		<0.00050	<0.00050		
	1,1,1,2-Tetrachloroethane (mg/L)		<0.0010	<0.0010		
	1,1,2,2-Tetrachloroethane (mg/L)		<0.00020	<0.00020		
	Tetrachloroethylene (mg/L)		<0.0010	<0.0010		
	Toluene (mg/L)		<0.00045	<0.00045		
	1,1,1-Trichloroethane (mg/L)		<0.0010	<0.0010		
	1,1,2-Trichloroethane (mg/L)		<0.00050	<0.00050		
	Trichloroethylene (mg/L)		<0.0010	<0.0010		
	Trichlorofluoromethane (mg/L)		<0.0010	<0.0010		
	Vinyl Chloride (mg/L)		<0.00040	<0.00040		
	ortho-Xylene (mg/L)		<0.00050	<0.00050		
	meta- & para-Xylene (mg/L)		<0.00050	<0.00050		
	Xylenes (mg/L)		<0.00075	<0.00075		
	Surrogate: 4-Bromofluorobenzene (SS) (%)		92.1	84.1		
	Surrogate: 1,4-Difluorobenzene (SS) (%)		103.9	104.7		
Hydrocarbons	EPH10-19 (mg/L)		<0.25	<0.25		
	EPH19-32 (mg/L)		<0.25	<0.25		
	LEPH (mg/L)		<0.25	<0.25		
	HEPH (mg/L)		<0.25	<0.25		
	Volatile Hydrocarbons (VH6-10) (mg/L)		<0.10	<0.10		
	VPH (C6-C10) (mg/L)		<0.10	<0.10		
	Surrogate: 2-Bromobenzotrifluoride (%)		92.0	85.9		
	Surrogate: 3,4-Dichlorotoluene (SS) (%)		96.8	88.0		

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2296357-1	L2296357-2	L2296357-3	L2296357-4	L2296357-5
Description	Water	Water	Water	Water	Water
Sampled Date	20-JUN-19	20-JUN-19	20-JUN-19	20-JUN-19	20-JUN-19
Sampled Time	10:45	11:30	10:00	13:30	13:45
Client ID	MW-2D	MW-2S	MW-3	MW-4	DUPLICATE - MW-4
Grouping / **Analyte**					
WATER					
Polycyclic Aromatic Hydrocarbons / Acenaphthene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Acenaphthylene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Acridine (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Anthracene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benz(a)anthracene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benzo(a)pyrene (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Benzo(b&j)fluoranthene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benzo(b+j+k)fluoranthene (mg/L)	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015
Benzo(g,h,i)perylene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benzo(k)fluoranthene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chrysene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dibenz(a,h)anthracene (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Fluoranthene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Fluorene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Indeno(1,2,3-c,d)pyrene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
1-Methylnaphthalene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
2-Methylnaphthalene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Naphthalene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Phenanthrene (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Pyrene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Quinoline (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Surrogate: Acridine d9 (%)	97.8	84.3	99.1	2.6 SURR-ND	62.0
Surrogate: Chrysene d12 (%)	119.4	105.1	124.0	115.3	129.5
Surrogate: Naphthalene d8 (%)	94.5	81.2	97.1	105.8	96.1
Surrogate: Phenanthrene d10 (%)	101.6	87.6	103.5	109.5	108.1

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2296357-6	L2296357-7	L2296357-8	L2296357-9	L2296357-10
Description	Water	Water	Water	Water	Water
Sampled Date	20-JUN-19	20-JUN-19	20-JUN-19	20-JUN-19	20-JUN-19
Sampled Time	16:30	12:00	12:15	15:45	14:30
Client ID	MW-6	SFC-2	SFC-2B	SFC-3	SFC-4B
Grouping / **Analyte**					
WATER					
Polycyclic Aromatic Hydrocarbons					
Acenaphthene (mg/L)	<0.000010				
Acenaphthylene (mg/L)	<0.000010				
Acridine (mg/L)	<0.000010				
Anthracene (mg/L)	<0.000010				
Benz(a)anthracene (mg/L)	<0.000010				
Benzo(a)pyrene (mg/L)	<0.0000050				
Benzo(b&j)fluoranthene (mg/L)	<0.000010				
Benzo(b+j+k)fluoranthene (mg/L)	<0.000015				
Benzo(g,h,i)perylene (mg/L)	<0.000010				
Benzo(k)fluoranthene (mg/L)	<0.000010				
Chrysene (mg/L)	<0.000010				
Dibenz(a,h)anthracene (mg/L)	<0.0000050				
Fluoranthene (mg/L)	<0.000010				
Fluorene (mg/L)	<0.000010				
Indeno(1,2,3-c,d)pyrene (mg/L)	<0.000010				
1-Methylnaphthalene (mg/L)	<0.000050				
2-Methylnaphthalene (mg/L)	<0.000050				
Naphthalene (mg/L)	<0.000050				
Phenanthrene (mg/L)	<0.000020				
Pyrene (mg/L)	<0.000010				
Quinoline (mg/L)	<0.000050				
Surrogate: Acridine d9 (%)	109.3				
Surrogate: Chrysene d12 (%)	130.0				
Surrogate: Naphthalene d8 (%)	101.5				
Surrogate: Phenanthrene d10 (%)	111.6				

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	Sample ID: L2296357-11 Description: Water Sampled Date: 20-JUN-19 Sampled Time: 16:00 Client ID: SFC-11	Sample ID: L2296357-12 Description: Water Sampled Date: 20-JUN-19 Sampled Time: 15:15 Client ID: GW INT.	Sample ID: L2296357-13 Description: Water Sampled Date: 20-JUN-19 Sampled Time: 15:15 Client ID: FIELD BLANK		
WATER						
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)		0.000833	<0.000010		
	Acenaphthylene (mg/L)		<0.000010	<0.000010		
	Acridine (mg/L)		<0.000010	<0.000010		
	Anthracene (mg/L)		<0.000020 DLQ	<0.000010		
	Benz(a)anthracene (mg/L)		<0.000010	<0.000010		
	Benzo(a)pyrene (mg/L)		<0.0000050	<0.0000050		
	Benzo(b&j)fluoranthene (mg/L)		<0.000010	<0.000010		
	Benzo(b+j+k)fluoranthene (mg/L)		<0.000015	<0.000015		
	Benzo(g,h,i)perylene (mg/L)		<0.000010	<0.000010		
	Benzo(k)fluoranthene (mg/L)		<0.000010	<0.000010		
	Chrysene (mg/L)		<0.000010	<0.000010		
	Dibenz(a,h)anthracene (mg/L)		<0.0000050	<0.0000050		
	Fluoranthene (mg/L)		0.000187	<0.000010		
	Fluorene (mg/L)		0.000203	<0.000010		
	Indeno(1,2,3-c,d)pyrene (mg/L)		<0.000010	<0.000010		
	1-Methylnaphthalene (mg/L)		<0.000050	<0.000050		
	2-Methylnaphthalene (mg/L)		<0.000050	<0.000050		
	Naphthalene (mg/L)		<0.000050	<0.000050		
	Phenanthrene (mg/L)		<0.000020	<0.000020		
	Pyrene (mg/L)		0.000100	<0.000010		
	Quinoline (mg/L)		<0.000050	<0.000050		
	Surrogate: Acridine d9 (%)		115.5	108.2		
	Surrogate: Chrysene d12 (%)		129.3	124.3		
	Surrogate: Naphthalene d8 (%)		100.4	94.6		
	Surrogate: Phenanthrene d10 (%)		110.0	104.9		

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

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Silver (Ag)-Total	B	L2296357-10, -11, -7, -8, -9
Laboratory Control Sample	Sulfur (S)-Dissolved	MES	L2296357-1, -2, -3, -4, -5, -6
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2296357-1, -2, -3, -4, -5, -6
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2296357-1, -2, -3, -4, -5, -6
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2296357-12, -13
Matrix Spike	Iron (Fe)-Dissolved	MS-B	L2296357-1, -2, -3, -4, -5, -6
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2296357-1, -2, -3, -4, -5, -6
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2296357-1, -2, -3, -4, -5, -6
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2296357-12, -13
Matrix Spike	Potassium (K)-Dissolved	MS-B	L2296357-1, -2, -3, -4, -5, -6
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2296357-1, -2, -3, -4, -5, -6
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2296357-1, -2, -3, -4, -5, -6
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2296357-12, -13
Matrix Spike	Barium (Ba)-Total	MS-B	L2296357-10, -11, -7, -8, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L2296357-10, -11, -7, -8, -9
Matrix Spike	Iron (Fe)-Total	MS-B	L2296357-10, -11, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2296357-10, -11, -7, -8, -9
Matrix Spike	Manganese (Mn)-Total	MS-B	L2296357-10, -11, -7, -8, -9
Matrix Spike	Sodium (Na)-Total	MS-B	L2296357-10, -11, -7, -8, -9
Matrix Spike	Strontium (Sr)-Total	MS-B	L2296357-10, -11, -7, -8, -9
Matrix Spike	Sulfur (S)-Total	MS-B	L2296357-10, -11, -7, -8, -9
Matrix Spike	Uranium (U)-Total	MS-B	L2296357-10, -11, -7, -8, -9
Matrix Spike	Total Nitrogen	MS-B	L2296357-1, -10, -11, -12, -13, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Total Nitrogen	MS-B	L2296357-5
Matrix Spike	Phosphorus (P)-Total	MS-B	L2296357-5

Qualifiers for Individual Parameters Listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
DLA	Detection Limit adjusted for required dilution
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DLQ	Detection Limit raised due to co-eluting interference. GCMS qualifier ion ratio did not meet acceptance criteria.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis
SURR-ND	Surrogate recovery marginally exceeded ALS DQO. Reported non-detect results for associated samples were deemed to be unaffected.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0
Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).			
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Reference Information

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

COD-COL-VA	Water	Chemical Oxygen Demand by Colorimetric	APHA 5220 D. CHEMICAL OXYGEN DEMAND

This analysis is carried out using procedures adapted from APHA Method 5220 "Chemical Oxygen Demand (COD)". Chemical oxygen demand is determined using the closed reflux colourimetric method.

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

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

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

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

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

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

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

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

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

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

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

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

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

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

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

LEPHw and HEPHw are measures of Light and Heavy Extractable Petroleum Hydrocarbons in water. Results are calculated by subtraction of applicable PAH concentrations from EPH10-19 and EPH19-32, as per the BC Lab Manual LEPH/HEPH calculation procedure.

LEPHw = EPH10-19 minus Acenaphthene, Acridine, Anthracene, Fluorene, Naphthalene and Phenanthrene.

HEPHw = EPH19-32 minus Benz(a)anthracene, Benzo(a)pyrene, Fluoranthene, and Pyrene.

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

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

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

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

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

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

N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

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

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

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

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

Reference Information

Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

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

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

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

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

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

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

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

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

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

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

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

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

VOC7-HSMS-VA	Water	BTEX/MTBE/Styrene by Headspace GCMS	EPA 5021A/8260C

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

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

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

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

Calculation of Total Xylenes

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

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

17-190313

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Morrison Hershfield Limited
ATTN: Josie Gilson
310 - 4321 Still Creek Drive
Burnaby BC V5C 6S7

Date Received: 27-SEP-19
Report Date: 16-OCT-19 11:08 (MT)
Version: FINAL

Client Phone: 604-454-0402

Certificate of Analysis

Lab Work Order #: L2355476

Project P.O. #: 726379
Job Reference: 18001536
C of C Numbers: 17-190313
Legal Site Desc:

Carla Fuginski
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2355476-1 Water 26-SEP-19 09:30 MW-2D	L2355476-2 Water 26-SEP-19 09:00 MW-2S	L2355476-3 Water 26-SEP-19 15:00 MW-3	L2355476-4 Water 26-SEP-19 10:00 MW-4	L2355476-5 Water 26-SEP-19 10:15 DUPLICATE-MW-4
WATER						
Physical Tests	Conductivity (uS/cm)	886	287	226	228	231
	Hardness (as CaCO3) (mg/L)	335	108	55.1	79.8	78.7
	pH (pH)	6.77	7.04	7.48	7.19	7.14
	Total Suspended Solids (mg/L)	91.6	91.8	24.6	621	512
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	297	76.4	27.6	67.1	66.2
	Ammonia, Total (as N) (mg/L)	9.71 DLDS	2.40	0.475	1.27	1.32
	Bromide (Br) (mg/L)	<0.25	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	44.3 DLDS	7.05	29.4	13.8	14.0
	Fluoride (F) (mg/L)	<0.10	0.114	0.040	0.066	0.067
	Nitrate and Nitrite (as N) (mg/L)	<0.025 DLDS	0.0150	0.0196	0.0134	0.0183
	Nitrate (as N) (mg/L)	<0.025	0.0150	0.0196	0.0134	0.0171
	Nitrite (as N) (mg/L)	<0.0050 DLDS	<0.0010	<0.0010	<0.0010	0.0012
	Total Kjeldahl Nitrogen (mg/L)	9.95	3.05	0.581	1.65	1.71
	Total Nitrogen (mg/L)	10.6	3.06	0.587	1.72 RRV	1.48 RRV
	Phosphorus (P)-Total (mg/L)	0.128	0.0975	0.0066	0.408	0.264
	Sulfate (SO4) (mg/L)	150	56.4	34.6	26.3	26.9
Total Metals	Aluminum (Al)-Total (mg/L)					
	Antimony (Sb)-Total (mg/L)					
	Arsenic (As)-Total (mg/L)					
	Barium (Ba)-Total (mg/L)					
	Beryllium (Be)-Total (mg/L)					
	Bismuth (Bi)-Total (mg/L)					
	Boron (B)-Total (mg/L)					
	Cadmium (Cd)-Total (mg/L)					
	Calcium (Ca)-Total (mg/L)					
	Cesium (Cs)-Total (mg/L)					
	Chromium (Cr)-Total (mg/L)					
	Cobalt (Co)-Total (mg/L)					
	Copper (Cu)-Total (mg/L)					
	Iron (Fe)-Total (mg/L)					
	Lead (Pb)-Total (mg/L)					
	Lithium (Li)-Total (mg/L)					
	Magnesium (Mg)-Total (mg/L)					
	Manganese (Mn)-Total (mg/L)					
	Mercury (Hg)-Total (mg/L)					
	Molybdenum (Mo)-Total (mg/L)					
	Nickel (Ni)-Total (mg/L)					

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2355476-6	L2355476-7	L2355476-8	L2355476-9	L2355476-10
Description	Water	Water	Water	Water	Water
Sampled Date	26-SEP-19	26-SEP-19	26-SEP-19	26-SEP-19	26-SEP-19
Sampled Time	12:45	10:45	11:00	11:45	13:30
Client ID	MW-6	SFC-2	SFC-2B	SFC-3	SFC-4B
Grouping / **Analyte**					
WATER					
Physical Tests					
Conductivity (uS/cm)	502	401	1220	278	208
Hardness (as CaCO3) (mg/L)	109	151 HTC	320 HTC	63.8 HTC	65.7 HTC
pH (pH)	6.93	7.53	3.10	7.13	7.36
Total Suspended Solids (mg/L)	163	9.2	24.6	18.2	37.4
Anions and Nutrients					
Alkalinity, Total (as CaCO3) (mg/L)	78.9	88.8	<1.0	31.9	35.8
Ammonia, Total (as N) (mg/L)	0.0472	0.147	1.24	0.0358	0.0094
Bromide (Br) (mg/L)	<0.050	<0.050	<0.25 DLDS	<0.050	<0.050
Chloride (Cl) (mg/L)	63.6	25.8	9.4	41.4	23.8
Fluoride (F) (mg/L)	0.078	0.062	0.87	0.056	0.044
Nitrate and Nitrite (as N) (mg/L)	0.108	1.29	0.064	0.811	0.417
Nitrate (as N) (mg/L)	0.108	1.29	0.064	0.808	0.417
Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0050 DLDS	0.0034	<0.0010
Total Kjeldahl Nitrogen (mg/L)	0.464	0.355	1.70	0.287	0.144
Total Nitrogen (mg/L)	0.723	1.50	1.69	1.01	0.559
Phosphorus (P)-Total (mg/L)	0.984	0.0093	0.0126	0.126	0.0298
Sulfate (SO4) (mg/L)	76.7	74.3	561	36.8	30.1
Total Metals					
Aluminum (Al)-Total (mg/L)		0.771	22.2	1.65	0.153
Antimony (Sb)-Total (mg/L)		<0.00010	<0.00020 DLA	0.00011	<0.00010
Arsenic (As)-Total (mg/L)		0.00018	0.00204	0.00047	<0.00010
Barium (Ba)-Total (mg/L)		0.0575	0.0291	0.0411	0.0181
Beryllium (Be)-Total (mg/L)		<0.00010	0.00081	<0.00010	<0.00010
Bismuth (Bi)-Total (mg/L)		<0.000050	<0.00010 DLA	<0.000050	<0.000050
Boron (B)-Total (mg/L)		0.025	0.027	<0.010	0.016
Cadmium (Cd)-Total (mg/L)		0.0000487	0.000789	0.0000688	0.0000097
Calcium (Ca)-Total (mg/L)		52.5	89.3	21.1	22.4
Cesium (Cs)-Total (mg/L)		0.000011	0.000118	0.000043	<0.000010
Chromium (Cr)-Total (mg/L)		0.00012	0.00250	0.00085	<0.00010
Cobalt (Co)-Total (mg/L)		0.00572	0.103	0.00313	0.00045
Copper (Cu)-Total (mg/L)		0.0149	0.379	0.0193	0.00297
Iron (Fe)-Total (mg/L)		2.36	32.9	1.82	0.343
Lead (Pb)-Total (mg/L)		<0.000050	0.00013	0.000679	0.000053
Lithium (Li)-Total (mg/L)		<0.0010	0.0093	<0.0010	<0.0010
Magnesium (Mg)-Total (mg/L)		4.90	23.6	2.72	2.35
Manganese (Mn)-Total (mg/L)		0.616	3.98	0.0712	0.117
Mercury (Hg)-Total (mg/L)		<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Total (mg/L)		0.00544	0.00013	0.00165	0.000830
Nickel (Ni)-Total (mg/L)		0.00238	0.0571	0.00229	<0.00050

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2355476-11	L2355476-12	L2355476-13	L2355476-14	
Description	Water	Water	Water	Water	
Sampled Date	26-SEP-19	26-SEP-19	26-SEP-19	26-SEP-19	
Sampled Time	12:00	11:30	14:15	09:30	
Client ID	SFC-11	GW INT.	L1	FIELD BLANK	
Grouping / **Analyte**					
WATER					
Physical Tests					
Conductivity (uS/cm)	132	689	749	<2.0	
Hardness (as CaCO3) (mg/L)	42.5 HTC	192	368	<0.50	
pH (pH)	7.24	6.66	7.27	5.55	
Total Suspended Solids (mg/L)	3.0	17.0	3.0	<3.0	
Anions and Nutrients					
Alkalinity, Total (as CaCO3) (mg/L)	34.2	124	120	<1.0	
Ammonia, Total (as N) (mg/L)	<0.0050	0.855	0.0895	<0.0050	
Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	
Chloride (Cl) (mg/L)	9.49	92.5	6.12	<0.50	
Fluoride (F) (mg/L)	0.044	0.119	0.042	<0.020	
Nitrate and Nitrite (as N) (mg/L)	0.304	0.0101	16.6	<0.0051	
Nitrate (as N) (mg/L)	0.304	0.0101	16.6	<0.0050	
Nitrite (as N) (mg/L)	<0.0010	<0.0010	0.0056	<0.0010	
Total Kjeldahl Nitrogen (mg/L)	0.065	1.09	1.13 TKNI	<0.050	
Total Nitrogen (mg/L)	0.352	1.02	17.2	<0.030	
Phosphorus (P)-Total (mg/L)	0.0094	0.0145	0.0630	<0.0020	
Sulfate (SO4) (mg/L)	16.7	81.2	215	<0.30	
Total Metals					
Aluminum (Al)-Total (mg/L)	0.183				
Antimony (Sb)-Total (mg/L)	<0.00010				
Arsenic (As)-Total (mg/L)	<0.00010				
Barium (Ba)-Total (mg/L)	0.0140				
Beryllium (Be)-Total (mg/L)	<0.00010				
Bismuth (Bi)-Total (mg/L)	<0.000050				
Boron (B)-Total (mg/L)	<0.010				
Cadmium (Cd)-Total (mg/L)	0.0000179				
Calcium (Ca)-Total (mg/L)	13.7				
Cesium (Cs)-Total (mg/L)	<0.000010				
Chromium (Cr)-Total (mg/L)	0.00023				
Cobalt (Co)-Total (mg/L)	0.00011				
Copper (Cu)-Total (mg/L)	0.00144				
Iron (Fe)-Total (mg/L)	0.160				
Lead (Pb)-Total (mg/L)	0.000089				
Lithium (Li)-Total (mg/L)	<0.0010				
Magnesium (Mg)-Total (mg/L)	2.03				
Manganese (Mn)-Total (mg/L)	0.0126				
Mercury (Hg)-Total (mg/L)	<0.0000050				
Molybdenum (Mo)-Total (mg/L)	0.000261				
Nickel (Ni)-Total (mg/L)	<0.00050				

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2355476-1 Water 26-SEP-19 09:30 MW-2D	L2355476-2 Water 26-SEP-19 09:00 MW-2S	L2355476-3 Water 26-SEP-19 15:00 MW-3	L2355476-4 Water 26-SEP-19 10:00 MW-4	L2355476-5 Water 26-SEP-19 10:15 DUPLICATE-MW-4
WATER						
Total Metals	Phosphorus (P)-Total (mg/L)					
	Potassium (K)-Total (mg/L)					
	Rubidium (Rb)-Total (mg/L)					
	Selenium (Se)-Total (mg/L)					
	Silicon (Si)-Total (mg/L)					
	Silver (Ag)-Total (mg/L)					
	Sodium (Na)-Total (mg/L)					
	Strontium (Sr)-Total (mg/L)					
	Sulfur (S)-Total (mg/L)					
	Tellurium (Te)-Total (mg/L)					
	Thallium (Tl)-Total (mg/L)					
	Thorium (Th)-Total (mg/L)					
	Tin (Sn)-Total (mg/L)					
	Titanium (Ti)-Total (mg/L)					
	Tungsten (W)-Total (mg/L)					
	Uranium (U)-Total (mg/L)					
	Vanadium (V)-Total (mg/L)					
	Zinc (Zn)-Total (mg/L)					
	Zirconium (Zr)-Total (mg/L)					
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0045	0.0038	0.0165	0.0138	0.0163
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.0166	0.00694	<0.00010	0.00723	0.00627
	Barium (Ba)-Dissolved (mg/L)	0.0367	0.0734	0.0891	0.0943	0.0897
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	0.238	0.088	<0.010	0.032	0.031
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	0.0000054	0.000411	0.0000992	0.0000786
	Calcium (Ca)-Dissolved (mg/L)	109	32.8	16.3	26.1	26.4
	Cesium (Cs)-Dissolved (mg/L)	0.000022	0.000015	0.000059	0.000036	0.000030
	Chromium (Cr)-Dissolved (mg/L)	0.00018	0.00013	0.00011	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	0.0113	0.00206	0.0120	0.0142	0.0137
	Copper (Cu)-Dissolved (mg/L)	0.00033	0.00115	0.00272	0.00125	0.00069
	Iron (Fe)-Dissolved (mg/L)	52.0	33.7	0.041	25.4	23.0
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	0.000110	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2355476-6 Water 26-SEP-19 12:45 MW-6	L2355476-7 Water 26-SEP-19 10:45 SFC-2	L2355476-8 Water 26-SEP-19 11:00 SFC-2B	L2355476-9 Water 26-SEP-19 11:45 SFC-3	L2355476-10 Water 26-SEP-19 13:30 SFC-4B
WATER						
Total Metals	Phosphorus (P)-Total (mg/L)		<0.050	<0.10 DLA	0.102	<0.050
	Potassium (K)-Total (mg/L)		4.43	4.19	2.30	1.63
	Rubidium (Rb)-Total (mg/L)		0.00490	0.00650	0.00236	0.00166
	Selenium (Se)-Total (mg/L)		0.000079	<0.00010 DLA	0.000077	0.000053
	Silicon (Si)-Total (mg/L)		5.90	18.3	10.3	7.29
	Silver (Ag)-Total (mg/L)		<0.000010	<0.000020 DLA	0.000017	<0.000010
	Sodium (Na)-Total (mg/L)		19.5	10.6	28.0	13.8
	Strontium (Sr)-Total (mg/L)		0.330	0.355	0.183	0.224
	Sulfur (S)-Total (mg/L)		30.3	217	13.7	11.2
	Tellurium (Te)-Total (mg/L)		<0.00020	<0.00040 DLA	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)		0.000010	<0.000020 DLA	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)		<0.00010	0.00200	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)		<0.00010	0.00021	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)		<0.00030	<0.00060 DLA	0.0583	0.00306
	Tungsten (W)-Total (mg/L)		<0.00010	<0.00020 DLA	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)		0.000155	0.00117	0.000103	0.000021
	Vanadium (V)-Total (mg/L)		<0.00050	<0.0010 DLA	0.00310	<0.00050
	Zinc (Zn)-Total (mg/L)		0.0093	0.129	0.0110	<0.0030
	Zirconium (Zr)-Total (mg/L)		<0.00020	<0.00040 DLA	0.00040	<0.00020
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD				
	Dissolved Metals Filtration Location	FIELD				
	Aluminum (Al)-Dissolved (mg/L)	0.0223				
	Antimony (Sb)-Dissolved (mg/L)	<0.00010				
	Arsenic (As)-Dissolved (mg/L)	0.00042				
	Barium (Ba)-Dissolved (mg/L)	0.0347				
	Beryllium (Be)-Dissolved (mg/L)	<0.00010				
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050				
	Boron (B)-Dissolved (mg/L)	0.016				
	Cadmium (Cd)-Dissolved (mg/L)	0.0000529				
	Calcium (Ca)-Dissolved (mg/L)	37.2				
	Cesium (Cs)-Dissolved (mg/L)	0.000013				
	Chromium (Cr)-Dissolved (mg/L)	0.00010				
	Cobalt (Co)-Dissolved (mg/L)	0.00234				
	Copper (Cu)-Dissolved (mg/L)	0.00309				
	Iron (Fe)-Dissolved (mg/L)	2.22				
	Lead (Pb)-Dissolved (mg/L)	<0.000050				
	Lithium (Li)-Dissolved (mg/L)	<0.0010				

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2355476-11	L2355476-12	L2355476-13	L2355476-14	
Description	Water	Water	Water	Water	
Sampled Date	26-SEP-19	26-SEP-19	26-SEP-19	26-SEP-19	
Sampled Time	12:00	11:30	14:15	09:30	
Client ID	SFC-11	GW INT.	L1	FIELD BLANK	
Grouping / **Analyte**					
WATER					
Total Metals Phosphorus (P)-Total (mg/L)	<0.050				
Potassium (K)-Total (mg/L)	0.782				
Rubidium (Rb)-Total (mg/L)	0.00061				
Selenium (Se)-Total (mg/L)	<0.000050				
Silicon (Si)-Total (mg/L)	10.5				
Silver (Ag)-Total (mg/L)	<0.000010				
Sodium (Na)-Total (mg/L)	8.66				
Strontium (Sr)-Total (mg/L)	0.169				
Sulfur (S)-Total (mg/L)	6.01				
Tellurium (Te)-Total (mg/L)	<0.00020				
Thallium (Tl)-Total (mg/L)	<0.000010				
Thorium (Th)-Total (mg/L)	<0.00010				
Tin (Sn)-Total (mg/L)	<0.00010				
Titanium (Ti)-Total (mg/L)	0.00533				
Tungsten (W)-Total (mg/L)	<0.00010				
Uranium (U)-Total (mg/L)	<0.000010				
Vanadium (V)-Total (mg/L)	0.00073				
Zinc (Zn)-Total (mg/L)	<0.0030				
Zirconium (Zr)-Total (mg/L)	<0.00020				
Dissolved Metals Dissolved Mercury Filtration Location		FIELD	FIELD	FIELD	
Dissolved Metals Filtration Location		FIELD	FIELD	FIELD	
Aluminum (Al)-Dissolved (mg/L)		0.0546	0.0182	<0.0010	
Antimony (Sb)-Dissolved (mg/L)		<0.00010	0.00016	<0.00010	
Arsenic (As)-Dissolved (mg/L)		0.00053	0.00022	<0.00010	
Barium (Ba)-Dissolved (mg/L)		0.0702	0.0533	<0.00010	
Beryllium (Be)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	
Bismuth (Bi)-Dissolved (mg/L)		<0.000050	<0.000050	<0.000050	
Boron (B)-Dissolved (mg/L)		0.117	0.034	<0.010	
Cadmium (Cd)-Dissolved (mg/L)		<0.0000050	0.0000808	<0.0000050	
Calcium (Ca)-Dissolved (mg/L)		64.5	128	<0.050	
Cesium (Cs)-Dissolved (mg/L)		0.000014	<0.000010	<0.000010	
Chromium (Cr)-Dissolved (mg/L)		0.00030	0.00020	<0.00010	
Cobalt (Co)-Dissolved (mg/L)		0.00148	0.00050	<0.00010	
Copper (Cu)-Dissolved (mg/L)		<0.00020	0.0208	<0.00020	
Iron (Fe)-Dissolved (mg/L)		22.8	0.023	<0.010	
Lead (Pb)-Dissolved (mg/L)		<0.000050	<0.000050	<0.000050	
Lithium (Li)-Dissolved (mg/L)		<0.0010	<0.0010	<0.0010	

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2355476-1	L2355476-2	L2355476-3	L2355476-4	L2355476-5
Description	Water	Water	Water	Water	Water
Sampled Date	26-SEP-19	26-SEP-19	26-SEP-19	26-SEP-19	26-SEP-19
Sampled Time	09:30	09:00	15:00	10:00	10:15
Client ID	MW-2D	MW-2S	MW-3	MW-4	DUPLICATE-MW-4
Grouping / **Analyte**					
WATER					
Dissolved Metals	Magnesium (Mg)-Dissolved (mg/L)	15.4	6.29	3.51	3.55	3.11
	Manganese (Mn)-Dissolved (mg/L)	3.66	1.64	2.63	1.45	1.38
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.0119	0.00488	0.000745	0.0158	0.0159
	Nickel (Ni)-Dissolved (mg/L)	0.00208	0.00063	0.00245	0.00195	0.00189
	Phosphorus (P)-Dissolved (mg/L)	0.088	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	20.8	6.95	3.98	3.96	3.87
	Rubidium (Rb)-Dissolved (mg/L)	0.0116	0.00429	0.0108	0.00297	0.00286
	Selenium (Se)-Dissolved (mg/L)	0.000080	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	14.1	8.53	7.36	9.33	9.85
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	39.4	7.94	17.6	11.9	11.0
	Strontium (Sr)-Dissolved (mg/L)	0.525	0.205	0.153	0.162	0.156
	Sulfur (S)-Dissolved (mg/L)	51.9	19.2	10.8	8.95	8.68
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	0.000087	0.000015	0.000018
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.000145	0.000015	<0.000010	0.000078	0.000085
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0013	0.0217	0.0038	0.0053	0.0039
	Zirconium (Zr)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Aggregate Organics	COD (mg/L)	34	<20	<20	22	<20
Volatile Organic Compounds	Benzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bromodichloromethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Bromoform (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Carbon Tetrachloride (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Chlorobenzene (mg/L)	0.0020	<0.0010	<0.0010	<0.0010	<0.0010
	Dibromochloromethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Chloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Chloroform (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Chloromethane (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	1,2-Dichlorobenzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	1,3-Dichlorobenzene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2355476-6 Water 26-SEP-19 12:45 MW-6	L2355476-7 Water 26-SEP-19 10:45 SFC-2	L2355476-8 Water 26-SEP-19 11:00 SFC-2B	L2355476-9 Water 26-SEP-19 11:45 SFC-3	L2355476-10 Water 26-SEP-19 13:30 SFC-4B
WATER						
Dissolved Metals	Magnesium (Mg)-Dissolved (mg/L)	4.04				
	Manganese (Mn)-Dissolved (mg/L)	0.182				
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050				
	Molybdenum (Mo)-Dissolved (mg/L)	0.00104				
	Nickel (Ni)-Dissolved (mg/L)	<0.00050				
	Phosphorus (P)-Dissolved (mg/L)	<0.050				
	Potassium (K)-Dissolved (mg/L)	3.40				
	Rubidium (Rb)-Dissolved (mg/L)	0.00459				
	Selenium (Se)-Dissolved (mg/L)	0.000057				
	Silicon (Si)-Dissolved (mg/L)	6.96				
	Silver (Ag)-Dissolved (mg/L)	<0.000010				
	Sodium (Na)-Dissolved (mg/L)	61.4				
	Strontium (Sr)-Dissolved (mg/L)	0.295				
	Sulfur (S)-Dissolved (mg/L)	29.4				
	Tellurium (Te)-Dissolved (mg/L)	<0.00020				
	Thallium (Tl)-Dissolved (mg/L)	0.000036				
	Thorium (Th)-Dissolved (mg/L)	<0.00010				
	Tin (Sn)-Dissolved (mg/L)	<0.00010				
	Titanium (Ti)-Dissolved (mg/L)	<0.00030				
	Tungsten (W)-Dissolved (mg/L)	<0.00010				
	Uranium (U)-Dissolved (mg/L)	0.000042				
	Vanadium (V)-Dissolved (mg/L)	<0.00050				
	Zinc (Zn)-Dissolved (mg/L)	0.0017				
	Zirconium (Zr)-Dissolved (mg/L)	<0.00020				
Aggregate Organics	COD (mg/L)	34	<20	<20	<20	<20
Volatile Organic Compounds	Benzene (mg/L)	<0.00050				
	Bromodichloromethane (mg/L)	<0.0010				
	Bromoform (mg/L)	<0.0010				
	Carbon Tetrachloride (mg/L)	<0.00050				
	Chlorobenzene (mg/L)	<0.0010				
	Dibromochloromethane (mg/L)	<0.0010				
	Chloroethane (mg/L)	<0.0010				
	Chloroform (mg/L)	<0.0010				
	Chloromethane (mg/L)	<0.0050				
	1,2-Dichlorobenzene (mg/L)	<0.00050				
	1,3-Dichlorobenzene (mg/L)	<0.0010				

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2355476-11	L2355476-12	L2355476-13	L2355476-14	
Description	Water	Water	Water	Water	
Sampled Date	26-SEP-19	26-SEP-19	26-SEP-19	26-SEP-19	
Sampled Time	12:00	11:30	14:15	09:30	
Client ID	SFC-11	GW INT.	L1	FIELD BLANK	
Grouping / **Analyte**					
WATER					
Dissolved Metals Magnesium (Mg)-Dissolved (mg/L)		7.41	11.5	<0.0050	
Manganese (Mn)-Dissolved (mg/L)		2.26	0.0451	<0.00010	
Mercury (Hg)-Dissolved (mg/L)		<0.0000050	<0.0000050	<0.0000050	
Molybdenum (Mo)-Dissolved (mg/L)		0.000531	0.000605	<0.000050	
Nickel (Ni)-Dissolved (mg/L)		0.00085	0.00217	<0.00050	
Phosphorus (P)-Dissolved (mg/L)		<0.050	0.065	<0.050	
Potassium (K)-Dissolved (mg/L)		6.44	4.66	<0.050	
Rubidium (Rb)-Dissolved (mg/L)		0.00435	0.00311	<0.00020	
Selenium (Se)-Dissolved (mg/L)		<0.000050	0.000158	<0.000050	
Silicon (Si)-Dissolved (mg/L)		10.1	12.9	<0.050	
Silver (Ag)-Dissolved (mg/L)		<0.000010	<0.000010	<0.000010	
Sodium (Na)-Dissolved (mg/L)		55.2	15.0	<0.050	
Strontium (Sr)-Dissolved (mg/L)		0.478	0.477	<0.00020	
Sulfur (S)-Dissolved (mg/L)		28.9	75.9	<0.50	
Tellurium (Te)-Dissolved (mg/L)		<0.00020	<0.00020	<0.00020	
Thallium (Tl)-Dissolved (mg/L)		<0.000010	<0.000010	<0.000010	
Thorium (Th)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	
Tin (Sn)-Dissolved (mg/L)		<0.00010	0.00033	<0.00010	
Titanium (Ti)-Dissolved (mg/L)		0.00038	<0.00030	<0.00030	
Tungsten (W)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	
Uranium (U)-Dissolved (mg/L)		0.000015	0.000060	<0.000010	
Vanadium (V)-Dissolved (mg/L)		0.00076	<0.00050	<0.00050	
Zinc (Zn)-Dissolved (mg/L)		0.0037	0.0437	<0.0010	
Zirconium (Zr)-Dissolved (mg/L)		<0.00020	<0.00020	<0.00020	
Aggregate Organics COD (mg/L)	<20	<20	22	<20	
Volatile Organic Compounds Benzene (mg/L)		<0.00050	<0.00050	<0.00050	
Bromodichloromethane (mg/L)		<0.0010	<0.0010	<0.0010	
Bromoform (mg/L)		<0.0010	<0.0010	<0.0010	
Carbon Tetrachloride (mg/L)		<0.00050	<0.00050	<0.00050	
Chlorobenzene (mg/L)		<0.0010	<0.0010	<0.0010	
Dibromochloromethane (mg/L)		<0.0010	<0.0010	<0.0010	
Chloroethane (mg/L)		<0.0010	<0.0010	<0.0010	
Chloroform (mg/L)		<0.0010	<0.0010	<0.0010	
Chloromethane (mg/L)		<0.0050	<0.0050	<0.0050	
1,2-Dichlorobenzene (mg/L)		<0.00050	<0.00050	<0.00050	
1,3-Dichlorobenzene (mg/L)		<0.0010	<0.0010	<0.0010	

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2355476-1	L2355476-2	L2355476-3	L2355476-4	L2355476-5
Description	Water	Water	Water	Water	Water
Sampled Date	26-SEP-19	26-SEP-19	26-SEP-19	26-SEP-19	26-SEP-19
Sampled Time	09:30	09:00	15:00	10:00	10:15
Client ID	MW-2D	MW-2S	MW-3	MW-4	DUPLICATE-MW-4
Grouping / **Analyte**					
WATER					
Volatile Organic Compounds					
1,4-Dichlorobenzene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
1,1-Dichloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
1,2-Dichloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
1,1-Dichloroethylene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
cis-1,2-Dichloroethylene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
trans-1,2-Dichloroethylene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Dichloromethane (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
1,2-Dichloropropane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
cis-1,3-Dichloropropylene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
trans-1,3-Dichloropropylene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
1,3-Dichloropropene (cis & trans) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Ethylbenzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Methyl t-butyl ether (MTBE) (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Styrene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
1,1,1,2-Tetrachloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
1,1,2,2-Tetrachloroethane (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Tetrachloroethylene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Toluene (mg/L)	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045
1,1,1-Trichloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
1,1,2-Trichloroethane (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Trichloroethylene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Trichlorofluoromethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Vinyl Chloride (mg/L)	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040
ortho-Xylene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
meta- & para-Xylene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Xylenes (mg/L)	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075
Surrogate: 4-Bromofluorobenzene (SS) (%)	90.3	91.4	88.0	90.8	90.7
Surrogate: 1,4-Difluorobenzene (SS) (%)	95.1	80.5	104.9	69.3 SURR-ND	102.7
Hydrocarbons					
EPH10-19 (mg/L)	<0.25	<0.25	<0.25	<0.25	<0.25
EPH19-32 (mg/L)	<0.25	<0.25	<0.25	<0.25	<0.25
LEPH (mg/L)	<0.25	<0.25	<0.25	<0.25	<0.25
HEPH (mg/L)	<0.25	<0.25	<0.25	<0.25	<0.25
Volatile Hydrocarbons (VH6-10) (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
VPH (C6-C10) (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
Surrogate: 2-Bromobenzotrifluoride (%)	87.9	91.0	64.0	68.0	77.5
Surrogate: 3,4-Dichlorotoluene (SS) (%)	72.6	86.5	76.5	86.3	87.7

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	Sample ID: L2355476-6 Description: Water Sampled Date: 26-SEP-19 Sampled Time: 12:45 Client ID: MW-6	L2355476-7 Water 26-SEP-19 10:45 SFC-2	L2355476-8 Water 26-SEP-19 11:00 SFC-2B	L2355476-9 Water 26-SEP-19 11:45 SFC-3	L2355476-10 Water 26-SEP-19 13:30 SFC-4B
WATER						
Volatile Organic Compounds	1,4-Dichlorobenzene (mg/L)	<0.0010				
	1,1-Dichloroethane (mg/L)	<0.0010				
	1,2-Dichloroethane (mg/L)	<0.0010				
	1,1-Dichloroethylene (mg/L)	<0.0010				
	cis-1,2-Dichloroethylene (mg/L)	<0.0010				
	trans-1,2-Dichloroethylene (mg/L)	<0.0010				
	Dichloromethane (mg/L)	<0.0050				
	1,2-Dichloropropane (mg/L)	<0.0010				
	cis-1,3-Dichloropropylene (mg/L)	<0.00050				
	trans-1,3-Dichloropropylene (mg/L)	<0.00050				
	1,3-Dichloropropene (cis & trans) (mg/L)	<0.0010				
	Ethylbenzene (mg/L)	<0.00050				
	Methyl t-butyl ether (MTBE) (mg/L)	<0.00050				
	Styrene (mg/L)	<0.00050				
	1,1,1,2-Tetrachloroethane (mg/L)	<0.0010				
	1,1,2,2-Tetrachloroethane (mg/L)	<0.00020				
	Tetrachloroethylene (mg/L)	<0.0010				
	Toluene (mg/L)	<0.00045				
	1,1,1-Trichloroethane (mg/L)	<0.0010				
	1,1,2-Trichloroethane (mg/L)	<0.00050				
	Trichloroethylene (mg/L)	<0.0010				
	Trichlorofluoromethane (mg/L)	<0.0010				
	Vinyl Chloride (mg/L)	<0.00040				
	ortho-Xylene (mg/L)	<0.00050				
	meta- & para-Xylene (mg/L)	<0.00050				
	Xylenes (mg/L)	<0.00075				
	Surrogate: 4-Bromofluorobenzene (SS) (%)	91.9				
	Surrogate: 1,4-Difluorobenzene (SS) (%)	95.0				
Hydrocarbons	EPH10-19 (mg/L)	<0.25				
	EPH19-32 (mg/L)	<0.25				
	LEPH (mg/L)	<0.25				
	HEPH (mg/L)	<0.25				
	Volatile Hydrocarbons (VH6-10) (mg/L)	<0.10				
	VPH (C6-C10) (mg/L)	<0.10				
	Surrogate: 2-Bromobenzotrifluoride (%)	70.9				
	Surrogate: 3,4-Dichlorotoluene (SS) (%)	88.2				

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2355476-11	L2355476-12	L2355476-13	L2355476-14	
Description	Water	Water	Water	Water	
Sampled Date	26-SEP-19	26-SEP-19	26-SEP-19	26-SEP-19	
Sampled Time	12:00	11:30	14:15	09:30	
Client ID	SFC-11	GW INT.	L1	FIELD BLANK	
Grouping	**Analyte**				
WATER					
Volatile Organic Compounds	1,4-Dichlorobenzene (mg/L)	<0.0010	<0.0010	<0.0010	
	1,1-Dichloroethane (mg/L)	<0.0010	<0.0010	<0.0010	
	1,2-Dichloroethane (mg/L)	<0.0010	<0.0010	<0.0010	
	1,1-Dichloroethylene (mg/L)	<0.0010	<0.0010	<0.0010	
	cis-1,2-Dichloroethylene (mg/L)	<0.0010	<0.0010	<0.0010	
	trans-1,2-Dichloroethylene (mg/L)	<0.0010	<0.0010	<0.0010	
	Dichloromethane (mg/L)	<0.0050	<0.0050	<0.0050	
	1,2-Dichloropropane (mg/L)	<0.0010	<0.0010	<0.0010	
	cis-1,3-Dichloropropylene (mg/L)	<0.00050	<0.00050	<0.00050	
	trans-1,3-Dichloropropylene (mg/L)	<0.00050	<0.00050	<0.00050	
	1,3-Dichloropropene (cis & trans) (mg/L)	<0.0010	<0.0010	<0.0010	
	Ethylbenzene (mg/L)	<0.00050	<0.00050	<0.00050	
	Methyl t-butyl ether (MTBE) (mg/L)	<0.00050	<0.00050	<0.00050	
	Styrene (mg/L)	<0.00050	<0.00050	<0.00050	
	1,1,1,2-Tetrachloroethane (mg/L)	<0.0010	<0.0010	<0.0010	
	1,1,2,2-Tetrachloroethane (mg/L)	<0.00020	<0.00020	<0.00020	
	Tetrachloroethylene (mg/L)	<0.0010	<0.0010	<0.0010	
	Toluene (mg/L)	<0.00045	<0.00045	<0.00045	
	1,1,1-Trichloroethane (mg/L)	<0.0010	<0.0010	<0.0010	
	1,1,2-Trichloroethane (mg/L)	<0.00050	<0.00050	<0.00050	
	Trichloroethylene (mg/L)	<0.0010	<0.0010	<0.0010	
	Trichlorofluoromethane (mg/L)	<0.0010	<0.0010	<0.0010	
	Vinyl Chloride (mg/L)	<0.00040	<0.00040	<0.00040	
	ortho-Xylene (mg/L)	<0.00050	<0.00050	<0.00050	
	meta- & para-Xylene (mg/L)	<0.00050	<0.00050	<0.00050	
	Xylenes (mg/L)	<0.00075	<0.00075	<0.00075	
	Surrogate: 4-Bromofluorobenzene (SS) (%)	87.1	88.0	88.0	
	Surrogate: 1,4-Difluorobenzene (SS) (%)	99.8	73.5	105.4	
Hydrocarbons	EPH10-19 (mg/L)	<0.25	<0.25	<0.25	
	EPH19-32 (mg/L)	<0.25	<0.25	<0.25	
	LEPH (mg/L)	<0.25	<0.25	<0.25	
	HEPH (mg/L)	<0.25	<0.25	<0.25	
	Volatile Hydrocarbons (VH6-10) (mg/L)	<0.10	<0.10	<0.10	
	VPH (C6-C10) (mg/L)	<0.10	<0.10	<0.10	
	Surrogate: 2-Bromobenzotrifluoride (%)	90.0	77.9	70.8	
	Surrogate: 3,4-Dichlorotoluene (SS) (%)	82.2	149.9 SURR-ND	44.0 SURR-ND	

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2355476-1 Water 26-SEP-19 09:30 MW-2D	L2355476-2 Water 26-SEP-19 09:00 MW-2S	L2355476-3 Water 26-SEP-19 15:00 MW-3	L2355476-4 Water 26-SEP-19 10:00 MW-4	L2355476-5 Water 26-SEP-19 10:15 DUPLICATE-MW-4
WATER						
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Acenaphthylene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Acridine (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Anthracene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Benz(a)anthracene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Benzo(a)pyrene (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Benzo(b&j)fluoranthene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Benzo(b+j+k)fluoranthene (mg/L)	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015
	Benzo(g,h,i)perylene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Benzo(k)fluoranthene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Chrysene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Dibenz(a,h)anthracene (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Fluoranthene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Fluorene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Indeno(1,2,3-c,d)pyrene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	1-Methylnaphthalene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	2-Methylnaphthalene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Naphthalene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Phenanthrene (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Pyrene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Quinoline (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Surrogate: Acridine d9 (%)	89.7	87.0	95.9	22.0 SURR-ND	42.6 SURR-ND
	Surrogate: Chrysene d12 (%)	93.1	94.8	96.3	86.8	100.4
	Surrogate: Naphthalene d8 (%)	93.0	91.7	94.1	84.4	93.8
	Surrogate: Phenanthrene d10 (%)	99.4	96.9	101.8	92.5	102.7

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2355476-6	L2355476-7	L2355476-8	L2355476-9	L2355476-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	26-SEP-19	26-SEP-19	26-SEP-19	26-SEP-19	26-SEP-19
	Sampled Time	12:45	10:45	11:00	11:45	13:30
	Client ID	MW-6	SFC-2	SFC-2B	SFC-3	SFC-4B
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)	<0.000010				
	Acenaphthylene (mg/L)	<0.000010				
	Acridine (mg/L)	<0.000010				
	Anthracene (mg/L)	<0.000010				
	Benz(a)anthracene (mg/L)	<0.000010				
	Benzo(a)pyrene (mg/L)	<0.0000050				
	Benzo(b&j)fluoranthene (mg/L)	<0.000010				
	Benzo(b+j+k)fluoranthene (mg/L)	<0.000015				
	Benzo(g,h,i)perylene (mg/L)	<0.000010				
	Benzo(k)fluoranthene (mg/L)	<0.000010				
	Chrysene (mg/L)	<0.000010				
	Dibenz(a,h)anthracene (mg/L)	<0.0000050				
	Fluoranthene (mg/L)	<0.000010				
	Fluorene (mg/L)	<0.000010				
	Indeno(1,2,3-c,d)pyrene (mg/L)	<0.000010				
	1-Methylnaphthalene (mg/L)	<0.000050				
	2-Methylnaphthalene (mg/L)	<0.000050				
	Naphthalene (mg/L)	<0.000050				
	Phenanthrene (mg/L)	<0.000020				
	Pyrene (mg/L)	<0.000010				
	Quinoline (mg/L)	<0.000050				
	Surrogate: Acridine d9 (%)	72.9				
	Surrogate: Chrysene d12 (%)	95.2				
	Surrogate: Naphthalene d8 (%)	89.9				
	Surrogate: Phenanthrene d10 (%)	99.8				

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2355476-11	L2355476-12	L2355476-13	L2355476-14	
Description	Water	Water	Water	Water	
Sampled Date	26-SEP-19	26-SEP-19	26-SEP-19	26-SEP-19	
Sampled Time	12:00	11:30	14:15	09:30	
Client ID	SFC-11	GW INT.	L1	FIELD BLANK	
Grouping	**Analyte**				
WATER					
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)	0.000693	<0.000010	<0.000010	
	Acenaphthylene (mg/L)	<0.000010	<0.000010	<0.000010	
	Acridine (mg/L)	<0.000010	<0.000010	<0.000010	
	Anthracene (mg/L)	0.000013	<0.000010	<0.000010	
	Benz(a)anthracene (mg/L)	<0.000010	<0.000010	<0.000010	
	Benzo(a)pyrene (mg/L)	<0.0000050	<0.0000050	<0.0000050	
	Benzo(b&j)fluoranthene (mg/L)	<0.000010	<0.000010	<0.000010	
	Benzo(b+j+k)fluoranthene (mg/L)	<0.000015	<0.000015	<0.000015	
	Benzo(g,h,i)perylene (mg/L)	<0.000010	<0.000010	<0.000010	
	Benzo(k)fluoranthene (mg/L)	<0.000010	<0.000010	<0.000010	
	Chrysene (mg/L)	<0.000010	<0.000010	<0.000010	
	Dibenz(a,h)anthracene (mg/L)	<0.0000050	<0.0000050	<0.0000050	
	Fluoranthene (mg/L)	0.000155	<0.000010	<0.000010	
	Fluorene (mg/L)	0.000123	<0.000010	<0.000010	
	Indeno(1,2,3-c,d)pyrene (mg/L)	<0.000010	<0.000010	<0.000010	
	1-Methylnaphthalene (mg/L)	<0.000050	<0.000050	<0.000050	
	2-Methylnaphthalene (mg/L)	<0.000050	<0.000050	<0.000050	
	Naphthalene (mg/L)	<0.000050	<0.000050	<0.000050	
	Phenanthrene (mg/L)	<0.000020	<0.000020	<0.000020	
	Pyrene (mg/L)	0.000084	<0.000010	<0.000010	
	Quinoline (mg/L)	<0.000050	<0.000050	<0.000050	
	Surrogate: Acridine d9 (%)	88.0	92.4	85.6	
	Surrogate: Chrysene d12 (%)	94.0	92.2	90.9	
	Surrogate: Naphthalene d8 (%)	89.9	89.1	80.4	
	Surrogate: Phenanthrene d10 (%)	96.7	98.2	91.7	

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

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Laboratory Control Sample	Acridine	LCS-L	L2355476-1, -12, -13, -14, -2, -3, -4, -5, -6
Laboratory Control Sample	Quinoline	LCS-ND	L2355476-1, -12, -13, -14, -2, -3, -4, -5, -6
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2355476-1, -2, -3, -4
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2355476-12, -13, -14, -5, -6
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2355476-1, -2, -3, -4
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2355476-12, -13, -14, -5, -6
Matrix Spike	Iron (Fe)-Dissolved	MS-B	L2355476-1, -2, -3, -4
Matrix Spike	Iron (Fe)-Dissolved	MS-B	L2355476-12, -13, -14, -5, -6
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2355476-1, -2, -3, -4
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2355476-12, -13, -14, -5, -6
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2355476-1, -2, -3, -4
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2355476-12, -13, -14, -5, -6
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L2355476-1, -2, -3, -4
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2355476-1, -2, -3, -4
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2355476-12, -13, -14, -5, -6
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2355476-1, -2, -3, -4
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2355476-12, -13, -14, -5, -6
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2355476-12, -13, -14, -5, -6
Matrix Spike	Barium (Ba)-Total	MS-B	L2355476-10, -11, -7, -8, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L2355476-10, -11, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2355476-10, -11, -7, -8, -9
Matrix Spike	Sodium (Na)-Total	MS-B	L2355476-10, -11, -7, -8, -9
Matrix Spike	Strontium (Sr)-Total	MS-B	L2355476-10, -11, -7, -8, -9
Matrix Spike	Sulfur (S)-Total	MS-B	L2355476-10, -11, -7, -8, -9
Matrix Spike	Uranium (U)-Total	MS-B	L2355476-10, -11, -7, -8, -9
Matrix Spike	Total Nitrogen	MS-B	L2355476-1, -10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Phosphorus (P)-Total	MS-B	L2355476-1, -10, -11, -12, -13, -14, -2, -3, -6, -7, -8, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
LCS-L	Lab Control Sample recovery was below ALS DQO. Reference Material and/or Matrix Spike results were acceptable. Non-detected sample results are considered reliable. Other results, if reported, have been qualified.
LCS-ND	Lab Control Sample recovery was slightly outside ALS DQO. Reported non-detect results for associated samples were unaffected.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis
SURR-ND	Surrogate recovery marginally exceeded ALS DQO. Reported non-detect results for associated samples were deemed to be unaffected.
TKNI	TKN result may be biased low due to Nitrate interference. Nitrate-N is > 10x TKN.

Test Method References:

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

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

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

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

Reference Information

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

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

COD-COL-VA	Water	Chemical Oxygen Demand by Colorimetric	APHA 5220 D. CHEMICAL OXYGEN DEMAND

This analysis is carried out using procedures adapted from APHA Method 5220 "Chemical Oxygen Demand (COD)". Chemical oxygen demand is determined using the closed reflux colourimetric method.

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

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

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

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

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

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

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

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

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

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

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

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

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

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

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

LEPHw and HEPHw are measures of Light and Heavy Extractable Petroleum Hydrocarbons in water. Results are calculated by subtraction of applicable PAH concentrations from EPH10-19 and EPH19-32, as per the BC Lab Manual LEPH/HEPH calculation procedure.

LEPHw = EPH10-19 minus Acenaphthene, Acridine, Anthracene, Fluorene, Naphthalene and Phenanthrene.

HEPHw = EPH19-32 minus Benz(a)anthracene, Benzo(a)pyrene, Fluoranthene, and Pyrene.

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

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

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

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

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

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

N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

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

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

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

P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus

Reference Information

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

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

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

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

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

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

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

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

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

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

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

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

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

VOC7-HSMS-VA	Water	BTEX/MTBE/Styrene by Headspace GCMS	EPA 5021A/8260C

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

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

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

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

Calculation of Total Xylenes

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

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

17-190313

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **VA19A0727**	Page	: 1 of 10
Client	: **Morrison Hershfield Limited**	Laboratory	: Vancouver - Environmental
Contact	: Emily Peets	Account Manager	: Carla Fuginski
Address	: 4321 Still Creek Dr Burnaby BC Canada V5C 6S7	Address	: 8081 Lougheed Highway Burnaby BC Canada V5A 1W9
Telephone	: 604-454-0402	Telephone	: +1 604 253 4188
Project	: ----	Date Samples Received	: 18-Dec-2019 08:10
PO	: ----	Date Analysis Commenced	: 19-Dec-2019
C-O-C number	: 17-785555	Issue Date	: 30-Dec-2019 11:09
Sampler	: ----		
Site	: ----		
Quote number	: Q65605 - Whistler Landfill Closure Environmental Monitoring Program		
No. of samples received	: 12		
No. of samples analysed	: 11		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Brieanna Allen	Department Manager - Organics	Organics, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Kinny Wu	Laboratory Analyst	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Matthew Woods	Lab Assistant	Metals, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Inorganics - Water Quality, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

Qualifiers

Qualifier	*Description*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*

Analytical Results

Sub-Matrix: **Groundwater**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW 6	MW 3	MW 2S	MW 2D	GW Int.
					Client sampling date / time	17-Dec-2019 15:00	17-Dec-2019 09:00	17-Dec-2019 10:00	17-Dec-2019 10:00	17-Dec-2019 14:30
						VA19A0727-007	VA19A0727-008	VA19A0727-009	VA19A0727-010	VA19A0727-012
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, total (as CaCO3)	----	E290-L	1.0	mg/L		41.9	27.3	111	301	116
conductivity	----	E100-L	2.0	µS/cm		485	220	424	921	697
pH	----	E108	0.10	pH units		6.82	6.33	6.62	6.54	6.42
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		178	39.6	65.4	84.4	47.0
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		91.8	51.0	161	362	240
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298-L	0.0050	mg/L		0.0434	0.491	3.44	11.6	0.864
bromide	24959-67-9	E235.Br-L	0.050	mg/L		<0.050	<0.050	0.076	<0.250 DLDS	<0.250 DLDS
chloride	16887-00-6	E235.Cl	0.50	mg/L		53.2	25.5	18.1	44.0	57.2
fluoride	16984-48-8	E235.F	0.020	mg/L		0.072	0.032	0.132	<0.100 DLDS	<0.100 DLDS
Kjeldahl nitrogen, total [TKN]	----	E318-L	0.050	mg/L		0.536	0.555	3.40	11.6	1.10
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.115	0.135	0.0053	0.0419	<0.0250 DLDS
nitrate + nitrite (as N)	----	EC235.N+N	0.50	mg/L		<0.50	<0.50	<0.50	<0.50	<0.50
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	0.0014	<0.0010	<0.0050 DLDS	<0.0050 DLDS
nitrogen, total	7727-37-9	E366	0.030	mg/L		0.565	0.660	3.11	9.86	0.927
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L		0.888	0.0244	0.0366	0.153	0.0395
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		103	32.2	74.4	138	115
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0128	0.0285	0.0033	0.0027	0.0478
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00012	<0.00010	0.00790	0.0140	0.00043
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0297	0.0866	0.118	0.0392	0.0735
beryllium, dissolved	7440-41-7	E421	0.000100	mg/L		<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.014	<0.010	0.113	0.254	0.105
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000466	0.000314	<0.0000050	<0.0000100 DLM	0.0000063
calcium, dissolved	7440-70-2	E421	0.050	mg/L		31.0	15.0	50.2	120	81.4
cesium, dissolved	7440-46-2	E421	0.000010	mg/L		0.000011	0.000057	0.000018	0.000018	<0.000010
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00013	0.00026
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00049	0.00960	0.00301	0.0113	0.00335

Analytical Results

Sub-Matrix: **Groundwater**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW 6	MW 3	MW 2S	MW 2D	GW Int.
					Client sampling date / time	17-Dec-2019 15:00	17-Dec-2019 09:00	17-Dec-2019 10:00	17-Dec-2019 10:00	17-Dec-2019 14:30
						VA19A0727-007	VA19A0727-008	VA19A0727-009	VA19A0727-010	VA19A0727-012
						Result	Result	Result	Result	Result
Dissolved Metals										
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00155	0.00438	0.00025	0.00043	0.00051
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.444	0.547	51.2	53.3	24.8
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L		3.52	3.28	8.64	14.7	8.98
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0743	2.32	2.29	3.76	2.28
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.000796	0.000492	0.00502	0.0126	0.000365
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	0.00160	0.00086	0.00208	0.00259
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	0.119	<0.050
potassium, dissolved	7440-09-7	E421	0.050	mg/L		2.87	3.18	9.31	20.7	5.77
rubidium, dissolved	7440-17-7	E421	0.00020	mg/L		0.00460	0.00972	0.00531	0.0109	0.00419
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
silicon, dissolved	7440-21-3	E421	0.050	mg/L		5.59	7.28	9.70	14.7	8.59
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		66.4	16.8	13.0	39.4	50.2
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.348	0.138	0.312	0.588	0.582
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		37.4	10.3	24.9	50.9	47.7
tellurium, dissolved	13494-80-9	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		0.000026	0.000114	<0.000010	<0.000010	<0.000010
thorium, dissolved	7440-29-1	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	0.00015	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	0.00067
tungsten, dissolved	7440-33-7	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000021	<0.000010	0.000032	0.000137	0.000011
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0011	0.0042	0.0054	0.0015	0.0181
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field
Aggregate Organics										

Analytical Results

Sub-Matrix: **Groundwater**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW 6	MW 3	MW 2S	MW 2D	GW Int.
					Client sampling date / time	17-Dec-2019 15:00	17-Dec-2019 09:00	17-Dec-2019 10:00	17-Dec-2019 10:00	17-Dec-2019 14:30
						VA19A0727-007	VA19A0727-008	VA19A0727-009	VA19A0727-010	VA19A0727-012
						Result	Result	Result	Result	Result
Aggregate Organics										
chemical oxygen demand [COD]	----	E559	20	mg/L		26	<20	29	37	22
Volatile Organic Compounds										
benzene	71-43-2	E611C	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50
bromodichloromethane	75-27-4	E611C	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50
bromoform	75-25-2	E611C	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50
carbon tetrachloride	56-23-5	E611C	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50
chlorobenzene	108-90-7	E611C	0.50	µg/L		<0.50	<0.50	0.80	2.20	<0.50
chloroethane	75-00-3	E611C	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50
chloroform	67-66-3	E611C	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50
chloromethane	74-87-3	E611C	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50
dibromochloromethane	124-48-1	E611C	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50
dichlorobenzene, 1,2-	95-50-1	E611C	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50
dichlorobenzene, 1,3-	541-73-1	E611C	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50
dichlorobenzene, 1,4-	106-46-7	E611C	0.50	µg/L		<0.50	<0.50	<0.50	0.54	<0.50
dichloroethane, 1,1-	75-34-3	E611C	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50
dichloroethane, 1,2-	107-06-2	E611C	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50
dichloroethylene, 1,1-	75-35-4	E611C	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50
dichloroethylene, cis-1,2-	156-59-4	E611C	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50
dichloroethylene, trans-1,2-	156-60-5	E611C	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50
dichloromethane	75-09-2	E611C	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50
dichloropropane, 1,2-	78-87-5	E611C	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50
dichloropropylene, cis+trans-1,3-	542-75-6	E611C	0.75	µg/L		<0.75	<0.75	<0.75	<0.75	<0.75
dichloropropylene, cis-1,3-	10061-01-5	E611C	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50
dichloropropylene, trans-1,3-	10061-02-6	E611C	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50
ethylbenzene	100-41-4	E611C	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50
methyl-tert-butyl ether [MTBE]	1634-04-4	E611C	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50
styrene	100-42-5	E611C	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50
tetrachloroethane, 1,1,1,2-	630-20-6	E611C	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50
tetrachloroethane, 1,1,2,2-	79-34-5	E611C	0.20	µg/L		<0.20	<0.20	<0.20	<0.20	<0.20
tetrachloroethylene	127-18-4	E611C	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50
toluene	108-88-3	E611C	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50

Analytical Results

Sub-Matrix: **Groundwater**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW 6	MW 3	MW 2S	MW 2D	GW Int.
					Client sampling date / time	17-Dec-2019 15:00	17-Dec-2019 09:00	17-Dec-2019 10:00	17-Dec-2019 10:00	17-Dec-2019 14:30
						VA19A0727-007	VA19A0727-008	VA19A0727-009	VA19A0727-010	VA19A0727-012
						Result	Result	Result	Result	Result
Volatile Organic Compounds										
trichloroethane, 1,1,1-	71-55-6	E611C	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50
trichloroethane, 1,1,2-	79-00-5	E611C	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50
trichloroethylene	79-01-6	E611C	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50
trichlorofluoromethane	75-69-4	E611C	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50
vinyl chloride	75-01-4	E611C	0.40	µg/L		<0.40	<0.40	<0.40	<0.40	<0.40
xylene, m+p-	179601-23-1	E611C	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50
xylene, o-	95-47-6	E611C	0.50	µg/L		<0.50	<0.50	<0.50	<0.50	<0.50
xylenes, total	1330-20-7	E611C	0.75	µg/L		<0.75	<0.75	<0.75	<0.75	<0.75
bromofluorobenzene, 4-	460-00-4	E611C	0.50	%		97.9	95.4	100	97.7	95.3
difluorobenzene, 1,4-	540-36-3	E611C	0.50	%		101	99.9	100	99.8	102
Hydrocarbons										
EPH (C10-C19)	----	E601A	250	µg/L		<250	<250	<250	<250	<250
EPH (C19-C32)	----	E601A	250	µg/L		<250	<250	<250	<250	<250
VHw (C6-C10)	----	E581.VH	100	µg/L		<100	<100	<100	<100	<100
HEPHw	----	EC600A	250	µg/L		<250	<250	<250	<250	<250
LEPHw	----	EC600A	250	µg/L		<250	<250	<250	<250	<250
VPHw	----	EC580A	100	µg/L		<100	<100	<100	<100	<100
bromobenzotrifluoride, 2- (EPH surr)	392-83-6	E601A	50	%		104	99.9	92.7	100.0	98.2
dichlorotoluene, 3,4-	97-75-0	E581.VH	1.0	%		109	107	115	95.2	99.2
Polycyclic Aromatic Hydrocarbons										
acenaphthene	83-32-9	E641A	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	0.589
acenaphthylene	208-96-8	E641A	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
acridine	260-94-6	E641A	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
anthracene	120-12-7	E641A	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	0.020
benz(a)anthracene	56-55-3	E641A	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	0.012
benzo(a)pyrene	50-32-8	E641A	0.0050	µg/L		<0.0050	<0.0050	<0.0050	<0.0050	0.0092
benzo(b+j)fluoranthene	----	E641A	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	0.013
benzo(b+j+k)fluoranthene	----	E641A	0.015	µg/L		<0.015	<0.015	<0.015	<0.015	<0.015
benzo(g,h,i)perylene	191-24-2	E641A	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
benzo(k)fluoranthene	207-08-9	E641A	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
chrysene	218-01-9	E641A	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	0.015

Analytical Results

Sub-Matrix: **Groundwater**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW 6	MW 3	MW 2S	MW 2D	GW Int.
					Client sampling date / time	17-Dec-2019 15:00	17-Dec-2019 09:00	17-Dec-2019 10:00	17-Dec-2019 10:00	17-Dec-2019 14:30
						VA19A0727-007	VA19A0727-008	VA19A0727-009	VA19A0727-010	VA19A0727-012
						Result	Result	Result	Result	Result
Polycyclic Aromatic Hydrocarbons										
dibenz(a,h)anthracene	53-70-3	E641A	0.0050	µg/L		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
fluoranthene	206-44-0	E641A	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	0.147
fluorene	86-73-7	E641A	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	0.223
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
methylnaphthalene, 1-	90-12-0	E641A	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
methylnaphthalene, 2-	91-57-6	E641A	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
naphthalene	91-20-3	E641A	0.050	µg/L		<0.050	<0.050	<0.050	<0.050	<0.050
phenanthrene	85-01-8	E641A	0.020	µg/L		<0.020	<0.020	<0.020	<0.020	<0.020
pyrene	129-00-0	E641A	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	0.086
quinoline	6027-02-7	E641A	0.050	µg/L		<0.050	<0.050	<0.050	<0.050	<0.050
acridine-d9	34749-75-2	E641A	0.010	%		88.7	93.1	95.2	96.0	90.8
chrysene-d12	1719-03-5	E641A	0.010	%		108	107	106	109	106
naphthalene-d8	1146-65-2	E641A	0.010	%		111	104	107	117	107
phenanthrene-d10	1517-22-2	E641A	0.010	%		104	102	106	109	101

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Surface Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	SFC 2	SFC 2B	SFC 3	SFC 11	Duplicate SFC 3
					Client sampling date / time	17-Dec-2019 11:00	17-Dec-2019 11:00	17-Dec-2019 14:00	17-Dec-2019 14:00	17-Dec-2019 14:00
						VA19A0727-001	VA19A0727-002	VA19A0727-003	VA19A0727-004	VA19A0727-005
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, total (as CaCO3)	----	E290-L	1.0	mg/L		62.2	7.3	21.3	23.6	21.1
conductivity	----	E100-L	2.0	µS/cm		339	548	190	106	192
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		121	236	32.6	33.1	31.8
pH	----	E108	0.10	pH units		7.13	5.53	7.00	7.09	7.13
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		8.6	63.2	12.8	5.8	14.8
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298-L	0.0050	mg/L		0.299	0.323	0.0144	<0.0050	0.0152
bromide	24959-67-9	E235.Br-L	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
chloride	16887-00-6	E235.Cl	0.50	mg/L		17.0	5.00	33.3	6.88	33.3
fluoride	16984-48-8	E235.F	0.020	mg/L		0.067	0.238	0.038	0.047	0.037
Kjeldahl nitrogen, total [TKN]	----	E318-L	0.050	mg/L		0.519	1.07	0.102	0.051	0.116
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		1.61	5.71	0.302	0.504	0.304
nitrate + nitrite (as N)	----	EC235.N+N	0.50	mg/L		1.62	5.73	<0.50	0.50	<0.50
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0024	0.0220	<0.0010	<0.0010	<0.0010
nitrogen, total	7727-37-9	E366	0.030	mg/L		1.83	6.83	0.397	0.534	0.402
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L		0.0045	0.0343	0.0568	0.0168	0.0567
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		68.4	227	14.1	13.3	14.1
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		1.06	9.72	0.694	0.340	0.669
antimony, total	7440-36-0	E420	0.00010	mg/L		<0.00010	<0.00010	0.00011	<0.00010	0.00011
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00016	0.00077	0.00023	0.00013	0.00020
barium, total	7440-39-3	E420	0.00010	mg/L		0.0473	0.0343	0.0207	0.0120	0.0208
beryllium, total	7440-41-7	E420	0.000100	mg/L		<0.000100	0.000246	<0.000100	<0.000100	<0.000100
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, total	7440-42-8	E420	0.010	mg/L		0.024	0.027	<0.010	<0.010	<0.010
cadmium, total	7440-43-9	E420	0.0000050	mg/L		0.0000577	0.000346	0.0000266	0.0000142	0.0000270
calcium, total	7440-70-2	E420	0.050	mg/L		41.4	76.5	10.6	10.4	10.2
cesium, total	7440-46-2	E420	0.000010	mg/L		<0.000010	0.000020	0.000020	<0.000010	0.000019
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00022	0.00147	0.00045	0.00014	0.00043
cobalt, total	7440-48-4	E420	0.00010	mg/L		0.00546	0.0347	0.00051	0.00016	0.00052
copper, total	7440-50-8	E420	0.00050	mg/L		0.0201	0.144	0.00591	0.00246	0.00588

Analytical Results

Sub-Matrix: **Surface Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	SFC 2	SFC 2B	SFC 3	SFC 11	Duplicate SFC 3
					Client sampling date / time	17-Dec-2019 11:00	17-Dec-2019 11:00	17-Dec-2019 14:00	17-Dec-2019 14:00	17-Dec-2019 14:00
						VA19A0727-001	VA19A0727-002	VA19A0727-003	VA19A0727-004	VA19A0727-005
						Result	Result	Result	Result	Result
Total Metals										
iron, total	7439-89-6	E420	0.010	mg/L		1.89	16.3	0.710	0.261	0.675
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	0.000058	0.000246	0.000153	0.000247
lithium, total	7439-93-2	E420	0.0010	mg/L		<0.0010	0.0028	<0.0010	<0.0010	<0.0010
magnesium, total	7439-95-4	E420	0.0050	mg/L		4.21	10.9	1.50	1.74	1.50
manganese, total	7439-96-5	E420	0.00010	mg/L		0.500	1.07	0.0227	0.0100	0.0221
mercury, total	7439-97-6	E508	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.00475	0.000233	0.000608	0.000336	0.000649
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00257	0.0183	0.00058	<0.00050	0.00056
phosphorus, total	7723-14-0	E420	0.050	mg/L		<0.050	0.078	0.067	<0.050	0.083
potassium, total	7440-09-7	E420	0.050	mg/L		3.86	3.80	1.27	0.739	1.28
rubidium, total	7440-17-7	E420	0.00020	mg/L		0.00368	0.00347	0.00116	0.00055	0.00117
selenium, total	7782-49-2	E420	0.000050	mg/L		0.000059	0.000084	<0.000050	<0.000050	<0.000050
silicon, total	7440-21-3	E420	0.10	mg/L		5.12	11.2	6.44	8.61	6.44
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, total	7440-23-5	E420	0.050	mg/L		14.5	8.90	23.0	6.76	23.2
strontium, total	7440-24-6	E420	0.00020	mg/L		0.233	0.285	0.0923	0.126	0.0954
sulfur, total	7704-34-9	E420	0.50	mg/L		23.0	84.6	4.42	4.27	4.65
tellurium, total	13494-80-9	E420	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
thorium, total	7440-29-1	E420	0.00010	mg/L		<0.00010	0.00083	<0.00010	<0.00010	<0.00010
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	0.00030	<0.00010	<0.00010	<0.00010
titanium, total	7440-32-6	E420	0.00030	mg/L		<0.00030	0.00252	0.0222	0.00998	0.0214
tungsten, total	7440-33-7	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
uranium, total	7440-61-1	E420	0.000010	mg/L		0.000085	0.000446	0.000026	0.000012	0.000026
vanadium, total	7440-62-2	E420	0.00050	mg/L		<0.00050	<0.00050	0.00141	0.00108	0.00136
zinc, total	7440-66-6	E420	0.0030	mg/L		0.0102	0.0528	0.0081	<0.0030	0.0086
zirconium, total	7440-67-7	E420	0.00020	mg/L		<0.00020	<0.00020	0.00024	0.00021	0.00023
Aggregate Organics										
chemical oxygen demand [COD]	----	E559	20	mg/L		<20	23	<20	<20	<20

Please refer to the General Comments section for an explanation of any qualifiers detected.

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: Field Blank	----	----	----	----
					Client sampling date / time: 17-Dec-2019 15:00	----	----	----	----
					VA19A0727-006	--------	--------	--------	--------
					Result	----	----	----	----
Physical Tests									
alkalinity, total (as CaCO3)	----	E290-L	1.0	mg/L	<1.0	----	----	----	----
conductivity	----	E100-L	2.0	µS/cm	<2.0	----	----	----	----
pH	----	E108	0.10	pH units	5.37	----	----	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L	<3.0	----	----	----	----
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298-L	0.0050	mg/L	<0.0050	----	----	----	----
bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	----	----	----	----
chloride	16887-00-6	E235.Cl	0.50	mg/L	<0.50	----	----	----	----
fluoride	16984-48-8	E235.F	0.020	mg/L	<0.020	----	----	----	----
Kjeldahl nitrogen, total [TKN]	----	E318-L	0.050	mg/L	<0.050	----	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	<0.0050	----	----	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.50	mg/L	<0.50	----	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	----	----	----	----
nitrogen, total	7727-37-9	E366	0.030	mg/L	<0.030	----	----	----	----
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	<0.0020	----	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	<0.30	----	----	----	----
Aggregate Organics									
chemical oxygen demand [COD]	----	E559	20	mg/L	<20	----	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

APPENDIX B: Field Data Collection Results for Leachate, Groundwater, and Surface Water Monitoring

		Groundwater Levels					Water Quality					
Well ID	Date	Ground Surface Elevation	Top of Well Riser Elevation	Depth to Water	Static Water Level Elevation		Conductivity	Temp	pH	D.O.	ORP	Comments
		mASML	mASML	m below top of well riser	mASL		uS/cm	C		mg/l		
MW2S	13-Mar-19	603.84	604.94	6.23	598.71		356.7	6.4	6.15	2.88	151.4	Tubing requires replacement next visit.
MW2D	13-Mar-19	603.84	604.9	6.28	598.62		1032.0	6.0	6.43	4.21	90.5	Tubing requires replacement next visit.
MW3	13-Mar-19	600.61	601.47	-	-		-	-	-	-	-	Not sampled. Could not be located due to snow.
MW4	13-Mar-19	596.54	677.54	4.2	673.34		517.4	7.6	6.52	6.61	79.9	Obstruction at 1.24m depth to water level could not be determined.
MW6	13-Mar-19	610.88	610.88	-	-		-	-	-	-	-	Not sampled. Cap frozen on due to surface water infiltration.
SFC2	13-Mar-19						328.5	7.9	5.55	5.40	228.6	
SFC2B	13-Mar-19						1156.0	1.8	3.21	5.01	306.1	
SFC3	13-Mar-19						664.0	2.7	6.94	13.31	75.9	
SFC11	13-Mar-19						136.7	4.6	7.12	10.00	51.5	
SFC4B	13-Mar-19						278.7	1.8	7.2	14.29	62.9	
Leachate Manhole	13-Mar-19						420.9	6.8	6.61	0.50	130.2	
GW Interceptor	13-Mar-19						914.0	7.9	6.39	2.31	79.9	Duplicate sample
MW2S	20-Jun-19	603.84	604.94	6.38	598.56		377.4	8.4	6.32	1.08	104.2	Tubing replaced.
MW2D	20-Jun-19	603.84	604.9	6.43	598.47		1084.0	8.4	4.85	1.62	77.4	Tubing replaced.
MW3	20-Jun-19	600.61	601.47	1.89	599.58		215.0	8.9	5.28	3.58	229.1	Tubing requires replacement next visit.
MW4	20-Jun-19	596.54	677.54	4.19	673.35		418.4	8.6	5.52	1.35	82.5	Duplicate sample
MW6	20-Jun-19	610.88	610.88	5.15	605.73		638.1	9.4	6.28	6.24	82.1	Tubing requires replacement next visit.
SFC2	20-Jun-19						317.1	8.7	6.53	6.65	29.5	
SFC2B	20-Jun-19						1273.0	11.2	2.13	1.08	413.5	
SFC3	20-Jun-19						152.4	7.0	6.65	8.66	11.5	
SFC11	20-Jun-19						145.6	6.2	6.3	7.70	26.9	
SFC4B	20-Jun-19						264.6	9.9	5.07	8.67	53.3	
GW Interceptor	20-Jun-19						906.0	10.1	4.42	1.86	73.8	Field Blank
MW2S	26-Sep-19	603.84	604.94	6.6	598.34		274.8	7.9	6.55	1.29	141.2	
MW2D	26-Jun-19	603.84	604.9	6.61	598.29		718.0	8.4	6.5	1.71	127.6	Field Blank sample.
MW3	26-Jun-19	600.61	601.47	2.1	599.37		171.8	10.4	6.01	6.19	184.7	
MW4	26-Jun-19	596.54	677.54	4.15	673.39		186.5	8.7	6.57	4.19	88	Tubing requires replacement next visit. Duplicate sample.
MW6	26-Jun-19	610.88	610.88	4.7	606.18		397	10.5	6.21	2.81	215.4	Tubing replaced.
SFC2	26-Jun-19						302.1	10.0	6.75	7.17	95.2	
SFC2B	26-Jun-19						835.0	10.6	3.14	2.96	369.7	
SFC3	26-Jun-19						203.2	9.7	6.6	8.72	219.8	
SFC11	26-Jun-19						70.2	7.6	6.47	8.93	205.6	
SFC4B	26-Jun-19						153.4	9.5	7.08	8.44	181.4	
Leachate Manhole	26-Jun-19						594.0	12.8	6.37	5.93	197.1	

		Groundwater Levels					Water Quality					
Well ID	Date	Ground Surface Elevation	Top of Well Riser Elevation	Depth to Water	Static Water Level Elevation		Conductivity	Temp	pH	D.O.	ORP	Comments
		mASML	mASML	m below top of well riser	mASL		uS/cm	C		mg/l		
GW Interceptor	26-Jun-19						520.0	9.2	6.05	0.83	291.2	
MW2S	17-Dec-19	603.84	604.94	6.6	598.34		312.8	6.3	6.67	3.25	60.2	
MW2D	17-Dec-19	603.84	604.9	6.1	598.80		665.0	7.0	6.54	1.93	71.5	
MW3	17-Dec-19	600.61	601.47	1.5	599.97		144.0	7.9	5.73	1.90	62.9	
MW4	17-Dec-19	596.54	677.54	-	-		-	-	-	-	-	Not sampled - bentonite has seeped into the well through a crack in the casing and formed a blockage. MW may require replacement due to cracked well casing.
MW6	17-Dec-19	610.88	610.88	5.84	605.04		95.9	8.6	6.46	3.88	60.8	Tubing requires replacement in Q1 or Q2. Field Blank.
SFC2	17-Dec-19						221.3	7.8	6.2	8.20	62.3	
SFC2B	17-Dec-19						311.8	1.9	5.54	7.93	65.7	
SFC3	17-Dec-19						111.8	3.9	6.7	11.72	102.1	Duplicate.
SFC11	17-Dec-19						63.6	4.7	6.77	10.23	75.2	
SFC4B	17-Dec-19						175.5	4.0	5.62	11.34	107.7	
GW Interceptor	17-Dec-19						94.1	6.3	6.22	3.57	98.8	