



# FORCEMAN RIDGE WASTE MANAGEMENT FACILITY

## 2022 Annual Report

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## Executive Summary

The Forceman Ridge Waste Management Facility (FRWMF) was commissioned in 2016, and has been receiving waste from the Greater Terrace Area, and from construction sites and work camps in the District of Kitimat. The site includes a five-stage leachate treatment system, phytoremediation orchard, septage receiving facility, composting facility, and engineered landfill. The site is operated under Operational Certificate (OC) MR-17277 which includes a comprehensive environmental effects monitoring program and requirements to report non-compliance events. In 2022 the site received one temporary authorisation to accept Avian Flu infected bird carcasses from the region. No Avian Flu infected bird carcasses were received at the site in 2022.

Traffic at site significantly increased from 2021 and has been trending upwards with the influx of waste from oil and gas construction projects in the surrounding area. The facility received 27,680 tonnes of solid waste over 2022, which translates to 1.4 times more than was received in 2021. Of this waste 14,662 tonnes were received from within the service-area, and 13,018 tonnes was received from outside of the service-area. Total transactions at FRWMF in 2022 totaled 4,152 events, which were also 1.4 times greater than in 2021.

Two capital construction projects took place at FRWMF during 2022; the completion of the new perimeter wildlife fence, and completion of Stage 1 of construction for new Cell 1B. FRWMF completed filling the final lifts of Cell 1A in 2022 and began filling into newly constructed Cell 1B in December of 2022. The asbestos pit in Cell 1A will continue to be used in 2023 and has a limited remaining volume of airspace available. The new cell has an estimated equivalency of 144,777 tonnes of airspace for MSW disposal over an estimated 10 years.

Following the commissioning of Cell 1B in December 2022, the FRWMF landfill is six years ahead of projection for this expansion and has a remaining life expectancy of 94 years over the remaining expansion phases. The tonnage of waste received in Cell 1A was approximately 56% of the design tonnage, excluding the remaining airspace reserved for asbestos disposal. This has resulted in approximately 62,000 tonnes of airspace lost resulting from poor compaction and over-use of cover material. The landfill has received waste for six complete years and should have had approximately six years remaining in Cell 1A. Under current operational conditions the remaining landfill life expectancy may be 50% lower than the 94 years that the remaining phases were designed for.

In 2022 a total of 107,156.7 m<sup>3</sup> of treated effluent was discharged under the OC. Of this volume, 89,002 m<sup>3</sup> was discharged to the phytoremediation orchard, and the remaining 18,155 m<sup>3</sup> discharged to the rapid infiltration ditch, with an annual discharge rate of 293.6 m<sup>3</sup> per day. The total volume of landfill leachate generation in 2022 was 20,405 m<sup>3</sup>. Environmental monitoring requirements under the OC were completed in 2022, no exceedances to surface, groundwater, or OC criteria were noted in 2022.



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## 1 Introduction

The Forceman Ridge Waste Management Facility (FRWMF) is operated under Operational Certificate (OC) MR-17227, Issued by the Ministry of Environment (ENV) in November 2008, and most recently amended in November 2021 (Appendix A). The OC requires the operator to submit an operational and environmental annual report for each 12-month period. This report fulfills the operational reporting requirements, and captures major works and projects completed in the same year.

The 2022 Annual Report summarizes the following topics presented in Table 1.

**Table 1: Report Objectives**

<p><b>Reporting of Waste Tracking</b></p> <ul style="list-style-type: none"> <li>Summary of Visits to FRWMF</li> <li>Quantity of Waste Received, Recycled and Composted</li> <li>Quantity of Liquid Waste Received</li> <li>Quantity of Waste Asbestos Received</li> <li>Total Waste in Place</li> </ul> <p><b>Facility Operations and Maintenance</b></p> <ul style="list-style-type: none"> <li>Operational Certificate Updates</li> <li>Airspace Utilization</li> <li>Capital Construction Projects</li> <li>Scale Maintenance</li> <li>Leachate Discharge Volumes</li> <li>Expenditures</li> </ul> <p><b>Wildlife Observations</b></p> <p><b>Environmental Monitoring</b></p> <p><b>Projected Operational Plan</b></p>	
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The Operational Certificate authorizes the discharge of municipal solid and liquid wastes and outlines the criteria for environmental and human protection at FRWMF. Environmental monitoring requirements for surface water, groundwater and leachate are prescribed in the Environmental Effects Monitoring Program of the OC. The results of the EEMP are discussed in the Environmental Effects Monitoring Report by Stantec Consulting Ltd and contained in Appendix B of this report.

## 2 Background

FRWMF opened in November 2016 and is owned and operated by the Regional District of Kitimat-Stikine (RDKS). It is located 40 km south of the City of Terrace at 3112 Highway 37. Access is via the North Kitimat, Chist Creek, and Scully Creek Forest Service Roads. FRWMF is responsible for the management of municipal solid waste (MSW) and liquid waste generated from commercial, residential, and institutional sources in the greater Terrace area in accordance with the Regional District Kitimat-Stikine

Solid Waste Management Plan, which was approved by the Minister in 2022. Most solid waste received is consolidated at the Thornhill Transfer Station (TTS), also owned and managed by the RDKS, and hauled to FRWMF for final disposal.

Landfill operations are regulated by ENV under the OC, issued in November 2008, and most recently amended in November 2021. Operations are conducted in accordance with the Forceman Ridge Landfill Design Operations and Closure Plan (DOCP) prepared by Sperling Hansen Associates in 2017. Waste is accepted for disposal at FRWMF under Bylaw No. 671 (as amended) which outlines accepted, restricted, and prohibited wastes, as well as tipping fees.

The footprint for the Waste Management Facility lease is 53.5 ha in size; this area includes buffer reserves. FRWMF (Figure 1) contains a compost facility, septage receiving facility, an engineered landfill, five stage leachate treatment and detection system, and a phytoremediation orchard. Currently the landfill filling is in lift 5 of Phase 1A.



**Figure 1 Overview Forceman Ridge Waste Management Facility**

## 2.1 Landfill

The landfill is double lined with a high-density polyethylene and clay matting composite with leachate capture. Captured leachate is pumped to a 90,000 m<sup>3</sup> equalization pond. Leachate is then pumped from the equalization pond to the aeration pond, which has 30 diffusers for bio-oxidation treatment. After treatment in the aeration pond, leachate flows passively to the sedimentation pond, which allows for settling of biomasses and suspended solids. Treated leachate is then sent through a sand filter and discharged to the phytoremediation orchard or rapid infiltration ditch during April through October.





In Summer of 2022 the construction of Cell 1B commenced with a partial completion in November of 2022. The cell was approximately 50% completed and was used over the winter months with a forecasted completion of spring 2023. The closure of Cell 1A will not occur until 2023.

## 2.2 Compost Facility

Since November 2016, FRWMF has operated a compost facility for residential as well as institutional, commercial, and industrial (ICI) organics in the Terrace area. Residential organics are collected curbside, or residents can self-haul their organics to the Thornhill Transfer Station. Organics collection for businesses and industry is through contracted commercial haulers. Collected organics are taken to the Thornhill Transfer Station, consolidated, and hauled to the FRWMF Compost Facility. The City of Terrace operates a yard and garden curbside waste collection service from May to September for City of Terrace residents only; it is windrow composted and the finished product is used in municipal parks and community garden areas.

The FRWMF Compost Facility utilizes a Gore® composting system and has the capability of producing Class A compost. The facility hosts three windrow stations inside a Mega-Dome®, and two outdoor curing bays. Collected organics are mixed with hog fuel collected from a local sawmill or from chipping diverted untreated and unprocessed wood residue. Temperature, oxygen, and moisture levels are monitored during the composting process. It takes approximately eight weeks to generate Class A compost. The finished compost is initially slated to be used as final cover material for final closure of the Thornhill Landfill, as well as to close future phases of the Forceman Ridge Landfill. Leachate from the compost facility is collected and stored in separate containment near the compost facility. The collected leachate is used for additional moisture for the compost; any surplus of compost leachate is diverted into the leachate treatment process.

## 3 Waste Disposal

The FRWMF serves residents and business in the greater Terrace area. Waste from approximately 19,606 residents and 8,661 dwellings<sup>1</sup> is disposed of at the FRWMF. In addition to residential, commercial, and ICI users within the service area, the facility accepts waste from several work camps and construction sites in the District of Kitimat, including the LNG Canada and Coastal Gas Link Pipeline projects.

The FRWMF accepts waste from tax-paying, “in service-area” users, as well as waste from non-taxpaying, “out of service-area” users. The service area includes Electoral Area C, Electoral Area E (Thornhill), and the City of Terrace. Out of service-area users refer large to industry, short-term projects and work camps within the region, and the District of Kitimat who operates a landfill for their residents. Solid waste collected through the curbside collection programs or self-hauled to the Thornhill Transfer Station, is sorted, compacted, and hauled to the Forceman Ridge WMF.

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<sup>1</sup> 2021 Census Canada Population and Dwelling Counts



In April 2021, the District of Kitimat passed an amendment to the Municipal Code with the adoption of a new solid waste bylaw that would prohibit waste from industrial workcamps and industrial construction sites from being accepted at the Kitimat Landfill<sup>2</sup>. The RDKS has been accepting C&D waste from industry within the District of Kitimat since 2017 when deconstruction of the former Methanex site commenced. The prohibition of industrial camp waste resulted in an increase in MSW received at FRWMF in 2022.


Out of service-area waste is charged under its own rate schedule under the bylaw, with an additional 50% surcharge. The rate schedule was established in 2021, and the surcharge was raised from 25% to 50%. In 2022, most transactions at the Forceman Ridge WMF were from out of service-area users. The total user counts, including transactions from the Coastal Gas Link and LNG Canada projects, are provided in Table 2.

The annual totals from January through December 2022 of MSW received at the Forceman Ridge WMF are shown in Table 3. Tonnages of diverted wastes are also included in the Table 3. Out of service area waste comprised 46% of the total waste landfilled and 70% of diverted solid waste (excluding septage) at the Forceman Ridge WMF in 2022. Operational waste, which is waste transferred from the TTS, accounted for 39% of waste received at the facility over the year.

In 2022, a total of 19,513 tonnes of municipal solid waste including out-of-service area waste, refuse, construction and demolition waste (C&D), and various types of controlled waste were disposed of within Phase 1A, lifts 3 and 4 of the Forceman Ridge Landfill. An additional 8,074 tonnes of diverted waste was received, including soil, clean wood, metal, concrete, and organics through the compost facility.

**Table 2: Count of Transactions at FRWMF in 2022**

User Type	Count of Scale Transactions
<b>In Service-Area</b>	<b>1,221</b>
General Controlled Waste	577
Operational Hauling from TTS	644
<b>Out of Service-Area</b>	<b>2,931</b>
General Controlled Waste	444
Coastal Gas Link Waste	369
LNG Canada Waste	2,118
<b>Total</b>	<b>4,152</b>



In service-area waste received at FRMWF in 2022 totaled 14,662 tonnes (including septage), with 3,997 tonnes of this waste being diverted from disposal in the landfill. Out of service-area waste received at FRWMF in 2022 totaled 13,018 tonnes, with 4,077 tonnes of this waste being diverted from disposal in the landfill including clean wood, soil, concrete, and organic waste.

<sup>2</sup> District of Kitimat Regular Council Meeting Agenda, September 20, 2021 [https://www.kitimat.ca/en/municipal-hall/resources/Documents/Council-Meetings-and-Agendas/Agendas/2021\\_09\\_20\\_Agenda\\_Final.pdf](https://www.kitimat.ca/en/municipal-hall/resources/Documents/Council-Meetings-and-Agendas/Agendas/2021_09_20_Agenda_Final.pdf)



The RDKS began tracking waste from outside of the service area in 2021. Waste designated as outside of the service area in Table 4 prior to 2021 is based on the billing account for out of service area users where it could be determined that the waste associated with a billing account was from outside of the service area. In service area waste from 2016 to 2019 includes waste from outside of the service area that was hauled from local waste haulers and billed back to the waste generator by the hauler. Lifetime disposal tonnages of waste, including airspace and non-airspace consuming material for the FRWMF are shown in Table 4 and Figure 2.

**Table 3: Landfilled and Diverted Waste Tonnages by In Service-Area and Out of Service-Area Users**

Waste Type	Tonnes In Service-Area	Tonnes Out Service-Area	Total Tonnes
<b>Landfilled Waste</b>	<b>10,569</b>	<b>8,941</b>	<b>19,607</b>
Tipped Waste	1,250	8,941	10,285
Asbestos	52	5	57
C&D	1,184	8,580	9,764
Refuse	14	357	371
Compost Residual*	93	-	93
Hauled Refuse from TTS	9,322	-	9,322
<b>Diverted Waste</b>	<b>3,997</b>	<b>4,077</b>	<b>8,074</b>
Tipped Waste	2,594	4,077	6,670
Clean Wood	138	1,913	2,051
Concrete	5	775	781
Organics	-	880	880
Septage	2,258	-	2,258
Soil	193	508	700
Hauled from TTS	1,403	-	1,403
Clean Wood	82	-	82
Organics	1,186	-	1,186
Yard & Garden	136	-	136
<b>Total</b>	<b>14,662</b>	<b>13,018</b>	<b>27,680</b>



\* Compost residual moved to Cell 1B for use as cushion layer on the liner, compost residual is an operational waste and recorded as in service area.



**Table 4: Lifetime Tonnages of Airspace and Non-Airspace Consuming Waste Received RWWMF**

Year	Tonnes ASC	Tonnes Non-ASC	Total
<b>2016</b>	<b>602</b>	<b>223</b>	<b>825</b>
In SA	602	223	825
Out of SA	-	-	-
<b>2017</b>	<b>8,460</b>	<b>3,049</b>	<b>11,509</b>
In SA	8,083	2,386	10,469
Out of SA	377	663	1,040
<b>2018</b>	<b>8,754</b>	<b>4,625</b>	<b>13,380</b>
In SA	8,580	2,739	11,319
Out of SA	175	1,886	2,061
<b>2019</b>	<b>10,875</b>	<b>5,590</b>	<b>16,465</b>
In SA	8,848	2,466	11,314
Out of SA	2,027	3,124	5,151
<b>2020</b>	<b>15,290</b>	<b>14,698</b>	<b>29,988</b>
In SA	9,679	3,666	13,345
Out of SA	5,611	11,032	16,643
<b>2021</b>	<b>14,840</b>	<b>4,855</b>	<b>19,695</b>
In SA	11,189	3,026	14,210
Out of SA	3,657	1,829	5,485
<b>2022</b>	<b>19,607</b>	<b>8,074</b>	<b>27,680</b>
In SA	10,569	3,997	14,662
Out of SA	8,941	4,077	13,018
<b>Total</b>	<b>78,428</b>	<b>41,113</b>	<b>119,542</b>



The total waste in place at FRWMF landfill at the end of 2022 was 78,428 tonnes from a total of 119,542 tonnes of waste received at the site. The DOCP projected that at the end of 2023, the landfill would have received 81,511 tonnes of waste into the landfill, with five years remaining in Cell 1A<sup>3</sup>. The total waste landfilled at the end of 2022 was slightly ahead of the projected tonnage, but the airspace consumption was significantly higher. Airspace consumption at the site is discussed in further detail in Section 5.6 of the report.

<sup>3</sup> Regional District of Kitimat-Stikine Forceman Ridge Regional Landfill Design, Operations and Closure Plan, 2018, Sperling Hansen Associates, Table 12-12

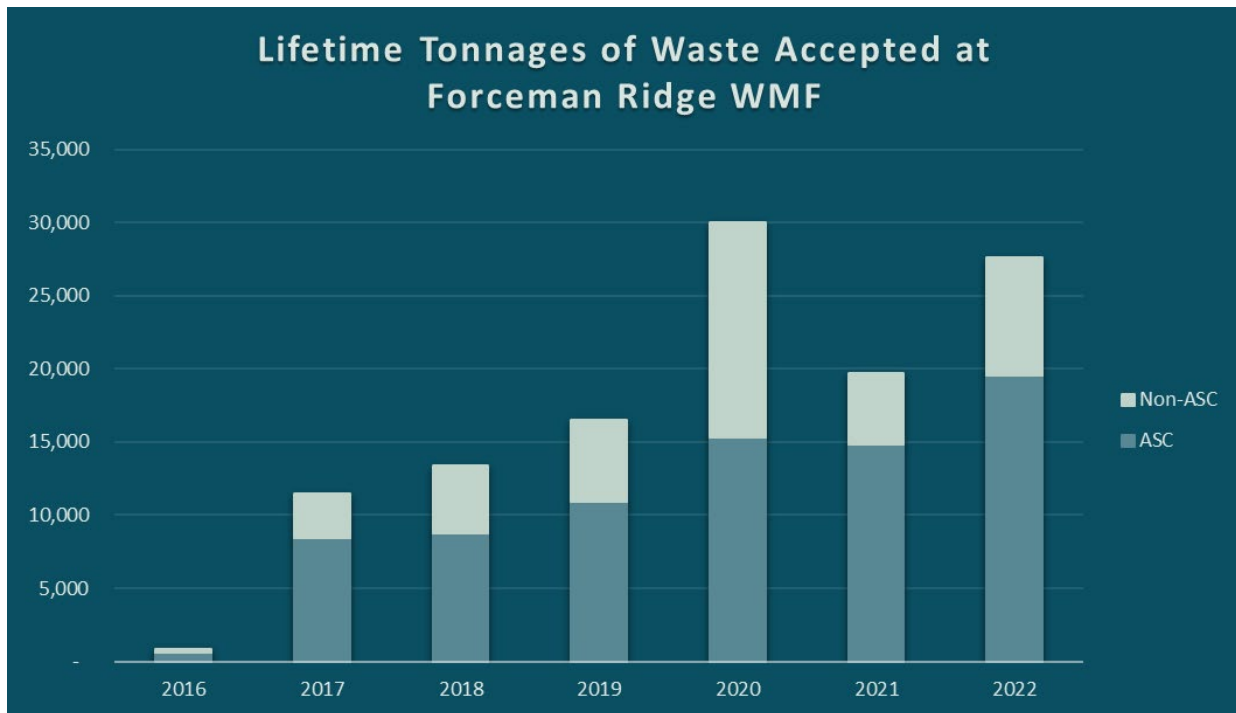


Figure 2: Lifetime Tonnages at FRWMF for Airspace Consuming and Non-Airspace Consuming Waste

### 3.1 Landfilled Wastes

Landfilled waste is disposed in the active face of the landfill. This waste includes asbestos, C&D, land clearing waste, and refuse.

#### *Asbestos*

Asbestos containing waste, including waste asbestos as defined in the HWR, generated from residential, commercial, and institutional customers is accepted in the Forceman Ridge Landfill through the Controlled Waste application process. Asbestos containing waste is received at the landfill using approved containment methods under Section 40 of the HWR and is accepted by scheduled appointment for immediate burial in the landfill.

On February 20, 2021, FRWMF became a Registered Site under the Hazardous Waste Regulation (HWR) for asbestos. As a Registered Site, unlimited amounts of asbestos can be accepted for final disposal in accordance with section 40 of the HWR. A condition of this authorisation is that asbestos received onsite be reported in the annual report. The HWR registration site number for FRWMF is 110582 (Appendix C).

Asbestos disposed at FRWMF totalled **57 tonnes** from a total of 46 tip events.

#### *Construction and Demolition*

C&D waste accepted at FRWMF includes painted and treated wood waste, demolition waste, construction waste products from out of service area, and from loads greater than 5 m<sup>3</sup> from within the



service area. In 2022, **9,763 tonnes** of construction and demolition waste was disposed of in the Forceman Ridge landfill, with 8,579 tonnes of this total coming from outside of the service-area.

### *Land Clearing Waste*

Land clearing waste is defined as waste produced from the clearing of land for development, including trunks, stumps, tree branches 75 millimeters in diameter or greater, treetops, and whole trees. Land clearing debris does not include other organic materials, such as vegetative matter, tree branches under 75 millimeters, and compostable structural wood waste. Due to presence of rock and gravel within this land clearing debris, this material is often deposited in the landfill. In 2022, no land clearing waste was disposed of at the landfill.

### *Refuse*

Refuse includes general municipal solid waste transferred from the TTS (curbside refuse, commercial and self hauled refuse, and small loads of C&D waste), City of Terrace wastewater treatment plant screenings, and industrial work camp refuse received at FRWMF through the non-controlled waste permitting process. In 2022 **9,321 tonnes** of refuse was received from the TTS and tipping at FRWMF, with 356 tonnes of this total coming from outside of the service-area.

### *Compost Residuals*

Compost residuals includes the overs from screened compost that are too heavily contaminated to be recirculated back into the compost facility, and contaminated compost feedstock. The overs from compost screening includes large pieces of yard and garden, animal bones, plastics, and other large contaminants from the MSW waste stream that are screened out of the compost. Contaminated compost feedstock includes curbside organics that contain bagged MSW, and a large composition of plastic waste. In 2022, compost residuals from the compost facility were composed of failed compost batches that did not meet the requirements for Class A compost. In 2022, **294 tonnes** of compost residual was used to line the floor of the new Cell1B to provide a cushion layer that will protect the liner of the landfill cell.

## **3.2 Diverted Wastes**

Diverted waste includes materials that are recycled on site, such as asphalt shingles, concrete, contaminated soils, metal, and materials diverted from the landfill for disposal through other avenues, such as septage received in the septage bays, and organics accepted in the compost facility.

### *Clean Wood Waste*

Clean Wood means wood that is free of glue, laminate, paint, treatment, and may include small metal fasteners but does not include plywood or OSB. Clean wood is segregated, and either burned as prescribed in the Operational Certificate or chipped and used as hog fuel in the compost facility. In 2022, **2,051 tonnes** of clean wood waste were received from the TTS and tipping at FRWMF, with **1,913 tonnes** of this waste received from outside of the service-area.





### *Broken Concrete*

Concrete includes concrete with or without rebar, in pieces less than 300mm at their widest width. Broken concrete is used as alternative daily cover for waste. In 2022, **780 tonnes** of broken concrete were received at the facility, with **775 tonnes** of this waste received from outside of the service-area.

### *Contaminated Soils*

Contaminated soil, including soil with contaminants greater than the industrial criteria of the Contaminated Sites Regulation, but less than hazardous waste, as defined by the HWR, are accepted for disposal at FRWMF. Soil, including contaminated soils, fall into two categories, soils suitable for cover and soils not suitable for cover. Soils are suitable for cover if they are mineral soils that are not clay or organic soils. In 2022, **880 tonnes** of contaminated soil was accepted from outside of the service-area.

### *Metals*

Metals are not accepted at Forceman Ridge. Unauthorized metal that comes commingled in loads is segregated on-site and sold at market value to local recyclers. Metals are accepted for free at several scrapyards within the Terrace area. No metals were recorded as received at the facility during 2022.

### *Organics*

Organics includes food scraps that are received from commercial sources, industrial work camps, and from the curbside program for the City of Terrace, Electoral Area E, and parts of Electoral Area C. Organics are composted through the compost facility and used for landfill closure projects. In 2022, **2066 tonnes** of organics were received in the composting facility from the TTS and industrial work camps, with **880 tonnes** of this total coming from out of the service-area.

### *Septage*

Septage includes septic tank pumpage and treated sewage sludge, but does not include other sewage wastes (wastewater, sewage or slurry, including catch basins, oil water separators, or shop floor drains). Septage is disposed of directly in the Forceman Ridge septage receiving facility. The facility has two lagoons (septage bays) available for disposal which dewater the septage. Liquid from dewatering is treated in the leachate treatment system.

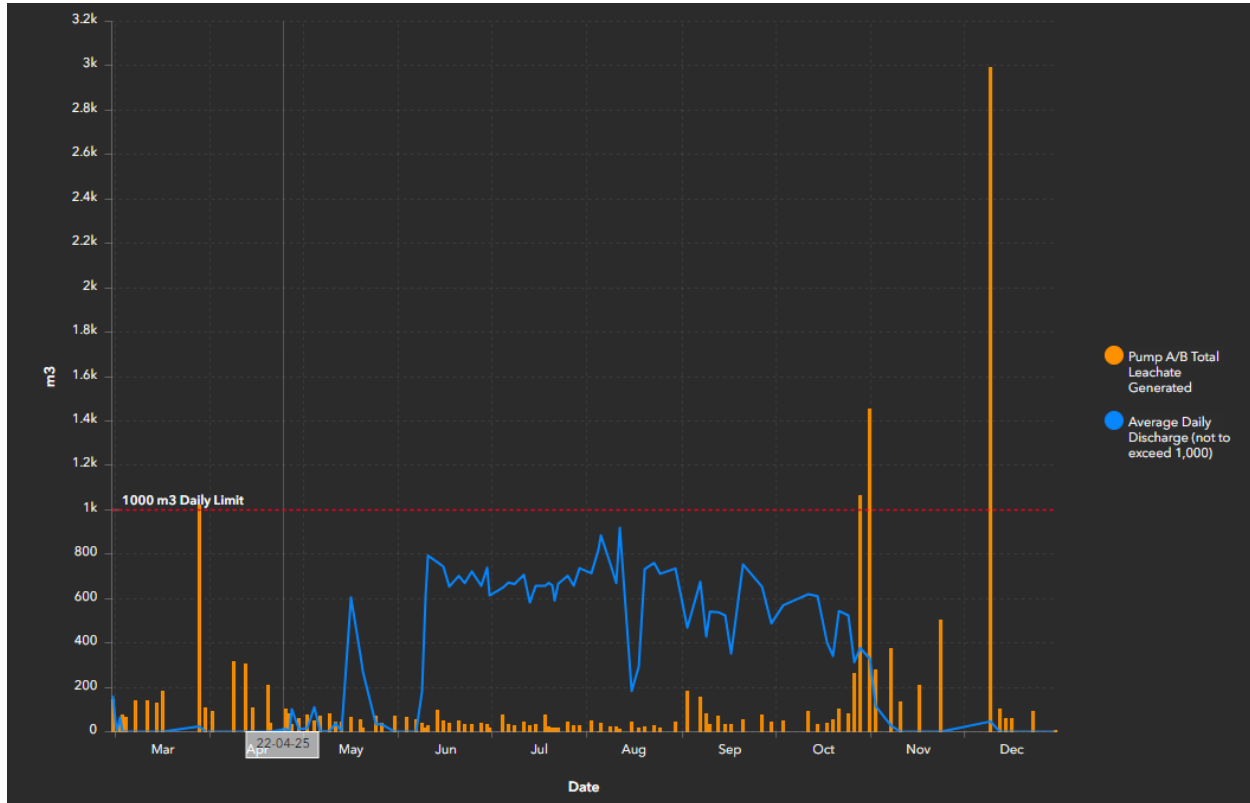
In 2022, **2,258 tonnes** of septage were disposed of in the septage facility. Dewatered solids cleaned from the bottom of the septage bays are mixed with wood chips and the resulting product is windrowed in a designated location on the landfill footprint.

## **3.3 Effluent Discharge**

Treated effluent from the landfill is discharged to the phytoremediation orchard, or to the rapid infiltration ditch, as authorised under s.2.4.1 and s.2.4.3 of the OC. Discharge of treated effluent is authorised at a rate of 1,000 m<sup>3</sup>/day, and an average rate of discharge of 400 m<sup>3</sup>/day. Leachate is required to meet the limits of s.2.4.2 and is sampled prior to discharge each spring. Sampling of leachate was completed twice in 2022 and did not exceed the authorised limits.



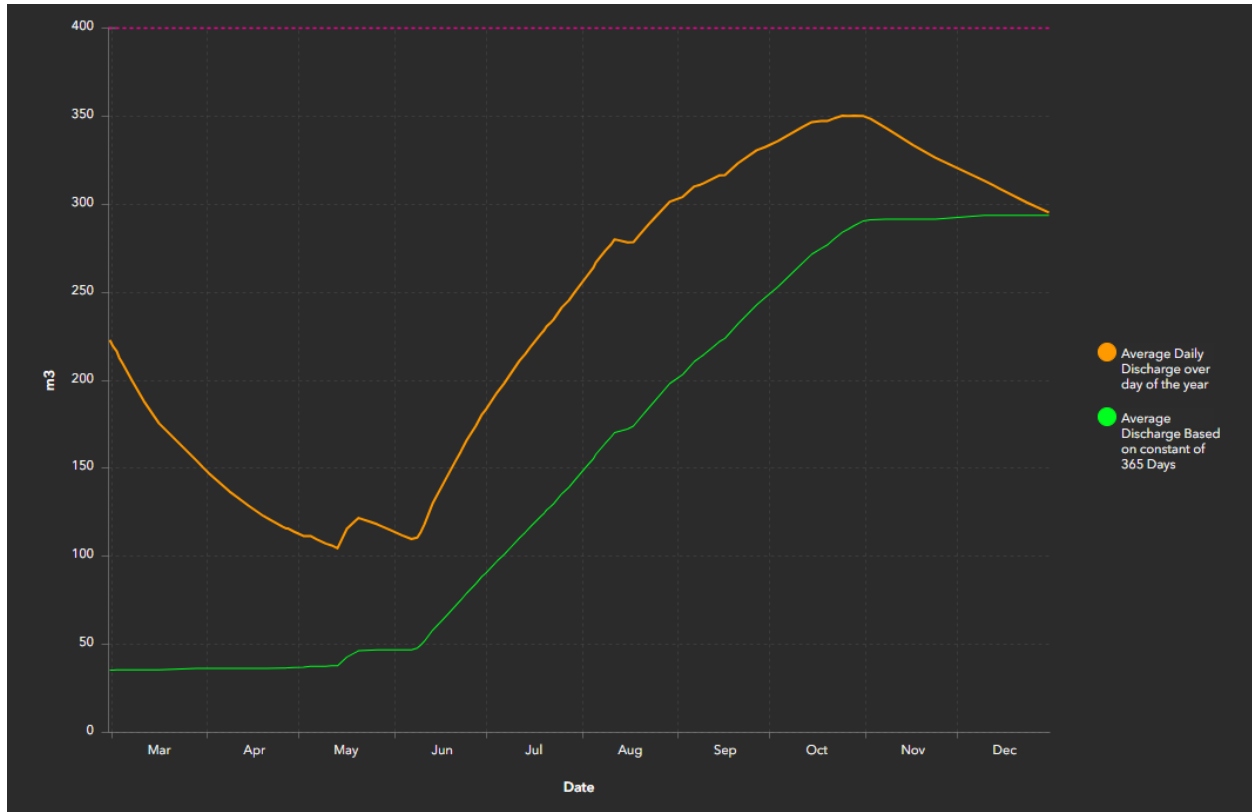
Discharge volumes are tracked through a flow meter prior to discharge to the phytoremediation orchard and rapid infiltration ditch. Landfill leachate generation volumes are tracked through a flow meter on a leachate conveyance line to the equalisation pond. The pumped volumes, and average daily discharge are shown in Figure 3. The average annual rate of discharge is shown in Figure 4.



**Figure 3: Daily Discharge and Pump Volumes**

In 2022 a total of 107,156.7 m<sup>3</sup> of treated effluent was discharged under the authorisation, with 89,002 m<sup>3</sup> discharged to the phytoremediation orchard, and the remaining 18,155 m<sup>3</sup> discharged to the rapid infiltration ditch. The total volume of landfill leachate generation in 2022 was 20,405 m<sup>3</sup>.

The Authorisation does not specify how the average rate of discharge is calculated. The average has been calculated using a constant denominator of 365 days and using day of the year as a denominator. Under both formulas, the average rate discharge over the year did not exceed the authorised volume limits in 2022.



**Figure 4: Average Annual Rate of Discharge as a Function of 365 Days in a Year, and as a Function of Day of the Year**

## Open Burning

Burning of clean wood takes place per the requirements of the OC. In 2022 there were three occurrences of Open Burning resulting in approximately 9,850 tonnes of clean wood burned. Table 5 below displays the timing and quantities of the burns which occurred in 2022.

**Table 5: Controlled Burns at FRWMF**

Date Range of Burn	Volume of Clean Wood (m3)	Tonnes of Clean Wood**
April 10 to 16, 2022*	1,250/600/2,500	436.1
December 18 to 24, 2022	3,000	300.8
November 6 -12, 2022	2,500	250.7
<b>Total</b>	<b>9,850</b>	<b>987.6</b>

\* Three clean woodpiles were burned during the April burning event.

\*\*Volume to weight conversions factors for solid waste United States Environmental Protection Agency, 2016 for dimensional lumber.



## **4 Wildlife Occurrences and Observations**

The Forceman Ridge WMF is located in an area with bears, wolves, coyotes, several species of birds of prey, and many other species of mammals that may attempt access to the facility. To prevent wildlife from gaining access, the entire facility is enclosed in a 2.1-metre-high composite electrified fence. To prevent vectors from gaining access to the landfill active face, Revelstoke Iron Grizzly (RIG) plates are used as alternative daily cover and are positioned on the active face at the end of each day to cover all waste. Soil from site is used as intermediate cover.

Facility operators are required to inspect the fence line weekly, testing for proper voltage, proper tension on fence stands, overall condition of the fence, and signs of wildlife activity. The results of the inspections are recorded on the Daily Operation Inspection Forms.

There were no mammalian wildlife incidents or encounters observed during 2022 at the FRWMF.

### **4.1 Bird and Vector Control**

Birds, such as ravens and crows, are a nuisance at landfill sites, as they can scatter litter into the surrounding environment. Bird control at Forceman Ridge WMF is based on thorough and complete cover of waste. The active face is only exposed when a load of waste is delivered to the landfill. Between loads, the active face is covered with the RIG plates or alternative daily cover. There was minimal vector activity from birds, including raptor species (bald eagles), and corvid species (crows and ravens).

## **5 Operations and Maintenance**

### **5.1 Complaints Received**

No complaints were received regarding Forceman Ridge WMF in 2022.

### **5.2 Annual Inspection of Cover System and Works**

An annual inspection of the cover system was not completed in 2022.

### **5.3 Waste Cover**

Volumes of waste cover are captured in the routine airspace and compaction surveys. Dates of and application, and total volume applied were not tracked in 2022.

### **5.4 OC Amendments and Authorisations**

On December 1, 2022, the RDKS received a temporary authorisation for the disposal of bird carcasses infected with Avian Influenza, which are considered a hazardous waste (). The temporary authorisation granted the RDKS permission to accept carcasses infected with Avian Influenza for the proceeding 90 days (Table 6). In 2022 no Avian Influenza carcasses were received.



**Table 6: Description Temporary Authorisations, and OC Amendments in 2022**

Temporary Authorisation Date & Section of OC	Description
December 1, 2022 Section 1.1.2 Characteristics of Discharge	To allow for Avian Influenza Disease infected carcasses in compliance with the Hazardous Waste Regulation for a period of 90 days.



## 5.5 Non-Compliance Reports

There were no non-compliance reports submitted for FRWMF in 2022.

## 5.6 Airspace and Compaction

One airspace and compaction study was completed in 2022 to measure the air space consumed and waste density achieved. The study looked at the volume of waste accepted at the facility, and the volume of soil removed from the borrow pit. The results of the airspace compaction reports are expressed as waste density (tonnes/m<sup>3</sup>) and a ratio of waste to cover. The optimal waste density is 0.75 tonnes/m<sup>3</sup> and the optimal waste to cover ratio is 4 to 1. The results of the airspace compaction survey completed in 2022 is listed below:

- Nov. 9, 2022 – 0.82 tonnes/m<sup>3</sup> and 1.81:1

The remaining estimated life capacity of the FRWMF Landfill was not included in the scope of the 2022 airspace compaction survey. Based on the DOCP the landfill is projected to be full in 2123, 100 years from the end of 2022. Phase 1A would receive approximately 141,000 tonnes of waste under ideal cover use and compaction conditions, with Cell 1B accepting waste beginning in 2029. Cell 1A received its last load of MSW waste in December 2022, following the commissioning of Cell 1B, and will only be used for asbestos disposal in 2023. The FRWMF landfill is six years ahead of projection for expansion, with a remaining life expectancy of 94 years. The FRWMF landfill has received waste for six complete years, suggesting that under current conditions the landfill life expectancy may be 50% lower. Improving compaction and reducing excess cover use is imperative to ensure the remaining life of the landfill can be fully utilised.

## 5.7 Landfill Gas Management

Landfill gas collection and flaring has not been initiated at the Forceman Ridge WMF. The Forceman Ridge site is now in the planning stage of landfill gas collection. Identifying the volumes of waste landfilled and the composition of this waste will aid in calculating landfill gas generation and inform landfill gas collection designs for the existing cell as well as the new cell in construction. The RDKS will be exploring next steps for landfill gas management in 2023.



The Landfill Gas Management Regulation (LGMR) sets requirements under the regulation for Regulated Landfill Sites.

The LGMR defines a “Regulated Landfill Site”, as a landfill site that:

- (a) has 100,000 tonnes or more of municipal solid waste in place, or
- (b) receives 10,000 or more tonnes of municipal solid waste for disposal into the landfill site in any calendar year after 2008;

Regulated Landfill Sites are required to have an initial assessment completed by a qualified professional, to monitor and maintain records on the quantity and sources of MSW received for disposal at the landfill site, and report on the composition of waste received for disposal at the landfill site if a waste composition analysis has been performed. Regulated landfill sites must also produce an annual report for the site including all applicable topics of section 12 and 14 of the LGMR, which includes the description of any diversion program used at the site.

An Initial Landfill Gas report is required to be filed to the director when the annual quantity of municipal solid waste received for disposal into the landfill site reaches or exceeds 10, 000 tonnes. This report must be filed by March 31 of the year immediately following the year in which the annual quantity of municipal solid waste received for disposal into the landfill site reaches or exceeds 10, 000 tonnes.

In 2019, 2020, 2021 and 2022, greater than 10,000 tonnes of waste, excluding cover soils, was disposed of in the landfill (Table 4). The initial landfill gas generation assessment required under the LGMR was submitted to ENV in 2021. Annual reports required under the LGMR have not been filed FRWMF. The RDKS will consult with ENV to determine corrective action and timeline to complete outstanding reporting requirements.

## **5.8 Leachate Collection System**

In October of 2022 the aeration pond was drained for maintenance. The level of sludge was measured, and samples were submitted for analysis, including dioxins, PAHs, and TCLP metals, for comparison against the HWR, and the Contaminated Sites Regulation (CSR) to determine if dewatered sludge can be landfilled on site. The results of the analysis confirm that the material may be treated as IL- material and be dewatered and discharged into the landfill.

The sludge level as below 300 mm. The Forceman Ridge Operations Manual prescribes removal of sludge every five years, or whenever the sludge level is higher than 300 mm after draining.





**Figure 5: Aeration Pond After Dewatering, October 19, 2022**

## **5.9 Phytoremediation**

The phytoremediation orchard and the treated leachate system were started back up in March 2022, with system resuming discharge to the orchard in April 2022. Spring re-commissioning included a check of all spitters and tubing being in adequate working condition prior to discharge. The system was drained and prepared for winter storage during the month of November 2022.

There was no brushing or pruning maintenance performed on the phytoremediation orchard during 2022. The phytoremediation orchard received 89,002 cubic metres of treated effluent in 2022.



**Figure 6 Phytoremediation Orchard as seen on March 31st, 2022.**

## **5.10 Fence Maintenance**

Fence inspections are done weekly by the Operations Contractor and recorded on the weekly inspection logs. The facility fence was in good working condition over the duration of 2022.

The perimeter fence at Forceman was expanded in 2022 to accommodate the landfill expansion construction and is discussed in further detail in section 6.1 below.

## **5.11 Scale Maintenance**

Scale maintenance and calibration was performed on the scales at FRWMF by a qualified contractor on the following dates:

- March 31, 2022
- November 7, 2022

Scale reports are available in Appendix D.



## 5.12 Operational and Maintenance Expenditures

Operation and maintenance of the Forceman Ridge Waste Management Facility totaled \$,,619,546 in 2022. This included the operations of the Thornhill Transfer Station where residential, commercial, curbside and ICI waste from within the service area is hauled from. Maintenance expenses totalled \$111,501 in 2022.

## 6 Construction

Capital construction projects completed in 2022 included expansion of the perimeter wildlife fence, and construction of cell 1B.

### 6.1 Fence Expansion

In 2021 the RDKS awarded a contract to expand the perimeter wildlife fence to accommodate landfill expansion works planned for 2022. The expanded fence was designed to accommodate both the immediate landfilled expansion needs for Phase 1B, as well as all phases 3, 4, 5, 6 and 7. The fence construction was completed in January 2022, increasing the total fence perimeter from 1,802 m to 2,055 m at the site.

### 6.2 Expansion Works

Expansion works were initiated in 2022 to construct the next landfill cell of Phase 1, cell 1B. Construction was split into Stage 1 and Stage 2. Stage 1 was completed in fall of 2022, and Stage 2 was started in 2022 and paused for the winter. Figure 7 shows the berm and liner of Cell 1B during construction. Following the completion of Stage 1, a layer of organic material and residuals from the compost facility was deposited onto the floor of the phase to provide a cushion layer. The volume of this material was 441 cubic metres.

### 6.3 Closure Works

No closure works completed in 2022. Scoping of progressive closure of Cell1A is planned for 2023.

## 7 Projected Operational Plan

Operational plans for 2023 at FRWMF include completing a conformance review for the facility and the compost facility, updating the DOCP, and preparing a Facility Operational Plan for the Compost Facility. A list of tasks slated for completion in 2023 is included in Appendix E. Tasks are subject to budget approval and may change or be deferred subject to competing priorities a risk-based approach.





**Figure 7: Construction of Cell 1B**

## **8 Environmental Monitoring**

The RDKS performed regular monitoring and sampling of surface water, groundwater, and leachate at the FRWMF in accordance with the OC. The details of the Facility water quality monitoring program, including results of groundwater, surface water, and treated leachate discharge monitoring are discussed in *Forceman Ridge Waste Management Facility 2022 Annual Environmental Effects Monitoring Report*, prepared by Stantec, and contained in Appendix A of this report.

### ***Groundwater***

Sixteen groundwater wells were monitored in 2022. Two background wells, eight early detection and six located further beyond the early detection zone which were monitored for water elevation. The wells were monitored quarterly and sampled annually. In-Situ parameters were monitored using a YSI and TLC Depth Tape. A Waterra Hydrolift was used for purging wells and drawing water for filling lab provided sampling kits. Lab samples were collected in sample bottles and shipped to ALS for analysis.



### *Surface Water*

Five surface water sampling and monitoring locations located downgradient to the West of the landfill were monitored in 2022. These sites were located on, or connected to, Onion and the Clearwater Lakes. The sites were monitored quarterly and sampled annually during the lowest stream flows. In-Situ parameters were monitored using a YSI and flow meter. Lab samples were collected in sample bottles and shipped to ALS for analysis.

### *Facility*

Two facility compliance points were monitored in 2022. One for treated leachate prior to discharge to the phytoremediation area and a composite soil sample from the phytoremediation area. The treated leachate prior to the phytoremediation orchard was monitored quarterly and sampled annually. It was monitored with a YSI as well as an In-Situ LaMotte iron test kit. The phytoremediation soil was sampled once, prior to the start of discharge. Lab samples were collected in sample bottles and shipped to ALS for analysis.

## **9 Summary**

During 2022, 19,866 tonnes of refuse, including garbage, construction and demolition materials, and controlled waste, were disposed in the Forceman Ridge landfill; 7,721 tonnes of materials were diverted from the landfill. Diverted materials include 2,022 tonnes of organic feedstock for the compost facility, 700 tonnes of contaminated soils, and 2,133 tonnes of clean wood. Cell 1B was partially completed and commissioned in December with Cell1A designated for the continued burial of asbestos waste received at the site. Annual reporting required under the LGMR has not been completed FRWMF. The RDKS will consult with ENV to determine corrective action and timeline to complete outstanding reporting requirements.

With the construction and commissioning of Cell 1B, the FRWMF landfill is six years ahead of projection for expansion and has a remaining life expectancy of 94 years. Under current operational conditions the landfill life expectancy may be 50% lower. Improving compaction and reducing excess cover use is imperative to ensure the remaining life of the landfill can be fully utilised. The RDKS intends to complete a subsequent airspace survey in Summer 2023 and will implement a corrective action plan to reduce the rate in which airspace is being consumed by improving operational oversight of compaction and cover use.

Operational projects highlighted for 2022 include a conformance review, DOCP update, and development of the Compost Facility Operations Manual.



**Compiled by:**

A handwritten signature in black ink that reads "Hannah Shinton".

---

**Hannah Shinton, B.Sc, A.Tag**  
Environmental Technologist  
Regional District of Kitimat-Stikine  
hshinton@rdks.bc.ca

**Technical Review by:**

A handwritten signature in blue ink that reads "Nicole Lavoie".

---

**Nicole Lavoie, B.Tech, A.Ag**  
Environmental Services Coordinator  
Regional District of Kitimat-Stikine  
nlavoie@rdks.bc.ca

**Document Certified by:**

A handwritten signature in black ink that reads "Robert Wickie".

---

**Robert Wickie, P.Eng**  
Director of Works and Services  
Regional District of Kitimat-Stikine  
rwickie@rdks.bc.ca





Regional District of  
**Kitimat-Stikine**

## Appendix A Operational Certificates





December 1, 2022

Tracking Number: 419986  
Authorization Number: 17227

REGIONAL DISTRICT OF KITIMAT-STIKINE  
300 4545 LAZELLE AVENUE  
TERRACE, BC  
V8G 4E1

Attention: Erin Blaney, *Solid Waste Manager*, Regional District of Kitimat Stikine

**RE: Hazardous Waste Substitution Letter: Carcasses Infected with Avian Influenza**

In response to the potential need to manage Avian Influenza Disease (AI) infected mortalities at the Forceman Ridge Landfill south of Terrace BC, authorized under Operational Certificate No. 17227, I have reviewed the request you submitted to the ministry on November 29, 2022.

Pursuant to the Environmental Management Act (EMA) section 16(4), I amend OC 17227 section 1.1.2. Characteristics of the Discharge, to also allow for Avian Influenza Disease (AI) infected carcasses in compliance with the Hazardous Waste Regulation (HWR).

Pursuant to the Environmental Management Act (EMA) and the Hazardous Waste Regulation (HWR) and under provisions of Section 2(9), I am hereby substituting the requirements in Parts 3, 4 and Sections 43 and 44 of the HWR for the requirements listed below:

1. This Letter of Substitution under HWR Section 2(9) expires 90 days from the date of issuance. Request for extension may be submitted in writing and addressed to the undersigned.
2. The landfill operates under an approved Waste Management Plan and has a valid Operational Certificate (OC-17227).
3. The waste stream authorized comprises AI-infected waste.
4. The waste is confined during handling, storage, and transportation by packing in a 6-millimetre-thick plastic bag placed within a second 6 mil plastic bag and then sealed.
5. The waste materials are disposed of at the landfill by being immediately buried within a minimum of 0.5 m of cover material.
6. A means of identifying the area of burial and ensuring it remains undisturbed must be in place and immediately available to all persons with access to the site.

7. The owner of the facility must keep for inspection by an officer an operating record at his or her facility and must record in a written or retrievable electronic form the following information:
- a. The quantity in kilograms received,
  - b. The method and date received,
  - c. Identifying information from a shipping document such as a bill of lading if available,
  - d. The date and location of burial.

Please note that although a revised Authorization Document has not been produced at this time a copy of this letter is being placed on the Authorization file, as an addendum to the Authorization, to formally reflect the change.

This Authorization does not authorize entry upon, crossing over, or use for any purpose of private or Crown lands or works, unless and except as authorized by the owner of such lands or works. The responsibility for obtaining such authority rests with the permittee. This Authorization is issued pursuant to the provisions of the *Environmental Management Act* to ensure compliance with Section 120(3) of that statute, which makes it an offence to discharge waste, from a prescribed industry or activity, without proper authorization. It is also the responsibility of the permittee to ensure that all activities conducted under this authorization are carried out with regard to the rights of third parties, and comply with other applicable legislation that may be in force.

This decision may be appealed to the Environmental Appeal Board in accordance with Part 8 of the *Environmental Management Act*. An appeal must be delivered within 30 days from the date that notice of this decision is given. For further information, please contact the Environmental Appeal Board at (250) 387-3464.

Yours truly,



Douglas J. Hill, P.Eng.  
for Director, Environmental Management Act

ENCL:       None

November 24, 2021

Tracking Number: 408044  
 Authorization Number: 17227

REGIONAL DISTRICT OF KITIMAT-STIKINE  
 300 4545 LAZELLE AVENUE  
 TERRACE, BC  
 V8G 4E1

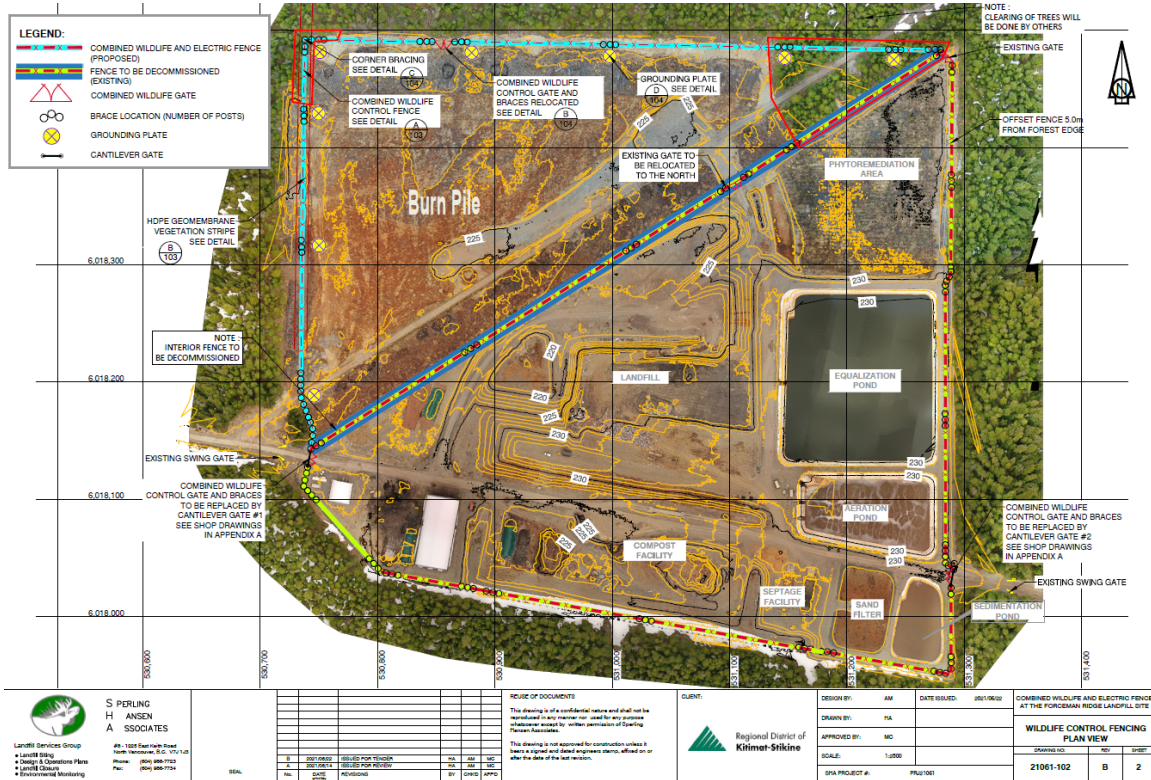
Dear REGIONAL DISTRICT OF KITIMAT-STIKINE,

Your application for an Authorization amendment under the Environmental Management Act

In response to your letter dated October 21, 2021, and pursuant to Section 16(4) of the *Environmental Management Act*, I as the Director approve the following changes to Sections 2.2.3, 2.4.1 and 2.4.3 of the Operational Certificate 17227.

**Section 2.2.3,**

Update to the Site Plan to facilitate relocation of the open burn area as shown on the update of the Site Plan below:



**S PERLING  
 H ANSEN  
 A SSOCIATES**  
 Landfill Services Group  
 • Landfill Site  
 • Design & Operations Plans  
 • Landfill Closure  
 • Environmental Monitoring  
 49-1181 East Main Street  
 North Vancouver, B.C. V1Y 1J8  
 Phone: (604) 448-7733  
 Fax: (604) 448-7734

REV	DATE	DESCRIPTION	BY	CHKD	APPD
1	2021/11/24	ISSUE FOR PERMIT	MC	MC	MC
2	2021/11/24	ISSUE FOR PERMIT	MC	MC	MC
3	2021/11/24	ISSUE FOR PERMIT	MC	MC	MC
4	2021/11/24	ISSUE FOR PERMIT	MC	MC	MC
5	2021/11/24	ISSUE FOR PERMIT	MC	MC	MC

REUSE OF DOCUMENTS  
 This drawing is of a confidential nature and shall not be reproduced or used for any purpose whatsoever without the written permission of Spurling Hansen Associates.  
 This drawing is not approved for construction unless it bears a signed and dated engineers stamp, affixed on or after the date of the last revision.

CLIENT:  
 Regional District of Kitimat-Stikine

DESIGN BY:	AM	DATE ISSUED:	2021/06/30
DRAWN BY:	JIA		
APPROVED BY:	MC		
SCALE:	1:2500		
SPR PROJECT #:	PRJ/1501		

COMBINED WILDLIFE AND ELECTRIC FENCE AT THE FORWARD RIDGE LANDFILL SITE			
<b>WILDLIFE CONTROL FENCING</b>			
PLAN NEW			
DRAWING NO.	REV	DATE	BY
21061-102	B		2

**From: Section 2.4.1 Quantity of Discharge**

The maximum authorized rate of discharge is 609 m<sup>3</sup>/day and the average rate of discharge is 400 m<sup>3</sup>/day. The discharge may occur 24 hours/day, 7 days/week during the months of April to October inclusive.

**To: Section 2.4.1 Quantity of Discharge**

The maximum authorized rate of discharge to the phytoremediation stand and rapid infiltration trenches is 1000 m<sup>3</sup>/day and the average rate of discharge is 400m<sup>3</sup>/day. The discharge may occur 24 hours/day, 7 days/week.

**From: Section 2.4.3 Authorized Works**

The authorized works are leachate collection and treatment facilities including an equalization basin, aeration lagoon, sedimentation pond, sand filter and hybrid poplar plantation and related appurtenances located approximately as shown on the attached Site Plan.

**To: Section 2.4.3 Authorized Works**

The authorized works are leachate collection and treatment facilities including an equalization basin, aeration lagoon, sedimentation pond, sand filter, rapid infiltration trenches, hybrid poplar plantation and related appurtenances located approximately as shown on the attached Site Plan.

Please note that although a revised Authorization Document has not been produced at this time a copy of this letter is being placed on the Authorization file, as an addendum to the Authorization, to formally reflect the change.

This Authorization does not authorize entry upon, crossing over, or use for any purpose of private or Crown lands or works, unless and except as authorized by the owner of such lands or works. The responsibility for obtaining such authority rests with the permittee. This Authorization is issued pursuant to the provisions of the *Environmental Management Act* to ensure compliance with Section 120(3) of that statute, which makes it an offence to discharge waste, from a prescribed industry or activity, without proper authorization. It is also the responsibility of the permittee to ensure that all activities conducted under this authorization are carried out with regard to the rights of third parties, and comply with other applicable legislation that may be in force.

This decision may be appealed to the Environmental Appeal Board in accordance with Part 8 of the *Environmental Management Act*. An appeal must be delivered within 30 days from the date that notice of this decision is given. For further information, please contact the Environmental Appeal Board at (250) 387-3464.

Yours truly,

November 24, 2021

3

Tracking Number:  
Authorization Number:

408044  
17227

A handwritten signature in blue ink, appearing to read "Karen Moores".

Karen Moores, P.Ag.  
Section Head, North Authorizations, Municipal and Smelter Sectors  
Environmental Protection Division  
Ministry of Environment and Climate Change Strategy  
email: Karen.Moores@gov.bc.ca

ENCL:       None



Foreman Ridge

September 19, 2019

Tracking Number: 385635

Authorization Number: 17227

**REGISTERED MAIL**

REGIONAL DISTRICT OF KITIMAT-STIKINE  
300 4545 LAZELLE AVENUE  
TERRACE, BC  
V8G 4E1

RECEIVED  
SEP 24 2019

REGIONAL DISTRICT OF  
KITIMAT-STIKINE

Dear Operational Certificate Holder:

Enclosed is Amended Operational Certificate 17227 issued under the provisions of the *Environmental Management Act*. Your attention is respectfully directed to the terms and conditions outlined in the operational certificate. An annual fee will be determined according to the Permit Fees Regulation.

This operational certificate does not authorize entry upon, crossing over, or use for any purpose of private or Crown lands or works, unless and except as authorized by the owner of such lands or works. The responsibility for obtaining such authority rests with the operational certificate holder. It is also the responsibility of the operational certificate holder to ensure that all activities conducted under this authorization are carried out with regard to the rights of third parties, and comply with other applicable legislation that may be in force.

The Director may require the Permittee to repair, remove, or add to existing works, or to construct new works, and to submit plans and specifications for works specified in this authorization.

The Director may require the Permittee to conduct additional monitoring, and may specify procedures for monitoring, analysis, and procedures or requirements respecting the handling, treatment, transportation, discharge or storage of waste.

This decision may be appealed to the Environmental Appeal Board in accordance with Part 8 of the *Environmental Management Act*. An appeal must be delivered within 30 days from the date that notice of this decision is given. For further information, please contact the Environmental Appeal Board at (250) 387-3464.



Administration of this operational certificate will be carried out by staff from the Authorizations - North Region. Plans, data and reports pertinent to the operational certificate are to be submitted to the Regional Manager, Environmental Protection, at Ministry of Environment and Climate Change Strategy, Regional Operations, Authorizations - North Region, Suite 325 - 1011 4th Avenue, Prince George BC V2L 3H9.

Yours truly,

Karen Moores, P.Ag.  
for Director, *Environmental Management Act*  
Authorizations - North Region



MINISTRY OF ENVIRONMENT  
AND CLIMATE CHANGE  
STRATEGY

**OPERATIONAL CERTIFICATE**

17227

for the

**FORECEMAN RIDGE LANDFILL**

*Under the Provisions of the Environmental Management Act and in Accordance with the  
Regional District of Kitimat-Stikine's Solid Waste Management Plan*

**REGIONAL DISTRICT OF KITIMAT-STIKINE**

**300 4545 LAZELLE AVENUE  
TERRACE, BC  
V8G 4E1**

is authorized to store, handle, treat and discharge municipal waste at a sanitary landfill facility located near Forceman Ridge approximately 30 km south of Terrace, British Columbia, subject to the terms and conditions listed below. Contravention of any of these conditions is a violation of the *Environmental Management Act* and may result in prosecution.

Capitalized terms referred to in this authorization are defined in the attached Glossary. Other terms used in this authorization have the same meaning as those defined in the *Environmental Management Act* and applicable regulations.

Where this authorization provides that the Director may require an action to be carried out, the Permittee must carry out the action in accordance with the requirements of the Director.

This Authorization supersedes and replaces all previous versions of Permit 17227 issued under Section 14 of the *Environmental Management Act*.

Date Issued: November 7, 2008  
Date Amended: September 19, 2019  
(most recent)

for Director, *Environmental Management Act*  
Authorizations - North Region

**1. LOCATION OF LANDFILL PROPERTY**

The location of the property where discharges are authorized to occur is described as District Lot 8128, Range 5, Coast District.

**2. AUTHORIZED DISCHARGES**

**2.1. Municipal Solid Waste**

This section applies to the discharge of municipal solid waste to ground. The site reference number for this discharge is E249849.

**2.1.1. Quantity of Discharge**

The quantity of solid wastes discharged to ground shall not exceed the design capacity of the landfill facility specified as follows: (1) by an engineered final design footprint (see section 3.3); and (2) by engineered excavation and final grade contours (see section 3.4).

**2.1.2. Characteristics of the Discharge**

Subject to sections 6.2, 6.3 and 6.4, the characteristics of the discharge shall be typical of municipal solid waste.

**2.1.3. Authorized Works**

The authorized works are a separate municipal solid waste disposal area and related appurtenances located approximately as shown on the attached site plan.

**2.2. Open Burning Air Contaminants**

This section applies to the discharge of air contaminants to the atmosphere from the regulated open burning of selected combustibles. The site reference number for this discharge is E249850.

**2.2.1. Quantity of Discharge**

The maximum authorized quantity of discharge of air contaminants is indeterminate.

Date Issued: November 7, 2008  
Date Amended: September 19, 2019  
(most recent)

for Director, *Environmental Management Act*  
Authorizations - North Region

2.2.2. Characteristics of the Discharge

The characteristics of the discharge shall be typical of those resulting from the regulated open burning of selected combustibles as per section 11.3.

2.2.3. Authorized Works

The authorized works are a separate burn area associated with a landfill operation and related appurtenances located approximately as shown on the attached Site Plan.

2.3. Liquid Wastes

This section applies to the discharge of selected liquid wastes to the ground. The site reference number for this discharge is E249851.

2.3.1. Quantity of Discharge

The maximum authorized quantity of discharge is indeterminate.

2.3.2. Characteristics of the Discharge

The characteristics of the discharge shall be those typical of septic tank pumpage, holding tank effluent, sewage treatment plant sludges, and wash water and grit from drain sumps at car and light truck wash facilities and parking lots.

2.3.3. Authorized Works

The authorized works are liquid waste storage and treatment lagoons and related appurtenances located approximately as shown on the attached Site Plan.

2.4. Leachate

This section applies to the discharge of leachate to a phytoremediation area. The site reference number for this discharge is E249852.

2.4.1. Quantity of Discharge

Date Issued: November 7, 2008  
Date Amended: September 19, 2019  
(most recent)

  
for Director, *Environmental Management Act*  
Authorizations - North Region

The maximum authorized rate of discharge is 609 m<sup>3</sup>/day and the average rate of discharge is 400 m<sup>3</sup>/day. The discharge may occur 24 hours/day, 7 days/week during the months of April to October inclusive.

2.4.2. Characteristics of the Discharge

The characteristics of treated leachate shall not exceed the following limits:

Total Nitrogen	300 mg/L
Ammonia	214 mg/L
pH	6.5 to 8.5
Chloride	5000 mg/L
Total iron	6 mg/L
Total zinc	100 mg/L
Total cadmium	0.1 mg/L

2.4.3. Authorized Works

The authorized works are leachate collection and treatment facilities including an equalization basin, aeration lagoon, sedimentation pond, sand filter and hybrid poplar plantation and related appurtenances located approximately as shown on the attached Site Plan.

**3. LANDFILL DESIGN**

**3.1. Design by Qualified Professional(s)**

The landfill and associated works [including but not limited to the size(s) and location(s) of disposal area(s), maximum allowable slopes of disposal area(s), leachate management system, progressive and final closure details, etc.] shall be designed by qualified professionals [such as

Date Issued: November 7, 2008  
Date Amended: September 19, 2019  
(most recent)

for Director, *Environmental Management Act*  
Authorizations - North Region

engineer(s) and/or geoscientist(s)] registered in the Province of British Columbia who have expertise in the field of landfill design. Where a design feature prepared by a qualified professional is in conflict with any requirement of this operational certificate, it shall be brought to the attention of the Director who shall determine a resolution to the conflict.

**3.2. Construction**

The landfill and associated works shall be constructed in accordance with the design prepared by qualified professionals.

**3.3. Engineered Footprint**

The landfill design shall include preparation of an engineered final design footprint delineating the maximum extent of solid waste disposal allowable at the facility horizontally (in plan view). The engineered final design footprint shall be clearly shown on a scaled plan of the site and the plan shall be made available in an electronic format as a computer aided design (CAD) drawing.

**3.4. Engineered Excavation and Final Grade Contours**


The landfill design shall include preparation of engineered excavation grade (if below grade landfilling is to occur) and final grade contours delineating the maximum extent of solid waste disposal allowable at the facility vertically (in cross-sectional view). The engineered excavation and final grade contours shall be clearly shown on scaled drawings (accompanied with typical cross sections to aid in depicting the landfill profile) and the drawings shall be made available in an electronic format as computer aided design (CAD) drawings.

**4. LANDFILL GAS MANAGEMENT**

**4.1. Lower Explosive Limit**

The landfill shall be operated such that combustible gas concentrations do not exceed the lower explosive limit in soils at the property boundary or 25% of the lower explosive limit in any on-site or off-site structure or facility, including any services (water, sewer, electrical, etc.).

Date Issued: November 7, 2008  
Date Amended: September 19, 2019  
(most recent)

  
for Director, *Environmental Management Act*  
Authorizations - North Region

## 5. LEACHATE MANAGEMENT REQUIREMENTS

### 5.1. Leachate Containment

The operational certificate holder shall ensure that leachate is contained through the use of a barrier system. The barrier system shall consist of a minimum of 2 metres of natural, *in-situ* clay with a hydraulic conductivity of  $1 \times 10^{-6}$  cm/s or less. Alternatively, an engineered barrier may be used provided it is equivalent to or better than the natural clay barrier specified above. The actual specifications of the leachate containment system shall be set out in the detailed engineering design.

### 5.2. Leachate Collection

A continuous drainage blanket shall be established beneath all landfill phases. The drainage blanket shall consist of, or be equivalent to, a minimum 300 mm thick layer of clean gravel with an effective hydraulic conductivity exceeding  $1 \times 10^{-1}$  cm/s. The leachate collection system shall be designed such that the hydraulic head on top of the barrier layer does not exceed 300 mm at any time.

### 5.3. Protection Against Clogging

The drainage layer shall be protected against sedimentation and bio-chemical clogging. Under no circumstances shall leachate piping or leachate collectors be wrapped in geotextile.

## 6. GENERAL REQUIREMENTS

### 6.1. Site Identification

A sign shall be erected at the main entrance to the site which identifies the following: site name, owner and operator, contact phone number and address, tipping fees (if applicable) and prohibited wastes. The lettering on the sign shall be such that it is clearly readable upon approach.

### 6.2. Prohibited Wastes

No wastes as defined by the *Hazardous Waste Regulation* shall be received, stored or disposed of at this site except as authorized by the Director. Lead-acid batteries shall not be landfilled but may be salvaged/recycled provided they are stored, handled and shipped in compliance with the *Hazardous Waste Regulation* and with section 10 of

Date Issued: November 7, 2008  
Date Amended: September 19, 2019  
(most recent)

for Director, *Environmental Management Act*  
Authorizations - North Region

this operational certificate. Tires equal to or less than 43.2 centimetres (17") in rim size and auto hulks shall not be landfilled.

**6.3. Waste Asbestos**

Notwithstanding section 6.2 of this operational certificate, the disposal of waste asbestos under section 2.1 of this operational certificate and in compliance with the requirements of the *Hazardous Waste Regulation* is hereby authorized.

**6.4. Contaminated Soil**

Soil that contains contaminants in concentrations less than "hazardous waste" as defined by the *Hazardous Waste Regulation* may be disposed at the landfill site. Disposal includes monofilling, co-disposal with other wastes, use as a refuse cell berm material and use as a refuse cell cover material. Disposal must occur within a disposal area as authorized by sections 7 and 8 of this operational certificate. Disposal does not include use as final cover material.

**6.5. Waste Measurement**

The quantity of waste material landfilled at the site shall be measured using a weigh scale or by volume or estimated by means suitable to the Director. The results shall be submitted once per year on or before June 30 for the previous year expressed in tonnes/yr and/or m<sup>3</sup>/yr.

**6.6. Ozone Depleting Substances**

Release of ozone depleting substances from the storage, handling and disposal of used refrigerator equipment, freezers, motor vehicle air conditioners and other air conditioning equipment, fire extinguishers or other equipment containing ozone depleting substances is strictly forbidden as per the requirements of the *Ozone Depleting Substances and other Halocarbons Regulation*.

**6.7. Fire Prevention**

The operational certificate holder shall make all reasonable efforts to prevent unauthorized fires from occurring at the landfill site. As a minimum, a fire break clear of all combustible materials at least 15 metres wide shall surround all disposal, treatment and individual storage areas

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which have received or are receiving combustible materials. Disposal areas that have had 30 cm of compacted mineral soil cell cover or final cover applied are exempt. Water supply and pumping capabilities and/or soil and earth moving equipment shall be maintained at a sufficient level to extinguish fires. In addition, reasonable efforts shall include, but are not necessarily limited to, the preparation of a fire prevention and response plan.

**6.8. Extinguishment of Fires**

In the event of an unauthorized fire (including any smouldering fire), the operational certificate holder shall immediately make all reasonable efforts to extinguish the fire. Any fire which poses a threat to public health or to neighbouring property shall be reported to Emergency Management BC at 1-800-663-3456, the local fire authority, and/or the BC Wildfire Service at 1-800-663-5555.

**6.9. Buffer Zone**

No material shall be landfilled within 50 metres of the property boundary.

**6.10. Litter Control**

The operational certificate holder shall make all reasonable efforts to prevent litter from scattering. Any litter scattered on neighbouring property shall be cleaned up as soon as practicable.

**6.11. Water Table Restriction**

Wastes shall not be deposited or stored less than 1.2 metres above the highest groundwater level.

**6.12. Inert Materials**

Specific inert materials may be exempted from the requirements of section 6.11 by the Director. The permission of the Director must be obtained in writing prior to any disposal or handling of inert materials on an exemption basis.

**6.13. Bear-Proof Containment of Putrescibles**

All putrescible wastes that arrive at the landfill facility must be

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immediately contained within a bear-proof bin (i.e. on-site transfer station of bear-proof design and construction) or within an area enclosed by an electric fence. Grass, leaves, weeds, branches and ground wood waste are not considered putrescible for the purposes of this operational certificate.

## 6.14. Electric Fencing

### 6.14.1. Design, Construction and Maintenance

Wherever required, electric fencing and gate systems at the landfill shall be designed, constructed, and maintained such that bears are prevented from entering into the landfill through any portion of the fence or gates at any time of the day.

### 6.14.2. Fence Type


Fencing may be either high tensile smooth wire or fence fabric (e.g., mesh-wire, page-wire or chain link). The configuration of a high tensile smooth wire fence shall consist of a minimum of eight strands, with four energized strands alternating with four grounded strands as follows: the bottom strand shall be a grounded or (-) strand and shall not be more than 10 cm from the ground (soil) at any location; and thence starting from the bottom strand, the other seven strands shall be spaced  $15 \pm 2$  cm,  $15 \pm 2$  cm,  $15 \pm 2$  cm,  $20 \pm 2$  cm,  $20 \pm 2$  cm,  $20 \pm 2$  cm, and  $25 \pm 2$  cm. Additional strands to this minimum configuration may be used.

A fence fabric may be used instead of high tensile smooth wire. The fence fabric shall: be a minimum of 1.22 metre high; be constructed of a minimum wire thickness of 11 gauge, and have a maximum mesh size of 15 cm. The bottom of the fabric shall not be more than 10 cm from the ground (soil) at any location. Any uncharged fence fabric must have a minimum of four strands of charged wires on an outrigger system, spaced as follows: the first strand shall not be higher than 25 cm from the ground; and each of the remaining three strands shall be spaced approximately 25 cm apart from adjacent charged strands.

### 6.14.3. Wire Tension

For a high tensile smooth wire fence construction, all strands shall be tightened to a minimum of 125 lbs tension at 20°C. The required tension is to be corrected for temperature by use of the following

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formula for 12-½ gauge high tensile steel wire:

$$Tension = 125 - 2.5(Temperature - 20)$$

where: *Tension* is in lbs force

*Temperature* is in °C

#### 6.14.4. Post Spacing

Fence posts shall be spaced a maximum of 7.5 metres apart.

#### 6.14.5. Grounding System

A grounding system shall be installed consisting of solid grounding rods (i.e., not pipe) with a minimum diameter of 16 mm (5/8 inch) that have a buried length of at least 2 metres. A minimum of three grounding rods (spaced at least 3 metres apart) shall be installed and connected to the energizer. Alternative energizer grounding systems (e.g., grounding plates, or a deep-driven grounding system) may be used provided the grounding is equivalent to or better than three grounding rods. A grounding rod (or equivalent) shall be installed at least once every 450 metres along the fence and connected to the grounded wire strands or uncharged fence fabric. Additional grounding may be required for dry sites or if other conditions affect proper grounding.

#### 6.14.6. Period of Operation

Electric fencing shall be fully operational during the period of April 1 to October 31 inclusive each year and at any other time of year when there is bear activity in the immediate surrounding area. If snow is present during this period, any electrified strands above snow line shall be isolated from the remainder of the system and energized.

#### 6.14.7. Minimum Voltage

Electric fencing shall be operated with a minimum voltage of 6,000 volts.

#### 6.14.8. Gate(s)

Any access through electric fencing for vehicles, equipment and

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personnel shall consist of an electrified gate system that is closed during non-operating hours. The gate system shall be electrified to a minimum voltage of 6,000 volts at all times except when being opened or closed. Any gate that is open during operating hours shall be periodically checked by the attendant for bear activity during hours of operation. Gaps between the gate and the fence and ground, and between gate panels (for a double-hung gate), shall not exceed 10 cm.

#### 6.14.9. Fence Inspections

The entire perimeter of the electric fencing shall be inspected at least once every seven days and the voltage of the fencing measured at several points along the fencing and at each gate using a proper electric fence voltmeter matched to the brand of the fence charging unit. The results of voltage testing shall be recorded in a log book or electronic record. Any results less than the minimum 6,000 volts shall be immediately investigated for the cause of the low voltage (e.g., low battery, litter, vegetation, loose or crossed wires, broken insulators, breaks in the grounding system, etc.). Corrective actions to restore proper voltage shall be immediately undertaken.

Signs of digging or other attempts by bears to penetrate electric fencing shall be recorded in a log book or electronic record. Any penetrations through electric fencing by bears shall be immediately reported to the Conservation Officer Service at 1-877-952-7277.

In cases of low voltage or signs of penetration attempts, inspections shall be increased from once per week to once per day until proper voltage is fully restored and until there are no new signs of penetration attempts, respectively.

#### 6.15. Municipal Solid Waste Separation

Municipal solid waste may be separated into the following streams: (1) a mixed waste stream including putrescibles for disposal; (2) a mixed waste stream not including any putrescibles for disposal; (3) an organic waste stream, including untreated wood wastes, for composting; (4) a selected waste stream for salvage and recycling; and (5) a selected combustibles waste stream for open burning or air-curtain burning. Each of these waste streams is subject to all of the general requirements contained in sections 6.1 through 6.14 above, as well as being subject to specific requirements as outlined in a separate section for each below.

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### **6.16 Groundwater Quality**

The characteristics of the groundwater at the property boundary shall not exceed drinking water standards in Schedule 6 of the Contaminated Sites Regulation. Where natural background water quality concentrations exceed the aforementioned standard, the characteristics of the groundwater at the property boundary must not exceed background concentrations.

Where monitoring shows contaminant concentrations exceed the applicable water use, or other standards, the operational certificate holder shall notify the Director and take one of the following corrective actions:

- Mitigation to meet standards or
- Based on the results of a risk assessment carried out in accordance with Contaminated Sites Regulation guidance (i.e. Technical Guidance 7), undertake the warranted mitigation measures to achieve acceptable risk.

## **7. OPERATIONAL REQUIREMENTS FOR DISPOSAL OF SOLID WASTES CONTAINING PUTRESCIBLES**

### **7.1. Location**

The operational certificate holder shall identify an area for disposal of putrescible refuse (herein referred to as the putrescible disposal area) that is within the authorized municipal solid waste disposal footprint (see section 2.1.1). Disposal of any solid wastes consisting of or mixed with putrescibles shall be restricted to the designated putrescible disposal area.

### **7.2. Nature of Wastes**

Wastes disposed at the active face of the putrescible disposal area may include any municipal solid waste except liquid wastes and hot ashes or as otherwise restricted by section 6.2.

### **7.3. Bear-Proofing**

The putrescible waste disposal area shall be maintained inside an electric fence. The electric fence shall comply with all requirements of section 6.14.

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**7.4. Waste Compaction**

Wastes at the active face of the putrescible disposal area shall be spread in layers of 60 centimetres or less on the active face and then compacted with a minimum of three (3) passes with heavy equipment.

**7.5. Maximum Lift Height**

The maximum height of any lift of compacted refuse in the putrescible disposal area shall be 5 metres.

**7.6. Waste Cover**

Cover shall be applied to refuse in the putrescible disposal area as specified below. The operational certificate holder shall maintain a log book or electronic record with all dates of cover application.

**7.6.1. Active Face Cover**

Except as otherwise stated in sub-section 7.6.2, the active face of the putrescible disposal area does not normally require cover. Based on information concerning environmental or public health concerns related to exposed refuse at the active face, however, the Director may require that the active face be covered completely at a specified frequency with 0.15 m of soil (or functional equivalent) for a specified period.

**7.6.2. Cell Cover**

A uniform cover of 30 cm compacted soil shall be applied to all sides of the active refuse cell in the putrescible disposal area such that no more than 500 m<sup>2</sup> of refuse are exposed at the active face at any time and such that the volume of refuse in the cell does not exceed 5,000 m<sup>3</sup>. Once the maximum volume of refuse has been reached in a cell, the active face shall be covered with 30 cm of compacted soil and a new refuse cell begun.

**7.6.3. Final Cover**

Completed portions of the putrescible disposal area shall progressively receive final cover during the active life of the landfill (see section 15.5).

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**7.7. Dead Animal Disposal**

Dead animals and animal parts shall be disposed of in the putrescible disposal area and covered as soon as practicable with a minimum of 60 centimetres of soil and/or refuse material such that flies and scavenging animals are prevented from accessing the carrion.

**8. OPERATIONAL REQUIREMENTS FOR DISPOSAL OF NON-PUTRESCIBLE SOLID WASTES**

**8.1. Location**

The operational certificate holder may identify an area for the disposal of non-putrescible wastes (herein referred to as the non-putrescible disposal area) that is within the authorized municipal solid waste disposal footprint (see sub-section 2.1.1).

**8.2. Nature of Wastes**

Wastes disposed at the active face of the non-putrescible disposal area may include any municipal solid waste except putrescibles, liquid wastes and hot ashes or materials otherwise restricted by section 6.2.

**8.3. Waste Compaction**

Wastes at the active face of the non-putrescible disposal area shall be spread in layers of 60 centimetres or less on the active face and then compacted with a minimum of three (3) passes with heavy equipment.

**8.4. Maximum Lift Height**

The maximum height of any lift of compacted refuse in the non-putrescible disposal area shall be 5 metres.

**8.5. Waste Cover**

Cover shall be applied to refuse in the non-putrescible disposal area as specified below. The operational certificate holder shall maintain a log book or electronic record with all dates of cover application.

**8.5.1. Active Face Cover**

Except as otherwise stated in sub-section 8.5.2, the active face of

the non-putrescible disposal area does not normally require cover. Based on information concerning environmental or public health concerns related to exposed refuse at the active face, however, the Director may require that the active face be covered completely at a specified frequency with 0.15 m of soil (or functional equivalent) for a specified period.

8.5.2. Cell Cover

A uniform cover of 30 cm compacted soil shall be applied to all sides of the active refuse cell in the non-putrescible disposal area such that no more than 500 m<sup>2</sup> of refuse are exposed at the active face at any time and such that the volume of refuse in the cell does not exceed 5,000 m<sup>3</sup>. Once the maximum volume of refuse has been reached in a cell, the active face shall be covered with 30 cm of compacted soil and a new refuse cell begun.

8.5.3. Final Cover

Completed portions of the non-putrescible disposal area shall progressively receive final cover during the active life of the landfill (see section 15.5).

**9. OPERATIONAL REQUIREMENTS FOR COMPOSTING**

**9.1. Location**

The operational certificate holder may identify an area for composting (herein referred to as the composting area). Any composting shall be restricted to the designated composting area. This area shall be clearly identified at the landfill site.


**9.2. On-Site Usage of Compost Product**

Composting may be conducted passively by static pile (i.e., no aeration, etc.) provided the compost product is used on-site at the landfill for cover, reclamation or landscaping purposes. The compost piles must be rested at least one year after the last addition of organic waste prior to use.

**9.3. Use of Sewage Sludge**

Dewatered sludge from the liquid waste disposal lagoons authorized by

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section 2.3 may be included in static compost piles provided: the sludge is first blended with carbonaceous material (e.g., sawdust and/or wood shavings); and the public is prohibited from accessing any composting area that includes sludge.

**9.4. Off-site Usage of Compost Product**

If compost product is to be made available to the public or otherwise used offsite, composting operations shall comply with the requirements of the *Organic Matter Recycling Regulation* and any other relevant composting legislation.

**9.5. Bear-Proofing**

If the composting operation is to receive any organic wastes that are potential attractants to bears, then composting shall be completely enclosed by an electric fence or contained in a bear-proof structure (building or composting vessel). The electric fence shall comply with all requirements of section 6.14.

**10. OPERATIONAL REQUIREMENTS FOR STORAGE OF SELECTED WASTES FOR SALVAGE AND RECYCLING**

**10.1. Location**

The operational certificate holder may identify an area for the storage of selected wastes for salvage and recycling (herein referred to as the salvage/recycling area). Any salvage/recycling shall be restricted to the designated salvage/recycling area.

**10.2. Nature of Wastes**

Wastes to be salvaged/recycled may be any items with potential salvage or recycling value but shall not include any refuse consisting of or containing putrescibles, any liquid wastes, hot ashes or materials otherwise restricted by section 6.2.

**10.3. Contamination**

Contamination of any of the designated salvage/recycling storage piles

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with putrescible wastes shall be cleaned up immediately. Contamination of any of the storage piles with materials other than the intended salvageable/recyclable material (e.g., scrap metal with wood waste, or white goods with demolition debris, etc.) may result in a requirement to clean up the contamination or to landfill the contaminated material.

## **11. OPERATIONAL REQUIREMENTS FOR REGULATED OPEN BURNING**

### **11.1. Location**

The operational certificate holder may identify an area for the use of open burning to treat selected combustibles (herein referred to as the open burning area). Any open burning of selected wastes shall be restricted to the designated open burning area.

### **11.2. Quantity, Timing and Duration of Discharge**

The maximum authorized quantity of wood residue to be open burned during each event is that which has accumulated at the time of burn initiation.

The maximum authorized duration of each burn shall be limited to the period between two hours after sunrise on the day of ignition, and sunset on the following day. Each open burn shall be completely extinguished at the end of the authorized burn duration.


Should a condition arise which prevents the burn pile(s) from being burned within this period, the Director shall be notified in accordance with this authorization.

### **11.3. Nature of Wastes**

Acceptable materials for burning may only include dry, unpainted, untreated demolition, construction and packing-related wood residue, clean stumps and brush, but shall exclude nuisance-causing combustibles such as glue-containing wood, painted and treated wood, sawdust, yard wastes, mulch, wood chips, rubber, plastics, tars, insulation, roofing material, asphalt shingles, etc.

### **11.4. Favourable Weather for Smoke Dispersion**

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Open burning shall not proceed unless the recorded Environment Canada Ventilation Index Forecast for Terrace is good for the first day and good or fair for the second day.

The contact number for the forecast is 1-888-281-2992. Ventilation index forecasts can also be obtained after 7:00 a.m. from the following Environment Canada website:

<http://www.env.gov.bc.ca/epd/epdpa/venting/venting.html>

A burn registration number shall be obtained from the Ministry of Forests (1-888-797-1717) prior to ignition.

Open burning of wood residue shall not be initiated or continued if the local air flow will cause the smoke to negatively impact a nearby population or cause pollution. No burning shall occur during periods of fire hazard or when burning is prohibited by other agencies.

**11.5. Fire Accelerant**

An approved fire accelerant such as diesel fuel or commercial fire starter gel or a flame-thrower shall be used to ensure efficient and rapid ignition of the waste material.

**11.6. Minimization of Smoke**

Each burn shall be tended in a manner that ensures minimization of smoke emissions. Measures to minimize smoke shall include, but not necessarily be limited to: stacking of waste in a manner that eliminates inclusion of dirt; waiting to burn until wastes are reasonably dry after any significant precipitation event; and using adequate equipment and staff.

**11.7. Extinguishment Contingency Plan**

Prior to burning, a contingency plan shall be in place detailing how the open burn will be extinguished in the event of any of the following occurring:

- i) Inadequate smoke dispersion in the surrounding environment;
- ii) wood continues to smoulder after the authorized burn period;
- iii) the Director requires that the open burn be extinguished for

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**11.8. Extinguishment**

All combustion shall be completely extinguished at the end of the authorized period as set out in Section 6.2.

**12. OPERATIONAL REQUIREMENTS FOR DISPOSAL OF LIQUID WASTES**

**12.1. Location**

The operational certificate holder may identify an area for the controlled disposal of selected liquid wastes (herein referred to as the liquid waste disposal area). Disposal of any liquid wastes from pumper trucks or the like shall be restricted to the designated liquid waste disposal area.

**12.2. Liquid Waste Disposal Lagoons**

Disposal of any liquid wastes shall be to properly designed and constructed lagoon(s) located in the liquid waste disposal area. The lagoon(s) shall function as decant lagoons (with decant discharged to an authorized liquid waste handling system such as a leachate treatment system) and/or as part of an organic matter composting system. The lagoons shall be of an impervious design that prevents the escapement of liquid to the ground. In all cases, design and construction of the liquid waste disposal lagoon(s) shall be such that seepage through the berms shall not occur.

**12.3. Signage and Fencing**

The liquid waste disposal area shall be fenced with chain link or steel woven-wire (e.g., page wire) a minimum of 1.2 metres high. Signs identifying the nature of the lagoon disposal area shall be erected on all sides of the fence such that the lagoons are easily identifiable from any approach.

**12.4. Freeboard**

A minimum freeboard of 50 centimetres shall be maintained at all times.

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The lagoon berms shall be maintained in good working order and the Director shall be notified immediately of any failure or overflow.

**12.5. Nature of Wastes**

The nature of wastes which may be discharged to a designated lagoon is that of typical septic tank pumpage, sewage holding tank waste, sewage treatment plant sludge, and wash water and grit from drain sumps at automobile wash facilities (intended primarily for cars and light trucks) and parking lots. Industrial liquid wastes and sludges shall be excluded.

**12.6. Off-Loading Chute**

An off-loading chute shall be provided to ensure that all effluent enters the lagoon and does not spill on the ground in the unloading area.

**12.7. Sludge Removal**

If the sludge is to be removed from a lagoon for final disposal at an active face of a designated solid waste disposal area (under section 7) or for composting (under section 9), then the lagoon must be rested for a sufficient amount of time to allow the wastes to dewater. Semi-solid sludge may be removed and stockpiled above ground for further dewatering provided: the sludge stockpile is located on impervious ground; drainage from the stockpile area is directed into the lagoon or other approved liquid waste disposal system (e.g., a leachate collection and treatment system) and provided the sludge stockpile is contained within a signed and fenced area as per section 12.3. Once the solidified sludge is deposited at an active face of a designated solid waste disposal area, it must be covered immediately with a minimum of 30 centimetres of cover material and then the area of sludge disposal compacted immediately after cover is applied.

**12.8. Lagoon Closure**

If a lagoon is to be closed without removal of sludge as per section 12.7, the sludge must be allowed to dewater to a moisture content that will support final cover. The lagoon must then be covered with a minimum of 1 metre of compacted soil and sloped to promote runoff.

**12.9. Volume Measurement**

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The operational certificate holder shall maintain a log book or electronic record with quantities of sewage wastes discharged to the lagoons.

**13. MONITORING REQUIREMENTS**

The operational certificate holder shall carry out an environmental monitoring program as follows:

**13.1 Treated Leachate/Phytoremediation Area**


Location	Parameters	Frequency
E249852 Treated Leachate Prior to Discharge to Phytoremediation Area	<u>Lab:</u> total metals, alkalinity, chloride, fluoride, sulphate, hardness, ammonia, nitrate, nitrite, total organic carbon, orthophosphorus, COD, BOD, VOCs <sup>1</sup> , pH and Total Kjeldahl Nitrogen	Quarterly → Annually*
	<u>Field:</u> conductivity, temperature, turbidity, water level, flow rate, pH and dissolved oxygen  Volume	Monthly → Quarterly*  Continuous during seasonal discharge
E306624 Composite Soil Sample <sup>2</sup> from Phytoremediation Area	<u>Lab:</u> metals, salinity	Annually, prior to discharge each season.

<sup>1</sup>One-time sample of VOCs for background levels

<sup>2</sup>Composite sample assembled from 4 locations from a pre-established list of 12 locations

\* quarterly reduced to annually and monthly reduced to quarterly following two complete years of sampling.

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### 13.2 Groundwater

Location	Parameters	Frequency
<u>Background</u> E251531 MW-02 E287385 MW-13	<u>Lab:</u> dissolved metals, alkalinity, chloride, fluoride, sulphate, hardness, ammonia, nitrate, nitrite, TOC, COD, pH, VOCs <sup>1</sup> and Total Kjedahl Nitrogen	Quarterly→Annually*
<u>Early Detection</u> E251530 MW-01 E251532 MW-03 E251533 MW-04 E287379 MW-07 E287380 MW-08 E287381 MW-09 E302210 MW-15 E302211 MW-16	<u>Field:</u> conductivity, temperature, water level and pH	Monthly→Quarterly*
All of the above wells and:  E251534 MW-05 E251535 MW-06 E287382 MW-10 E287383 MW-11 E287384 MW-12 E287386 MW-14	Water elevation	quarterly

<sup>1</sup>One-time sample of VOCs for background levels

\* quarterly reduced to annually and monthly reduced to quarterly following two complete years of sampling.

### 13.3 Surface Water

Location	Parameters	Frequency
E273828 SW-01 (Onion Lake) E273829 SW-02 (Upper Clearwater Lake at outlet) E273831 SW-03 (Lower Clearwater Lake at outlet) E306587 SW-04 (Creek)	<u>Lab:</u> total metals, dissolved metals, chloride, fluoride, sulphate, hardness, ammonia, nitrate, nitrite, Total Kjedahl Nitrogen, pH, COD and BOD	Quarterly→Annually*

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from Onion Lake at FSR) E296117 SW-05 (Clearwater Creek at FSR)		
	Field:  conductivity, temperature, turbidity, flow rate, pH and dissolved oxygen	Monthly → Quarterly*

\* quarterly reduced to annually and monthly reduced to quarterly following two complete years of sampling. Once sampling on an annual basis commences, it shall occur during the season with lowest stream flows

### 13.4 Leachate and Water Monitoring Procedures

#### 13.4.1 Sampling Procedures

Sampling is to be carried out in accordance with the procedures described in the most recent edition of the “British Columbia Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples”, or by suitable alternative procedures as authorized by the Director.

#### 13.4.2 Analytical Procedures

Analyses are to be carried out in accordance with procedures described in the most recent edition of the “British Columbia Environmental Laboratory Methods Manual for the Analysis of Water, Wastewater, Sediment, Biological Materials and Discrete Ambient Air Samples” or by suitable alternative procedures as authorized by the Director.

#### 13.4.3 Quality Assurance and Quality Control

The operational certificate holder is required to conduct the following Quality Assurance and Control Program to determine the acceptability of data required by this operational certificate and

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Section 2(d) of the Environmental Data Quality Assurance Regulation:

- a) Obtain and keep current, the laboratory precision, accuracy and blank quality control criteria for each laboratory analyzed parameter from the analytical laboratory(ies)
- b) Collect one duplicate sample during each sampling session from one of the discharge points.
- c) Each duplicate sample shall be submitted to the laboratory; one of the pair identified as the regular sample, and the other, as a blind sample identified by a fictitious site-name established solely to identify the duplicate sample.
- d) For each parameter, report the results of the field duplicates in terms of the degree of variation as the relative percent difference
- e) A sample collection blank shall be prepared, containing distilled water, and preservative if required, and submitted as a blank sample with one sample set per session. If any result for any parameter indicates detectable concentrations, then efforts shall be made to determine and control the source of contamination.

## 14. DATA ANALYSES AND REPORTING

### 14.1. Log Book

As required by sections 6.14.9, 7.6, 8.5, and 12.9 the operational certificate holder shall maintain a log book or electronic record. The log book or electronic record shall be made available for inspection upon request by Ministry staff or Kitselas First Nation.

### 14.2. Reporting

Whenever required, the operational certificate holder shall submit data, studies and reports to the Director by email or electronic transfer or as otherwise instructed.

An annual report shall be submitted to the Director and posted on the Regional District of Kitimat-Stikine website on or before June 30 each year for the previous calendar year.

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The annual report shall contain at minimum:

- i) The type and tonnage or volume of waste received, recycled, composted and landfilled for the year;
- ii) Occurrences or observations of wildlife attempting to access the facility;
- iii) The results of all required monitoring programs undertaken by the operational certificate holder for the site. Trend analysis, as well as an evaluation of any identified impacts of the discharges on the receiving environment in the previous year shall be carried out by a qualified professional.

#### **14.3. Groundwater Model**

The operational certificate holder shall have a qualified professional maintain the existing groundwater model of the landfill site and immediate downstream receiving environment using all available, relevant groundwater and surface water monitoring, stream flow, and precipitation data. Development of the groundwater model shall include a water balance assessment for the drainage area in which the landfill site is situated. The groundwater model shall define, where possible, the groundwater regime (flow directions, flow rates, groundwater divide, any evidence of a leachate plume, extent of plume, etc.) at and in the immediate surrounding area of the landfill site. Based on monitoring data and inferred groundwater flow direction from each previous year, the annual report as required in Section 14.2 shall contain a preliminary assessment of any recommended changes to the model. Based on this assessment and any other information available, the Director may require that a formal update to the model be undertaken.

### **15. CLOSURE REQUIREMENTS**


#### **15.1. Notification of Closure**

The operational certificate holder shall notify the Director and Kitselas First Nation in writing of intentions to close the landfill site.

#### **15.2. Closure Plan**

A closure plan shall be submitted to the Director upon request. Upon

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Date Amended: September 19, 2019  
(most recent)

  
for Director, *Environmental Management Act*  
Authorizations - North Region

issuance of the draft closure plan, the Kitselas First Nation shall also be provided with a copy. The closure plan shall, as a minimum, include the following:

- proposed end-use of the landfill property after closure;
- anticipated total waste volume and tonnage, and life of the landfill (i.e., closure date);
- a topographic plan showing the final elevation contours of the landfill and surface water diversion and drainage controls;
- design of the final cover suited to the intended end-use of the site, including the thickness and permeability of barrier layers and drainage layers, and information on topsoil, vegetative cover and erosion prevention controls;
- procedures for notifying the public about the closure and about alternative waste disposal facilities;
- rodent and nuisance wildlife control procedures;
- a comprehensive monitoring plan, including groundwater monitoring, surface water monitoring, landfill gas monitoring, leachate monitoring, final cover monitoring, and erosion and settlement monitoring, for a minimum post-closure period of 25 years;
- a plan and accompanying design for the collection, storage and treatment/use of landfill gas for a minimum 25 year post-closure period (if required);
- a plan for operation of any required pollution abatement engineering works such as leachate collection and treatment systems, for a minimum post-closure period of 25 years; and
- an estimated cost, updated annually, to carry out closure and post-closure activities for a minimum period of 25 years.

### **15.3. Closure Funding**

The operational certificate holder shall ensure that sufficient funds will be available to provide for all closure and post-closure requirements as outlined in the closure plan required by section 15.2, plus a reasonable contingency for any remediation which may be required.

### **15.4. Final Cover**

The final cover system shall be designed by a qualified professional to match the intended end-use of the landfill site and to match the needs of any required environmental management systems (leachate minimization or recirculation, as the case may be, landfill gas collection and treatment,

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etc.). Generally, the final cover shall consist of a layer of 1 metre of low permeability ( $<1 \times 10^{-5}$  cm/s) compacted soil followed by a layer of topsoil suitable for establishment of vegetation. Use of higher permeability soil must first be approved by the Director. The final cover shall be constructed with minimum and maximum slopes as specified by a qualified professional (see section 3.4) to promote runoff and minimize erosion, with appropriate runoff drainage controls, erosion controls, and gas venting controls. The site shall be seeded with a grass/legume mixture suited to the local climate.

**15.5. Progressive Application of Final Cover**

Completed portions of the landfill shall progressively receive final cover during the active life of the landfill. The maximum area of disposed refuse that has not yet received final cover shall not exceed 25% of the total final footprint area. Final cover is to be applied according to the specifications identified in section 15.4.


**16. ENVIRONMENTAL IMPACT**

Inspections of the discharge will be carried out by Environmental Protection personnel as a part of the routine operational certificate inspection procedure. Based on these inspections and any other information available to the Director on the effect of the discharge on the receiving environment, the operational certificate holder may be required to undertake additional monitoring, install additional pollution control works, or change the method of operation.

**17. MAINTENANCE OF WORKS, EMERGENCY PROCEDURES AND NON-COMPLIANCE REPORTING**

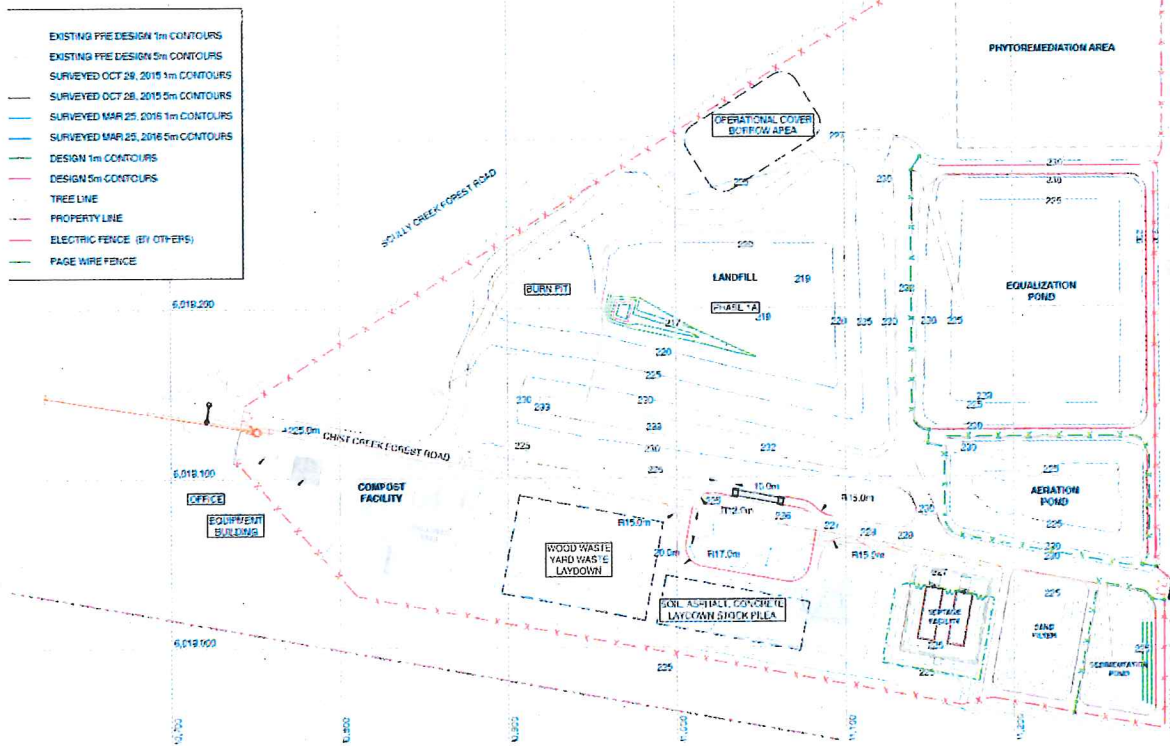
The operational certificate holder shall inspect the operation regularly and maintain it in good order. The operational certificate holder shall immediately notify the Director or designate as well as the Kitselas First Nation of any circumstance which prevents continuing operation in the approved manner or results in noncompliance with the requirements of this operational certificate.

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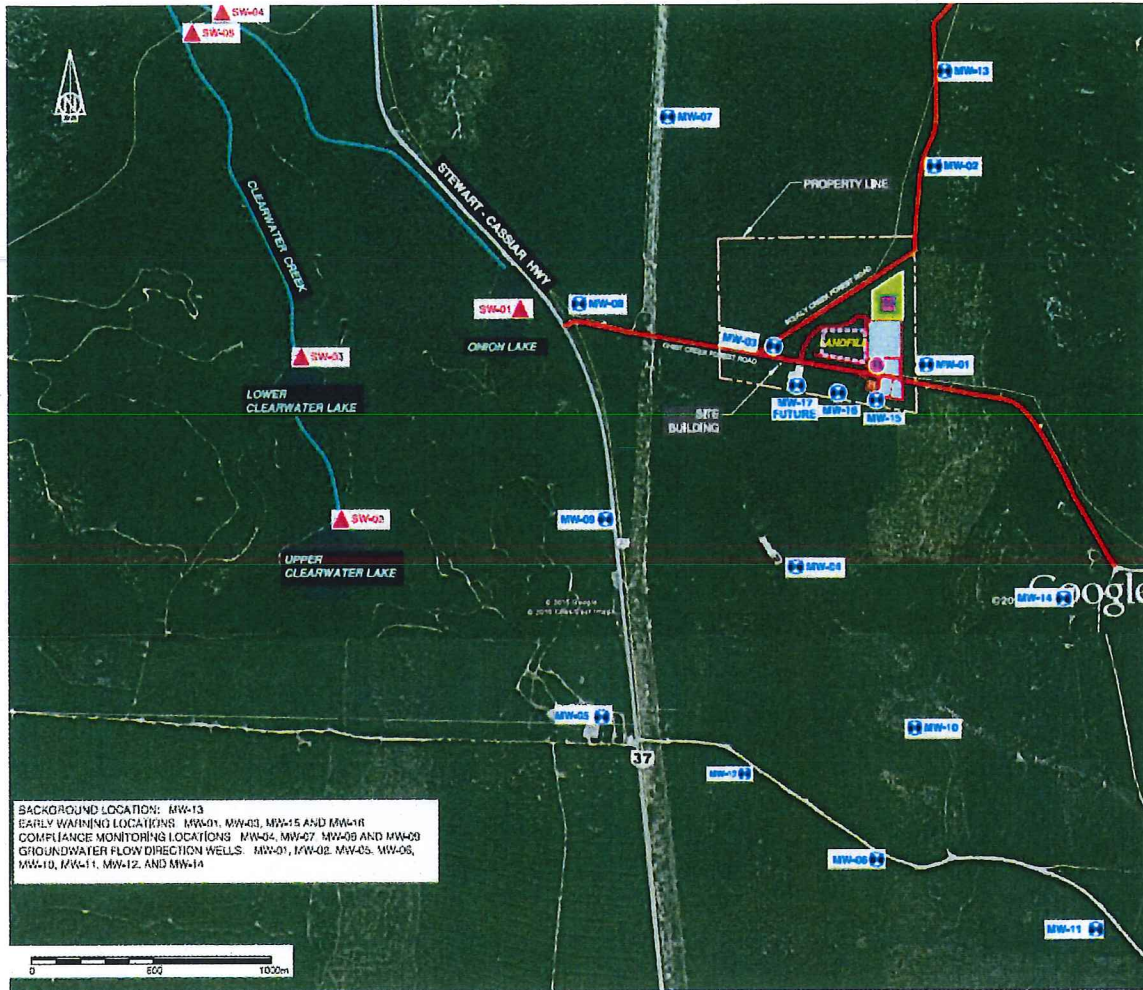
SITE PLAN



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Authorizations - North Region

### MONITORING LOCATIONS



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(most recent)

for Director, *Environmental Management Act*  
Authorizations - North Region



Regional District of  
**Kitimat-Stikine**

## **Appendix B Environmental Effects Monitoring Report**





**2022 Annual Environmental Effects  
Monitoring Report**

Forceman Ridge Waste Management Facility

June 26, 2023

Prepared for:  
Regional District of Kitimat-Stikine  
Suite 300 - 4545 Lazelle Avenue  
Terrace, BC V8G 4E1

Prepared by:  
Stantec Consulting Ltd.  
#500 - 4515 Central Blvd.  
Burnaby, BC V5H 0C6

Project Number:  
12322272

## Limitations and Sign-off

This document entitled Annual Environmental Effects Monitoring (EEM) was prepared by Stantec Consulting Ltd. (“Stantec”) for the account of the Regional District of Kitimat-Stikine (RDKS). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec’s professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Singed on behalf of Fares Abushaban

Prepared by:

Signature

**Fares Abushaban, M.Sc.A., EIT**

Printed Name

Reviewed by:

Signature

**Jeremiah Gladu, P.Ag., CSAP**

Printed Name

Reviewed by:

Signature

**Matthew Deane, P.Ag., PMP**

Printed Name



## Executive Summary

Stantec Consulting Ltd. (Stantec) was retained by the Regional District of Kitimat-Stikine (RDKS) to prepare the 2022 Annual Environmental Effects Monitoring (EEM) Report for the Forceman Ridge Waste Management Facility, herein referred to as the “Site”. A Site plan is provided in Appendix A.

The EEM was completed to satisfy the conditions of Operational Certificate (OC) #17227 issued in November 2008 and amended in September 2019. A copy of the certificate is provided in Appendix B.

The objective of the EEM is to identify impacts on the receiving environment from discharges that occurred under permit at the Site in 2022 and meet the reporting requirements of the OC EEM program for the facility. The scope of work of the EEM reporting consisted of the following:

- Completing a review of analytical data from groundwater, surface water, soil and leachate compared to the following regulatory criteria:
  - Contaminated Sites Regulation (CSR) standards;
  - BC Working and Approved Water Quality Guidelines (WQGs);
  - Hazardous Waste Regulation (HWR); and
  - OC #17227 discharge characteristics.
- Evaluating impacts to the receiving environment.
- Completing a trend analysis on select contaminants in groundwater to assess impacts from Site operations on the surrounding area.
- Providing recommendations for further sampling and analysis, if any.

Data for the EEM Report was provided by RDKS, and included:

- Annual groundwater sampling from 9 onsite monitoring wells;
- Quarterly groundwater monitoring of 16 onsite monitoring wells;
- Quarterly surface water samples collected from five monitoring locations;
- Monthly monitoring of landfill leachate;
- Annual sampling of landfill leachate; and
- Collection of one composite soil sample from a phytoremediation orchard.

Based on the information gathered and observations made during the EEM program, Stantec offers the following conclusions:

- The reported analytical results for groundwater and surface water samples collected in 2022 were below the applicable standards or guidelines.
- The analytical results for the leachate samples were below the applicable OC criteria.





**2022 Annual Environmental Effects Monitoring Report**  
**Executive Summary**  
June 26, 2023

- The composite soil sample collected from the phytoremediation treatment area contained concentrations of metals and salinity parameters less than the applicable CSR IL standards.

Based on the analytical results and observations made during the 2022 monitoring program, Stantec recommends that the current monitoring program should be continued in 2023 in accordance with the requirements under the OC.

The statements made in this Executive Summary are subject to the same limitations included in the Limitations of this Report (Section 9) and are to be read in conjunction with the remainder of this report.



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## Acronyms / Abbreviations

AW	Aquatic Life
BC	British Columbia
BC ENV	BC Ministry of Environment and Climate Change Strategy
BC WQG	BC Water Quality Guidelines
BFD	Blind Field Duplicate
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CALA	Canadian Association for Laboratory Accreditation
COD	Chemical Oxygen Demand
CSR	Contaminated Sites Regulation
DW	Drinking water
EMA	Environmental Management Act
EEM	Environmental Effects Monitoring
ENV	British Columbia Ministry of Environment and Climate Change
HSVL	Headspace vapour levels
IL	Industrial Land Use Standards
m	Metre
masl	Metres above sea level
mbg	Metres below ground surface
NAPL	Non-aqueous phase liquid
OC	Operational Certificate
PCOC	Potential contaminant of concern
PHC	Petroleum Hydrocarbon
ppm	Parts per million
QA/QC	Quality Control and Quality Assurance



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**Acronyms / Abbreviations**

June 26, 2023

RDL Reportable Detection Limit

TOC Total Dissolved Carbon



# 1 Introduction

Stantec Consulting Ltd. (Stantec) was retained by the Regional District of Kitimat-Stikine (RDKS) to prepare the 2022 Annual Environmental Effects Monitoring (EEM) Report for the Forceman Ridge Waste Management Facility, herein referred to as the “Site”. A Site plan is provided in Appendix A.

The EEM was completed to satisfy the conditions of Operational Certificate (OC) #17227 issued in November 2008 and amended in September 2019. A copy of the certificate is provided in Appendix B.

## 1.1 Objective and Scope of Work

The objective of the EEM is to identify impacts on the receiving environment from discharges that occurred under permit at the Site in 2022 and meet the reporting requirements of the OC EEM program for the facility. The scope of work of the EEM reporting consisted of the following:

- Completing a review of analytical data from groundwater, surface water, soil and leachate compared to the following regulatory criteria:
  - Contaminated Sites Regulation (CSR) standards;
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Data for the EEM Report was provided by RDKS, and included:

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- Monthly monitoring of landfill leachate;
- Annual sampling of landfill leachate; and
- Collection of one composite soil sample from a phytoremediation orchard.



## 2 Background

The following sections provide a description of the Site and a summary of relevant environmental reports and inspections previously completed for the Site.

### 2.1 Site Description

To determine the topographic, geologic, and hydrologic features of the Site, the following maps and reports were reviewed:

- GeoBC's web-based mapping tool iMapBC (accessed March 2023)
- The Surficial Geology Map of the Skeena River Area (Clague 1983)
- Google Earth (accessed March 2023)

The Site is located on the Chist Creek Forest Service Road, east of Highway 37 and south of Lakelse Lake. Based on a Google Earth elevation profile, the topography of the Site is relatively level, with a slight downward slope from northeast to southwest. Onion Lake is located on the west side of the highway, downslope from the Site, while Lower Clearwater Lake and Upper Clearwater Lake are situated further west. Surface water from Upper Clearwater Lake flows southward to Lower Clearwater Lake, which then drains northwards via Clearwater Creek to Lakelse Lake. No observable surface water connections from the Site to these bodies of water are present in aerial photographs or in the BC Water Resource Atlas (accessed April 2023).

The Site contains a WMF that manages both solid and liquid waste. The leachate from the Site is collected in an equalization pond and treated through several engineered ponds (aeration and sedimentation ponds). The treated leachate is then discharged through a sand filter to a phytoremediation treatment area or rapid infiltration ditch.

The underlying geology of the Site consists of a thick sequence of sand and gravel, believed to be deltaic glacial fluvial sediments (Clague 1983). These sediments extend to depths greater than 60 meters, as determined by previous monitoring well installations.

### 2.2 Previous Environmental Reports

Hydrogeological investigations of the Site have been completed by Agra Earth and Environmental (1998) and Golder (2000, 2003, 2006, 2007, 2008 and 2011). The most recent annual monitoring report for 2021, prepared by WSP Golder (WSP, 2022), identified the historical reports; however, the reports were not provided to Stantec during this current program.

EEM reports have been prepared for the Site during the period of 2017 to 2021. Stantec has reviewed the 2021 report titled "*Forceman Ridge Waste Management Facility 2021 Annual Environmental Effects Monitoring Report*", WSP Golder (WSP), dated June 2022. The 2021 EEM report provided the following conclusions:



- Impacts to groundwater and surface water quality were not identified in the 2021 monitoring program.
- With the exception of dissolved copper in surface water, reported groundwater and surface water analytical results were below standards and guidelines applied by WSP in the 2021 EEM. Dissolved copper exceeded the WQG in four out of five surface water sampling locations. Golder suggested the presence of dissolved copper above the BC WQG is due to naturally occurring background concentrations.
- The reported analytical results for the soil sample collected from the phytoremediation area were below the applicable CSR standards for the Site.

WSP noted that the pH of the leachate was below the range required in the OC #17227 during emergency discharge authorizations in the first quarter of 2021; however, pH was within the permitted levels for the remaining three quarters.

WSP recommended that the current monitoring program should be continued in 2022. They also recommended the addition of dissolved organic carbon to surface water monitoring program.

### **2.2.1 Historical Data Tables**

Historical data tables have been provided by RDKS and are included in Appendix C. The data tables contain historical results for previous groundwater and surface water sampling, leachate sampling, and soil sampling in the phytoremediation area. These data tables are presented as received and the standards, guidelines, and criteria within these tables have not been modified or updated. These tables are included for the purposes of maintaining a record of historical data for the Site.





## 3 Regulatory Framework

Contaminated sites in BC are governed by the *Environmental Management Act* (the Act) and administered by the BC ENV. The *Contaminated Sites Regulation* (CSR) is the enabling regulation under the Act that outlines procedures for the investigation and reporting of contaminated sites and includes numerical standards for soil and groundwater quality for specific land and water uses.

The applicable soil, sediment, groundwater, and surface water standards and/or guidelines are summarized below.

### 3.1 Groundwater Standards

Groundwater outside of the landfill and leachate collection areas is regulated under the BC CSR. The CSR includes generic numerical standards for groundwater quality for specific water uses (i.e., aquatic life, irrigation, livestock, and drinking water).

Per the BC ENV *Protocol 21 (P21): Water Use Determination* (BC ENV, 2017), site-specific factors are used to determine if CSR standards protective of drinking water (DW) apply at the Site, with current and future uses evaluated separately. Based on section 3.2 of Protocol 21, the drinking water standards applies regardless of whether drinking water wells currently exist near the Site to protect aquifers that could support future drinking water wells. Therefore, the DW standards for groundwater are considered applicable to the Site based on the potential for future drinking water use.

An aquatic habitat survey has not been completed for the Site. A search of the BC Water Atlas through iMap BC (accessed February 2023) indicated there are unnamed tributaries to Christ Creek located within 500 m of the Site. Therefore, the CSR freshwater aquatic life (AW<sub>FW</sub>) standards are considered applicable to the Site.

Water at and within 500 m of the Site, is not currently used for irrigation or livestock watering, and the Site is not located on Agricultural Land Reserve (ALR) land. Therefore, irrigation (IW) and livestock watering (LW) standards and guidelines were not considered applicable at the Site.

Based upon the historical and current uses of the Site (i.e., waste management facility), the groundwater standards for dissolved iron and manganese were not considered applicable at the Site.

In summary the CSR DW and AW<sub>FW</sub> standards are applicable to the Site.

### 3.2 Soil Standards

Waste received and discharged at the Site is managed under OC Permit #17227. Soil at the Site is regulated under the BC CSR. Generic numerical soil standards are presented in CSR Schedule 3.1. Soil standards are divided into matrix numerical standards (Schedule 3.1 Part 1) and generic numerical standards (Schedule 3.1 Parts 2 and 3). Standards protective of the following uses are provided for both the matrix and generic standards: wildlands (natural or reverted), agricultural, urban park, residential (low



or high density), commercial and industrial. Based on the Site land use, the CSR industrial land use (IL) standards are considered applicable to the Site. Matrix standard site-specific factors that were applied based on exposure pathways include:

- intake of contaminated soil (applies to all sites)
- toxicity to soil invertebrates and plants (applies to all sites)
- groundwater used for drinking water (to protect future water use)
- groundwater flow to surface water used by freshwater aquatic life

As per Section 11(3) of the BC CSR, a Site is not a contaminated Site if soil concentrations do not exceed local background concentrations. Regional estimates for background concentrations for soil are provided in Table 1 of BC ENV Protocol 4 (P4) for the Skeena Region (BC ENV 2021).

### 3.3 Surface Water Quality Guidelines

For the assessment of surface water quality within a freshwater waterbody, the BC ENV WQGs, both approved and working, are considered applicable. A search of the BC Water Atlas through iMap BC (accessed February 2023) indicated that registered surface water intakes (points of diversion) are not located within 500 m of the Site. The Site is currently surrounded by Crown land. Residential buildings have not been identified within 1 km of the Site. Based on this information, it is not anticipated that surface water within 1 km of the Site is used for drinking water on a permanent basis.

### 3.4 Operational Certificate # 17227

The certificate has criteria for the discharge of landfill leachate to the phytoremediation orchard area or the Sand Filter present onsite. The leachate discharge criteria are shown in Table 3.1 below.

**Table 3.1 Operational Certificate # 17227 Leachate Discharge Criteria**

Parameter	Discharge Limit
Ammonia	214 mg/L
pH	6.5 – 8.5
Total Nitrogen	300 mg/L
Chloride	5,000 mg/L
Total Iron	6 mg/L
Total Zinc	100 mg/L
Total Cadmium	0.1 mg/L

#### 3.4.1 Hazardous Waste Regulation

The HWR outlines siting standards for facilities that receive hazardous waste for treatment, storage, or disposal. Additionally, the HWR details operational and management requirements for facilities or



businesses that that generate, transport, or receive hazardous waste. Hazardous waste is generally defined as a dangerous good under the Federal Transportation of Dangerous Goods Act that no longer is suitable for their intended purpose. Hazardous waste can also include, but not limited to waste containing polychlorinated biphenyls (PCBs), pesticides or residues, biomedical waste, oil, asbestos, polycyclic aromatic hydrocarbons (PAHs), leachable toxic waste and waste streams prescribed in Schedule 7 of the HWR.

Under the OC #17227, the Site is not permitted to receive nor discharge hazardous waste with the exception of waste asbestos. As per Section 6.3 of OC #17227, receipt of waste asbestos under Section 2.1 of the OC #17227 is authorized.



## 4 Environmental Effects Monitoring Program

Sampling and monitoring for the 2022 EEM field program was completed by RDKS Environmental Technician and overseen by the RDKS Environmental Services Coordinator. Soil, groundwater, surface water, and leachate samples were collected by RDKS field staff using procedures outlined in the BC Field Sampling Manual (BCFSM) Part D – Solids and Part E – Water and Wastewater Sampling. Field QA/QC procedures followed the BCFSM Part A – Quality Control and Quality Assurance.

Methodologies, field observations and well monitoring data documented from the field program are presented and discussed in the following sub-sections. Site photographs collected during the field investigation are presented in Appendix C. A summary of the monitoring locations outlined in OC #17227 is also discussed in the following sub-sections.

### 4.1 Groundwater

Groundwater was sampled from the existing monitoring wells on November 30, as well as on December 01, 08, and 09 in 2022. Observations made during the groundwater monitoring program are summarized in Table 1 included in Appendix E.

The groundwater wells were monitored for conductivity, groundwater elevation, temperature and pH. . Groundwater elevation was measured using a Solinst TLC depth tape. The tape probe was cleansed with a mixture of Alconox<sup>®</sup> and water prior to each measurement to prevent cross-contamination from well to well.

Groundwater purging and sample collection was performed with the use of a Waterra Hydrolift. Prior to sampling, the monitoring wells were purged while monitoring the pH, conductivity, and temperature of the groundwater using a YSI water quality meter that was calibrated before each event following manufacture's instructions. Water was removed (purged) from each well (up to three well casing volumes), until the monitored parameters stabilized. The samples were stored in ice-chilled coolers prior to delivery to ALS Laboratories (ALS) in Burnaby, BC for analysis under chain of custody protocol. ALS is accredited by the Canadian Association for Laboratory Accreditation (CALA).

Groundwater monitoring of geophysical parameters was completed using a YSI water quality meter that was calibrated before each event following the manufacturer's instructions. Samples were collected in clean, laboratory-supplied sample bottles, and transported to an accredited laboratory for analysis.

A summary of the groundwater monitoring and sampling locations, parameters and frequency of analysis required by OC Permit #17227 is provided in Table 4.1 below.



**Table 4.1 Groundwater Monitoring Locations and Parameters**

Location	Monitoring Location	OC Station ID	Parameters/Frequency	Easting UTM <sup>1</sup>	Northing UTM <sup>1</sup>
<b>Background</b>	MW-02	E251531	<p style="text-align: center;"><u>Annually</u> <sup>2</sup></p> <p><b>Laboratory</b> - dissolved metals, alkalinity, chloride, fluoride, sulphate, hardness, ammonia, nitrate, nitrite, TOC, COD, VOCs<sup>3</sup></p> <p style="text-align: center;"><u>Quarterly</u> <sup>2</sup></p> <p><b>Field</b> – static water levels, conductivity, temperature</p>	531341	6018723
	MW-13	E287385		531409	6019029
<b>Early Detection</b>	MW-01	E251530		531353	6018032
	MW-03	E251532		530719	6018153
	MW-04	E251533		530750	6017195
	MW-07 <sup>4</sup>	E251530		530282	6018832
	MW-08	E302210		529925	6018269
	MW-09	E302211		530040	6017330
	MW-15	E302210		531171	6017953
	MW-16	E302211		531009	6017986
<b>Monitoring</b>	MW-05	E251534	<p style="text-align: center;"><u>Quarterly</u> <sup>2</sup></p> <p><b>Field</b> – static water levels,</p>	530049	6016551
	MW-06	E251535		531230	6015977
	MW-10	E287382		531369	6016530
	MW-11	E287383		532149	6015692
	MW-12	E287384		530660	6016332
	MW-14	E287386		531990	6017064

Notes:

<sup>1</sup> Coordinates obtained from the Forceman Ridge Waste Management Facility 2021 Annual Environmental Effects Monitoring Report, WSP Golder, June 2022. Coordinates are reported to be approximate.

<sup>2</sup> Frequency reduced after two complete years of sampling.

<sup>3</sup> One-time sample for VOCs for background levels.

<sup>4</sup>MW-07 was not sampled due to winter weather conditions. Water was freezing during purging.

Where:

TOC = Total Organic Carbon

COD = Chemical Oxygen Demand

VOCs = Volatile Organic Compounds

## 4.2 Surface Water

Five surface water samples were collected on November 22, 2022. Observations made during the surface water monitoring program are summarized in Table 2 in Appendix E. Hydrocarbon-like sheen and/or odours were not observed during sampling. Surface water samples were stored in ice-chilled coolers prior to delivery to ALS in Burnaby, BC for analysis under chain of custody protocol.



There are three lakes (Onion Lake, Lower Clearwater Lake and Upper Clearwater Lake) located downgradient of the Site. A summary of the surface water monitoring and sampling locations, parameters, and frequency of analysis required by OC #17227 is provided in Table 4.2 below.

**Table 4.2 Surface Water Sample Locations and Parameter**

Monitoring Location	OC Station ID	Parameters/Frequency	Easting UTM <sup>1</sup>	Northing UTM <sup>1</sup>
SW-01 (Onion Lake)	E273828	<b>Annually</b> <sup>2</sup> <b>Laboratory</b> – total metals, dissolved metals, chloride, fluoride, sulphate, hardness, ammonia, nitrate, nitrite, COD, BOD, pH	529699	6018262
SW-02 (Upper Clearwater Lake at outlet)	E273829		528908	6017519
SW-03 (Lower Clearwater Lake at outlet)	E273831		528720	6018167
SW-04 (creek from Onion Lake at Fraser Service Road)	E306587	<b>Quarterly</b> <sup>2</sup> <b>Field</b> – conductivity, temperature, turbidity, water level, flow rate	528663	6019436
SW-05 (Clearwater Creek at Fraser Service Road)	E296117		528273	6019463

Notes:

<sup>1</sup> Coordinates obtained from the Forceman Ridge Waste Management Facility 2021 Annual Environmental Effects Monitoring Report, WSP Golder, June 2022. Coordinates are reported to be approximate.

<sup>2</sup> Frequency reduced after two complete years of sampling. Once sampling on an annual basis begins, sampling is to be completed during the season with the lowest stream flow.

Where:

BOD = Biological Oxygen Demand

### 4.3 Leachate

The Site includes a five-stage leachate treatment system. Treated leachate is sent through a sand filter then discharged to either the phytoremediation orchard or a rapid infiltration. Table 4.3 below summarizes the sampling and monitoring requirements of the treated leachate outlined in OC Permit #17227. Sampling is required prior to each discharge event.

**Table 4.3 Treated Leachate Monitoring and Sampling Parameters and Frequency**

Location	OC Station ID	Parameters/Frequency	Easting UTM <sup>1</sup>	Northing UTM <sup>1</sup>
Leachate station F5 - Sand Filter	E249852	<b>Annually</b> <sup>2</sup> <b>Laboratory</b> – total metals, alkalinity, chloride, fluoride, sulphate, hardness, ammonia, nitrate, nitride, TOC, orthophosphorus, COD, VOCs <sup>3</sup>	531146	6018102



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Location	OC Station ID	Parameters/Frequency	Easting UTM <sup>1</sup>	Northing UTM <sup>1</sup>
		<u>Quarterly</u> <sup>2</sup> Field –conductivity, temperature, DO and turbidity		

Notes:

<sup>1</sup> Coordinates obtained from the Forceman Ridge Waste Management Facility 2021 Annual Environmental Effects Monitoring Report, WSP Golder, June 2022. Coordinates are reported to be approximate.

<sup>2</sup> Frequency reduced after two complete years of sampling.

<sup>3</sup> One-time sample for VOCs for background levels.

Where:

DO = Dissolved Oxygen

Leachate was historically collected at five locations as show in Table 4.4 below. These leachate sample locations are not part of the current EEM program.

**Table 4.4 Historical Leachate Monitoring Locations**

MonitoringLocation	Easting UTM <sup>1</sup>	Northing UTM <sup>1</sup>
F1 - Raw Landfill Leachate	531149	6018201
F2 - Raw Septage/ Composting Effluent	531149	6018194
F3 - Aeration Pond Inlet	531163	6018113
F4 – Sedimentation Pond Inlet	531268	6018031
F6 – Compost Facility	530883	6018070

<sup>1</sup> Coordinates obtained from the Forceman Ridge Waste Management Facility 2021 Annual Environmental Effects Monitoring Report, WSP Golder, June 2022. Coordinates are reported to be approximate.

## 4.4 Phytoremediation Orchard Area

One composite soil sample is required by OC Permit #17227 to be collected from the phytoremediation orchard area annually. A summary of the sampling and analysis requirements are presented in Table 4.5 below.



**Table 4.5 Phytoremediation Orchard Area Sampling Requirements**

Location	OC Station ID	Parameters/Frequency	Easting UTM <sup>1</sup>	Northing UTM <sup>1</sup>
Composite Soil Sample from Phytoremediation Area	E306624	<u>Annually</u> <sup>2</sup> Laboratory – metals, salinity	531146	6018102

Notes:

<sup>1</sup> Coordinates obtained from the Forceman Ridge Waste Management Facility 2021 Annual Environmental Effects Monitoring Report, WSP Golder, June 2022. Coordinates are reported to be approximate.

<sup>2</sup> Sampling to be completed prior to discharge each season.

<sup>3</sup> One-time sample for VOCs for background levels.

## 4.5 Quality Assurance/Quality Control Program

### 4.5.1 Field Duplicates and Relative Percent Difference (RPD)

A field duplicate sample is a split of a homogenized soil, groundwater, or surface water sample that is prepared and analyzed following the same procedure as the original sample. The relative percent different (RPD) is calculated for the results of the pair of samples. The RPD for two data points is equal to the difference divided by the mean multiplied by 100 percent, as shown below. The RPD is used to evaluate the precision of the laboratory analysis.

$$\left( \frac{|X_i - X_{ii}|}{\bar{X}} \right) \times 100 \%$$

**NOTES:**

- $X_i$  Concentration in Original Sample
- $X_{ii}$  Concentration in Duplicate Sample
- $\bar{X}$  Mean of Sample Concentrations

Throughout the investigation, blind field duplicates (BFDs) were collected during sampling events. These BFDs were collected at the same location, at the same time, by the same person utilizing the same equipment during field activities. The BC ENV suggests that BFDs should be collected at a rate of 10% of the total primary samples collected, and the following Table 4.6 summarizes the percent of BFDs obtained for soil and groundwater.

**Table 4.6 Sample and Blind Field Duplicate Summary**

Sampled Media	Number of Samples	Number of BFDs	Percentage of BFDs	Total Samples Collected
Groundwater	10	1	10	11
Surface Water	5	1	20	6





Once RPD values were calculated for analytical results of original and field duplicate samples, RPD values were compared to recommended BC ENV RPD targets, categorized by analytical parameter. These RPD targets are presented in Table 4.7 below and were obtained from Q.#36 of the Q&A section (Category: Standards, Sub-Category: General) on the BC ENV Land Remediation website. The BC ENV recommends that the RPD for duplicate field samples not exceed 1.5 times the acceptable lab RPD for the same compound. The lab RPDs can be found in the BC Environmental Laboratory Manual<sup>1</sup>.

**Table 4.7 Recommended RPD Targets**

Parameter Category	Recommended RPD
<b>Organics in Soil</b>	
Polycyclic Aromatic Hydrocarbons (PAH)	75%
Volatile organics (including F1, BTEX and VH)	60%
F2-F4 (Similar to Extractable Petroleum Hydrocarbons (EPH))	60%
Most Other Typical Organic Parameters	60%
<b>Organics in Water<sup>2</sup></b>	
Volatile Organics (including F1, BTEX and VH)	45%
Most other Typical Organic Parameters	45%
<b>Others</b>	
High variability metals in soil: Ag, Al, Ba, Hg, K, Mo, Na, Pb, Sn, Sr, Ti	60%
Other metals in soil and sediment	45%
Metals in Water	30%
General Inorganics in Soil and Sediment	45%
General Inorganics in Water	30%

<sup>1</sup> BC ENV, 2016. British Columbia Environmental Laboratory Manual, 2015 Edition.

<sup>2</sup> The BC ENV manual does not specifically list soil vapour, therefore the water recommended RPDs were applied to soil vapour.



## 5 Summary of Results

A summary of the results of the groundwater, surface water, leachate, and phytoremediation soil sampling are provided in the following sections.

### 5.1 Groundwater

#### 5.1.1 Monitoring

Monitoring wells MW-01 to MW-16 were monitored quarterly in 2022. The measured depth to groundwater varied between the monitoring wells. Generally, the depth to groundwater measurements in October 2022 ranged from approximately 199.623 meters above sea level (masl) in MW-14 to 158.627 masl in MW-09. Variations in groundwater levels due to seasonality were observed to be between 3 to 6 m within most wells, with the exception of MW-2 where variations of up to 16 m were observed.

Groundwater flow is inferred to be from the north to the southeast across the Site. MW-05 was not monitored during the 2022 monitoring program due to the presence of a water pump inside the well.

Groundwater monitoring data are summarized in Table 1 in Appendix E.

#### 5.1.2 Analysis

Ten groundwater samples, including one blind field duplicate, were collected, and submitted for laboratory analysis of the parameters identified in Table 4.1. The reported concentrations were less than the CSR  $AW_{FW}$  and DW standards.

The groundwater analytical results for the 2022 EEM program are summarized in Table 4 in Appendix E. Laboratory analytical certificates are provided in Appendix F.

### 5.2 Surface Water

#### 5.2.1 Monitoring

Surface water at five locations was monitored quarterly in 2022. Surface water monitoring data are summarized in Table 2 in Appendix E

Calculated discharges are presented in Table 5.1 below.

**Table 5.1 Discharge Data**

Date	Discharge (m <sup>3</sup> /s)
<b>SW-02<sup>1</sup></b>	
22 July 2022	0.276



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<b>Date</b>	<b>Discharge (m<sup>3</sup>/s)</b>
2 September 2022	0.395
22 November 2022	0.464
<b>SW-03<sup>1</sup></b>	
22 July 2022	0.352
2 September 2022	0.551
22 November 2022	0.450
<b>SW-04<sup>2</sup></b>	
22 July 2022	0.008
2 September 2022	0.030
22 November 2022	0.030
<b>SW-05</b>	
31 March 2022	0.268
22 July 2022	0.563
2 September 2022	0.696
22 November 2022	0.827

Note:

<sup>1</sup> Discharges on 28 March 2022 were not calculated at SW-02 and SW-03 due to insufficient data (depth data was not measured due to low flow in the watercourse).

<sup>2</sup> Velocity values were not measured on 31 March 2022. Hence, discharge was not calculated.



## **5.2.2 Analysis**

Six surface water samples, including one blind field duplicate, were collected, and submitted for laboratory analysis of the parameters listed in Table 4.2. The reported concentrations of PCOCs were less than the applicable standards and/or guidelines.

The surface water analytical results for the 2022 EEM program are summarized in Table 5 in Appendix E. Laboratory analytical certificates are provided in Appendix F.



## 5.3 Facility

### 5.3.1 Leachate Monitoring

Two leachate locations were monitored quarterly in 2022. Monitoring data was not collected at the sand filter during the December monitoring event. The water was too low to be monitored. Leachate monitoring data are summarized in Table 3 in Appendix E.

### 5.3.2 Leachate Analysis

Two leachate samples (from sand cyclone and sand filter) were collected and submitted for laboratory analysis during the 2022 EEM program. The analytical results for the leachate samples were compared to the applicable OC criteria listed in Table 4.3. During 2022, the reported leachate concentrations for the listed parameters were less than the OC permit criteria for leachate.

The leachate analytical results for the 2022 EEM program are summarized in Table 6 in Appendix E. Laboratory analytical certificates are provided in Appendix F.

## 5.4 Composite Soil

One composite soil sample was collected from the phytoremediation area in March, 2022. The reported analytical results for the phytoremediation soil sample were compared to the applicable CSR IL standards. The reported soil concentrations for the analyzed parameters were less than the CSR IL standards.

The soil analytical results for the 2022 EEM program are summarized in Table 7 in Appendix E. Laboratory analytical certificates are provided in Appendix F.



## 6 QA/QC Summary

Except for the RPD for total selenium and dissolved zinc at SW-05 and its duplicate SW-22, the calculated RPDs were less than the data quality objectives (DQOs). As the reported concentration of selenium and zinc for both the parent and duplicate samples were less than the most conservative guideline, the elevated RPD did not impact the conclusions of this report.

### 6.1 Laboratory QA/QC

Stantec reviewed the laboratory QA/QC data and identified the following outliers,

#### Work Order VA22A6903

- The laboratory reported that Travel Blank exceeded ALS recommended hold times for anions and nutrients prior to analysis. Given the sample is a Travel Blank which is lab controlled sample, analysis for anions and nutrients completed past the recommended hold times does not affect the interpretation of overall anion and nutrients results.
- The laboratory reported that Travel Blank, Field Blank and Sand Filter samples exceeded ALS recommended hold times for pH prior to sample reception. However, pH in Sand Filter sample was measured in the field and met the OCP Leachate Criteria. Further, the Travel Blank and Field Blank are lab controlled samples therefore hold times for analysis of pH are not applicable.

#### Work Order VA2209420

- The laboratory reported that MW-03, MW-01, MW-02, MW-03, MW-04, MW-09, MW-13, MW-22, and Field Blank exceeded ALS recommended hold times for anions and nutrients prior to the analysis. However, the reported results for the anion and nutrients were below the applicable BC CSR standard, therefore samples analyzed outside recommended hold times does not affect the overall interpretation of anion and nutrients results in the groundwater.
- The laboratory reported that Field Blank, MW-01, MW-02, MW-03, MW-04, MW-09, MW-13, MW-22 and Trip Blank exceeded ALS recommended hold times for pH prior to sample reception. However, pH is not regulated under the BC CSR. Therefore, understanding of the pH results does not affect the interpretation of groundwater data.
- The laboratory reported that the initial method blank (QC Lot: 768025) for the submission had positive results for dissolved aluminum. Low level samples were repeated with new QC. High level results (>5X initial method blank level) and non-detect results were reported and were deemed defensible.

#### Work Order VA22C8721

- The laboratory reported recovery greater than upper control limit for total bismuth in QC-759369-002. However, total bismuth is not regulated under BC WQGs. Therefore, recovery greater than upper control limit does not affect the interpretation of overall total metals results in surface water samples.



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### 6 QA/QC Summary

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- The laboratory reported that SW-01, SW-02, SW-03, SW-04, SW-05 and SW-22 exceeded ALS recommended hold times for anions and nutrients prior to the analysis. However, the reported results for the anion and nutrients were below the applicable BC WQGs, therefore samples analyzed outside recommended hold times does not affect the overall interpretation of anion and nutrients results in the surface.
- The laboratory reported that SW-01, SW-02, SW-03, SW-04, SW-05, SW-22 and Field Blank exceeded ALS recommended hold times for pH prior to sample reception. However, pH in the above samples were measured in the field and met the BC WQGs.

#### Work Order VA22C0792

- The laboratory reported that method blank result of alkalinity in a QC sample exceeded permitted value. However, associated sample result was less laboratory RDL and was considered reliable.
- The laboratory reported that F5-Sand Cyclone sample exceeded ALS recommended hold times for pH prior to sample reception. However, pH in the above sample was measured in the field and the pH values met the OC Leachate Criteria. Further, it is practically not possible to submit the sample to ALS within the recommended hold time of 15 minutes.



## 7 Trend Analysis

To assess the changes in water quality over time, a temporal graph of select EEM data for groundwater and surface water was completed and presented in Appendix G. Non-detectable results were plotted at the detection limit. The time frame represented in the temporal graphs is 2017 to 2022. For consistency purposes, the parameters selected for trend analysis follow previous EEM reports and include the following:

- Ammonia
- Electrical Conductivity
- Chloride
- Sulphate
- Iron (dissolved for groundwater, total for surface water)

These geochemical parameters are used as a screening list to assist in identifying if something may have been introduced into an aquifer or surface water and influencing the geochemistry or surface water chemistry. The following upward trends were identified in the temporal plots.

- Conductivity in groundwater appears to be trending upward in monitoring well MW-02.
- Conductivity and chloride in groundwater appears to be trending upward in monitoring well MW-15.
- Conductivity and chloride in groundwater appears to be trending upward in monitoring well MW-16.
- Ammonia in surface water sampled at SW-2 appears to be increasing since 2017
- The trends in the remaining parameters assessed in groundwater and surface water have been relatively stable during the monitoring years.





## 8 Conclusion and Recommendations

Based on the information gathered and observations made during the EEM program, Stantec offers the following conclusions:

- The reported analytical results for groundwater and surface water samples collected in 2022 were below the applicable standards or guidelines.
- The analytical results for the leachate samples were below the applicable OC criteria.
- The composite soil sample collected from the phytoremediation treatment area contained concentrations of metals and salinity parameters less than the applicable CSR IL standards.

Based on the analytical results and observations made during the 2022 monitoring program, Stantec recommends that the current monitoring program should be continued in 2023 in accordance with the requirements under the OC.



## 9 Limitations

This report documents work that was performed in accordance with generally accepted professional standards at the time and location in which the services were provided. No other representations, warranties or guarantees are made concerning the accuracy or completeness of the data or conclusions contained within this report, including no assurance that this work has uncovered all potential liabilities associated with the identified property.

This report provides an evaluation of selected environmental conditions associated with the identified portion of the property that was assessed at the time the work was conducted and is based on information obtained by and/or provided to Stantec at that time. There are no assurances regarding the accuracy and completeness of this information. All information received from the client or third parties in the preparation of this report has been assumed by Stantec to be correct. Stantec assumes no responsibility for any deficiency or inaccuracy in information received from others.

The opinions in this report can only be relied upon as they relate to the condition of the portion of the identified property that was assessed at the time the work was conducted. Activities at the property subsequent to Stantec's assessment may have significantly altered the property's condition. Stantec cannot comment on other areas of the property that were not assessed.

Conclusions made within this report consist of Stantec's professional opinion as of the time of the writing of this report and are based solely on the scope of work described in the report, the limited data available and the results of the work. They are not a certification of the property's environmental condition. This report should not be construed as legal advice.

This report has been prepared for the exclusive use of the client identified herein and any use by any third party is prohibited. Stantec assumes no responsibility for losses, damages, liabilities or claims, howsoever arising, from third party use of this report. The locations of any utilities, buildings and structures, and property boundaries illustrated in or described within this report, if any, including pole lines, conduits, water mains, sewers and other surface or sub-surface utilities and structures are not guaranteed. Before starting work, the exact location of all such utilities and structures should be confirmed and Stantec assumes no liability for damage to them.

This report is limited by the following:

- Stantec did not conduct, nor was present for, the sampling or monitoring onsite
- Historical data was provided to Stantec by RDKS and is presumed to be accurate

The conclusions are based on the Site conditions encountered by Stantec at the time the work was performed at the specific testing and/or sampling locations, and conditions may vary among sampling locations. Factors such as areas of potential concern identified in previous studies, Site conditions (e.g., utilities) and cost may have constrained the sampling locations used in this assessment. In addition, analysis has been carried out for only a limited number of chemical parameters, and it should not be inferred that other chemical species are not present. Due to the nature of the investigation and the limited



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### 9 Limitations

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data available, Stantec does not warrant against undiscovered environmental liabilities nor that the sampling results are indicative of the condition of the entire site. As the purpose of this report is to identify Site conditions which may pose an environmental risk; the identification of non-environmental risks to structures or people on the Site is beyond the scope of this assessment.

Should additional information become available which differs significantly from our understanding of conditions presented in this report, Stantec specifically disclaims any responsibility to update the conclusions in this report.



## 10 References

- BC ENV. Contaminated Sites Regulation (2021), B.C. Reg. 179/2021
- BC ENV Field Sampling Manual, Version: 2013, Accessed at <https://www2.gov.bc.ca/gov/content/environment/research-monitoringreporting/monitoring/laboratory-standards-quality-assurance/bc-field-sampling-manual>, on April 20, 2023
- BC ENV. Hazardous Waste Regulation (2022), B.C. Reg. 63/88
- BC ENV. Protocol 21 For Contaminated Sites: Water Use Determination, Version 1 November 2017, Accessed at: [https://www2.gov.bc.ca/assets/gov/environment/air-land-water/site-remediation/docs/protocols/protocol\\_21.pdf](https://www2.gov.bc.ca/assets/gov/environment/air-land-water/site-remediation/docs/protocols/protocol_21.pdf), on April 20, 2023
- BC ENV Protocol 4 For Contaminated Sites: Establishing local background concentrations in soil, Version: 1 February 2023, Accessed at <https://www2.gov.bc.ca/assets/gov/environment/airland-water/site-remediation/docs/protocols/protocol04.pdf>, on April 20, 2023
- Clague, The Surficial Geology Map of the Skeena River and Bulkley River Area, 1983
- EMA Operational Certificate #17227, 2019
- Environmental Management Act. RSBC 2003 Chapter 53. Victoria, BC.
- GeoBC's web-based mapping tool iMapBC, Accessed at <https://www2.gov.bc.ca/gov/content/data/geographic-data-services/web-based-mapping/imapbc>, on April, 2023
- WSP Golder, Forceman Ridge Waste Management Facility 2021 Annual Environmental Effects Monitoring Report, 2021



# Appendices



## Appendix A      Figures









## Appendix B      Operational Certificate







September 19, 2019

Tracking Number: 385635  
Authorization Number: 17227

**REGISTERED MAIL**

REGIONAL DISTRICT OF KITIMAT-STIKINE  
300 4545 LAZELLE AVENUE  
TERRACE, BC  
V8G 4E1

Dear Operational Certificate Holder:

Enclosed is Amended Operational Certificate 17227 issued under the provisions of the *Environmental Management Act*. Your attention is respectfully directed to the terms and conditions outlined in the operational certificate. An annual fee will be determined according to the Permit Fees Regulation.

This operational certificate does not authorize entry upon, crossing over, or use for any purpose of private or Crown lands or works, unless and except as authorized by the owner of such lands or works. The responsibility for obtaining such authority rests with the operational certificate holder. It is also the responsibility of the operational certificate holder to ensure that all activities conducted under this authorization are carried out with regard to the rights of third parties, and comply with other applicable legislation that may be in force.

The Director may require the Permittee to repair, remove, or add to existing works, or to construct new works, and to submit plans and specifications for works specified in this authorization.

The Director may require the Permittee to conduct additional monitoring, and may specify procedures for monitoring, analysis, and procedures or requirements respecting the handling, treatment, transportation, discharge or storage of waste.

This decision may be appealed to the Environmental Appeal Board in accordance with Part 8 of the *Environmental Management Act*. An appeal must be delivered within 30 days from the date that notice of this decision is given. For further information, please contact the Environmental Appeal Board at (250) 387-3464.

Administration of this operational certificate will be carried out by staff from the Authorizations - North Region. Plans, data and reports pertinent to the operational certificate are to be submitted to the Regional Manager, Environmental Protection, at Ministry of Environment and Climate Change Strategy, Regional Operations, Authorizations - North Region, Suite 325 - 1011 4th Avenue, Prince George BC V2L 3H9.

Yours truly,

A handwritten signature in blue ink, appearing to read "Karen Moores".

Karen Moores, P.Ag.  
for Director, *Environmental Management Act*  
Authorizations - North Region



**MINISTRY OF ENVIRONMENT  
AND CLIMATE CHANGE  
STRATEGY**

**OPERATIONAL CERTIFICATE**

17227

for the

**FORECEMAN RIDGE LANDFILL**

*Under the Provisions of the Environmental Management Act and in Accordance with the  
Regional District of Kitimat-Stikine's Solid Waste Management Plan*

**REGIONAL DISTRICT OF KITIMAT-STIKINE**

**300 4545 LAZELLE AVENUE  
TERRACE, BC  
V8G 4E1**

is authorized to store, handle, treat and discharge municipal waste at a sanitary landfill facility located near Forceman Ridge approximately 30 km south of Terrace, British Columbia, subject to the terms and conditions listed below. Contravention of any of these conditions is a violation of the *Environmental Management Act* and may result in prosecution.

Capitalized terms referred to in this authorization are defined in the attached Glossary. Other terms used in this authorization have the same meaning as those defined in the *Environmental Management Act* and applicable regulations.

Where this authorization provides that the Director may require an action to be carried out, the Permittee must carry out the action in accordance with the requirements of the Director.

This Authorization supersedes and replaces all previous versions of Permit 17227 issued under Section 14 of the *Environmental Management Act*.

Date Issued: November 7, 2008  
Date Amended: September 19, 2019  
(most recent)

A handwritten signature in blue ink, appearing to read "Kurt Berg", is written over a faint blue grid.

for Director, *Environmental Management Act*  
Authorizations - North Region

1. **LOCATION OF LANDFILL PROPERTY**

The location of the property where discharges are authorized to occur is described as District Lot 8128, Range 5, Coast District.

2. **AUTHORIZED DISCHARGES**

2.1. **Municipal Solid Waste**

This section applies to the discharge of municipal solid waste to ground. The site reference number for this discharge is E249849.

2.1.1. **Quantity of Discharge**

The quantity of solid wastes discharged to ground shall not exceed the design capacity of the landfill facility specified as follows: (1) by an engineered final design footprint (see section 3.3); and (2) by engineered excavation and final grade contours (see section 3.4).

2.1.2. **Characteristics of the Discharge**

Subject to sections 6.2, 6.3 and 6.4, the characteristics of the discharge shall be typical of municipal solid waste.

2.1.3. **Authorized Works**

The authorized works are a separate municipal solid waste disposal area and related appurtenances located approximately as shown on the attached site plan.

2.2. **Open Burning Air Contaminants**

This section applies to the discharge of air contaminants to the atmosphere from the regulated open burning of selected combustibles. The site reference number for this discharge is E249850.

2.2.1. **Quantity of Discharge**

The maximum authorized quantity of discharge of air contaminants is indeterminate.

Date Issued: November 7, 2008  
Date Amended: September 19, 2019  
(most recent)



for Director, *Environmental Management Act*  
Authorizations - North Region

2.2.2. Characteristics of the Discharge

The characteristics of the discharge shall be typical of those resulting from the regulated open burning of selected combustibles as per section 11.3.

2.2.3. Authorized Works

The authorized works are a separate burn area associated with a landfill operation and related appurtenances located approximately as shown on the attached Site Plan.

**2.3. Liquid Wastes**

This section applies to the discharge of selected liquid wastes to the ground. The site reference number for this discharge is E249851.

2.3.1. Quantity of Discharge

The maximum authorized quantity of discharge is indeterminate.

2.3.2. Characteristics of the Discharge

The characteristics of the discharge shall be those typical of septic tank pumpage, holding tank effluent, sewage treatment plant sludges, and wash water and grit from drain sumps at car and light truck wash facilities and parking lots.

2.3.3. Authorized Works

The authorized works are liquid waste storage and treatment lagoons and related appurtenances located approximately as shown on the attached Site Plan.

**2.4. Leachate**

This section applies to the discharge of leachate to a phytoremediation area. The site reference number for this discharge is E249852.

2.4.1. Quantity of Discharge

Date Issued: November 7, 2008  
Date Amended: September 19, 2019  
(most recent)



for Director, *Environmental Management Act*  
Authorizations - North Region

The maximum authorized rate of discharge is 609 m<sup>3</sup>/day and the average rate of discharge is 400 m<sup>3</sup>/day. The discharge may occur 24 hours/day, 7 days/week during the months of April to October inclusive.

2.4.2. Characteristics of the Discharge

The characteristics of treated leachate shall not exceed the following limits:

Total Nitrogen	300 mg/L
Ammonia	214 mg/L
pH	6.5 to 8.5
Chloride	5000 mg/L
Total iron	6 mg/L
Total zinc	100 mg/L
Total cadmium	0.1 mg/L

2.4.3. Authorized Works

The authorized works are leachate collection and treatment facilities including an equalization basin, aeration lagoon, sedimentation pond, sand filter and hybrid poplar plantation and related appurtenances located approximately as shown on the attached Site Plan.

**3. LANDFILL DESIGN**

**3.1. Design by Qualified Professional(s)**

The landfill and associated works [including but not limited to the size(s) and location(s) of disposal area(s), maximum allowable slopes of disposal area(s), leachate management system, progressive and final closure details, etc.] shall be designed by qualified professionals [such as

Date Issued: November 7, 2008  
Date Amended: September 19, 2019  
(most recent)



for Director, *Environmental Management Act*  
Authorizations - North Region

engineer(s) and/or geoscientist(s)] registered in the Province of British Columbia who have expertise in the field of landfill design. Where a design feature prepared by a qualified professional is in conflict with any requirement of this operational certificate, it shall be brought to the attention of the Director who shall determine a resolution to the conflict.

**3.2. Construction**

The landfill and associated works shall be constructed in accordance with the design prepared by qualified professionals.

**3.3. Engineered Footprint**

The landfill design shall include preparation of an engineered final design footprint delineating the maximum extent of solid waste disposal allowable at the facility horizontally (in plan view). The engineered final design footprint shall be clearly shown on a scaled plan of the site and the plan shall be made available in an electronic format as a computer aided design (CAD) drawing.

**3.4. Engineered Excavation and Final Grade Contours**

The landfill design shall include preparation of engineered excavation grade (if below grade landfilling is to occur) and final grade contours delineating the maximum extent of solid waste disposal allowable at the facility vertically (in cross-sectional view). The engineered excavation and final grade contours shall be clearly shown on scaled drawings (accompanied with typical cross sections to aid in depicting the landfill profile) and the drawings shall be made available in an electronic format as computer aided design (CAD) drawings.

**4. LANDFILL GAS MANAGEMENT**

**4.1. Lower Explosive Limit**

The landfill shall be operated such that combustible gas concentrations do not exceed the lower explosive limit in soils at the property boundary or 25% of the lower explosive limit in any on-site or off-site structure or facility, including any services (water, sewer, electrical, etc.).

Date Issued: November 7, 2008  
Date Amended: September 19, 2019  
(most recent)



for Director, *Environmental Management Act*  
Authorizations - North Region

## 5. LEACHATE MANAGEMENT REQUIREMENTS

### 5.1. Leachate Containment

The operational certificate holder shall ensure that leachate is contained through the use of a barrier system. The barrier system shall consist of a minimum of 2 metres of natural, *in-situ* clay with a hydraulic conductivity of  $1 \times 10^{-6}$  cm/s or less. Alternatively, an engineered barrier may be used provided it is equivalent to or better than the natural clay barrier specified above. The actual specifications of the leachate containment system shall be set out in the detailed engineering design.

### 5.2. Leachate Collection

A continuous drainage blanket shall be established beneath all landfill phases. The drainage blanket shall consist of, or be equivalent to, a minimum 300 mm thick layer of clean gravel with an effective hydraulic conductivity exceeding  $1 \times 10^{-1}$  cm/s. The leachate collection system shall be designed such that the hydraulic head on top of the barrier layer does not exceed 300 mm at any time.

### 5.3. Protection Against Clogging

The drainage layer shall be protected against sedimentation and bio-chemical clogging. Under no circumstances shall leachate piping or leachate collectors be wrapped in geotextile.

## 6. GENERAL REQUIREMENTS

### 6.1. Site Identification

A sign shall be erected at the main entrance to the site which identifies the following: site name, owner and operator, contact phone number and address, tipping fees (if applicable) and prohibited wastes. The lettering on the sign shall be such that it is clearly readable upon approach.

### 6.2. Prohibited Wastes

No wastes as defined by the *Hazardous Waste Regulation* shall be received, stored or disposed of at this site except as authorized by the Director. Lead-acid batteries shall not be landfilled but may be salvaged/recycled provided they are stored, handled and shipped in compliance with the *Hazardous Waste Regulation* and with section 10 of

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this operational certificate. Tires equal to or less than 43.2 centimetres (17") in rim size and auto hulks shall not be landfilled.

**6.3. Waste Asbestos**

Notwithstanding section 6.2 of this operational certificate, the disposal of waste asbestos under section 2.1 of this operational certificate and in compliance with the requirements of the *Hazardous Waste Regulation* is hereby authorized.

**6.4. Contaminated Soil**

Soil that contains contaminants in concentrations less than "hazardous waste" as defined by the *Hazardous Waste Regulation* may be disposed at the landfill site. Disposal includes monofilling, co-disposal with other wastes, use as a refuse cell berm material and use as a refuse cell cover material. Disposal must occur within a disposal area as authorized by sections 7 and 8 of this operational certificate. Disposal does not include use as final cover material.

**6.5. Waste Measurement**

The quantity of waste material landfilled at the site shall be measured using a weigh scale or by volume or estimated by means suitable to the Director. The results shall be submitted once per year on or before June 30 for the previous year expressed in tonnes/yr and/or m<sup>3</sup>/yr.

**6.6. Ozone Depleting Substances**

Release of ozone depleting substances from the storage, handling and disposal of used refrigerator equipment, freezers, motor vehicle air conditioners and other air conditioning equipment, fire extinguishers or other equipment containing ozone depleting substances is strictly forbidden as per the requirements of the *Ozone Depleting Substances and other Halocarbons Regulation*.

**6.7. Fire Prevention**

The operational certificate holder shall make all reasonable efforts to prevent unauthorized fires from occurring at the landfill site. As a minimum, a fire break clear of all combustible materials at least 15 metres wide shall surround all disposal, treatment and individual storage areas

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which have received or are receiving combustible materials. Disposal areas that have had 30 cm of compacted mineral soil cell cover or final cover applied are exempt. Water supply and pumping capabilities and/or soil and earth moving equipment shall be maintained at a sufficient level to extinguish fires. In addition, reasonable efforts shall include, but are not necessarily limited to, the preparation of a fire prevention and response plan.

**6.8. Extinguishment of Fires**

In the event of an unauthorized fire (including any smouldering fire), the operational certificate holder shall immediately make all reasonable efforts to extinguish the fire. Any fire which poses a threat to public health or to neighbouring property shall be reported to Emergency Management BC at 1-800-663-3456, the local fire authority, and/or the BC Wildfire Service at 1-800-663-5555.

**6.9. Buffer Zone**

No material shall be landfilled within 50 metres of the property boundary.

**6.10. Litter Control**

The operational certificate holder shall make all reasonable efforts to prevent litter from scattering. Any litter scattered on neighbouring property shall be cleaned up as soon as practicable.

**6.11. Water Table Restriction**

Wastes shall not be deposited or stored less than 1.2 metres above the highest groundwater level.

**6.12. Inert Materials**

Specific inert materials may be exempted from the requirements of section 6.11 by the Director. The permission of the Director must be obtained in writing prior to any disposal or handling of inert materials on an exemption basis.

**6.13. Bear-Proof Containment of Putrescibles**

All putrescible wastes that arrive at the landfill facility must be

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immediately contained within a bear-proof bin (i.e. on-site transfer station of bear-proof design and construction) or within an area enclosed by an electric fence. Grass, leaves, weeds, branches and ground wood waste are not considered putrescible for the purposes of this operational certificate.

#### 6.14. Electric Fencing

##### 6.14.1. Design, Construction and Maintenance

Wherever required, electric fencing and gate systems at the landfill shall be designed, constructed, and maintained such that bears are prevented from entering into the landfill through any portion of the fence or gates at any time of the day.

##### 6.14.2. Fence Type

Fencing may be either high tensile smooth wire or fence fabric (e.g., mesh-wire, page-wire or chain link). The configuration of a high tensile smooth wire fence shall consist of a minimum of eight strands, with four energized strands alternating with four grounded strands as follows: the bottom strand shall be a grounded or (-) strand and shall not be more than 10 cm from the ground (soil) at any location; and thence starting from the bottom strand, the other seven strands shall be spaced  $15 \pm 2$  cm,  $15 \pm 2$  cm,  $15 \pm 2$  cm,  $20 \pm 2$  cm,  $20 \pm 2$  cm,  $20 \pm 2$  cm, and  $25 \pm 2$  cm. Additional strands to this minimum configuration may be used.

A fence fabric may be used instead of high tensile smooth wire. The fence fabric shall: be a minimum of 1.22 metre high; be constructed of a minimum wire thickness of 11 gauge, and have a maximum mesh size of 15 cm. The bottom of the fabric shall not be more than 10 cm from the ground (soil) at any location. Any uncharged fence fabric must have a minimum of four strands of charged wires on an outrigger system, spaced as follows: the first strand shall not be higher than 25 cm from the ground; and each of the remaining three strands shall be spaced approximately 25 cm apart from adjacent charged strands.

##### 6.14.3. Wire Tension

For a high tensile smooth wire fence construction, all strands shall be tightened to a minimum of 125 lbs tension at 20°C. The required tension is to be corrected for temperature by use of the following

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formula for 12-½ gauge high tensile steel wire:

$$Tension = 125 - 2.5(Temperature - 20)$$

where: *Tension* is in lbs force

*Temperature* is in °C

6.14.4. Post Spacing

Fence posts shall be spaced a maximum of 7.5 metres apart.

6.14.5. Grounding System

A grounding system shall be installed consisting of solid grounding rods (i.e., not pipe) with a minimum diameter of 16 mm (5/8 inch) that have a buried length of at least 2 metres. A minimum of three grounding rods (spaced at least 3 metres apart) shall be installed and connected to the energizer. Alternative energizer grounding systems (e.g., grounding plates, or a deep-driven grounding system) may be used provided the grounding is equivalent to or better than three grounding rods. A grounding rod (or equivalent) shall be installed at least once every 450 metres along the fence and connected to the grounded wire strands or uncharged fence fabric. Additional grounding may be required for dry sites or if other conditions affect proper grounding.

6.14.6. Period of Operation

Electric fencing shall be fully operational during the period of April 1 to October 31 inclusive each year and at any other time of year when there is bear activity in the immediate surrounding area. If snow is present during this period, any electrified strands above snow line shall be isolated from the remainder of the system and energized.

6.14.7. Minimum Voltage

Electric fencing shall be operated with a minimum voltage of 6,000 volts.

6.14.8. Gate(s)

Any access through electric fencing for vehicles, equipment and

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personnel shall consist of an electrified gate system that is closed during non-operating hours. The gate system shall be electrified to a minimum voltage of 6,000 volts at all times except when being opened or closed. Any gate that is open during operating hours shall be periodically checked by the attendant for bear activity during hours of operation. Gaps between the gate and the fence and ground, and between gate panels (for a double-hung gate), shall not exceed 10 cm.

6.14.9. Fence Inspections

The entire perimeter of the electric fencing shall be inspected at least once every seven days and the voltage of the fencing measured at several points along the fencing and at each gate using a proper electric fence voltmeter matched to the brand of the fence charging unit. The results of voltage testing shall be recorded in a log book or electronic record. Any results less than the minimum 6,000 volts shall be immediately investigated for the cause of the low voltage (e.g., low battery, litter, vegetation, loose or crossed wires, broken insulators, breaks in the grounding system, etc.). Corrective actions to restore proper voltage shall be immediately undertaken.

Signs of digging or other attempts by bears to penetrate electric fencing shall be recorded in a log book or electronic record. Any penetrations through electric fencing by bears shall be immediately reported to the Conservation Officer Service at 1-877-952-7277.

In cases of low voltage or signs of penetration attempts, inspections shall be increased from once per week to once per day until proper voltage is fully restored and until there are no new signs of penetration attempts, respectively.

6.15. Municipal Solid Waste Separation

Municipal solid waste may be separated into the following streams: (1) a mixed waste stream including putrescibles for disposal; (2) a mixed waste stream not including any putrescibles for disposal; (3) an organic waste stream, including untreated wood wastes, for composting; (4) a selected waste stream for salvage and recycling; and (5) a selected combustibles waste stream for open burning or air-curtain burning. Each of these waste streams is subject to all of the general requirements contained in sections 6.1 through 6.14 above, as well as being subject to specific requirements as outlined in a separate section for each below.

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### 6.16 Groundwater Quality

The characteristics of the groundwater at the property boundary shall not exceed drinking water standards in Schedule 6 of the Contaminated Sites Regulation. Where natural background water quality concentrations exceed the aforementioned standard, the characteristics of the groundwater at the property boundary must not exceed background concentrations.

Where monitoring shows contaminant concentrations exceed the applicable water use, or other standards, the operational certificate holder shall notify the Director and take one of the following corrective actions:

- Mitigation to meet standards or
- Based on the results of a risk assessment carried out in accordance with Contaminated Sites Regulation guidance (i.e. Technical Guidance 7), undertake the warranted mitigation measures to achieve acceptable risk.

## 7. OPERATIONAL REQUIREMENTS FOR DISPOSAL OF SOLID WASTES CONTAINING PUTRESCIBLES

### 7.1. Location

The operational certificate holder shall identify an area for disposal of putrescible refuse (herein referred to as the putrescible disposal area) that is within the authorized municipal solid waste disposal footprint (see section 2.1.1). Disposal of any solid wastes consisting of or mixed with putrescibles shall be restricted to the designated putrescible disposal area.

### 7.2. Nature of Wastes

Wastes disposed at the active face of the putrescible disposal area may include any municipal solid waste except liquid wastes and hot ashes or as otherwise restricted by section 6.2.

### 7.3. Bear-Proofing

The putrescible waste disposal area shall be maintained inside an electric fence. The electric fence shall comply with all requirements of section 6.14.

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**7.4. Waste Compaction**

Wastes at the active face of the putrescible disposal area shall be spread in layers of 60 centimetres or less on the active face and then compacted with a minimum of three (3) passes with heavy equipment.

**7.5. Maximum Lift Height**

The maximum height of any lift of compacted refuse in the putrescible disposal area shall be 5 metres.

**7.6. Waste Cover**

Cover shall be applied to refuse in the putrescible disposal area as specified below. The operational certificate holder shall maintain a log book or electronic record with all dates of cover application.

**7.6.1. Active Face Cover**

Except as otherwise stated in sub-section 7.6.2, the active face of the putrescible disposal area does not normally require cover. Based on information concerning environmental or public health concerns related to exposed refuse at the active face, however, the Director may require that the active face be covered completely at a specified frequency with 0.15 m of soil (or functional equivalent) for a specified period.

**7.6.2. Cell Cover**

A uniform cover of 30 cm compacted soil shall be applied to all sides of the active refuse cell in the putrescible disposal area such that no more than 500 m<sup>2</sup> of refuse are exposed at the active face at any time and such that the volume of refuse in the cell does not exceed 5,000 m<sup>3</sup>. Once the maximum volume of refuse has been reached in a cell, the active face shall be covered with 30 cm of compacted soil and a new refuse cell begun.

**7.6.3. Final Cover**

Completed portions of the putrescible disposal area shall progressively receive final cover during the active life of the landfill (see section 15.5).

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**7.7. Dead Animal Disposal**

Dead animals and animal parts shall be disposed of in the putrescible disposal area and covered as soon as practicable with a minimum of 60 centimetres of soil and/or refuse material such that flies and scavenging animals are prevented from accessing the carrion.

**8. OPERATIONAL REQUIREMENTS FOR DISPOSAL OF NON-PUTRESCIBLE SOLID WASTES**

**8.1. Location**

The operational certificate holder may identify an area for the disposal of non-putrescible wastes (herein referred to as the non-putrescible disposal area) that is within the authorized municipal solid waste disposal footprint (see sub-section 2.1.1).

**8.2. Nature of Wastes**

Wastes disposed at the active face of the non-putrescible disposal area may include any municipal solid waste except putrescibles, liquid wastes and hot ashes or materials otherwise restricted by section 6.2.

**8.3. Waste Compaction**

Wastes at the active face of the non-putrescible disposal area shall be spread in layers of 60 centimetres or less on the active face and then compacted with a minimum of three (3) passes with heavy equipment.

**8.4. Maximum Lift Height**

The maximum height of any lift of compacted refuse in the non-putrescible disposal area shall be 5 metres.

**8.5. Waste Cover**

Cover shall be applied to refuse in the non-putrescible disposal area as specified below. The operational certificate holder shall maintain a log book or electronic record with all dates of cover application.

**8.5.1. Active Face Cover**

Except as otherwise stated in sub-section 8.5.2, the active face of

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the non-putrescible disposal area does not normally require cover. Based on information concerning environmental or public health concerns related to exposed refuse at the active face, however, the Director may require that the active face be covered completely at a specified frequency with 0.15 m of soil (or functional equivalent) for a specified period.

8.5.2. Cell Cover

A uniform cover of 30 cm compacted soil shall be applied to all sides of the active refuse cell in the non-putrescible disposal area such that no more than 500 m<sup>2</sup> of refuse are exposed at the active face at any time and such that the volume of refuse in the cell does not exceed 5,000 m<sup>3</sup>. Once the maximum volume of refuse has been reached in a cell, the active face shall be covered with 30 cm of compacted soil and a new refuse cell begun.

8.5.3. Final Cover

Completed portions of the non-putrescible disposal area shall progressively receive final cover during the active life of the landfill (see section 15.5).

9. **OPERATIONAL REQUIREMENTS FOR COMPOSTING**

9.1. **Location**

The operational certificate holder may identify an area for composting (herein referred to as the composting area). Any composting shall be restricted to the designated composting area. This area shall be clearly identified at the landfill site.

9.2. **On-Site Usage of Compost Product**

Composting may be conducted passively by static pile (i.e., no aeration, etc.) provided the compost product is used on-site at the landfill for cover, reclamation or landscaping purposes. The compost piles must be rested at least one year after the last addition of organic waste prior to use.

9.3. **Use of Sewage Sludge**

Dewatered sludge from the liquid waste disposal lagoons authorized by

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section 2.3 may be included in static compost piles provided: the sludge is first blended with carbonaceous material (e.g., sawdust and/or wood shavings); and the public is prohibited from accessing any composting area that includes sludge.

**9.4. Off-site Usage of Compost Product**

If compost product is to be made available to the public or otherwise used offsite, composting operations shall comply with the requirements of the *Organic Matter Recycling Regulation* and any other relevant composting legislation.

**9.5. Bear-Proofing**

If the composting operation is to receive any organic wastes that are potential attractants to bears, then composting shall be completely enclosed by an electric fence or contained in a bear-proof structure (building or composting vessel). The electric fence shall comply with all requirements of section 6.14.

**10. OPERATIONAL REQUIREMENTS FOR STORAGE OF SELECTED WASTES FOR SALVAGE AND RECYCLING**

**10.1. Location**

The operational certificate holder may identify an area for the storage of selected wastes for salvage and recycling (herein referred to as the salvage/recycling area). Any salvage/recycling shall be restricted to the designated salvage/recycling area.

**10.2. Nature of Wastes**

Wastes to be salvaged/recycled may be any items with potential salvage or recycling value but shall not include any refuse consisting of or containing putrescibles, any liquid wastes, hot ashes or materials otherwise restricted by section 6.2.

**10.3. Contamination**

Contamination of any of the designated salvage/recycling storage piles

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with putrescible wastes shall be cleaned up immediately. Contamination of any of the storage piles with materials other than the intended salvageable/recyclable material (e.g., scrap metal with wood waste, or white goods with demolition debris, etc.) may result in a requirement to clean up the contamination or to landfill the contaminated material.

## 11. OPERATIONAL REQUIREMENTS FOR REGULATED OPEN BURNING

### 11.1. Location

The operational certificate holder may identify an area for the use of open burning to treat selected combustibles (herein referred to as the open burning area). Any open burning of selected wastes shall be restricted to the designated open burning area.

### 11.2. Quantity, Timing and Duration of Discharge

The maximum authorized quantity of wood residue to be open burned during each event is that which has accumulated at the time of burn initiation.

The maximum authorized duration of each burn shall be limited to the period between two hours after sunrise on the day of ignition, and sunset on the following day. Each open burn shall be completely extinguished at the end of the authorized burn duration.

Should a condition arise which prevents the burn pile(s) from being burned within this period, the Director shall be notified in accordance with this authorization.

### 11.3. Nature of Wastes

Acceptable materials for burning may only include dry, unpainted, untreated demolition, construction and packing-related wood residue, clean stumps and brush, but shall exclude nuisance-causing combustibles such as glue-containing wood, painted and treated wood, sawdust, yard wastes, mulch, wood chips, rubber, plastics, tars, insulation, roofing material, asphalt shingles, etc.

### 11.4. Favourable Weather for Smoke Dispersion

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Open burning shall not proceed unless the recorded Environment Canada Ventilation Index Forecast for Terrace is good for the first day and good or fair for the second day.

The contact number for the forecast is 1-888-281-2992. Ventilation index forecasts can also be obtained after 7:00 a.m. from the following Environment Canada website:

<http://www.env.gov.bc.ca/epd/epdpa/venting/venting.html>

A burn registration number shall be obtained from the Ministry of Forests (1-888-797-1717) prior to ignition.

Open burning of wood residue shall not be initiated or continued if the local air flow will cause the smoke to negatively impact a nearby population or cause pollution. No burning shall occur during periods of fire hazard or when burning is prohibited by other agencies.

#### **11.5. Fire Accelerant**

An approved fire accelerant such as diesel fuel or commercial fire starter gel or a flame-thrower shall be used to ensure efficient and rapid ignition of the waste material.

#### **11.6. Minimization of Smoke**

Each burn shall be tended in a manner that ensures minimization of smoke emissions. Measures to minimize smoke shall include, but not necessarily be limited to: stacking of waste in a manner that eliminates inclusion of dirt; waiting to burn until wastes are reasonably dry after any significant precipitation event; and using adequate equipment and staff.

#### **11.7. Extinguishment Contingency Plan**

Prior to burning, a contingency plan shall be in place detailing how the open burn will be extinguished in the event of any of the following occurring:

- i) Inadequate smoke dispersion in the surrounding environment;
- ii) wood continues to smoulder after the authorized burn period;
- iii) the Director requires that the open burn be extinguished for

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**11.8. Extinguishment**

All combustion shall be completely extinguished at the end of the authorized period as set out in Section 6.2.

**12. OPERATIONAL REQUIREMENTS FOR DISPOSAL OF LIQUID WASTES**

**12.1. Location**

The operational certificate holder may identify an area for the controlled disposal of selected liquid wastes (herein referred to as the liquid waste disposal area). Disposal of any liquid wastes from pumper trucks or the like shall be restricted to the designated liquid waste disposal area.

**12.2. Liquid Waste Disposal Lagoons**

Disposal of any liquid wastes shall be to properly designed and constructed lagoon(s) located in the liquid waste disposal area. The lagoon(s) shall function as decant lagoons (with decant discharged to an authorized liquid waste handling system such as a leachate treatment system) and/or as part of an organic matter composting system. The lagoons shall be of an impervious design that prevents the escapement of liquid to the ground. In all cases, design and construction of the liquid waste disposal lagoon(s) shall be such that seepage through the berms shall not occur.

**12.3. Signage and Fencing**

The liquid waste disposal area shall be fenced with chain link or steel woven-wire (e.g., page wire) a minimum of 1.2 metres high. Signs identifying the nature of the lagoon disposal area shall be erected on all sides of the fence such that the lagoons are easily identifiable from any approach.

**12.4. Freeboard**

A minimum freeboard of 50 centimetres shall be maintained at all times.

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The lagoon berms shall be maintained in good working order and the Director shall be notified immediately of any failure or overflow.

**12.5. Nature of Wastes**

The nature of wastes which may be discharged to a designated lagoon is that of typical septic tank pumpage, sewage holding tank waste, sewage treatment plant sludge, and wash water and grit from drain sumps at automobile wash facilities (intended primarily for cars and light trucks) and parking lots. Industrial liquid wastes and sludges shall be excluded.

**12.6. Off-Loading Chute**

An off-loading chute shall be provided to ensure that all effluent enters the lagoon and does not spill on the ground in the unloading area.

**12.7. Sludge Removal**

If the sludge is to be removed from a lagoon for final disposal at an active face of a designated solid waste disposal area (under section 7) or for composting (under section 9), then the lagoon must be rested for a sufficient amount of time to allow the wastes to dewater. Semi-solid sludge may be removed and stockpiled above ground for further dewatering provided: the sludge stockpile is located on impervious ground; drainage from the stockpile area is directed into the lagoon or other approved liquid waste disposal system (e.g., a leachate collection and treatment system) and provided the sludge stockpile is contained within a signed and fenced area as per section 12.3. Once the solidified sludge is deposited at an active face of a designated solid waste disposal area, it must be covered immediately with a minimum of 30 centimetres of cover material and then the area of sludge disposal compacted immediately after cover is applied.

**12.8. Lagoon Closure**

If a lagoon is to be closed without removal of sludge as per section 12.7, the sludge must be allowed to dewater to a moisture content that will support final cover. The lagoon must then be covered with a minimum of 1 metre of compacted soil and sloped to promote runoff.

**12.9. Volume Measurement**

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The operational certificate holder shall maintain a log book or electronic record with quantities of sewage wastes discharged to the lagoons.

**13. MONITORING REQUIREMENTS**

The operational certificate holder shall carry out an environmental monitoring program as follows:

**13.1 Treated Leachate/Phytoremediation Area**

Location	Parameters	Frequency
E249852 Treated Leachate Prior to Discharge to Phytoremediation Area	<u>Lab:</u> total metals, alkalinity, chloride, fluoride, sulphate, hardness, ammonia, nitrate, nitrite, total organic carbon, orthophosphorus, COD, BOD, VOCs <sup>1</sup> , pH and Total Kjeldahl Nitrogen	Quarterly→Annually*
	<u>Field:</u> conductivity, temperature, turbidity, water level, flow rate, pH and dissolved oxygen  Volume	Monthly→Quarterly*  Continuous during seasonal discharge
E306624 Composite Soil Sample <sup>2</sup> from Phytoremediation Area	<u>Lab:</u> metals, salinity	Annually, prior to discharge each season.

<sup>1</sup>One-time sample of VOCs for background levels

<sup>2</sup>Composite sample assembled from 4 locations from a pre-established list of 12 locations

\* quarterly reduced to annually and monthly reduced to quarterly following two complete years of sampling.

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### 13.2 Groundwater

Location	Parameters	Frequency
<u>Background</u> E251531 MW-02 E287385 MW-13	<u>Lab:</u> dissolved metals, alkalinity, chloride, fluoride, sulphate, hardness, ammonia, nitrate, nitrite, TOC, COD, pH, VOCs <sup>1</sup> and Total Kjeldahl Nitrogen	Quarterly→Annually*
<u>Early Detection</u> E251530 MW-01 E251532 MW-03 E251533 MW-04 E287379 MW-07 E287380 MW-08 E287381 MW-09 E302210 MW-15 E302211 MW-16		
All of the above wells and: E251534 MW-05 E251535 MW-06 E287382 MW-10 E287383 MW-11 E287384 MW-12 E287386 MW-14	Water elevation	quarterly

<sup>1</sup>One-time sample of VOCs for background levels

\* quarterly reduced to annually and monthly reduced to quarterly following two complete years of sampling.

### 13.3 Surface Water

Location	Parameters	Frequency
E273828 SW-01 (Onion Lake) E273829 SW-02 (Upper Clearwater Lake at outlet) E273831 SW-03 (Lower Clearwater Lake at outlet) E306587 SW-04 (Creek	<u>Lab:</u> total metals, dissolved metals, chloride, fluoride, sulphate, hardness, ammonia, nitrate, nitrite, Total Kjeldahl Nitrogen, pH, COD and BOD	Quarterly→Annually*

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from Onion Lake at FSR) E296117 SW-05 (Clearwater Creek at FSR)		
	<u>Field:</u>  conductivity, temperature, turbidity, flow rate, pH and dissolved oxygen	Monthly→Quarterly*

\* quarterly reduced to annually and monthly reduced to quarterly following two complete years of sampling. Once sampling on an annual basis commences, it shall occur during the season with lowest stream flows

**13.4 Leachate and Water Monitoring Procedures**

13.4.1 Sampling Procedures

Sampling is to be carried out in accordance with the procedures described in the most recent edition of the “British Columbia Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples”, or by suitable alternative procedures as authorized by the Director.

13.4.2 Analytical Procedures

Analyses are to be carried out in accordance with procedures described in the most recent edition of the “British Columbia Environmental Laboratory Methods Manual for the Analysis of Water, Wastewater, Sediment, Biological Materials and Discrete Ambient Air Samples” or by suitable alternative procedures as authorized by the Director.

13.4.3 Quality Assurance and Quality Control

The operational certificate holder is required to conduct the following Quality Assurance and Control Program to determine the acceptability of data required by this operational certificate and

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Section 2(d) of the Environmental Data Quality Assurance Regulation:

- a) Obtain and keep current, the laboratory precision, accuracy and blank quality control criteria for each laboratory analyzed parameter from the analytical laboratory(ies)
- b) Collect one duplicate sample during each sampling session from one of the discharge points.
- c) Each duplicate sample shall be submitted to the laboratory; one of the pair identified as the regular sample, and the other, as a blind sample identified by a fictitious site-name established solely to identify the duplicate sample.
- d) For each parameter, report the results of the field duplicates in terms of the degree of variation as the relative percent difference
- e) A sample collection blank shall be prepared, containing distilled water, and preservative if required, and submitted as a blank sample with one sample set per session. If any result for any parameter indicates detectable concentrations, then efforts shall be made to determine and control the source of contamination.

#### 14. **DATA ANALYSES AND REPORTING**

##### 14.1. **Log Book**

As required by sections 6.14.9, 7.6, 8.5, and 12.9 the operational certificate holder shall maintain a log book or electronic record. The log book or electronic record shall be made available for inspection upon request by Ministry staff or Kitselas First Nation.

##### 14.2. **Reporting**

Whenever required, the operational certificate holder shall submit data, studies and reports to the Director by email or electronic transfer or as otherwise instructed.

An annual report shall be submitted to the Director and posted on the Regional District of Kitimat-Stikine website on or before June 30 each year for the previous calendar year.

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The annual report shall contain at minimum:

- i) The type and tonnage or volume of waste received, recycled, composted and landfilled for the year;
- ii) Occurrences or observations of wildlife attempting to access the facility;
- iii) The results of all required monitoring programs undertaken by the operational certificate holder for the site. Trend analysis, as well as an evaluation of any identified impacts of the discharges on the receiving environment in the previous year shall be carried out by a qualified professional.

### **14.3. Groundwater Model**

The operational certificate holder shall have a qualified professional maintain the existing groundwater model of the landfill site and immediate downstream receiving environment using all available, relevant groundwater and surface water monitoring, stream flow, and precipitation data. Development of the groundwater model shall include a water balance assessment for the drainage area in which the landfill site is situated. The groundwater model shall define, where possible, the groundwater regime (flow directions, flow rates, groundwater divide, any evidence of a leachate plume, extent of plume, etc.) at and in the immediate surrounding area of the landfill site. Based on monitoring data and inferred groundwater flow direction from each previous year, the annual report as required in Section 14.2 shall contain a preliminary assessment of any recommended changes to the model. Based on this assessment and any other information available, the Director may require that a formal update to the model be undertaken.

## **15. CLOSURE REQUIREMENTS**

### **15.1. Notification of Closure**

The operational certificate holder shall notify the Director and Kitselas First Nation in writing of intentions to close the landfill site.

### **15.2. Closure Plan**

A closure plan shall be submitted to the Director upon request. Upon

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issuance of the draft closure plan, the Kitselas First Nation shall also be provided with a copy. The closure plan shall, as a minimum, include the following:

- proposed end-use of the landfill property after closure;
- anticipated total waste volume and tonnage, and life of the landfill (i.e., closure date);
- a topographic plan showing the final elevation contours of the landfill and surface water diversion and drainage controls;
- design of the final cover suited to the intended end-use of the site, including the thickness and permeability of barrier layers and drainage layers, and information on topsoil, vegetative cover and erosion prevention controls;
- procedures for notifying the public about the closure and about alternative waste disposal facilities;
- rodent and nuisance wildlife control procedures;
- a comprehensive monitoring plan, including groundwater monitoring, surface water monitoring, landfill gas monitoring, leachate monitoring, final cover monitoring, and erosion and settlement monitoring, for a minimum post-closure period of 25 years;
- a plan and accompanying design for the collection, storage and treatment/use of landfill gas for a minimum 25 year post-closure period (if required);
- a plan for operation of any required pollution abatement engineering works such as leachate collection and treatment systems, for a minimum post-closure period of 25 years; and
- an estimated cost, updated annually, to carry out closure and post-closure activities for a minimum period of 25 years.

**15.3. Closure Funding**

The operational certificate holder shall ensure that sufficient funds will be available to provide for all closure and post-closure requirements as outlined in the closure plan required by section 15.2, plus a reasonable contingency for any remediation which may be required.

**15.4. Final Cover**

The final cover system shall be designed by a qualified professional to match the intended end-use of the landfill site and to match the needs of any required environmental management systems (leachate minimization or recirculation, as the case may be, landfill gas collection and treatment,

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etc.). Generally, the final cover shall consist of a layer of 1 metre of low permeability ( $<1 \times 10^{-5}$  cm/s) compacted soil followed by a layer of topsoil suitable for establishment of vegetation. Use of higher permeability soil must first be approved by the Director. The final cover shall be constructed with minimum and maximum slopes as specified by a qualified professional (see section 3.4) to promote runoff and minimize erosion, with appropriate runoff/runoff drainage controls, erosion controls, and gas venting controls. The site shall be seeded with a grass/legume mixture suited to the local climate.

**15.5. Progressive Application of Final Cover**

Completed portions of the landfill shall progressively receive final cover during the active life of the landfill. The maximum area of disposed refuse that has not yet received final cover shall not exceed 25% of the total final footprint area. Final cover is to be applied according to the specifications identified in section 15.4.

**16. ENVIRONMENTAL IMPACT**

Inspections of the discharge will be carried out by Environmental Protection personnel as a part of the routine operational certificate inspection procedure. Based on these inspections and any other information available to the Director on the effect of the discharge on the receiving environment, the operational certificate holder may be required to undertake additional monitoring, install additional pollution control works, or change the method of operation.

**17. MAINTENANCE OF WORKS, EMERGENCY PROCEDURES AND NON-COMPLIANCE REPORTING**

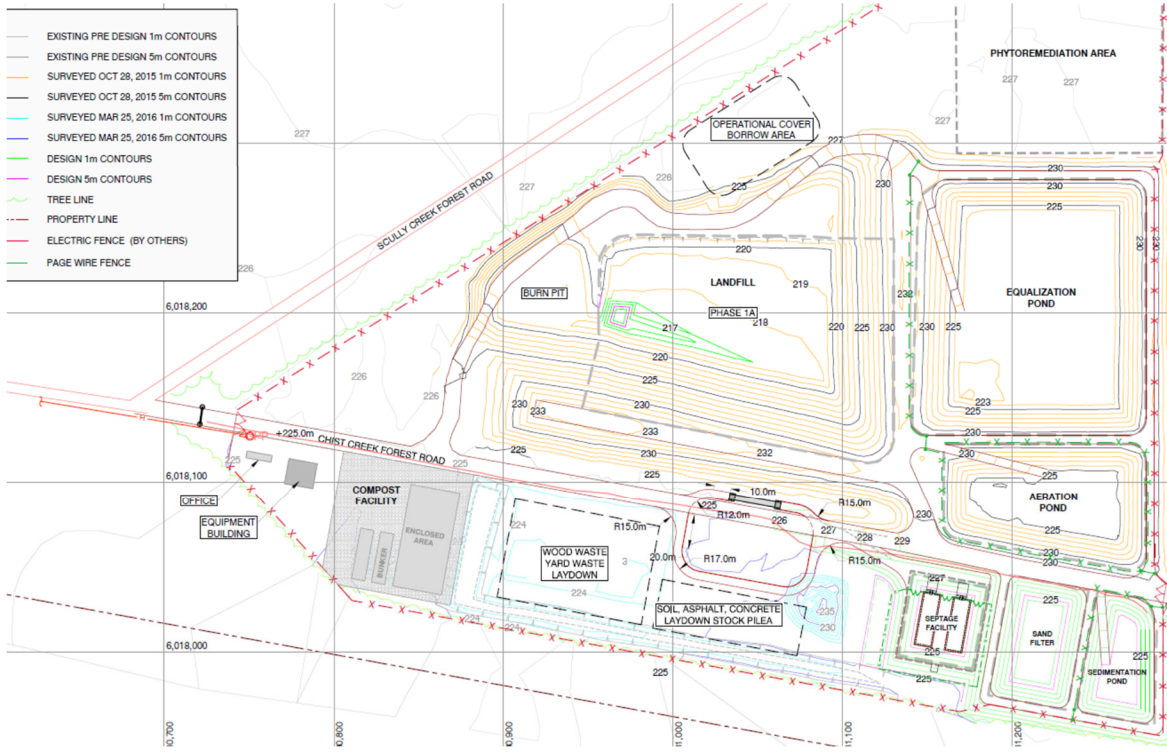
The operational certificate holder shall inspect the operation regularly and maintain it in good order. The operational certificate holder shall immediately notify the Director or designate as well as the Kitselas First Nation of any circumstance which prevents continuing operation in the approved manner or results in noncompliance with the requirements of this operational certificate.

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### SITE PLAN

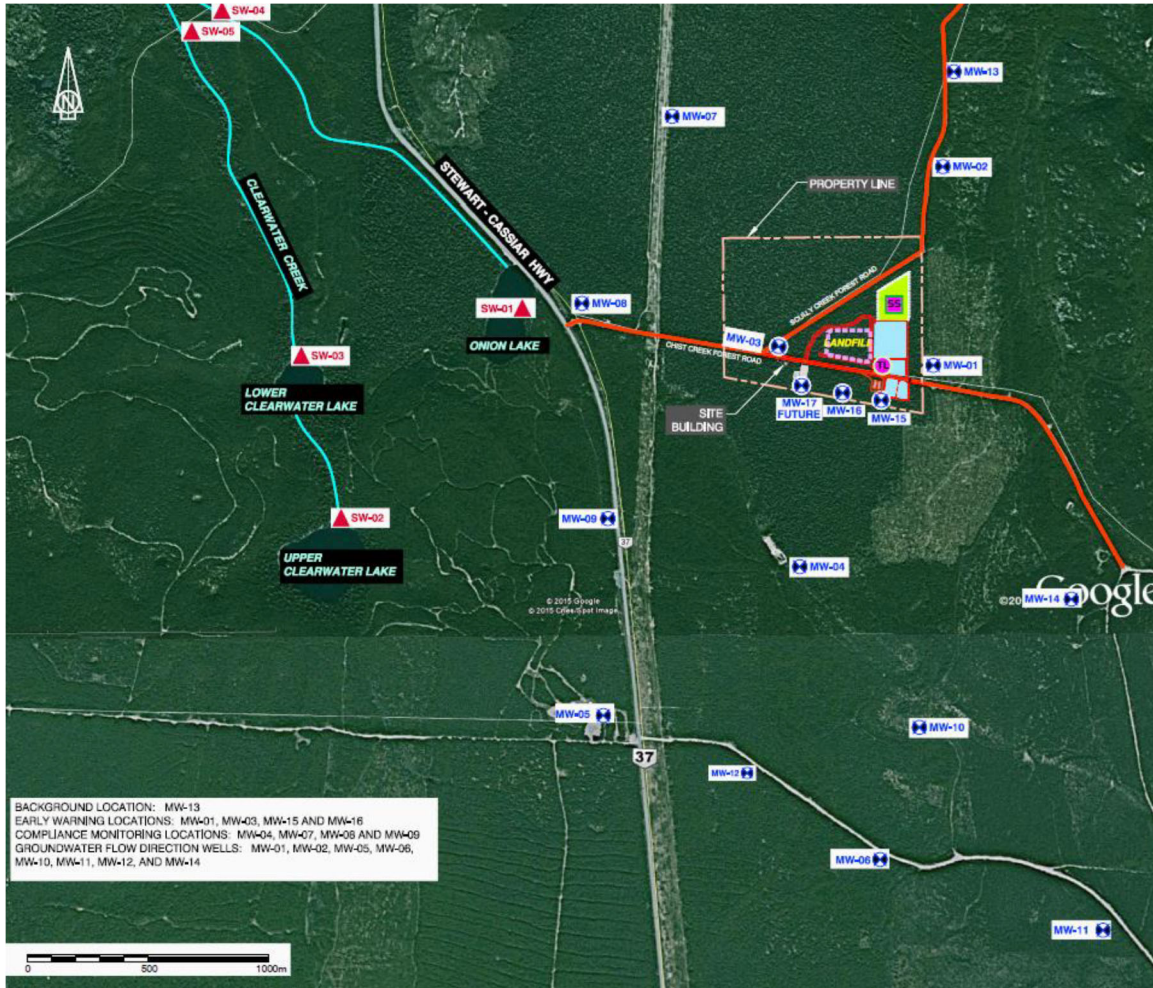


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### MONITORING LOCATIONS



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**From: Section 2.4.1 Quantity of Discharge**

The maximum authorized rate of discharge is 609 m<sup>3</sup>/day and the average rate of discharge is 400 m<sup>3</sup>/day. The discharge may occur 24 hours/day, 7 days/week during the months of April to October inclusive.

**To: Section 2.4.1 Quantity of Discharge**

The maximum authorized rate of discharge to the phytoremediation stand and rapid infiltration trenches is 1000 m<sup>3</sup>/day and the average rate of discharge is 400m<sup>3</sup>/day. The discharge may occur 24 hours/day, 7 days/week.

**From: Section 2.4.3 Authorized Works**

The authorized works are leachate collection and treatment facilities including an equalization basin, aeration lagoon, sedimentation pond, sand filter and hybrid poplar plantation and related appurtenances located approximately as shown on the attached Site Plan.

**To: Section 2.4.3 Authorized Works**

The authorized works are leachate collection and treatment facilities including an equalization basin, aeration lagoon, sedimentation pond, sand filter, rapid infiltration trenches, hybrid poplar plantation and related appurtenances located approximately as shown on the attached Site Plan.

Please note that although a revised Authorization Document has not been produced at this time a copy of this letter is being placed on the Authorization file, as an addendum to the Authorization, to formally reflect the change.

This Authorization does not authorize entry upon, crossing over, or use for any purpose of private or Crown lands or works, unless and except as authorized by the owner of such lands or works. The responsibility for obtaining such authority rests with the permittee. This Authorization is issued pursuant to the provisions of the *Environmental Management Act* to ensure compliance with Section 120(3) of that statute, which makes it an offence to discharge waste, from a prescribed industry or activity, without proper authorization. It is also the responsibility of the permittee to ensure that all activities conducted under this authorization are carried out with regard to the rights of third parties, and comply with other applicable legislation that may be in force.

This decision may be appealed to the Environmental Appeal Board in accordance with Part 8 of the *Environmental Management Act*. An appeal must be delivered within 30 days from the date that notice of this decision is given. For further information, please contact the Environmental Appeal Board at (250) 387-3464.

Yours truly,

November 24, 2021

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Tracking Number:  
Authorization Number:

408044  
17227

A handwritten signature in blue ink, appearing to read "Karen Moores".

Karen Moores, P.Ag.  
Section Head, North Authorizations, Municipal and Smelter Sectors  
Environmental Protection Division  
Ministry of Environment and Climate Change Strategy  
email: Karen.Moores@gov.bc.ca

ENCL:        None

## Appendix C      Historical Data Tables



Table 15: Surface Water Quality Results Sampling Location SW-01 (Onion Lake)

Field	Units	BC MoE Guidelines BCWQG-AW (1)															
		22-Oct-12	2-Apr-17	5-Jul-17	16-Sep-17	8-Nov-17	17-Jul-18	19-Nov-18	25-Jun-19	18-Jun-20	16-Jul-20	6-Nov-20	24-Mar-21	25-Jun-21	27-Aug-21	8-Nov-21	
Conductivity	uS/cm	-	-	28.5	25.7	19.9	25.9	18.7	22.9	19.8	20.1	14.4	2	31.3	46.7	30.2	
pH	pH	-	-	6.3	8.1	7.9	7.5	7.8	7.9	7.72	7.79	7.33	7.83	7.15	7.28	7.48	
Temperature	°C	-	-	20	15.7	5.4	20.2	7	18.6	16.1	16	7.3	4.1	19.3	18.4	6.7	
Dissolved Oxygen	mg/L	-	-	6.49	11.6	9.7	0.6	7.1	7.5	5	5	8.9	7.7	8.1	7.1	9.1	
Amalgam	Units	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Conductivity	uS/cm	-	33.7	14.1	30.3	30.8	-	-	-	-	-	-	-	-	-	43.6	
Hardness (as CaCO3)	mg/L	-	3.9	1.4	2.95	3.55	2.81	2.48	2.67	2.49	-	2.28	-	-	-	5.446	
pH	pH	6.5-9.0	6.3	6.6	6.8	6.7	6.8	6.9	6.7	6.5	-	6.21	-	-	-	6.7	
Total Suspended Solids	mg/L	25 mg/L (backgr. 25-250 mg/L) (f)	-	-	2	2.3	-	-	-	-	-	-	-	-	-	-	
Total Dissolved Solids	mg/L	-	16	21	20	50	-	-	-	-	-	-	-	-	-	-	
Alkalinity, Total (as CaCO3)	mg/L	-	3.9	2.3	4	3	-	-	-	-	-	-	-	-	-	-	
Ammonia, Total (as N)	mg/L	0.681-28.7 (a)	-	0.03	<0.03	<0.03	<0.0050	0.006	<0.0050	<0.0050	-	<0.0050	-	-	-	<0.0050	
Total Nitrogen as N	mg/L	-	-	0.108	0.051	0.161	-	-	-	-	-	-	-	-	-	-	
Bromide (Br)	mg/L	-	-	-	-	-	<0.050	-	<0.050	<0.050	-	<0.050	-	-	-	<0.050	
Chloride (Cl)	mg/L	600	10.3	3.9	6.9	7.1	6.85	6.22	6.14	5.69	-	4.9	-	-	-	9.89	
Fluoride (F)	mg/L	0.4-1.87 (d)	ND	ND	<0.1	<0.1	0.027	0.023	0.025	0.025	-	0.026	-	-	-	0.50	
Nitrate (as N)	mg/L	32.8	ND	ND	<0.1	0.017	<0.0050	<0.0050	<0.0050	<0.0050	-	<0.0050	-	-	-	0.006	
Nitrite (as N)	mg/L	0.06-0.6 (h)	ND	ND	<0.01	<0.01	<0.0010	<0.0010	<0.0010	<0.0010	-	<0.0010	-	-	-	<0.0010	
Sulfate (SO4)	mg/L	128-429 (d)	0.62	1.1	<1.0	<1.0	0.31	<0.30	<0.30	<0.30	-	0.31	-	-	-	0.7	
Total Organic Carbon	mg/L	+/- 20% of background	2.15	0.65	<0.50	1.68	-	-	-	-	-	-	-	-	-	-	
BOD	mg/L	-	ND	<4.0	<4.0	<2.0	<2.0	<2.0	<2.0	<2.0	-	<2.0	-	-	-	<2.0	
COD	mg/L	-	-	-	-	-	<20	<20	<20	<20	-	<20	-	-	-	<20	
<b>Total Metals</b>																	
Aluminum (Al)-Total	mg/L	-	0.0065	0.0058	0.0142	0.021	0.0489	0.0105	0.0067	0.0256	-	0.0064	-	-	-	0.0089	
Antimony (Sb)-Total	mg/L	0.009	ND	ND	<0.0010	<0.0020	<0.0010	<0.0010	<0.0010	<0.0010	-	<0.0010	-	-	-	<0.0010	
Arsenic (As)-Total	mg/L	0.005	ND	ND	<0.0050	<0.0050	0.0010	0.0012	<0.0010	0.0022	-	0.0016	-	-	-	0.0014	
Barium (Ba)-Total	mg/L	1	0.0127	0.0041	<0.0050	0.0051	0.00647	0.00533	0.00559	0.00506	-	0.00393	-	-	-	0.0135	
Beryllium (Be)-Total	mg/L	0.00013	ND	ND	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-	<0.00100	-	-	-	<0.00100	
Bismuth	mg/L	-	ND	ND	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	-	<0.00050	-	-	-	<0.00050	
Boron (B)-Total	mg/L	1.2	ND	ND	0.007	0.0059	<0.010	<0.010	<0.010	<0.010	-	<0.010	-	-	-	<0.010	
Cadmium (Cd)-Total	mg/L	-	0.000056	0.000014	<0.000010	<0.000010	0.0000209	<0.0000050	<0.0000050	0.0000128	-	<0.0000050	-	-	-	0.0000059	
Calcium (Ca)-Total	mg/L	<4 sensitive to acid input	1.22	0.434	1	1.16	0.912	0.824	0.905	0.791	-	0.788	-	-	-	1.80	
Cesium (Cs) - Total	mg/L	-	ND	ND	-	-	0.000011	<0.000010	<0.000010	<0.000010	-	<0.000010	-	-	-	<0.000010	
Chromium (Cr)-Total	mg/L	0.001 (e)	ND	ND	<0.0050	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	-	<0.0010	-	-	-	<0.0050	
Cobalt (Co)-Total	mg/L	0.11	ND	ND	<0.0025	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-	<0.0010	-	-	-	<0.0010	
Copper (Cu)-Total	mg/L	0.0032-0.0396 (d,f)	0.00106	0.00025	<0.00020	<0.00040	<0.00050	0.00050	0.00069	<0.00050	-	<0.00050	-	-	-	<0.00050	
Iron (Fe)-Total	mg/L	1	0.0304	0.0165	0.011	0.022	0.089	0.10	0.028	0.031	-	<0.010	-	-	-	0.061	
Lead (Pb)-Total	mg/L	0.011-0.402 (d,f)	ND	ND	<0.0010	<0.00020	0.000108	<0.000050	<0.000050	0.000127	-	<0.000050	-	-	-	<0.000050	
Lithium (Li)-Total	mg/L	-	ND	ND	0.0001	0.00012	<0.0010	<0.0010	<0.0010	<0.0010	-	<0.0010	-	-	-	<0.0010	
Magnesium (Mg)-Total	mg/L	0.209	0.076	0.144	0.161	0.149	0.135	0.130	0.120	0.120	-	0.120	-	-	-	0.235	
Manganese (Mn)-Total	mg/L	0.8-3.4 (d,f)	0.0211	0.0078	0.00787	0.0147	0.0025	0.0116	0.0394	0.0233	-	0.0108	-	-	-	0.011	
Mercury (Hg)-Total	mg/L	0.0001	ND	ND	<0.000020	<0.000010	<0.000025	<0.000050	<0.000050	<0.000050	-	<0.000050	-	-	-	<0.000050	
Molybdenum (Mo)-Total	mg/L	2	ND	ND	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	-	<0.00050	-	-	-	<0.00050	
Nickel (Ni)-Total	mg/L	0.025-0.15 (d,f)	ND	ND	<0.0020	<0.00040	<0.00050	<0.00050	<0.00050	<0.00050	-	<0.00050	-	-	-	<0.00050	
Phosphorus - Total	mg/L	0.005-0.015 (lakes only)	ND	ND	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	-	<0.050	-	-	-	<0.050	
Potassium (K)-Total	mg/L	-	0.270	0.128	0.17	0.19	0.228	0.154	0.146	0.142	-	0.136	-	-	-	0.221	
Rubidium (Rb) - Total	mg/L	-	ND	ND	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	<0.00050	-	-	-	<0.00050	
Selenium (Se)-Total	mg/L	0.002	ND	ND	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	<0.00050	-	-	-	0.000056	
Silicon - Total	mg/L	-	0.486	ND	<1.0	<1.0	0.13	<0.10	0.19	0.11	-	0.11	-	-	-	0.46	
Silver (Ag)-Total	mg/L	0.0001-0.003 (d)	ND	ND	0.000055	<0.000050	<0.000010	<0.000010	<0.000010	<0.000010	-	<0.000010	-	-	-	<0.000010	
Sodium (Na)-Total	mg/L	-	5.53	2	4.6	4.63	4.32	3.83	3.89	3.44	-	3.13	-	-	-	5.45	
Strontium - Total	mg/L	-	0.0116	0.0034	0.0075	0.0076	0.00777	0.00669	0.00755	0.00669	-	0.00661	-	-	-	0.0147	
Sulfur - Total	mg/L	-	ND	ND	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	-	<3.0	-	-	-	<3.0	
Tellurium - Total	mg/L	-	-	-	<0.00020	<0.00050	<0.00020	<0.00020	<0.00020	<0.00020	-	<0.00020	-	-	-	<0.00020	
Thallium (Tl)-Total	mg/L	0.0008	ND	ND	<0.000020	<0.000020	<0.000010	<0.000010	<0.000010	<0.000010	-	<0.000010	-	-	-	<0.000010	
Thorium - Total	mg/L	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-	<0.0010	-	-	-	<0.0010	
Tin (Sn)-Total	mg/L	-	ND	ND	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-	<0.00010	-	-	-	<0.00010	
Titanium (Ti)-Total	mg/L	-	ND	ND	<0.0050	<0.0050	0.00177	0.00031	<0.00030	0.00033	-	<0.00030	-	-	-	<0.00030	
Tungsten (W) - Total	mg/L	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-	<0.0010	-	-	-	<0.0010	
Uranium (U)-Total	mg/L	0.0085	ND	ND	<0.000020	<0.000020	<0.000010	<0.000010	<0.000010	<0.000010	-	<0.000010	-	-	-	<0.000010	
Vanadium (V)-Total	mg/L	-	ND	ND	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	-	<0.00050	-	-	-	<0.00050	
Zinc (Zn)-Total	mg/L	0.033-0.34 (d,f)	ND	ND	<0.0040	0.005	<0.0030	<0.0030	<0.0030	<0.0030	-	<0.0030	-	-	-	<0.0030	
Zirconium - Total	mg/L	-	ND	ND	<0.0010	<0.0010	<0.00060	<0.00060	<0.00060	<0.00060	-	<0.00060	-	-	-	<0.00060	
<b>Dissolved Metals</b>																	
Aluminum (Al)-Dissolved	mg/L	0.023-0.1 (bc)	0.0034	0.0038	<0.0030	<0.0050	<0.0010	0.0037	0.0015	0.0039	-	0.0022	-	-	-	0.0035	
Antimony (Sb)-Dissolved	mg/L	-	ND	ND	<0.0010	<0.0020	<0.0010	<0.0010	<0.0010	<0.0010	-	<0.0010	-	-	-	<0.0010	
Arsenic (As)-Dissolved	mg/L	-	ND	ND	<0.00050	<0.00050	0.00014	<0.00010	<0.00010	<0.00010	-	<0.00010	-	-	-	0.00018	
Barium (Ba)-Dissolved	mg/L	-	0.0128	0.0045	<0.0050	<0.0050	0.00515	0.00475	0.00553	0.00460	-	0.00358	-	-	-	0.0143	
Beryllium (Be)-Dissolved	mg/L	-	ND	ND	<0.0010	<0.0010	<0.00010	<0.00010	<0.00010	<0.00010	-	<0.000100	-	-	-	<0.000100	
Bismuth - Dissolved	mg/L	-	ND	ND	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.000							

Table 16: Surface Water Quality Results Sampling Location SW-02 (Upper Clearwater Lake)

Parameter	Units	BC MoE Guidelines		22-Oct-12		2-Apr-13		6-Apr-17		5-Jul-17		26-Sep-17		8-Nov-17		17-Jul-18		19-Nov-18		29-Mar-19		25-Jun-19		18-Jun-20		16-Jul-20		6-Nov-20		24-Mar-21		25-Jun-21		27-Aug-21		8-Nov-21		
		BCWQG-AW (1)																																				
<b>Field</b>																																						
Conductivity	uS/cm	-	-	-	137.5	28.8	113	97.9	124.1	98.3	96.2	123.3	119.1	119	95.7	123.3	119.1	119	95.7	123.3	119.1	119	95.7	123.3	119.1	119	95.7	123.3	119.1	119	95.7	123.3	119.1	119	95.7	123.3	119.1	119
pH		-	-	-	7.8	8	7.9	8.1	8.1	7.9	7.6	7.8	7.8	7.8	7.6	7.8	7.8	7.8	7.6	7.8	7.8	7.8	7.6	7.8	7.8	7.8	7.6	7.8	7.8	7.8	7.6	7.8	7.8	7.6	7.8	7.8	7.6	
Temperature	°C	-	-	-	5.2	6.8	11.4	5.3	14.5	5.8	4.7	15	13.9	13.9	4.7	15	13.9	13.9	4.7	15	13.9	13.9	4.7	15	13.9	13.9	4.7	15	13.9	13.9	4.7	15	13.9	13.9	4.7	15		
Dissolved Oxygen	mg/L	-	-	-	2.5	13.6	9.4	4.2	6.1	8.4	9.3	5.2	5.1	10.3	10	9.8	10.2	9.5	10	9.8	10.2	9.5	10	9.8	10.2	9.5	10	9.8	10.2	9.5	10	9.8	10.2	9.5	10	9.8		
Flow Rate	m/s	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Discharge	m³/s	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
<b>Analyte</b>																																						
Conductivity	uS/cm	-	-	-	154	154	148	164	161	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Hardness (as CaCO3)	mg/L	-	-	-	74.8	75.6	69.4	76.6	77.8	78	75.3	74.4	79.3	80.6	73	73	73	73	73	73	73	73	73	73	73	73	73	73	73	73	73	73	73	73	73	73	73	
pH		-	-	-	6.5-9.0	8	7.9	8.1	8.1	8.2	8.3	8.2	8.1	8.18	8.13	8.13	8.13	8.13	8.13	8.13	8.13	8.13	8.13	8.13	8.13	8.13	8.13	8.13	8.13	8.13	8.13	8.13	8.13	8.13	8.13	8.13	8.13	
Total Suspended Solids	mg/L	-	-	-	25 mg/L (backgr. 25-250 mg/L) (f)	ND	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		
Total Dissolved Solids	mg/L	-	-	-	73	105	89	79	93	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Alkalinity, Total (as CaCO3)	mg/L	-	-	-	77	75.7	73	80	79	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Ammonia, Total (as N)	mg/L	-	-	-	2.0-26.5 (a)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Total Nitrogen as N	mg/L	-	-	-	0.048	0.094	-0.050	0.0715	-0.050	0.053	0.097	-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	-0.050	-0.050	-0.050	-0.050	-0.050	-0.050	-0.050	-0.050	-0.050	-0.050		
Bromide (Br)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Chloride (Cl)	mg/L	-	-	-	1.8	1.1	<1.0	1.2	1.1	1.2	0.84	0.84	0.88	0.88	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	
Fluoride (F)	mg/L	-	-	-	0.7-1.9 (d)	ND	<0.01	<0.01	0.012	0.0133	-0.0050	-0.0050	0.0175	0.0116	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Nitrate (as N)	mg/L	-	-	-	0.06-0.6 (h)	ND	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Sulfate (SO4)	mg/L	-	-	-	128-429 (d)	2.57	4.23	2.5	2.8	2.3	2.56	2.33	2.1	2.24	2.32	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37		
Total Organic Carbon	mg/L	-	-	-	>= 20% of background	ND	<0.5	<0.5	0.89	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BOD	mg/L	-	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		
COD	mg/L	-	-	-	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20		
<b>Total Metals</b>																																						
Aluminum (Al)-Total	mg/L	-	-	-	ND	0.052	-0.0050	-0.0050	-0.0050	-0.0050	0.0033	0.0069	-0.0050	-0.0050	-0.0050	-0.0050	-0.0050	-0.0050	-0.0050	-0.0050	-0.0050	-0.0050	-0.0050	-0.0050	-0.0050	-0.0050	-0.0050	-0.0050	-0.0050	-0.0050	-0.0050	-0.0050	-0.0050	-0.0050	-0.0050	-0.0050		
Antimony (Sb)-Total	mg/L	-	-	-	0.009	ND	<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	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
Arsenic (As)-Total	mg/L	-	-	-	0.005	0.00191	0.00182	0.00167	0.00193	0.00193	0.00209	0.00205	0.00197	0.00210	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Barium (Ba)-Total	mg/L	-	-	-	1	0.0219	0.0198	0.0217	0.0238	0.0213	0.0224	0.02480	0.02350	0.02480	0.0222	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Beryllium (Be)-Total	mg/L	-	-	-	0.00013	ND	<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	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010		
Bismuth (Bi)-Total	mg/L	-	-	-	1	ND	<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	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010		
Boron (B)-Total	mg/L	-	-	-	1.2	ND	<0.0010	0.006	0.0115	0.007	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010		
Cadmium (Cd)-Total	mg/L	-	-	-	0.000025	-0.000011	-0.000011	-0.000011	-0.000011	-0.000011	-0.000011	-0.000011	-0.000011	-0.000011	-0.000011	-0.000011	-0.000011	-0.000011	-0.000011	-0.000011	-0.000011	-0.000011	-0.000011	-0.000011	-0.000011	-0.000011	-0.000011	-0.000011	-0.000011	-0.000011	-0.000011	-0.000011	-0.000011	-0.000011	-0.000011	-0.000011		
Calcium (Ca)-Total	mg/L	-	-	-	<4 sensitive to acid input	26.2	26	24.8	27.1	28	27.9	26.7	26.0	28.5	26.3	27.1	27.1	27.1	27.1	27.1	27.1	27.1	27.1	27.1	27.1	27.1	27.1	27.1	27.1	27.1	27.1	27.1	27.1	27.1	27.1	27.1		
Cesium (Cs)-Total	mg/L	-	-	-	0.001 (c)	ND	<0.0005	-0.0005	0.00069	0.00032	0.00041	0.00035	0.00035	0.00037	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Chromium (Cr)-Total	mg/L	-	-	-	0.001 (c)	ND	<0.0005	-0.0005	0.00069	0.00032																												

Table 17: Surface Water Quality Results Sampling Location SW-03 (Lower Clearwater Lake)

Parameter	Units	BC MOE Guidelines												Sample		monitor		sample		monitor		sample		monitor	
		22-Oct-12	2-Apr-13	6-Apr-17	7-Jul-17	26-Sep-17	8-Nov-17	12-Apr-18	17-Jul-18	19-Nov-18	29-Mar-19	25-Jun-19	18-Jun-20	16-Jul-20	6-Nov-20	24-Mar-21	25-Jun-21	17-Aug-21	8-Nov-21	Sample	Sample	Sample	Sample	Sample	Sample
Conductivity	µS/cm	-	-	140	141	111	92	91	126	93	81.2	122.2	114.2	113.8	88.7	81.4	116.5	114.2	99.3	-	-	-	-	-	-
pH	-	-	-	7.6	7.5	8.2	8.0	7.6	7.9	7.6	7.7	7.4	7.4	7.3	7.21	7.92	7.98	8.19	7.57	-	-	-	-	-	-
Temperature	°C	-	-	7	14.1	11	4.2	5.2	15.4	5.3	5	15.5	13.2	13.2	5.9	3.9	14	12.2	6.4	-	-	-	-	-	-
Dissolved Oxygen	mg/L	-	-	-	-	-	14.2	16.3	1	5.4	11.2	10.9	5.7	5.4	11.7	13.5	10	11	12.5	-	-	-	-	-	-
Flow Rate	m³/s	-	-	-	-	-	-	-	-	-	0.08	-	-	-	-	-	-	-	0.087	-	-	-	-	-	-
Discharge	m³/s	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.454	-	-	-	-	-	-
<b>Analyte</b>																									
Conductivity	µS/cm	-	149	151	145	161	158	-	-	-	-	-	-	-	-	-	-	-	152	-	-	-	-	-	-
Hardness (as CaCO3)	mg/L	-	72.8	73.3	68	75.4	73.1	78.7	70.2	73.4	67.1	79.6	-	-	-	-	-	-	69.3	-	-	-	-	-	-
pH	-	-	6.5-9.0	-	-	7.9	8	8.1	7.9	8.2	8.2	8.2	8.0	8.17	-	-	-	-	8.06	-	-	-	-	-	-
Total Suspended Solids	mg/L	-	25 mg/L (backgr. 25-250 mg/l) (i)	-	ND	1.1	1.8	<1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	71	104	82	78	91	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Alkalinity, Total (as CaCO3)	mg/L	-	75.2	71	78	76	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ammonia, Total (as N)	mg/L	-	-	-	-0.03	-0.03	-0.03	-0.050	0.066	-	-0.050	-0.050	-0.050	0.054	-	-	-	-	-0.050	-	-	-	-	-	-0.050
Total Nitrogen as N	mg/L	-	-	-	-0.0200	0.121	-0.0500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Boronide (Br)	mg/L	-	-	-	-	-	-	-0.050	-0.050	-	-	-	-	-	-	-	-	-	-0.050	-	-	-	-	-	-0.050
Chloride (Cl)	mg/L	-	600, MAC	1.7	1.3	1.1	1.4	1.1	0.97	0.86	0.87	0.90	0.85	1.11	-	-	-	-	0.91	-	-	-	-	-	-
Fluoride (F)	mg/L	-	0.71-9 (d)	ND	ND	<0.1	<0.10	<0.10	0.07	0.047	0.047	0.047	0.048	0.061	-	-	-	-	0.05	-	-	-	-	-	-
Nitrate (as N)	mg/L	-	32.8	0.036	0.032	<0.01	<0.010	0.012	0.0164	0.0089	-0.0500	0.0069	0.012	0.0063	-	-	-	-	-0.0500	-	-	-	-	-	-
Nitrite (as N)	mg/L	-	0.06-0.6 (h)	ND	ND	<0.01	<0.01	<0.01	-0.0010	-0.0010	-0.0010	-0.0010	-0.0010	-0.0010	-	-	-	-	-0.0010	-	-	-	-	-	-0.0010
Sulfate (SO4)	mg/L	-	128-429 (d)	2.63	3.38	2.6	2.8	2.4	2.5	2.21	2.25	2.12	2.04	2.36	-	-	-	-	2.37	-	-	-	-	-	-
Total Organic Carbon	mg/L	-	>= 20% of background	1.09	ND	<0.50	<0.50	0.65	-0.50	-0.50	-0.50	-0.50	-0.50	-0.50	-	-	-	-	-0.50	-	-	-	-	-	-
BOD	mg/L	-	-	ND	ND	<4.0	<4.0	<4.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	-	-	-	-	<2.0	-	-	-	-	-	<2.0
COD	mg/L	-	-	-	-	-	-	<20	<20	<20	<20	<20	<20	<20	-	-	-	-	<20	-	-	-	-	-	<20
<b>Total Metals</b>																									
Aluminum (Al)-Total	mg/L	-	0.0032	0.0043	-0.0056	-0.0146	-0.0050	-0.0010	0.0051	0.0040	0.0039	0.0098	0.0048	-	-	-	-	-	0.0038	-	-	-	-	-	-
Antimony (Sb)-Total	mg/L	-	0.009	ND	ND	<0.0010	0.0001	<0.0020	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-	-	-	-	<0.0010	-	-	-	-	-	<0.0010
Arsenic (As)-Total	mg/L	-	0.005	0.00179	0.00185	0.00155	0.00186	0.00195	0.00184	0.00165	0.00196	0.00181	0.00160	0.00199	-	-	-	-	0.00206	-	-	-	-	-	0.00171
Barium (Ba)-Total	mg/L	-	1	0.0219	0.0225	0.0187	0.0218	0.0215	0.0215	0.01990	0.0210	0.02160	0.01970	0.0191	-	-	-	-	0.0202	-	-	-	-	-	0.0223
Beryllium (Be)-Total	mg/L	-	0.00013	ND	ND	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-	-	-	-	<0.00010	-	-	-	-	-	<0.00010
Bismuth - Total	mg/L	-	1.09	ND	ND	<0.0010	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	-	-	-	<0.00050	-	-	-	-	-	<0.00050
Boron (B)-Total	mg/L	-	1.2	ND	ND	0.007	0.0072	0.0083	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-	-	-	-	-0.010	-	-	-	-	-	-0.010
Cadmium (Cd)-Total	mg/L	-	-	ND	ND	<0.00001	<0.000010	<0.000010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-	-	-	-	<0.000050	-	-	-	-	-	<0.000050
Calcium (Ca)-Total	mg/L	-	<4 sensitive to acid input	25.5	26.7	24.2	26.7	30.3	27.5	23.8	26.2	24.8	23.8	26.0	-	-	-	-	26.7	-	-	-	-	-	26.3
Cesium (Cs)-Total	mg/L	-	0.001 (e)	ND	ND	<0.0005	<0.00050	0.00066	0.00034	0.00045	0.00044	0.0003	0.00031	0.00039	-	-	-	-	0.00034	-	-	-	-	-	<0.00050
Cobalt (Co)-Total	mg/L	-	0.11	ND	ND	<0.0005	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-	-	-	-	<0.00010	-	-	-	-	-	<0.00010
Copper (Cu)-Total	mg/L	-	0.0032-0.0396 (d,f)	0.00074	ND	<0.0002	<0.00020	<0.00040	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	-	-	-	<0.00050	-	-	-	-	-	<0.00050
Iron (Fe)-Total	mg/L	-	0.0509	0.0901	0.011	0.023	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-	<0.10	-	-	-	-	-	<0.10
Lead (Pb)-Total	mg/L	-	0.011-0.402 (d,f)	ND	ND	<0.0001	<0.00010	<0.00020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	-	-	-	<0.00050	-	-	-	-	-	<0.00050
Lithium (Li)-Total	mg/L	-	-	ND	ND	0.001	0.00122	0.00125	<0.0010	0.0011	0.0011	<0.0010	<0.0010	<0.0010	-	-	-	-	0.0012	-	-	-	-	-	0.0012
Magnesium (Mg)-Total	mg/L	-	2.21	2.15	1.85	2.09	2.4	2.34	1.840	2.110	2.010	1.910	1.99	-	-	-	-	-	2.07	-	-	-	-	-	1.99
Manganese (Mn)-Total	mg/L	-	0.8-3.4 (d,f)	ND	ND	0.00075	0.00113	0.00105	0.00051	0.0007	0.0010	0.0007	0.00085	0.001	-	-	-	-	0.0010	-	-	-	-	-	0.00087
Merccury (Hg)-Total	mg/L	-	0.0001	ND	ND	<0.00002	<0.000020	<0.000010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-	-	-	-	<0.000050	-	-	-	-	-	<0.000050
Molybdenum (Mo)-Total	mg/L	-	2	ND	ND	0.00029	0.00032	0.00032	0.000275	0.000283	0.000287	0.00031	0.000257	0.000302	-	-	-	-	0.00032	-	-	-	-	-	0.000289
Nickel (Ni)-Total	mg/L	-	0.02-0.15 (d,f)	ND	ND	<0.0002	<0.00020	<0.00040	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	-	-	-	<0.00050	-	-	-	-	-	<0.00050
Phosphorus - Total	mg/L	-	0.005-0.015 (lakes only)	0.0001	ND	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-	-	-	-	<0.00010	-	-	-	-	-	<0.00010
Potassium (K)-Total	mg/L	-	0.880	0.814	0.71	0.84	0.93	-	0.813	0.724	-	0.809	0.824	-	-	-	-	-	0.819	-	-	-	-	-	0.838
Rubidium (Rb)- Total	mg/L	-	-	ND	ND	-	-	-	0.00033	0.00033	0.00029	0.00031	0.00029	0.00031	-	-	-	-	0.00035	-	-	-	-	-	0.00032
Selenium (Se)-Total	mg/L	-	0.00013	ND	ND	<0.00050	<0.00050	<0.00050	0.000133	0.000136	0.000095	0.000091	0.00012	0.000143	-	-	-	-	0.000185	-	-	-	-	-	0.000147
Silicon - Total	mg/L	-	4.70	5.13	4.5	5	4.2	4.84	4.49	4.99	4.51	4.7	4.83	-	-	-	-	-	4.83	-	-	-	-	-	5.33
Silver (Ag)-Total	mg/L	-	0.0001-0.003 (d)	ND	ND	<0.00005	<0.000050	<0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-	-	-	-	<0.000010	-	-	-	-	-	<0.000010
Sodium (Na)-Total	mg/L	-	1.91	1.89	1.73	2.01	2.23	1.95	1.73	1.89	1.86	1.77	1.88	-	-	-	-	-	1.85	-	-	-	-	-	1.88
Strontium - Total	mg/L	-	0.0961	0.0983	0.0894	0.101	0.1	0.0962																	

Table 18: Surface Water Quality Results Sampling Location SW-04 (Creek from Onion Lake at FSR)

	Units	BC MoE Guidelines															
		BCWQG-AW (1)	5-Jul-17	26-Sep-17	8-Nov-17	12-Apr-18	17-Jul-18	19-Nov-18	29-Mar-19	25-Jun-19	18-Jun-20	16-Jul-20	9-Nov-20	24-Mar-21	29-Jun-21	27-Aug-21	8-Nov-21
<b>Field</b>																	
Conductivity	uS/cm	-	97	70	44	56	85	50	45	69.5	71	70	30.5	41	59.3	57	50
pH	pH	-	6.5	7.6	7.8	7.5	7.2	7.8	7.3	6.82	7.16	7.4	6.78	7.4	7.32	7.52	7.88
Temperature	°C	-	11.8	10	2.3	2.5	16.8	4.4	1.5	11.1	9.8	10.6	3.6	3.2	9.7	8.8	4.6
Dissolved Oxygen	mg/L	-	9.41	14.1	13.7	13.4	1.9	10.8	13.2	9.8	7.9	5.9	11.4	14.6	10.9	12.4	12.4
Flow Rate	m³/s	-	-	-	-	-	-	-	0.2	-	-	-	-	-	-	-	-
Discharge	m³/s	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Analyte</b>																	
Conductivity	uS/cm	-	105	104	-	-	-	-	-	-	-	105	-	-	-	-	88.7
Hardness (as CaCO3)	mg/L	-	42.3	42.3	28.1	26.4	39.4	27.7	25.5	31.8	-	33.9	-	-	-	-	35.8
pH	pH	6.5-9.0	7.5	7.6	7.9	7.7	7.9	7.8	7.5	7.7	-	7.56	-	-	-	-	7.78
Total Suspended Solids	mg/L	25 mg/L (backgr. 25-250 mg/l) (f)	<1.0	<1.0	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	53	76	-	-	-	-	-	-	-	-	-	-	-	-	-
Alkalinity, Total (as CaCO3)	mg/L	-	42	40	-	-	-	-	-	-	-	-	-	-	-	-	-
Ammonia, Total (as N)	mg/L	2.0-26.5 (a)	<0.03	<0.03	<0.0050	0.0058	<0.0050	<0.0050	<0.0050	<0.0050	-	0.0053	-	-	-	-	<0.0050
Total Nitrogen as N	mg/L	-	<0.0500	0.066	<0.050	-	-	-	-	-	-	-	-	-	-	-	<0.050
Bromide (Br)	mg/L	-	6.1	6.1	4.13	13.8	-	10.8	7.02	9.61	11	11.5	-	-	-	-	1.36
Chloride (Cl)	mg/L	600, MAC	<10	<10	0.038	0.035	0.039	0.038	0.037	0.053	-	0.045	-	-	-	-	0.39
Fluoride (F)	mg/L	0.7-1.9 (d)	<0.01	<0.01	<0.0050	0.0054	0.0842	<0.0050	0.024	0.0158	-	0.0137	-	-	-	-	<0.0050
Nitrate (as N)	mg/L	32.8	<0.01	<0.01	<0.0010	<0.0010	<0.0010	<0.0010	0.0015	<0.0010	-	<0.0010	-	-	-	-	<0.0010
Nitrite (as N)	mg/L	0.06-0.6 (h)	<0.01	<0.01	<0.0010	<0.0010	<0.0010	<0.0010	0.0015	<0.0010	-	<0.0010	-	-	-	-	<0.0010
Sulfate (SO4)	mg/L	128-429 (d)	1.7	1.4	1.22	0.87	<0.30	0.9	0.87	0.94	-	1.11	-	-	-	-	1.55
Total Organic Carbon	mg/L	+/- 20% of background	<0.50	1.53	-	1.94	-	-	-	-	-	-	-	-	-	-	-
BOD	mg/L	-	<4.0	<4.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	-	<2.0	-	-	-	-	<2.0
COD	mg/L	-	-	-	<20	<20	<20	<20	<20	<20	-	29	-	-	-	-	<20
<b>Total Metals</b>																	
Aluminum (Al)-Total	mg/L	-	0.0061	0.0166	0.0140	0.0353	0.3660	0.0257	0.0331	0.0159	-	0.11	-	-	-	-	0.0348
Antimony (Sb)-Total	mg/L	0.009	<0.0010	<0.0020	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-	<0.0010	-	-	-	-	<0.0010
Arsenic (As)-Total	mg/L	0.005	0.00184	0.00192	0.00135	0.00104	0.00461	0.00133	0.00103	0.00163	-	0.00211	-	-	-	-	0.00221
Barium (Ba)-Total	mg/L	1	0.0121	0.0129	0.00997	0.01060	0.02680	0.01040	0.01090	0.0138	-	0.017	-	-	-	-	0.0113
Beryllium (Be)-Total	mg/L	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-	<0.000100	-	-	-	-	<0.000100
Bismuth	mg/L	-	<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	<0.00050	-	-	-	-	<0.00050
Boron (B)-Total	mg/L	1.2	<0.0050	0.0117	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	<0.010	-	-	-	-	<0.010
Cadmium (Cd)-Total	mg/L	-	<0.00010	<0.00010	<0.00050	0.000151	<0.00050	<0.00050	<0.00050	<0.00050	-	<0.00050	-	-	-	-	<0.00050
Calcium (Ca)-Total	mg/L	<4 sensitive to acid input	12.6	15.1	11.3	8.4	14.8	10.0	8.5	11.6	-	12.3	-	-	-	-	12.9
Cesium (Cs) - Total	mg/L	-	-	-	<0.00010	<0.00010	0.000022	<0.00010	<0.00010	<0.00010	-	<0.00010	-	-	-	-	<0.00010
Chromium (Cr)-Total	mg/L	0.001 (e)	<0.0050	0.00033	0.00015	0.00018	0.00073	0.00019	0.00014	<0.00010	-	0.00024	-	-	-	-	<0.0050
Cobalt (Co)-Total	mg/L	0.11	<0.0010	<0.0010	<0.0010	<0.0010	0.00037	<0.0010	<0.0010	<0.0010	-	<0.0010	-	-	-	-	<0.0010
Copper (Cu)-Total	mg/L	0.0032-0.0396 (d,f)	<0.00020	<0.00040	<0.00050	<0.00050	0.00073	<0.00050	<0.00050	<0.00050	-	<0.00050	-	-	-	-	<0.00050
Iron (Fe)-Total	mg/L	1	<0.010	0.064	0.025	0.055	0.795	0.068	0.056	0.049	-	0.25	-	-	-	-	0.063
Lead (Pb)-Total	mg/L	0.011-0.402 (d,f)	<0.00010	<0.00020	<0.00050	<0.00050	0.000225	<0.00050	<0.00050	<0.00050	-	<0.00050	-	-	-	-	<0.00050
Lithium (Li)-Total	mg/L	-	0.00029	0.00047	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-	<0.0010	-	-	-	-	<0.0010
Magnesium (Mg)-Total	mg/L	-	0.934	1.12	0.853	0.714	1.210	0.856	0.720	0.912	-	1.02	-	-	-	-	0.860
Manganese (Mn)-Total	mg/L	0.8-3.4 (d,f)	0.00109	0.0154	0.00606	0.0094	0.2440	0.0174	0.0109	0.0193	-	0.059	-	-	-	-	0.0177
Mercury (Hg)-Total	mg/L	0.0001	<0.000010	<0.000010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-	<0.000050	-	-	-	-	<0.000050
Molybdenum (Mo)-Total	mg/L	2	0.00021	0.00023	0.000163	0.000141	0.000242	0.000121	0.000128	0.000144	-	0.000193	-	-	-	-	0.000187
Nickel (Ni)-Total	mg/L	0.025-0.15 (d,f)	<0.00020	<0.00040	<0.00050	<0.00050	0.00059	<0.00050	<0.00050	<0.00050	-	<0.00050	-	-	-	-	<0.00050
Phosphorus - Total	mg/L	0.005-0.015 (lakes only)	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	-	<0.050	-	-	-	-	<0.050
Potassium (K)-Total	mg/L	-	0.43	0.72	0.509	0.520	0.544	0.511	0.502	0.363	-	0.572	-	-	-	-	0.522
Rubidium (Rb) - Total	mg/L	-	-	-	0.00043	0.00048	0.00064	0.00051	0.00046	0.00038	-	0.00056	-	-	-	-	0.00034
Selenium (Se)-Total	mg/L	0.002	<0.00050	<0.00050	0.000055	0.00005	0.000169	<0.000050	<0.000050	<0.000050	-	<0.000050	-	-	-	-	0.000087
Silicon - Total	mg/L	-	4.2	4.6	4.19	3.34	4.65	4.17	3.79	4.85	-	4.63	-	-	-	-	4.73
Silver (Ag)-Total	mg/L	0.0001-0.003 (d)	<0.000050	<0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-	<0.000010	-	-	-	-	<0.000010
Sodium (Na)-Total	mg/L	-	4.17	4.57	3.58	7.70	6.97	4.29	5.79	6.24	-	7.02	-	-	-	-	2.74
Strontium - Total	mg/L	-	0.0542	0.0594	0.0461	0.04320	0.06900	0.04820	0.04180	0.0563	-	0.0616	-	-	-	-	0.0491
Sulfur - Total	mg/L	-	<3.0	<3.0	0.51	0.5	<0.50	<0.50	<0.50	<0.50	-	<0.50	-	-	-	-	0.63
Tellurium - Total	mg/L	-	<0.00020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	<0.00050	-	-	-	-	<0.00050
Thallium (Tl)-Total	mg/L	0.0008	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-	<0.00010	-	-	-	-	<0.00010
Thorium - Total	mg/L	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-	<0.00010	-	-	-	-	<0.00010
Tin (Sn)-Total	mg/L	-	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-	<0.00010	-	-	-	-	<0.00010
Titanium (Ti)-Total	mg/L	-	<0.0050	<0.0050	<0.00030	0.00062	0.00970	0.00047	0.00073	<0.00030	-	0.00282	-	-	-	-	0.00079
Tungsten (W) - Total	mg/L	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-	<0.00010	-	-	-	-	<0.00010
Uranium (U)-Total	mg/L	0.00047	0.000033	0.000025	0.000023	0.000195	0.000021	0.000021	0.000016	0.000016	-	0.000055	-	-	-	-	0.000054
Vanadium (V)-Total	mg/L	-	<0.0010	<0.0010	<0.00050	0.00054	0.00263	0.00052	0.00069	0.00055	-	0.00103	-	-	-	-	0.00085
Zinc (Zn)-Total	mg/L	0.033-0.34 (d,f)	<0.0040	<0.0040	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	-	<0.0030	-	-	-	-	<0.0030
Zirconium - Total	mg/L	-	<0.00010	<0.00010	<0.00060	<0.00060	<0.00060	<0.00060	<0.00060	<0.00060	-	<0.00060	-	-	-	-	<0.00060
<b>Dissolved Metals</b>																	





Table 21: Forceman Ridge Operation Certificate discharge limits site F5 (sand cyclone) - MOE site ID E249852

Parameter	OC limit (mg/L)	(Northern labs)			(ALS lab)		18-May-18	27-Aug-18	16-Apr-19
		6-Jun-17	5-Jul-17	15-Aug-17	7-Nov-17	25-Apr-18			
Total nitrogen	300	<0.05	0.0898	0.164	-	-	-		-
Ammonia	214	<0.03	<0.03	<0.03	15.5	18.5	-	30.8	36.8
pH	6.5 to 8.5	7.4	7.4	7.6	7.57	-	-	8.02	7.29
Chloride	5000	<1.0	2.4	2.7	58.4	15.3	-	94.7	88.9
Total iron	6	0.086	0.093	0.052	5.64	14.90	2.20	2.46	25.3
Total zinc	100		0.0249	<0.0040	0.0428	0.0616	-	<0.0030	0.019
Total cadmuim	0.1	<0.00001	0.000019	<0.00001	0.0000618	0.0005290	-	0.0000512	0.000429

23-May-19	28-May-19	29-May-19	31-May-19	20-Jul-19	1-Aug-19	27-May-20	19-Jan-21	16-Mar-21	9-Apr-21	30-Aug-21	25-Nov-21
-	-	-	-	-	-	-	0.068	0.141	41.5	17.7	1.49
28.1	-	-	-	21.7	18.3	2.11	0.0089	0.0159	35.3	15.3	0.148
7.48	-	-	-	8.27	8.47	8.19	-	5.55	8.1	8.21	7.72
91.8	-	-	-	79.4	94.2	42.3	<0.50	<0.50	100	140	1.74
7.62	6.23	6.52	3.68	7.67	1.15	0.868	0.109	0.041	3.82	2.02	0.019
0.382	<0.015	<0.015	0.0091	0.0637	0.0083	0.01	<0.0030	0.0114	0.0352	0.0187	0.0169
0.000091	0.00005	0.000048	0.000466	0.000724	0.000166	0.000365	0.0000277	0.0000263	0.000247	0.0000576	0.0000072

Table 25: Leachate Water Quality Results Sampling Location F5, Sand Cyclone

Client sample ID		MC MOE						
Date sampled								
Time sampled								
ALS sample ID								
QA/QC		OC Criteria						
Field	Units		6-Jun-17	5-Jul-17	15-Aug-17	7-Nov-17	25-Apr-18	18-May-18
Conductivity	uS/cm	-	83.5	96.4	352	566	532	239
pH	pH	-	8.4	7.4	6.8	7.08	6.46	7.07
Temperature	°C	-	16.2	13.3	14.2	3.5	5.0	16.2
Dissolved Oxygen (%)	mg/L	-	-	6.4	12.7	7.7	5.7	-
Dissolved Oxygen (mg/L)								
Turbidity	NTU	-	-	-	-	-	-	-
ORP	mV	-	-	-	-	-	105.6	-
Iron	ppm	6						
<b>Analyte</b>	Units							
<b>Physical Tests (Matrix: Water)</b>								
Conductivity	uS/cm	-	-	-	-	-	-	-
Alkalinity, Total (as CaCO3)	mg/L	-	36	41	59	348	110	-
Hardness (as CaCO3)	mg/L	-	43.2	39.8	59.3	244	213	-
pH	pH	6.5 - 8.5	7.4	7.4	7.6	7.57	-	-
<b>Anions and Nutrients (Matrix: Water)</b>								
Kjeldahl Nitrogen, Total [TKN]	mg/L							
Ammonia, Total (as N)	mg/L	214	<0.03	<0.03	<0.03	15.5	18.5	-
Bromide (Br)	mg/L		-	-	-	-	0.071	-
Chloride (Cl)	mg/L	5000	<1.0	2.4	2.7	58.4	15.3	-
Fluoride (F)	mg/L	-	<0.10	<0.10	<0.10	<0.20	0.071	-
Nitrate (as N)	mg/L	-	<0.01	0.023	0.031	<0.050	0.071	-
Nitrite (as N)	mg/L	-	<0.01	<0.01	<0.01	<0.010	<0.0050	-
Nitrogen, total	mg/L							
Orthophosphorus (P)	mg/L	-	-	-	-	<0.0010	<0.0010	-
Sulfate (SO4)	mg/L	-	3.4	5.5	5.3	13.1	<0.0010	-
<b>Organic / Inorganic Carbon (Matrix: Water)</b>								
Total Organic Carbon	mg/L	-	2.14	1.39	1.57	146	42.4	-
<b>Total Metals (Matrix: Water)</b>								
Aluminum (Al)-Total	mg/L	-	0.054	0.0497	0.0183	0.0388	0.0290	-
Antimony (Sb)-Total	mg/L	-	0.00021	0.00027	0.00022	0.00059	0.00041	-
Arsenic (As)-Total	mg/L	-	<0.00050	<0.00050	<0.00050	0.00250	0.00529	-
Barium (Ba)-Total	mg/L	-	0.0513	0.0341	0.0432	0.241	0.320	-
Beryllium (Be)-Total	mg/L	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020	-
Bismuth	mg/L	-	<0.00010	<0.00010	<0.00010	<0.000050	<0.00010	-
Boron (B)-Total	mg/L	-	0.009	0.0165	0.0111	0.355	0.217	-
Cadmium (Cd)-Total	mg/L	0.1	<0.000010	0.000019	<0.000010	0.0000618	0.0005260	-
Calcium (Ca)-Total	mg/L	-	15.9	14.6	22	83.6	72.9	-
Cesium (Cs) - Total	mg/L	-	-	-	-	0.000630	0.000529	-
Chromium (Cr)-Total	mg/L	-	<0.00050	<0.00050	<0.00050	0.00453	0.00093	-
Cobalt (Co)-Total	mg/L	-	<0.00010	<0.00010	<0.00010	0.00823	0.00965	-
Copper (Cu)-Total	mg/L	-	0.00155	0.00203	0.00177	0.00650	0.02150	-
Iron (Fe)-Total	mg/L	6	0.086	0.093	0.052	5.64	14.90	2.21
Lead (Pb)-Total	mg/L	-	0.00077	0.00085	<0.00020	0.000572	0.004330	-
Lithium (Li)-Total	mg/L	-	<0.00010	<0.00010	<0.00010	<0.0010	<0.0020	-
Magnesium (Mg)-Total	mg/L	-	0.841	0.806	1.05	8.63	7.56	-
Manganese (Mn)-Total	mg/L	-	0.00355	0.00483	0.012	16.7	25.0	-
Mercury (Hg)-Total	mg/L	-	<0.00002	<0.000020	<0.000010	<0.000025	<0.000050	-
Molybdenum (Mo)-Total	mg/L	-	0.00058	0.00068	0.00074	0.000640	0.000700	-
Nickel (Ni)-Total	mg/L	-	<0.00020	<0.00020	<0.00040	0.00667	0.00540	-
Phosphorus - Total	mg/L	-	<0.050	<0.050	<0.050	1.32	0.13	-
Potassium (K)-Total	mg/L	-	0.89	0.93	1.17	28.5	16.4	-
Rubidium (Rb) - Total	mg/L	-	-	-	-	0.0326	0.0257	-
Selenium (Se)-Total	mg/L	-	<0.00050	<0.00050	<0.00050	0.000108	<0.00010	-
Silicon - Total	mg/L	-	2.3	2.1	2.5	2.72	3.43	-
Silver (Ag)-Total	mg/L	-	<0.000050	0.000073	<0.000050	<0.000010	<0.000020	-
Sodium (Na)-Total	mg/L	-	1.28	1.4	2.13	54.1	36.1	-
Strontium - Total	mg/L	-	0.183	0.204	0.271	0.297	0.401	-
Sulfur - Total	mg/L	-	4	3.9	<3.0	6.94	<1.0	-
Tellurium - Total	mg/L	-	<0.00020	<0.00020	<0.00050	<0.00020	<0.00040	-
Thallium (Tl)-Total	mg/L	-	<0.000020	<0.000020	<0.000020	0.000018	<0.000020	-
Thorium - Total	mg/L	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020	-
Tin (Sn)-Total	mg/L	-	<0.00020	<0.00020	<0.00020	0.00013	0.00037	-
Titanium (Ti)-Total	mg/L	-	<0.0050	<0.0050	<0.0050	0.00274	0.00203	-
Tungsten (W) - Total	mg/L	-	-	-	-	0.00010	<0.00020	-
Uranium (U)-Total	mg/L	-	<0.000020	<0.000020	0.00003	0.000045	0.000083	-
Vanadium (V)-Total	mg/L	-	<0.0010	<0.0010	<0.0010	0.00186	0.00170	-
Zinc (Zn)-Total	mg/L	100	0.0315	0.0249	<0.0040	0.0428	0.0616	-
Zirconium - Total	mg/L	-	<0.00010	<0.00010	<0.00010	0.000063	<0.00012	-
<b>Aggregate Organics (Matrix: Water)</b>								
BOD	mg/L	-	<3.0	<4.0	<4.0	-	11.8	-
COD	mg/L	-	-	-	-	466	167	-

OC Criteria Shaded Value Means Exceeded Discharge Criteria (OC)

Table 25: Leachate Water Quality Results Sampling Location F5, Sand C

Client sample ID		MC MOE	27-Aug-18	16-Apr-19	22-May-19	28-May-19	29-May-19
Date sampled							
Time sampled							
ALS sample ID							
QA/QC		OC Criteria					
Field	Units						
Conductivity	uS/cm	-	1019	978	1056		
pH	pH	-	6.96	6.95	7		
Temperature	°C	-	18.4	6.7	15.3		
Dissolved Oxygen (%)	mg/L	-	1	1.4	2.1		
Dissolved Oxygen (mg/L)							
Turbidity	NTU	-	-	-			
ORP	mV	-	-	-	195		
Iron	ppm	6					
<b>Analyte</b>	Units						
<b>Physical Tests (Matrix: Water)</b>							
Conductivity	uS/cm	-	-	-			
Alkalinity, Total (as CaCO3)	mg/L	-	466	553	539	-	-
Hardness (as CaCO3)	mg/L	-	227	377	304	252	254
pH	pH	6.5 - 8.5	8.02	7.29	7.48	-	
<b>Anions and Nutrients (Matrix: Water)</b>							
Kjeldahl Nitrogen, Total [TKN]	mg/L						
Ammonia, Total (as N)	mg/L	214	30.8	36.8	28.1	-	
Bromide (Br)	mg/L		-	<0.50	0.26	-	
Chloride (Cl)	mg/L	5000	<0.25	88.9	91.8	-	
Fluoride (F)	mg/L	-	<0.10	<0.20	<0.10	-	
Nitrate (as N)	mg/L	-	0.044	<0.050	<0.025	-	
Nitrite (as N)	mg/L	-	<0.0050	<0.010	0.0052	-	
Nitrogen, total	mg/L						
Orthophosphorus (P)	mg/L	-	<0.0010	0.0554	0.0017	-	
Sulfate (SO4)	mg/L	-	<1.5	<3.0	2.6	-	
<b>Organic / Inorganic Carbon (Matrix: Water)</b>							
Total Organic Carbon	mg/L	-	3.2	219	221	-	
<b>Total Metals (Matrix: Water)</b>							
Aluminum (Al)-Total	mg/L	-	0.0268	0.04	0.09	0.027	0.021
Antimony (Sb)-Total	mg/L	-	0.00045	0.00	0.00	0.00068	<0.00050
Arsenic (As)-Total	mg/L	-	0.00367	0.01	0.01	0.00515	0.00512
Barium (Ba)-Total	mg/L	-	0.254	0.38	0.41	0.407	0.497
Beryllium (Be)-Total	mg/L	-	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050
Bismuth	mg/L	-	<0.000050	<0.00025	<0.00025	<0.00025	<0.00025
Boron (B)-Total	mg/L	-	0.508	0.55	0.56	0.542	
Cadmium (Cd)-Total	mg/L	0.1	0.000051	0.00	0.00	0.00005	0.000048
Calcium (Ca)-Total	mg/L	-	68.6	125.00	98.40	81.3	80.4
Cesium (Cs) - Total	mg/L	-	0.000876	0.00	0.00	0.000924	0.000935
Chromium (Cr)-Total	mg/L	-	0.00146	0.00	0.00	0.00098	0.00093
Cobalt (Co)-Total	mg/L	-	0.00226	0.01	0.00	0.00454	0.00485
Copper (Cu)-Total	mg/L	-	0.0032	0.01	0.24	<0.0025	0.0054
Iron (Fe)-Total	mg/L	6	2.5	25.30	7.62	6.23	6.52
Lead (Pb)-Total	mg/L	-	0.00030	0.00	0.03	0.00186	0.00113
Lithium (Li)-Total	mg/L	-	<0.0010	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)-Total	mg/L	-	13.60	16.00	14.30	12	13
Manganese (Mn)-Total	mg/L	-	7.6	19.20	12.50	14.3	17.4
Mercury (Hg)-Total	mg/L	-	0.0000087	<0.000025	0.00	-	<0.000025
Molybdenum (Mo)-Total	mg/L	-	0.00040	0.00	0.00	0.00127	0.0013
Nickel (Ni)-Total	mg/L	-	0.0054	0.01	0.01	0.0052	0.0053
Phosphorus - Total	mg/L	-	0.74	0.78	1.11	0.43	0.58
Potassium (K)-Total	mg/L	-	44.6	48.50	43.90	36.9	35.7
Rubidium (Rb) - Total	mg/L	-	0.0506	0.05	0.05	0.0503	0.0514
Selenium (Se)-Total	mg/L	-	0.00009	<0.00025	<0.00025	<0.00025	<0.00025
Silicon - Total	mg/L	-	2.42	3.50	2.86	2.58	2.81
Silver (Ag)-Total	mg/L	-	<0.000010	<0.000050	<0.000050	<0.000050	<0.000050
Sodium (Na)-Total	mg/L	-	84.4	90.40	91.90	80.1	79.4
Strontium - Total	mg/L	-	0.347	0.55	0.44	0.405	0.388
Sulfur - Total	mg/L	-	1.27	<2.5	<2.5	<2.5	<2.5
Tellurium - Total	mg/L	-	<0.00020	<0.0010	<0.0010	<0.0010	<0.0010
Thallium (Tl)-Total	mg/L	-	0.000011	<0.000050	<0.000050	<0.000050	<0.000050
Thorium - Total	mg/L	-	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050
Tin (Sn)-Total	mg/L	-	<0.00010	<0.00050	0.00	<0.00050	<0.00050
Titanium (Ti)-Total	mg/L	-	0.00134	0.00	0.01	<0.0015	<0.0015
Tungsten (W) - Total	mg/L	-	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050
Uranium (U)-Total	mg/L	-	0.000056	0.00	0.00	0.000059	0.000066
Vanadium (V)-Total	mg/L	-	0.0014	0.00	0.00	<0.0025	<0.0025
Zinc (Zn)-Total	mg/L	100	<0.0030	0.02	0.38	<0.015	<0.015
Zirconium - Total	mg/L	-	0.000103	<0.00030	<0.00030	<0.00030	<0.00030
<b>Aggregate Organics (Matrix: Water)</b>							
BOD	mg/L	-	24.4	-	51	-	
COD	mg/L	-	178	669	234	-	

OC Criteria Shaded Value Means Exceeded Discharge (

Table 25: Leachate Water Quality Results Sampling Location F5, Sand C

Client sample ID		MC MOE	31-May-19	17-Jul-19	1-Aug-19	F5 - Sand Cyclone	F5 - Sand Cyclone
Date sampled						27-May-2020	19-Jan-2021
Time sampled						13:15	13:00
ALS sample ID						VA20A7415-001	VA21A1066-001
QA/QC		OC Criteria		EB	EB	MT	
Field	Units						
Conductivity	uS/cm	-		858	838	315.9	-
pH	pH	-		6.91	6.88	7.15	-
Temperature	°C	-		15.7	18.7	8.6	-
Dissolved Oxygen (%)	mg/L	-		0.9	2.2	26	-
Dissolved Oxygen (mg/L)						3	-
Turbidity	NTU	-		-	-	0.6	-
ORP	mV	-		451.6	348	152.7	-
Iron	ppm	6				~1.5	-
<b>Analyte</b>	<b>Units</b>						
<b>Physical Tests (Matrix: Water)</b>							
Conductivity	uS/cm	-			-	459	3.0
Alkalinity, Total (as CaCO3)	mg/L	-		366	365	169	1.8
Hardness (as CaCO3)	mg/L	-	278	210	194	95.6	1.33
pH	pH	6.5 - 8.5		8.27	8.47	8.19	
<b>Anions and Nutrients (Matrix: Water)</b>							
Kjeldahl Nitrogen, Total [TKN]	mg/L					3.42	0.050
Ammonia, Total (as N)	mg/L	214		21.7	18.3	2.11	0.0089
Bromide (Br)	mg/L			<0.25	0.28	0.099	-
Chloride (Cl)	mg/L	5000		79.4	94.2	42.3	<0.50
Fluoride (F)	mg/L	-		<0.10	<0.10	0.045	<0.020
Nitrate (as N)	mg/L	-		6.87	1.48	0.466	0.0179
Nitrite (as N)	mg/L	-		0.0323	0.0157	0.0540	<0.0010
Nitrogen, total	mg/L						0.068
Orthophosphorus (P)	mg/L	-		0.0057	0.004	0.0339	0.0039
Sulfate (SO4)	mg/L	-		4.7	1.8	3.88	<0.30
<b>Organic / Inorganic Carbon (Matrix: Water)</b>							
Total Organic Carbon	mg/L	-		25.4	20.5	7.72	0.92
<b>Total Metals (Matrix: Water)</b>							
Aluminum (Al)-Total	mg/L	-	0.03	0.0419	0.03	0.0102	0.0567
Antimony (Sb)-Total	mg/L	-	0.00	0.00058	0.00	0.00018	<0.00010
Arsenic (As)-Total	mg/L	-	0.00	0.00418	0.00	0.00149	<0.00010
Barium (Ba)-Total	mg/L	-	0.32	0.355	0.21	0.0910	0.00260
Beryllium (Be)-Total	mg/L	-	<0.00020	<0.00010	<0.00010	<0.000100	<0.000100
Bismuth	mg/L	-	<0.00010	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	mg/L	-	0.57	0.528	0.56	0.224	<0.010
Cadmium (Cd)-Total	mg/L	0.1	0.00	0.000724	0.00	0.000365	0.0000277
Calcium (Ca)-Total	mg/L	-	87.70	62.5	55.20	30.1	0.443
Cesium (Cs) - Total	mg/L	-	0.00	0.00102	0.00	0.000163	<0.000010
Chromium (Cr)-Total	mg/L	-	0.00	0.00139	0.00	0.00054	<0.00010
Cobalt (Co)-Total	mg/L	-	0.00	0.00393	0.00	0.00113	<0.00010
Copper (Cu)-Total	mg/L	-	0.02	0.855	0.01	0.0125	0.00078
Iron (Fe)-Total	mg/L	6	3.68	7.67	1.15	0.868	0.109
Lead (Pb)-Total	mg/L	-	0.00	0.00705	0.00	0.000755	0.000196
Lithium (Li)-Total	mg/L	-	<0.0020	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium (Mg)-Total	mg/L	-	14.30	13.1	13.50	4.94	0.0553
Manganese (Mn)-Total	mg/L	-	8.58	10.9	3.88	2.88	0.0476
Mercury (Hg)-Total	mg/L	-	0.00	<0.00010	<0.000025	<0.0000050	<0.0000050
Molybdenum (Mo)-Total	mg/L	-	0.00	0.00196	0.00	0.000825	<0.000050
Nickel (Ni)-Total	mg/L	-	0.01	0.00862	0.01	0.00263	<0.00050
Phosphorus - Total	mg/L	-	0.48	0.521	0.22	0.198	<0.050
Potassium (K)-Total	mg/L	-	43.60	40.0	42.30	18.6	0.065
Rubidium (Rb) - Total	mg/L	-	0.05	0.0540	0.05	0.0187	<0.00020
Selenium (Se)-Total	mg/L	-	0.00	0.000138	0.00	<0.000050	<0.000050
Silicon - Total	mg/L	-	2.92	3.28	3.09	1.80	<0.10
Silver (Ag)-Total	mg/L	-	<0.000020	0.000013	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	-	93.90	82.6	89.10	36.6	0.200
Strontium - Total	mg/L	-	0.42	0.344	0.31	0.149	0.00147
Sulfur - Total	mg/L	-	3.20	2.19	1.47	1.77	<0.50
Tellurium - Total	mg/L	-	<0.00040	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	mg/L	-	<0.000020	0.000054	<0.000010	0.000016	<0.000010
Thorium - Total	mg/L	-	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L	-	<0.00020	0.0005	0.00	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L	-	0.00	0.00103	<0.00090	0.00047	0.00168
Tungsten (W) - Total	mg/L	-	<0.00020	0.00011	<0.00010	<0.00010	<0.00010
Uranium (U)-Total	mg/L	-	0.00	0.000111	0.00	0.000061	<0.000010
Vanadium (V)-Total	mg/L	-	0.00	0.00303	0.00	0.00065	<0.00050
Zinc (Zn)-Total	mg/L	100	0.01	0.0637	0.01	0.0100	<0.0030
Zirconium - Total	mg/L	-	<0.00012	<0.00020	<0.00020	<0.00020	<0.00020
<b>Aggregate Organics (Matrix: Water)</b>							
BOD	mg/L	-		13.2	28.1	2.6	<2.0
COD	mg/L	-		76	72	34	<20

OC Criteria Shaded Value Means Exceeded Discharge (

Table 25: Leachate Water Quality Results Sampling Location F5, Sand C

Client sample ID			F5 - Sand Filter (manhole)	DUP		Sand Filter Culvert (manhole)
Date sampled		MC MOE	15-Mar-21	15-Mar-21	RPD	9-Apr-21
Time sampled			10:54	0.5	-	12:23
ALS sample ID			VA21A4846-001	VA21A4846-001	-	VA21A6678-001
QA/QC		OC Criteria	Sub-Matrix: Water	Sub-Matrix: Water	-	Sub-Matrix: Effluent
Field	Units					
Conductivity	uS/cm	-	3.1	-	-	1376
pH	pH	-	6.52	-	-	7.42
Temperature	°C	-	0.1	-	-	2.7
Dissolved Oxygen (%)	mg/L	-	88	-	-	20
Dissolved Oxygen (mg/L)		-	12.5	-	-	2.6
Turbidity	NTU	-	1.08	-	-	24.5
ORP	mV	-	277.6	-	-	139.7
Iron	ppm	6	<0.5	-	-	5
<b>Analyte</b>	Units					
<b>Physical Tests (Matrix: Water)</b>						
Conductivity	uS/cm	-	2.2	2.5	12.77%	1270
Alkalinity, Total (as CaCO3)	mg/L	-	<1.0	<1.0	#VALUE!	531.00
Hardness (as CaCO3)	mg/L	-	<0.60	<0.60	#VALUE!	302
pH	pH	6.5 - 8.5	5.55	5.57	0.36%	8.1
<b>Anions and Nutrients (Matrix: Water)</b>						
Kjeldahl Nitrogen, Total [TKN]	mg/L		0.142	0.208	37.71%	39
Ammonia, Total (as N)	mg/L	214	0.0159	0.0189	17.24%	35.30
Bromide (Br)	mg/L		<0.050	<0.050	#VALUE!	-
Chloride (Cl)	mg/L	5000	<0.50	<0.50	#VALUE!	100
Fluoride (F)	mg/L		<0.020	<0.020	#VALUE!	<0.100
Nitrate (as N)	mg/L	-	0.025	0.0250	0.00%	<0.0250
Nitrite (as N)	mg/L	-	<0.0010	<0.0010	#VALUE!	<0.0050
Nitrogen, total	mg/L		0.141	0.194	31.64%	41.5
Orthophosphorus (P)	mg/L	-	<0.0010	<0.0010	#VALUE!	0.136
Sulfate (SO4)	mg/L	-	0.32	0.31	3.17%	2.42
<b>Organic / Inorganic Carbon (Matrix: Water)</b>						
Total Organic Carbon	mg/L	-	0.61	0.76	21.90%	72.4
<b>Total Metals (Matrix: Water)</b>						
Aluminum (Al)-Total	mg/L	-	0.0176	0.0184	4.44%	0.0262
Antimony (Sb)-Total	mg/L	-	<0.00010	<0.00010	#VALUE!	0.00056
Arsenic (As)-Total	mg/L	-	<0.00010	<0.00010	#VALUE!	0.00298
Barium (Ba)-Total	mg/L	-	0.00040	0.00042	4.88%	0.286
Beryllium (Be)-Total	mg/L	-	<0.000100	<0.000100	#VALUE!	<0.000100
Bismuth	mg/L	-	<0.000050	<0.000050	#VALUE!	<0.000050
Boron (B)-Total	mg/L	-	<0.010	<0.010	#VALUE!	0.745
Cadmium (Cd)-Total	mg/L	0.1	0.0000263	0.0000237	10.40%	0.000247
Calcium (Ca)-Total	mg/L	-	0.123	0.114	7.59%	95.3
Cesium (Cs) - Total	mg/L	-	<0.000010	<0.000010	#VALUE!	0.000603
Chromium (Cr)-Total	mg/L	-	0.00011	0.00015	30.77%	0.00207
Cobalt (Co)-Total	mg/L	-	<0.00010	<0.00010	#VALUE!	0.00180
Copper (Cu)-Total	mg/L	-	0.00370	0.00452	19.95%	0.00599
Iron (Fe)-Total	mg/L	6	0.041	0.045	9.30%	3.82
Lead (Pb)-Total	mg/L	-	0.000287	0.000305	6.08%	0.000381
Lithium (Li)-Total	mg/L	-	<0.0010	<0.0010	#VALUE!	<0.0010
Magnesium (Mg)-Total	mg/L	-	0.0176	0.0159	10.15%	15.5
Manganese (Mn)-Total	mg/L	-	0.00236	0.00240	1.68%	5.81
Mercury (Hg)-Total	mg/L	-	<0.0000050	<0.0000050	#VALUE!	0.0000076
Molybdenum (Mo)-Total	mg/L	-	<0.000050	0.000127	#VALUE!	0.000517
Nickel (Ni)-Total	mg/L	-	<0.00050	<0.00050	#VALUE!	0.00515
Phosphorus - Total	mg/L	-	<0.050	<0.050	#VALUE!	0.717
Potassium (K)-Total	mg/L	-	0.169	0.223	27.55%	41.6
Rubidium (Rb) - Total	mg/L	-	<0.00020	0.00028	#VALUE!	0.0438
Selenium (Se)-Total	mg/L	-	<0.000050	<0.000050	#VALUE!	0.000112
Silicon - Total	mg/L	-	<0.10	<0.10	#VALUE!	2.44
Silver (Ag)-Total	mg/L	-	<0.000010	<0.000010	#VALUE!	0.000010
Sodium (Na)-Total	mg/L	-	0.122	0.152	21.90%	95.0
Strontium - Total	mg/L	-	0.00061	0.00055	10.34%	0.467
Sulfur - Total	mg/L	-	<0.50	<0.50	#VALUE!	1.76
Tellurium - Total	mg/L	-	<0.00020	<0.00020	#VALUE!	<0.00020
Thallium (Tl)-Total	mg/L	-	<0.000010	<0.000010	#VALUE!	0.000033
Thorium - Total	mg/L	-	<0.00010	<0.00010	#VALUE!	<0.00010
Tin (Sn)-Total	mg/L	-	<0.00010	0.00012	#VALUE!	0.00012
Titanium (Ti)-Total	mg/L	-	0.00046	0.00055	17.82%	0.00214
Tungsten (W) - Total	mg/L	-	<0.00010	<0.00010	#VALUE!	<0.00010
Uranium (U)-Total	mg/L	-	<0.000010	<0.000010	#VALUE!	0.000080
Vanadium (V)-Total	mg/L	-	<0.00050	<0.00050	#VALUE!	0.00155
Zinc (Zn)-Total	mg/L	100	0.0114	0.0137	18.33%	0.0352
Zirconium - Total	mg/L	-	<0.00020	<0.00020	#VALUE!	0.00022
<b>Aggregate Organics (Matrix: Water)</b>						
BOD	mg/L	-	<2.0	<2.0	#VALUE!	96.7
COD	mg/L	-	<20	<20	#VALUE!	233.00

OC Criteria Shaded Value Means Exceeded Discharge (

Table 25: Leachate Water Quality Results Sampling Location F5, Sand C

Client sample ID			DUP			DUP
Date sampled		MC MOE	9-Apr-21	RPD	30-Aug-21	30-Aug-21
Time sampled			12:00		10:22	12:00
ALS sample ID			VA21A6678-002		VA21B8594-001	VA21B8594-002
QA/QC		OC Criteria	Sub-Matrix: Effluent		Sub-Matrix: Water	Sub-Matrix: Water
Field	Units					DUP
Conductivity	uS/cm	-	-	-	926	-
pH	pH	-	-	-	7.75	-
Temperature	°C	-	-	-	14.3	-
Dissolved Oxygen (%)	mg/L	-	-	-	22	-
Dissolved Oxygen (mg/L)		-	-	-	2.2	-
Turbidity	NTU	-	-	-	6.07	-
ORP	mV	-	-	-	165.6	-
Iron	ppm	6	-	-	2.5	-
Analyte	Units					
<b>Physical Tests (Matrix: Water)</b>						
Conductivity	uS/cm	-	1270	0.00%	1150	1150
Alkalinity, Total (as CaCO3)	mg/L	-	533	0.38%	373.00	374
Hardness (as CaCO3)	mg/L	-	303	0.33%	174	161
pH	pH	6.5 - 8.5	8.10	0.00%	8.21	8.17
<b>Anions and Nutrients (Matrix: Water)</b>						
Kjeldahl Nitrogen, Total [TKN]	mg/L	-	40.3	3.28%	17.3	17.6
Ammonia, Total (as N)	mg/L	214	37.1	4.97%	15.30	15.5
Bromide (Br)	mg/L	-	-	-	-	-
Chloride (Cl)	mg/L	5000	101	1.00%	140	139
Fluoride (F)	mg/L	-	<0.100	#VALUE!	<0.100	<0.100
Nitrate (as N)	mg/L	-	0.0698	#VALUE!	0.029	<0.0250
Nitrite (as N)	mg/L	-	0.0055	#VALUE!	0.0093	0.0092
Nitrogen, total	mg/L	-	41.4	0.24%	17.7	17.6
Orthophosphorus (P)	mg/L	-	0.0928	37.76%	0.0950	0.117
Sulfate (SO4)	mg/L	-	4.51	60.32%	<1.50	<1.50
<b>Organic / Inorganic Carbon (Matrix: Water)</b>						
Total Organic Carbon	mg/L	-	74.6	2.99%	23.9	24.3
<b>Total Metals (Matrix: Water)</b>						
Aluminum (Al)-Total	mg/L	-	0.0267	1.89%	0.0260	0.0994
Antimony (Sb)-Total	mg/L	-	0.00057	1.77%	0.00047	0.00052
Arsenic (As)-Total	mg/L	-	0.00306	2.65%	0.00372	0.00400
Barium (Ba)-Total	mg/L	-	0.296	3.44%	0.134	0.139
Beryllium (Be)-Total	mg/L	-	<0.000100	#VALUE!	<0.000100	<0.000100
Bismuth	mg/L	-	<0.000050	#VALUE!	<0.000050	<0.000050
Boron (B)-Total	mg/L	-	0.756	1.47%	1.22	1.20
Cadmium (Cd)-Total	mg/L	0.1	0.000253	2.40%	0.0000576	0.0000851
Calcium (Ca)-Total	mg/L	-	95.3	0.00%	40.3	37.5
Cesium (Cs) - Total	mg/L	-	0.000607	0.66%	0.000403	0.000443
Chromium (Cr)-Total	mg/L	-	0.00221	6.54%	0.00081	0.00104
Cobalt (Co)-Total	mg/L	-	0.00186	3.28%	0.00092	0.00102
Copper (Cu)-Total	mg/L	-	0.00614	2.47%	0.00586	0.00388
Iron (Fe)-Total	mg/L	6	3.88	1.56%	2.02	1.43
Lead (Pb)-Total	mg/L	-	0.000385	1.04%	0.00390	0.000592
Lithium (Li)-Total	mg/L	-	<0.0010	#VALUE!	<0.0010	<0.0010
Magnesium (Mg)-Total	mg/L	-	15.8	1.92%	17.7	16.4
Manganese (Mn)-Total	mg/L	-	5.98	2.88%	1.96	1.90
Mercury (Hg)-Total	mg/L	-	0.0000059	25.19%	<0.0000050	<0.0000050
Molybdenum (Mo)-Total	mg/L	-	0.000528	2.11%	0.000575	0.000679
Nickel (Ni)-Total	mg/L	-	0.00519	0.77%	0.00735	0.00708
Phosphorus - Total	mg/L	-	0.733	2.21%	0.389	0.844
Potassium (K)-Total	mg/L	-	43.0	3.31%	51.5	48.6
Rubidium (Rb) - Total	mg/L	-	0.0455	3.81%	0.0422	0.0422
Selenium (Se)-Total	mg/L	-	0.000113	0.89%	0.000120	0.000135
Silicon - Total	mg/L	-	2.48	1.63%	2.98	3.12
Silver (Ag)-Total	mg/L	-	0.000011	9.52%	<0.000010	0.000012
Sodium (Na)-Total	mg/L	-	96.6	1.67%	141	135
Strontium - Total	mg/L	-	0.476	1.91%	0.315	0.340
Sulfur - Total	mg/L	-	2.00	12.77%	0.92	1.37
Tellurium - Total	mg/L	-	<0.00020	#VALUE!	<0.00020	<0.00020
Thallium (Tl)-Total	mg/L	-	0.000030	9.52%	<0.000010	<0.000010
Thorium - Total	mg/L	-	<0.00010	#VALUE!	<0.00010	<0.00010
Tin (Sn)-Total	mg/L	-	0.00011	8.70%	0.00032	0.00014
Titanium (Ti)-Total	mg/L	-	0.00180	17.26%	0.00079	<0.00300
Tungsten (W) - Total	mg/L	-	<0.00010	#VALUE!	0.00017	0.00030
Uranium (U)-Total	mg/L	-	0.000079	1.26%	0.000035	0.000066
Vanadium (V)-Total	mg/L	-	0.00160	3.17%	0.00081	0.00099
Zinc (Zn)-Total	mg/L	100	0.0365	3.63%	0.0187	0.0037
Zirconium - Total	mg/L	-	0.00021	4.65%	<0.00020	<0.00020
<b>Aggregate Organics (Matrix: Water)</b>						
BOD	mg/L	-	94.3	2.51%	9.3	11.0
COD	mg/L	-	304	26.44%	94.00	90

OC Criteria Shaded Value Means Exceeded Discharge (

Table 25: Leachate Water Quality Results Sampling Location F5, Sand C

Client sample ID		MC MOE	RPD	Sand Filter Culvert (manhole)	DUP	RPD
Date sampled				25-Nov-21	25-Nov-21	
Time sampled				9:57	12:00	
ALS sample ID				VA21C6526-001	VA21C6526-002	
QA/QC		OC Criteria		Sub-Matrix: Water	Sub-Matrix: Water	
Field	Units					
Conductivity	uS/cm	-	-	69.2	-	-
pH	pH	-	-	7.27	-	-
Temperature	°C	-	-	5.8	-	-
Dissolved Oxygen (%)	mg/L	-	-	100	-	-
Dissolved Oxygen (mg/L)		-	-	12	-	-
Turbidity	NTU	-	-	0.25	-	-
ORP	mV	-	-	196.6	-	-
Iron	ppm	6	-	0	-	-
Analyte	Units					
<b>Physical Tests (Matrix: Water)</b>						
Conductivity	uS/cm	-	0.00%	107	110	2.76%
Alkalinity, Total (as CaCO3)	mg/L	-	0.27%	42.2	43.0	1.88%
Hardness (as CaCO3)	mg/L	-	7.76%	30.1	30.1	0.00%
pH	pH	6.5 - 8.5	0.49%	7.72	7.74	0.26%
<b>Anions and Nutrients (Matrix: Water)</b>						
Kjeldahl Nitrogen, Total [TKN]	mg/L	-	1.72%	0.47	0.451	4.13%
Ammonia, Total (as N)	mg/L	214	1.30%	0.148	0.146	1.36%
Bromide (Br)	mg/L	-	-	-	-	-
Chloride (Cl)	mg/L	5000	0.72%	1.74	1.82	4.49%
Fluoride (F)	mg/L	-	#VALUE!	0.033	0.032	3.08%
Nitrate (as N)	mg/L	-	#VALUE!	1.28	1.34	4.58%
Nitrite (as N)	mg/L	-	1.08%	0.0302	0.0323	6.72%
Nitrogen, total	mg/L	-	0.57%	1.49	1.49	0.00%
Orthophosphorus (P)	mg/L	-	20.75%	0.0155	0.0162	4.42%
Sulfate (SO4)	mg/L	-	#VALUE!	2.26	2.28	0.88%
<b>Organic / Inorganic Carbon (Matrix: Water)</b>						
Total Organic Carbon	mg/L	-	1.66%	1.38	1.12	20.80%
<b>Total Metals (Matrix: Water)</b>						
Aluminum (Al)-Total	mg/L	-	117.07%	0.0121	0.0126	4.05%
Antimony (Sb)-Total	mg/L	-	10.10%	0.00014	0.00014	0.00%
Arsenic (As)-Total	mg/L	-	7.25%	0.00025	0.00024	4.08%
Barium (Ba)-Total	mg/L	-	3.66%	0.0166	0.0166	0.00%
Beryllium (Be)-Total	mg/L	-	#VALUE!	<0.000100	<0.000100	#VALUE!
Bismuth	mg/L	-	#VALUE!	<0.000050	<0.000050	#VALUE!
Boron (B)-Total	mg/L	-	1.65%	0.078	0.083	6.21%
Cadmium (Cd)-Total	mg/L	0.1	38.54%	0.0000072	0.0000090	22.22%
Calcium (Ca)-Total	mg/L	-	7.20%	9.93	9.92	0.10%
Cesium (Cs) - Total	mg/L	-	9.46%	0.000013	0.000014	7.41%
Chromium (Cr)-Total	mg/L	-	24.86%	<0.00050	<0.00050	#VALUE!
Cobalt (Co)-Total	mg/L	-	10.31%	<0.00010	<0.00010	#VALUE!
Copper (Cu)-Total	mg/L	-	40.66%	0.00106	0.00110	3.70%
Iron (Fe)-Total	mg/L	6	34.20%	0.019	0.018	5.41%
Lead (Pb)-Total	mg/L	-	147.28%	<0.000050	<0.000050	#VALUE!
Lithium (Li)-Total	mg/L	-	#VALUE!	<0.0010	<0.0010	#VALUE!
Magnesium (Mg)-Total	mg/L	-	7.62%	1.28	1.30	1.55%
Manganese (Mn)-Total	mg/L	-	3.11%	0.0541	0.0543	0.37%
Mercury (Hg)-Total	mg/L	-	#VALUE!	<0.000050	<0.000050	#VALUE!
Molybdenum (Mo)-Total	mg/L	-	16.59%	0.000149	0.000152	1.99%
Nickel (Ni)-Total	mg/L	-	3.74%	<0.00050	0.00052	#VALUE!
Phosphorus - Total	mg/L	-	73.80%	<0.050	<0.050	#VALUE!
Potassium (K)-Total	mg/L	-	5.79%	4.73	4.78	1.05%
Rubidium (Rb) - Total	mg/L	-	0.00%	0.00288	0.00288	0.00%
Selenium (Se)-Total	mg/L	-	11.76%	<0.000050	<0.000050	#VALUE!
Silicon - Total	mg/L	-	4.59%	2.36	2.34	0.85%
Silver (Ag)-Total	mg/L	-	#VALUE!	<0.000010	<0.000010	#VALUE!
Sodium (Na)-Total	mg/L	-	4.35%	6.04	6.10	0.99%
Strontium - Total	mg/L	-	7.63%	0.0461	0.0471	2.15%
Sulfur - Total	mg/L	-	39.30%	0.61	0.82	29.37%
Tellurium - Total	mg/L	-	#VALUE!	<0.00020	<0.00020	#VALUE!
Thallium (Tl)-Total	mg/L	-	#VALUE!	<0.000010	<0.000010	#VALUE!
Thorium - Total	mg/L	-	#VALUE!	<0.00010	<0.00010	#VALUE!
Tin (Sn)-Total	mg/L	-	78.26%	<0.00010	<0.00010	#VALUE!
Titanium (Ti)-Total	mg/L	-	#VALUE!	<0.00030	<0.00030	#VALUE!
Tungsten (W) - Total	mg/L	-	55.32%	<0.00010	<0.00010	#VALUE!
Uranium (U)-Total	mg/L	-	61.39%	<0.000010	<0.000010	#VALUE!
Vanadium (V)-Total	mg/L	-	20.00%	0.00061	0.00065	6.35%
Zinc (Zn)-Total	mg/L	100	133.93%	0.0169	0.0167	1.19%
Zirconium - Total	mg/L	-	#VALUE!	<0.00020	<0.00020	#VALUE!
<b>Aggregate Organics (Matrix: Water)</b>						
BOD	mg/L	-	16.75%	<2.0	<2.0	#VALUE!
COD	mg/L	-	4.35%	<20	<20	#VALUE!

OC Criteria Shaded Value Means Exceeded Discharge (



Phytoremediation Soil Sample Results

Plot	Units	BC MoE Guidelines	BC MoE Guidelines	22-Aug-17				25-Apr-18	22-May-19	7-May-20	27-Apr-21	27-Apr-21	RPD
		CSR-DW (1)	CSR-AW (2)	Site A	Site B	Site C	Site D	-	-	2, 3, 7, 9	11,1,7,2	DUP	
<b>Physical Tests (Soil)</b>													
pH (1:2 soil:water)	pH	-	-	5.74	5.35	5.16	5.13	5.24	5.47	5.61	6.03	6.02	0.17%
<b>Saturated Paste Extractables (Soil)</b>													
Chloride (Cl)	mg/L	-	-	-	-	-	-	-	-	5.5	<20.00	<20.0	#VALUE!
Chloride (Cl)	mg/kg	100	600	1.57	1.44	3.0	2.8	1.4	10.3	4.3	<13.8	<13.6	#VALUE!
% Saturation	%	-	-	35.5	39	54.2	53.8	50.6	61.6	79.0	68.90	68.2	1.02%
Sodium (Na)	mg/kg	15,000	-	<1.0	<1.0	<1.0	1.00	<1.0	5.9	<5.00	4.0	3.68	8.33%
<b>Metals (Soil)</b>													
Aluminum (Al)	mg/kg	250,000	-	-	-	-	-	25,500	35800	29900	35800	29800	18.29%
Antimony (Sb)	mg/kg	40,000	40	0.50	0.40	0.41	0.41	0.37	0.36	0.38	0.43	0.36	17.72%
Arsenic (As)	mg/kg	10	10	7.98	6.71	6.51	3.86	5.67	5.79	5.01	6.76	6.05	11.09%
Barium (Ba)	mg/kg	350	3,500	71.9	54.6	43.8	43.7	51.1	51.4	41.3	59.4	53.6	10.27%
Beryllium (Be)	mg/kg	1 - 2,500 (3)	1 - 500 (4)	0.40	0.37	0.36	0.36	0.29	0.41	0.29	0.38	0.33	14.08%
Bismuth (Bi)	mg/kg	-	-	-	-	-	-	<0.20	<0.20	<0.20	<0.20	<0.20	#VALUE!
Boron (B)	mg/kg	1,000,000	-	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	#VALUE!
Cadmium (Cd)	mg/kg	1 - 70 (5)	1 - 50 (5)	0.108	0.067	0.058	<0.050	0.067	0.055	0.057	0.073	0.061	17.91%
Calcium (Ca)	mg/kg	-	-	-	-	-	-	1,620	1280	1280	2410	2180	10.02%
Chromium (Cr)	mg/kg	60	60	33.1	29.1	29.6	27.6	27.1	30.7	27.4	32.8	27.4	17.94%
Cobalt (Co)	mg/kg	25	25	14.2	11.0	9.2	7.7	8.7	8.38	6.92	8.80	7.63	14.24%
Copper (Cu)	mg/kg	500	75	41.7	29.5	26.4	18.2	23.1	20.3	17.1	25.3	20.1	22.91%
Iron (Fe)	mg/kg	150,000	-	-	-	-	-	34,400	39300	37600	44600	38800	13.91%
Lead (Pb)	mg/kg	120 - 8,500 (6)	200 - 90,000 (7)	7.09	6.61	7.14	8.16	6.15	6.91	6.58	7.02	6.34	10.18%
Lithium (Li)	mg/kg	450	-	-	-	-	-	13	13.5	12.1	14.2	13.3	6.55%
Magnesium (Mg)	mg/kg	-	-	-	-	-	-	6,200	6220	5960	6380	5650	12.14%
Manganese (Mn)	mg/kg	2,000	-	-	-	-	-	564	479	444	588	518	12.66%
Mercury (Hg)	mg/kg	-	75	<0.050	<0.050	<0.050	<0.050	<0.050	0.056	0.0561	0.0567	0.0522	8.26%
Molybdenum (Mo)	mg/kg	15	650	0.61	0.62	0.79	0.77	0.67	0.90	0.79	0.93	0.77	18.82%
Nickel (Ni)	mg/kg	70 - 500 (8)	90 - 9,500 (7)	31.5	24.6	18.8	16.5	18.2	18.2	14.5	18.8	16.4	13.64%
Phosphorus (P)	mg/kg	-	-	-	-	-	-	1,020	1140	1160	1270	986	25.18%
Potassium (K)	mg/kg	-	-	-	-	-	-	610	610	520	750	690	8.33%
Selenium (Se)	mg/kg	1	1	<0.20	0.23	0.32	0.29	0.27	0.27	0.23	0.34	0.30	12.50%
Silver (Ag)	mg/kg	35,000	40	<0.10	<0.10	0.14	0.13	0.11	0.13	0.14	0.14	0.13	7.41%
Sodium (Na)	mg/kg	-	-	-	-	-	-	93	95	131	115	92	22.22%
Strontium (Sr)	mg/kg	-	-	-	-	-	-	15	14.0	14.1	21.0	18.8	11.06%
Sulfur (S)	mg/kg	-	-	-	-	-	-	<1000	<1000	<1000	<1000	<1000	#VALUE!
Thallium (Tl)	mg/kg	-	25	0.065	0.066	0.066	0.076	0.063	0.072	0.062	0.070	0.061	13.74%
Tin (Sn)	mg/kg	1,000,000	300	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	#VALUE!
Titanium (Ti)	mg/kg	-	-	-	-	-	-	1,090	1260	1050	1190	975	15.86%
Tungsten (W)	mg/kg	-	-	-	-	-	-	<0.50	<0.50	<0.50	<0.50	<0.50	#VALUE!
Uranium (U)	mg/kg	30	150	0.622	0.574	0.492	0.529	0.423	0.518	0.382	0.500	0.445	11.64%
Vanadium (V)	mg/kg	100	-	83.5	76.1	83.2	81.3	77.3	83.3	79.7	96.0	79.5	18.80%
Zinc (Zn)	mg/kg	200 - 5,500 (7)	150 - 3,000 (7)	92.0	78.2	70.4	66.4	71.8	74.3	62.0	73.5	63.4	14.76%
Zirconium (Zr)	mg/kg	-	-	-	-	-	-	10	17.5	11.9	12.2	10.6	14.04%

NOTES

- (1) BC Contaminated Sites Regulation (CSR) Soil Standards for Drinking Water, Schedule 3.1, 1997 (Amended June 2018)
- (2) BC Contaminated Sites Regulation (CSR) Soil Standards for Aquatic Life, Schedule 3.1, 1997 (Amended June 2018)
- (3) Limit dependent on pH. At pH less than 5.5, limit is 1 mg/kg.
- (4) Limit dependent on pH. At pH less than 6.5, limit is 1 mg/kg.
- (5) Limit dependent on pH. At pH less than 7, limit is 1 mg/kg.
- (6) Limit dependent on pH. At pH less than 5.5, limit is 120 mg/kg.
- (7) Limit dependent on pH.
- (8) Limit dependent on pH. At pH less than 7.5, limit is 70 mg/kg.

CSR-DW	BC Contaminated Sites Regulation Soil Standards for Drinking Water, Schedule 3.1
CSR-AW	BC Contaminated Sites Regulation Soil Standards for Aquatic Life, Schedule 3.1

Table 21: Leachate Water Quality Results Sampling Location F1, Raw Leachate

Date		BC MOE	6-Jun-17	5-Jul-17	18-May-18	16-Jul-18	16-Apr-19	
QA/QC Check		OC Criteria						
Field	Units							
Conductivity	uS/cm	-	283	3050	3,750	-	2,834	
pH	pH	-	5.4	5.7	5.6	-	6.30	
Temperature	°C	-	14.1	13.2	9.6	-	8.9	
Dissolved Oxygen	mg/L	-	-	2.4	-	-	0.8	
Turbidity	NTU	-	-	-	-	-	-	
<b>Analyte</b>	<b>Units</b>							
Conductivity	uS/cm	-	3,040	3,250	-	-	-	
Hardness (as CaCO3)	mg/L	-	920	990	-	2020	1130	
pH	pH	6.5 - 8.5	5.6	5.6	-	6.16	6.58	
Total Suspended Solids	mg/L	-	8.7	7	-	-	-	
Total Dissolved Solids	mg/L	-	1500	1600	-	-	-	
Alkalinity, Total (as CaCO3)	mg/L	-	860	950	-	2160	1670	
Ammonia, Total (as N)	mg/L	214	51.8	54.1	-	160	133	
Total Nitrogen as N	mg/L	-	60.9	49.6	-	-	-	
Bromide (Br)	mg/L	-	-	-	-	3.8	1.5	
Chloride (Cl)	mg/L	5000	238	242	-	408	237	
Fluoride (F)	mg/L	-	<0.10	<0.10	-	<0.40	<0.40	
Nitrate (as N)	mg/L	-	<0.01	<0.010	-	<0.10	<0.10	
Nitrite (as N)	mg/L	-	<0.01	0.02	-	0.042	<0.020	
Sulfate (SO4)	mg/L	-	80	48.2	-	<6.0	<6.0	
Orthophosphorus (P)	mg/L	-	-	-	-	<0.020	<0.0010	
Total Organic Carbon	mg/L	-	1290	1310	-	2100	922	
BOD	mg/L	-	>540	>1120	-	3840	-	
COD	mg/L	-	-	-	-	6290	2480	
<b>Total Metals</b>								
Aluminum (Al)-Total	mg/L	-	3.89	1.35	-	0.279	0.173	
Antimony (Sb)-Total	mg/L	-	0.00252	0.00159	-	0.003	0.00193	
Arsenic (As)-Total	mg/L	-	0.00535	0.00605	-	0.0122	0.0126	
Barium (Ba)-Total	mg/L	-	0.781	1.49	-	2.86	1.28	
Beryllium (Be)-Total	mg/L	-	0.00027	0.00024	-	<0.0020	<0.00020	
Bismuth	mg/L	-	<0.00010	<0.00010	-	<0.0010	<0.00010	
Boron (B)-Total	mg/L	-	0.833	0.731	-	2.1	1.68	
Cadmium (Cd)-Total	mg/L	0.1	0.000327	0.000133	-	<0.00010	0.000036	
Calcium (Ca)-Total	mg/L	-	309	334	-	699	381	
Cesium (Cs) - Total	mg/L	-	-	-	-	0.00069	0.000677	
Chromium (Cr)-Total	mg/L	-	0.0353	0.0266	-	0.0288	0.0169	
Cobalt (Co)-Total	mg/L	-	0.164	0.131	-	0.0318	0.0134	
Copper (Cu)-Total	mg/L	-	0.0028	0.00123	-	<0.010	0.0012	
Iron (Fe)-Total	mg/L	6	49.5	62.4	118	161	116	
Lead (Pb)-Total	mg/L	-	0.00094	0.00052	-	<0.0010	0.00023	
Lithium (Li)-Total	mg/L	-	0.00157	0.00123	-	<0.020	0.0025	
Magnesium (Mg)-Total	mg/L	-	36	37.5	-	68.1	42.4	
Manganese (Mn)-Total	mg/L	-	44.5	119	-	83.7	39	
Mercury (Hg)-Total	mg/L	-	<0.00002	<0.000020	-	<0.0000050	<0.000025	
Molybdenum (Mo)-Total	mg/L	-	0.00199	0.00055	-	<0.0010	0.00067	
Nickel (Ni)-Total	mg/L	-	0.0575	0.0392	-	0.024	0.0174	
Phosphorus - Total	mg/L	-	0.701	0.35	-	<1.0	0.65	
Potassium (K)-Total	mg/L	-	64.7	65.5	-	130	97.7	
Rubidium (Rb) - Total	mg/L	-	-	-	-	0.147	0.116	
Selenium (Se)-Total	mg/L	-	<0.00050	0.00076	-	<0.0010	0.00034	
Silicon - Total	mg/L	-	9.4	9.9	-	10.5	8.07	
Silver (Ag)-Total	mg/L	-	<0.000050	0.000063	-	<0.00020	<0.000020	
Sodium (Na)-Total	mg/L	-	217	215	-	414	257	
Strontium - Total	mg/L	-	0.897	1.05	-	2.63	1.61	
Sulfur - Total	mg/L	-	37.8	13	-	<10	4.5	
Tellurium - Total	mg/L	-	<0.00020	<0.00020	-	<0.0040	0.00044	
Thallium (Tl)-Total	mg/L	-	0.00062	0.00023	-	<0.00020	<0.000020	
Thorium - Total	mg/L	-	0.00018	<0.00010	-	<0.0020	<0.00020	
Tin (Sn)-Total	mg/L	-	0.00046	0.00024	-	<0.0020	0.00035	
Titanium (Ti)-Total	mg/L	-	0.104	0.025	-	<0.013	0.0128	
Tungston (W) - Total	mg/L	-	-	-	-	<0.0020	0.00033	
Uranium (U)-Total	mg/L	-	0.000191	0.000079	-	<0.00020	0.000057	
Vanadium (V)-Total	mg/L	-	0.02	0.0204	-	0.025	0.0203	
Zinc (Zn)-Total	mg/L	100	0.202	0.0814	-	<0.060	0.022	
Zirconium - Total	mg/L	-	0.00153	0.00114	-	<0.0012	0.00123	
<b>Dissolved Metals</b>								
Aluminum (Al)-Dissolved	mg/L	-	3.24	0.222	-	-	-	
Antimony (Sb)-Dissolved	mg/L	-	0.00173	0.00094	-	-	-	
Arsenic (As)-Dissolved	mg/L	-	0.00352	0.00293	-	-	-	
Barium (Ba)-Dissolved	mg/L	-	0.7340	1.3300	-	-	-	
Beryllium (Be)-Dissolved	mg/L	-	0.00025	0.00015	-	-	-	
Bismuth - Dissolved	mg/L	-	<0.00010	<0.00010	-	-	-	
Boron (B)-Dissolved	mg/L	-	0.734	0.647	-	-	-	
Cadmium (Cd)-Dissolved	mg/L	-	0.000041	<0.000010	-	-	-	
Calcium (Ca)-Dissolved	mg/L	-	285.00	291.00	-	-	-	
Cesium (Cs) - Dissolved	mg/L	-	-	-	-	-	-	
Chromium (Cr)-Dissolved	mg/L	-	0.0334	0.01	-	-	-	
Cobalt (Co)-Dissolved	mg/L	-	0.155	0.122	-	-	-	
Copper (Cu)-Dissolved	mg/L	-	0.00083	<0.00020	-	-	-	
Iron (Fe)-Dissolved	mg/L	-	47.1	30.7	106	-	-	
Lead (Pb)-Dissolved	mg/L	-	0.0002	<0.00010	-	-	-	
Lithium (Li)-Dissolved	mg/L	-	0.00137	0.00314	-	-	-	
Magnesium (Mg)-Dissolved	mg/L	-	33.3	33.1	-	-	-	
Manganese (Mn)-Dissolved	mg/L	-	40.2	99.4	-	-	-	
Mercury (Hg)-Dissolved	mg/L	-	<0.00002	-	-	-	-	
Molybdenum (Mo)-Dissolved	mg/L	-	0.00092	<0.00010	-	-	-	
Nickel (Ni)-Dissolved	mg/L	-	0.0538	0.0362	-	-	-	
Phosphorus - Dissolved	mg/L	-	0.48	0.16	-	-	-	
Potassium (K)-Dissolved	mg/L	-	62.400	62.000	-	-	-	
Rubidium (Rd) - Dissolved	mg/L	-	-	-	-	-	-	
Selenium (Se)-Dissolved	mg/L	-	<0.00050	0.00076	-	-	-	
Silicon - Dissolved	mg/L	-	8.8	8.6	-	-	-	
Silver (Ag)-Dissolved	mg/L	-	<0.000050	<0.000050	-	-	-	
Sodium (Na)-Dissolved	mg/L	-	203	193	-	-	-	
Strontium - Dissolved	mg/L	-	0.87	0.899	-	-	-	
Sulfur- Dissolved	mg/L	-	35.3	9.7	-	-	-	
Tellurium - Dissolved	mg/L	-	<0.00020	<0.00020	-	-	-	
Thallium (Tl)-Dissolved	mg/L	-	<0.000020	0.000021	-	-	-	
Thorium - Dissolved	mg/L	-	0.00013	<0.00010	-	-	-	
Tin (Sn)-Dissolved	mg/L	-	<0.00020	<0.00020	-	-	-	
Titanium (Ti)-Dissolved	mg/L	-	0.072	<0.0050	-	-	-	
Tungston (W) - Dissolved	mg/L	-	-	-	-	-	-	
Uranium (U)-Dissolved	mg/L	-	0.000166	0.000031	-	-	-	
Vanadium (V)-Dissolved	mg/L	-	0.018	<0.0010	-	-	-	
Zinc (Zn)-Dissolved	mg/L	-	0.0234	0.0459	-	-	-	
Zirconium - Dissolved	mg/L	-	0.00114	0.00018	-	-	-	

OC Criteria Shaded Value Means Exceeded Discharge Criteria (OC)

Table 21: Leachate Water Quality Results Sampling Location F1, I

Date		BC MOE		
QA/QC Check		OC Criteria		
Field	Units			
Conductivity	uS/cm	-		
pH	pH	-		
Temperature	°C	-		
Dissolved Oxygen	mg/L	-		
Turbidity	NTU	-		
<b>Analyte</b>	<b>Units</b>			
Conductivity	uS/cm	-		
Hardness (as CaCO3)	mg/L	-		
pH	pH	6.5 - 8.5		
Total Suspended Solids	mg/L	-		
Total Dissolved Solids	mg/L	-		
Alkalinity, Total (as CaCO3)	mg/L	-		
Ammonia, Total (as N)	mg/L	214		
Total Nitrogen as N	mg/L	-		
Bromide (Br)	mg/L	-		
Chloride (Cl)	mg/L	5000		
Fluoride (F)	mg/L	-		
Nitrate (as N)	mg/L	-		
Nitrite (as N)	mg/L	-		
Sulfate (SO4)	mg/L	-		
Orthophosphorus (P)	mg/L	-		
Total Organic Carbon	mg/L	-		
BOD	mg/L	-		
COD	mg/L	-		
<b>Total Metals</b>				
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	mg/L	-		
Boron (B)-Total	mg/L	-		
Cadmium (Cd)-Total	mg/L	0.1		
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	6		
Lead (Pb)-Total	mg/L	-		
Lithium (Li)-Total	mg/L	-		
Magnesium (Mg)-Total	mg/L	-		
Manganese (Mn)-Total	mg/L	-		
Mercury (Hg)-Total	mg/L	-		
Molybdenum (Mo)-Total	mg/L	-		
Nickel (Ni)-Total	mg/L	-		
Phosphorus - Total	mg/L	-		
Potassium (K)-Total	mg/L	-		
Rubidium (Rb) - Total	mg/L	-		
Selenium (Se)-Total	mg/L	-		
Silicon - Total	mg/L	-		
Silver (Ag)-Total	mg/L	-		
Sodium (Na)-Total	mg/L	-		
Strontium - Total	mg/L	-		
Sulfur - Total	mg/L	-		
Tellurium - Total	mg/L	-		
Thallium (Tl)-Total	mg/L	-		
Thorium - Total	mg/L	-		
Tin (Sn)-Total	mg/L	-		
Titanium (Ti)-Total	mg/L	-		
Tungston (W) - Total	mg/L	-		
Uranium (U)-Total	mg/L	-		
Vanadium (V)-Total	mg/L	-		
Zinc (Zn)-Total	mg/L	100		
Zirconium - Total	mg/L	-		
<b>Dissolved Metals</b>				
Aluminum (Al)-Dissolved	mg/L	-		
Antimony (Sb)-Dissolved	mg/L	-		
Arsenic (As)-Dissolved	mg/L	-		
Barium (Ba)-Dissolved	mg/L	-		
Beryllium (Be)-Dissolved	mg/L	-		
Bismuth - Dissolved	mg/L	-		
Boron (B)-Dissolved	mg/L	-		
Cadmium (Cd)-Dissolved	mg/L	-		
Calcium (Ca)-Dissolved	mg/L	-		
Cesium (Cs) - Dissolved	mg/L	-		
Chromium (Cr)-Dissolved	mg/L	-		
Cobalt (Co)-Dissolved	mg/L	-		
Copper (Cu)-Dissolved	mg/L	-		
Iron (Fe)-Dissolved	mg/L	-		
Lead (Pb)-Dissolved	mg/L	-		
Lithium (Li)-Dissolved	mg/L	-		
Magnesium (Mg)-Dissolved	mg/L	-		
Manganese (Mn)-Dissolved	mg/L	-		
Mercury (Hg)-Dissolved	mg/L	-		
Molybdenum (Mo)-Dissolved	mg/L	-		
Nickel (Ni)-Dissolved	mg/L	-		
Phosphorus - Dissolved	mg/L	-		
Potassium (K)-Dissolved	mg/L	-		
Rubidium (Rd) - Dissolved	mg/L	-		
Selenium (Se)-Dissolved	mg/L	-		
Silicon - Dissolved	mg/L	-		
Silver (Ag)-Dissolved	mg/L	-		
Sodium (Na)-Dissolved	mg/L	-		
Strontium - Dissolved	mg/L	-		
Sulfur- Dissolved	mg/L	-		
Tellurium - Dissolved	mg/L	-		
Thallium (Tl)-Dissolved	mg/L	-		
Thorium - Dissolved	mg/L	-		
Tin (Sn)-Dissolved	mg/L	-		
Titanium (Ti)-Dissolved	mg/L	-		
Tungston (W) - Dissolved	mg/L	-		
Uranium (U)-Dissolved	mg/L	-		
Vanadium (V)-Dissolved	mg/L	-		
Zinc (Zn)-Dissolved	mg/L	-		
Zirconium - Dissolved	mg/L	-		

OC Criteria Shaded Value Means Exceeded I

Table 22: Leachate Water Quality Results Sampling Location F2, Raw Septage

Date Sampled		MC MOE	5-Jul-17	15-Aug-17	18-May-18	16-Jul-18	16-Apr-19		
QA/QC Check		OC Criteria							
Field	Units								
Conductivity	uS/cm	-	-	26600	250	-	7747		
pH	pH	-	4.7	4.8	6.9	-	4.75		
Temperature	°C	-	14.3	14.5	18.1	-	5.4		
Dissolved Oxygen	mg/L	-	1.5	12.9	-	-	2.4		
Turbidity	NTU	-	-	-	-	-	-		
Analyte	Units								
Conductivity	uS/cm	-	23000	26400	-	-	-		
Hardness (as CaCO3)	mg/L	-	7210	8330	-	8420	4860		
pH	pH	6.5 - 8.5	4.8	4.6	-	4.9	4.74		
Total Suspended Solids	mg/L	-	1400	580	-	-	-		
Total Dissolved Solids	mg/L	-	11000	13000	-	-	-		
Alkalinity, Total (as CaCO3)	mg/L	-	1500	780	-	2330	1050		
Ammonia, Total (as N)	mg/L	214	1,420	1,640	-	922	518		
Total Nitrogen as N	mg/L	-	3210	3890	-	-	-		
Bromide (Br)	mg/L	-	-	-	-	13.2	<5.0		
Chloride (Cl)	mg/L	5000	2740	3010	-	1430	1120		
Fluoride (F)	mg/L	-	0.19	0.12	-	1.1	<7.2		
Nitrate (as N)	mg/L	-	<0.50	0.38	-	0.26	<0.50		
Nitrite (as N)	mg/L	-	<0.50	<0.20	-	<0.050	<0.10		
Sulfate (SO4)	mg/L	-	1030	471	-	560	343		
Orthophosphorus (P)	mg/L	-	-	-	-	236	197		
Total Organic Carbon	mg/L	-	36600	42000	-	20100	12200		
BOD	mg/L	-	>2230	>2270	-	32300	-		
COD	mg/L	-	-	-	-	54700	35900		
<b>Total Metals</b>									
Aluminum (Al)-Total	mg/L	-	31.3	32.4	-	25.7	12.3		
Antimony (Sb)-Total	mg/L	-	0.0207	0.0121	-	0.0176	0.0052		
Arsenic (As)-Total	mg/L	-	0.184	0.144	-	0.144	0.0362		
Barium (Ba)-Total	mg/L	-	1.33	1.14	-	0.942	0.614		
Beryllium (Be)-Total	mg/L	-	0.00069	<0.00100	-	<0.0020	<0.0010		
Bismuth	mg/L	-	0.00026	<0.00100	-	<0.0010	0.00233		
Boron (B)-Total	mg/L	-	5.51	3.01	-	1.56	0.64		
Cadmium (Cd)-Total	mg/L	0.1	0.0282	0.0174	-	0.0109	0.00494		
Calcium (Ca)-Total	mg/L	-	2390	2630	-	2620	1590		
Cesium (Cs) - Total	mg/L	-	-	-	-	0.00731	0.00439		
Chromium (Cr)-Total	mg/L	-	0.151	0.143	-	0.171	0.0681		
Cobalt (Co)-Total	mg/L	-	0.146	0.166	-	0.141	0.0388		
Copper (Cu)-Total	mg/L	-	0.262	0.214	-	0.293	0.108		
Iron (Fe)-Total	mg/L	6	172	221	1.82	226	60.40		
Lead (Pb)-Total	mg/L	-	0.0245	0.0153	-	0.0267	0.0107		
Lithium (Li)-Total	mg/L	-	0.0596	0.0715	-	0.054	0.035		
Magnesium (Mg)-Total	mg/L	-	401	464	-	454	214		
Manganese (Mn)-Total	mg/L	-	41.7	41.8	-	33	23.8		
Mercury (Hg)-Total	mg/L	-	0.000157	<0.000010	-	<0.00050	<0.00025		
Molybdenum (Mo)-Total	mg/L	-	0.0738	0.0845	-	0.103	0.0175		
Nickel (Ni)-Total	mg/L	-	0.409	0.403	-	0.361	0.133		
Phosphorus - Total	mg/L	-	489	582	-	549	297		
Potassium (K)-Total	mg/L	-	3000	4220	-	3270	1470		
Rubidium (Rb) - Total	mg/L	-	-	-	-	2.14	1		
Selenium (Se)-Total	mg/L	-	0.0133	0.0173	-	0.0193	0.00865		
Silicon - Total	mg/L	-	88.2	79.2	-	63.1	28.3		
Silver (Ag)-Total	mg/L	-	<0.000050	<0.000500	-	0.00061	0.00019		
Sodium (Na)-Total	mg/L	-	1530	1580	-	1330	834		
Strontium - Total	mg/L	-	7.01	5.72	-	5.35	3.28		
Sulfur - Total	mg/L	-	335	303	-	284	118		
Tellurium - Total	mg/L	-	<0.00020	<0.00500	-	<0.0040	<0.0020		
Thallium (Tl)-Total	mg/L	-	0.00132	0.00104	-	0.00053	0.00036		
Thorium - Total	mg/L	-	0.0008	<0.00100	-	<0.0020	<0.0010		
Tin (Sn)-Total	mg/L	-	0.00628	0.0122	-	0.011	0.0016		
Titanium (Ti)-Total	mg/L	-	1.48	1.86	-	1.82	0.368		
Tungston (W) - Total	mg/L	-	-	-	-	0.0139	0.004		
Uranium (U)-Total	mg/L	-	0.00291	0.00196	-	0.00135	0.0007		
Vanadium (V)-Total	mg/L	-	0.148	0.124	-	0.116	0.0399		
Zinc (Zn)-Total	mg/L	100	6.94	9.13	-	7.53	3.68		
Zirconium - Total	mg/L	-	0.022	0.0206	-	0.0178	0.003		
<b>Dissolved Metals</b>									
Aluminum (Al)-Dissolved	mg/L	-	9.51	14.7	-	-	-		
Antimony (Sb)-Dissolved	mg/L	-	0.0216	0.0272	-	-	-		
Arsenic (As)-Dissolved	mg/L	-	0.175	0.135	-	-	-		
Barium (Ba)-Dissolved	mg/L	-	0.1680	0.2460	-	-	-		
Beryllium (Be)-Dissolved	mg/L	-	0.0001	<0.00100	-	-	-		
Bismuth - Dissolved	mg/L	-	<0.00010	<0.00100	-	-	-		
Boron (B)-Dissolved	mg/L	-	5.32	2.72	-	-	-		
Cadmium (Cd)-Dissolved	mg/L	-	0.0245	0.0143	-	-	-		
Calcium (Ca)-Dissolved	mg/L	-	2120.00	2590.00	-	-	-		
Cesium (Cs) - Dissolved	mg/L	-	-	-	-	-	-		
Chromium (Cr)-Dissolved	mg/L	-	0.11	0.11	-	-	-		
Cobalt (Co)-Dissolved	mg/L	-	0.139	0.159	-	-	-		
Copper (Cu)-Dissolved	mg/L	-	0.201	0.151	-	-	-		
Iron (Fe)-Dissolved	mg/L	-	47.6	91.2	1.11	-	-		
Lead (Pb)-Dissolved	mg/L	-	0.00282	<0.00100	-	-	-		
Lithium (Li)-Dissolved	mg/L	-	0.0512	0.058	-	-	-		
Magnesium (Mg)-Dissolved	mg/L	-	463	448	-	-	-		
Manganese (Mn)-Dissolved	mg/L	-	37.9	39.4	-	-	-		
Mercury (Hg)-Dissolved	mg/L	-	-	0.000052	-	-	-		
Molybdenum (Mo)-Dissolved	mg/L	-	0.0885	0.12	-	-	-		
Nickel (Ni)-Dissolved	mg/L	-	0.395	0.382	-	-	-		
Phosphorus - Dissolved	mg/L	-	375	461	-	-	-		
Potassium (K)-Dissolved	mg/L	-	2690.000	3450.000	-	-	-		
Rubidium (Rd) - Dissolved	mg/L	-	-	-	-	-	-		
Selenium (Se)-Dissolved	mg/L	-	0.0147	0.0232	-	-	-		
Silicon - Dissolved	mg/L	-	88.3	75.4	-	-	-		
Silver (Ag)-Dissolved	mg/L	-	0.00006	<0.000500	-	-	-		
Sodium (Na)-Dissolved	mg/L	-	1690	1560	-	-	-		
Strontium - Dissolved	mg/L	-	5.58	4.81	-	-	-		
Sulfur- Dissolved	mg/L	-	431	299	-	-	-		
Tellurium - Dissolved	mg/L	-	<0.00020	<0.00500	-	-	-		
Thallium (Tl)-Dissolved	mg/L	-	0.000913	0.000793	-	-	-		
Thorium - Dissolved	mg/L	-	0.00019	<0.00100	-	-	-		
Tin (Sn)-Dissolved	mg/L	-	0.00578	0.0174	-	-	-		
Titanium (Ti)-Dissolved	mg/L	-	2.67	2.72	-	-	-		
Tungston (W) - Dissolved	mg/L	-	-	-	-	-	-		
Uranium (U)-Dissolved	mg/L	-	0.00047	0.000525	-	-	-		
Vanadium (V)-Dissolved	mg/L	-	0.118	0.109	-	-	-		
Zinc (Zn)-Dissolved	mg/L	-	6.72	8.54	-	-	-		
Zirconium - Dissolved	mg/L	-	0.0073	0.0105	-	-	-		

OC Criteria Shaded Value Means Exceeded Discharge Criteria (OC)

Table 23: Leachate Water Quality Results Sampling Location F3, Aeration Pond

Date Sampled		MC MOE	6-Jun-17	5-Jul-17	15-Aug-17	7-Nov-17	16-Jul-18	16-Apr-19	29-May-19	31-May-19
QA/QC Check		OC Criteria								
Lab ID									L2281807-1	L2283534-1
Field	Units									
Conductivity	uS/cm	-	472	720	701	-	-	1314		
pH	pH	-	5.1	6.4	5.9	-	-	6.56		
Temperature	°C	-	13.8	10.6	14.1	-	-	5.4		
ORP	mV	-	-	-	-	-	-	87.3		
Dissolved Oxygen	mg/L	-	-	2.8	12.2	-	-	1.4		
Turbidity	NTU	-	-	-	-	-	-	-		
Analyte	Units									
Conductivity	uS/cm	-	456	680	578	-	-	-		
Hardness (as CaCO3)	mg/L	-	96	175	102	777	370	509	307	287
pH	pH	6.5 - 8.5	5.4	6.3	5.5	6.4	7.21	7.04		
Total Suspended Solids	mg/L	-	20	59	17	-	-	-		
Total Dissolved Solids	mg/L	-	220	300	480	-	-	-		
Alkalinity, Total (as CaCO3)	mg/L	-	110	240	140	757	605	826		
Ammonia, Total (as N)	mg/L	214	16.7	21.8	22.8	65.2	41.9	66.4		
Total Nitrogen as N	mg/L	-	14.7	28.8	25.3	-	-	-		
Bromide (Br)	mg/L	-	-	-	-	<5.0	<0.50	<1.0		
Chloride (Cl)	mg/L	5000	27.7	38.3	30.9	165	81.2	121		
Fluoride (F)	mg/L	-	<0.10	<0.10	<0.10	<2.0	<0.10	<0.40		
Nitrate (as N)	mg/L	-	0.012	0.011	<0.01	<0.50	<0.025	<0.10		
Nitrite (as N)	mg/L	-	<0.01	<0.01	<0.01	<0.10	0.0209	<0.020		
Sulfate (SO4)	mg/L	-	8.7	40.5	10.1	0.72	<1.5	<6.0		
Orthophosphorus (P)	mg/L	-	-	-	-	69	0.89	0.271		
Total Organic Carbon	mg/L	-	171	223	294	779	200	321		
BOD	mg/L	-	>210	320	430	-	294	-		
COD	mg/L	-	-	-	-	2420	690	942		
Total Metals										
Aluminum (Al)-Total	mg/L	-	0.318	0.245	0.203	0.1960	0.1680	0.1680	0.0171	0.0164
Antimony (Sb)-Total	mg/L	-	0.0004	0.00072	0.00032	0.00240	0.00081	0.00094	0.00051	0.00052
Arsenic (As)-Total	mg/L	-	0.00074	0.00107	0.00083	0.00882	0.00221	0.00403	0.00259	0.00261
Barium (Ba)-Total	mg/L	-	0.0762	0.0603	0.0765	0.419	0.270	0.412	0.238	0.231
Beryllium (Be)-Total	mg/L	-	<0.00010	<0.00010	<0.00010	<0.00020	<0.00050	<0.00010	<0.00020	<0.00020
Bismuth	mg/L	-	0.00024	0.00026	0.00014	<0.00010	<0.00025	<0.00050	<0.00010	<0.00010
Boron (B)-Total	mg/L	-	0.186	0.18	0.144	1.280	0.503	0.784	0.617	0.574
Cadmium (Cd)-Total	mg/L	0.1	0.000361	0.000356	0.000114	0.0004160	0.0000750	0.0000785	0.0000310	0.0000310
Calcium (Ca)-Total	mg/L	-	31.6	84.5	34.4	272.0	128.0	170.0	99.0	91.8
Cesium (Cs) - Total	mg/L	-	-	-	-	0.001740	0.000615	0.000778	0.000611	0.000618
Chromium (Cr)-Total	mg/L	-	0.00346	0.00271	0.00359	0.02060	0.00496	0.00664	0.00185	0.00183
Cobalt (Co)-Total	mg/L	-	0.0107	0.00522	0.0118	0.02220	0.00347	0.00430	0.00249	0.00237
Copper (Cu)-Total	mg/L	-	0.00422	0.00431	0.00328	0.00300	<0.0025	0.00214	0.00140	0.00130
Iron (Fe)-Total	mg/L	6	2.65	4.88	5.49	24.50	11.30	22.20000	3.75000	4.31000
Lead (Pb)-Total	mg/L	-	0.00028	0.00033	<0.00020	0.000840	0.00035	0.000202	0.000100	<0.00010
Lithium (Li)-Total	mg/L	-	0.00078	0.00153	0.00084	0.0052	<0.0050	0.0018	<0.0020	<0.0020
Magnesium (Mg)-Total	mg/L	-	4.11	6.24	4.73	23.50	12.10	20.30	14.50	14.10
Manganese (Mn)-Total	mg/L	-	3.72	2.9	4.33	34.8	15.6	17.5	6.1	7.0
Mercury (Hg)-Total	mg/L	-	<0.00002	<0.000020	<0.000010	0.000027	<0.000050	<0.000025	<0.000025	<0.000050
Molybdenum (Mo)-Total	mg/L	-	0.00072	0.00076	0.00054	0.000850	0.000570	0.000513	0.000310	0.000300
Nickel (Ni)-Total	mg/L	-	0.00581	0.00491	0.00564	0.01900	0.00710	0.00790	0.00560	0.00530
Phosphorus - Total	mg/L	-	4.14	4.2	4.36	2.08	2.87	4.55	0.94	0.95
Potassium (K)-Total	mg/L	-	17.1	17.8	18.6	69.9	41.1	66.1	43.2	43.1
Rubidium (Rb) - Total	mg/L	-	-	-	-	0.0832	0.0422	0.0706	0.0477	0.0472
Selenium (Se)-Total	mg/L	-	<0.00050	<0.00050	<0.00050	0.000320	<0.00025	0.000214	0.000100	0.000110
Silicon - Total	mg/L	-	1.9	8.6	2.3	6.83	3.78	4.27	2.52	2.64
Silver (Ag)-Total	mg/L	-	<0.000050	0.000083	<0.000050	<0.000020	<0.000050	<0.000010	<0.000020	<0.000020
Sodium (Na)-Total	mg/L	-	23.9	23.2	24.9	150.0	73.8	122.0	83.9	89.2
Strontium - Total	mg/L	-	0.104	0.185	0.109	0.974	0.441	0.658	0.445	0.425
Sulfur - Total	mg/L	-	5.4	5.1	<3.0	31.20	<2.5	3.27	2.20	2.00
Tellurium - Total	mg/L	-	<0.00020	<0.00020	<0.00050	<0.00040	<0.0010	<0.00020	<0.00040	<0.00040
Thallium (Tl)-Total	mg/L	-	<0.000020	<0.000020	<0.000020	<0.000020	<0.000050	<0.000010	<0.000020	<0.000020
Thorium - Total	mg/L	-	<0.00010	<0.00010	<0.00010	<0.00020	<0.00050	<0.00010	<0.00020	<0.00020
Tin (Sn)-Total	mg/L	-	0.00034	0.00038	0.00026	0.00068	<0.00050	0.00066	<0.00020	<0.00020
Titanium (Ti)-Total	mg/L	-	0.0096	0.0116	0.0108	0.00917	0.00810	0.01110	0.00129	0.00137
Tungston (W) - Total	mg/L	-	-	-	-	0.00023	<0.00050	0.00021	<0.00020	<0.00020
Uranium (U)-Total	mg/L	-	0.000066	0.000064	0.000041	0.000042	<0.000050	0.000028	0.000035	0.000034
Vanadium (V)-Total	mg/L	-	0.0015	0.0026	0.0013	0.00940	0.00250	0.00550	0.00120	0.00120
Zinc (Zn)-Total	mg/L	100	0.107	0.595	0.054	0.4030	0.0530	0.0875	<0.0060	<0.0060
Zirconium - Total	mg/L	-	0.00025	0.00033	0.00018	0.000230	<0.00030	0.000282	<0.00012	<0.00012
Dissolved Metals										
Aluminum (Al)-Dissolved	mg/L	-	0.117	0.0419	0.0834	-	-	-		
Antimony (Sb)-Dissolved	mg/L	-	0.0004	0.00014	0.00038	-	-	-		
Arsenic (As)-Dissolved	mg/L	-	<0.00050	<0.00050	0.00053	-	-	-		
Barium (Ba)-Dissolved	mg/L	-	0.0628	0.0417	0.0603	-	-	-		
Beryllium (Be)-Dissolved	mg/L	-	<0.00010	<0.00010	<0.00010	-	-	-		
Bismuth - Dissolved	mg/L	-	<0.00010	<0.00010	<0.00010	-	-	-		
Boron (B)-Dissolved	mg/L	-	0.166	0.155	0.136	-	-	-		
Cadmium (Cd)-Dissolved	mg/L	-	0.000098	0.000023	<0.000010	-	-	-		
Calcium (Ca)-Dissolved	mg/L	-	29.00	62.10	33.30	-	-	-		
Cesium (Cs) - Dissolved	mg/L	-	-	-	-	-	-	-		
Chromium (Cr)-Dissolved	mg/L	-	0.00262	0.00	0.00	-	-	-		
Cobalt (Co)-Dissolved	mg/L	-	0.00852	0.00311	0.0101	-	-	-		
Copper (Cu)-Dissolved	mg/L	-	0.00086	0.0004	0.00097	-	-	-		
Iron (Fe)-Dissolved	mg/L	-	2.42	3.35	5.06	-	-	-		
Lead (Pb)-Dissolved	mg/L	-	<0.00010	<0.00010	<0.00020	-	-	-		
Lithium (Li)-Dissolved	mg/L	-	0.00069	0.00146	0.00082	-	-	-		
Magnesium (Mg)-Dissolved	mg/L	-	3.83	4.7	4.43	-	-	-		
Manganese (Mn)-Dissolved	mg/L	-	3.52	2.85	3.91	-	-	-		
Mercury (Hg)-Dissolved	mg/L	-	<0.00002	-	<0.000010	-	-	-		
Molybdenum (Mo)-Dissolved	mg/L	-	0.00015	<0.00010	0.00018	-	-	-		
Nickel (Ni)-Dissolved	mg/L	-	0.00491	0.00348	0.00493	-	-	-		
Phosphorus - Dissolved	mg/L	-	3.53	0.466	3.74	-	-	-		
Potassium (K)-Dissolved	mg/L	-	16.500	14.900	17.200	-	-	-		
Rubidium (Rb) - Dissolved	mg/L	-	-	-	-	-	-	-		
Selenium (Se)-Dissolved	mg/L	-	<0.00050	<0.00050	<0.00050	-	-	-		
Silicon - Dissolved	mg/L	-	1.8	6.7	1.9	-	-	-		
Silver (Ag)-Dissolved	mg/L	-	<0.000050	<0.000050	<0.000050	-	-	-		
Sodium (Na)-Dissolved	mg/L	-	22.6	21.2	23.8	-	-	-		
Strontium - Dissolved	mg/L	-	0.0985	0.141	0.0977	-	-	-		
Sulfur - Dissolved	mg/L	-	17	5.9	<3.0	-	-	-		
Tellurium - Dissolved	mg/L	-	<0.00020	<0.00020	<0.00050	-	-	-		
Thallium (Tl)-Dissolved	mg/L	-	<0.000020	<0.000020	<0.000020	-	-	-		
Thorium - Dissolved	mg/L	-	<0.00010	<0.00010	<0.00010	-	-	-		
Tin (Sn)-Dissolved	mg/L	-	<0.00020	<0.00020	<0.00020	-	-	-		
Titanium (Ti)-Dissolved	mg/L	-	0.0067	<0.0050	0.0051	-	-	-		
Tungston (W) - Dissolved	mg/L	-	-	-	-	-	-	-		
Uranium (U)-Dissolved	mg/L	-	<0.000020	0.000021	<0.000020	-	-	-		
Vanadium (V)-Dissolved	mg/L	-	<0.0010	<0.0010	0.0011	-	-	-		
Zinc (Zn)-Dissolved	mg/L	-	0.0228	0.0261	0.0149	-	-	-		
Zirconium - Dissolved	mg/L	-	0.0002	0.00012	0.00016	-	-	-		

OC Criteria Shaded Value Means Exceeded Discharge Criteria (OC)

Table 24: Leachate Water Quality Results Sampling Location F4, Sedimentation Pond

Date		MC MOE	16-Jul-18	16-Apr-19				
QA/QC Check		OC Criteria						
Field	Units							
Conductivity	uS/cm	-	-	1051				
pH	pH	-	-	6.77				
Temperature	°C	-	-	8.6				
Dissolved Oxygen	mg/L	-	-	0.6				
Turbidity	NTU	-	-	-				
<b>Analyte</b>	<b>Units</b>							
Conductivity	uS/cm	-	-	-				
Hardness (as CaCO3)	mg/L	-	305	348				
pH	pH	6.5 - 8.5	7.46	7.63				
Total Suspended Solids	mg/L	-	-	-				
Total Dissolved Solids	mg/L	-	-	-				
Alkalinity, Total (as CaCO3)	mg/L	-	489	534				
Ammonia, Total (as N)	mg/L	214	24.6	42.9				
Total Nitrogen as N	mg/L	-	-	-				
Bromide (Br)	mg/L	-	<0.25	<0.50				
Chloride (Cl)	mg/L	5000	71.5	90.7				
Fluoride (F)	mg/L	-	<0.10	<0.20				
Nitrate (as N)	mg/L	-	<0.025	<0.050				
Nitrite (as N)	mg/L	-	0.0079	<0.010				
Sulfate (SO4)	mg/L	-	<1.5	<3.0				
Orthophosphorus (P)	mg/L	-	0.0048	0.92				
Total Organic Carbon	mg/L	-	78.7	226				
BOD	mg/L	-	124	-				
COD	mg/L	-	276	694				
<b>Total Metals</b>								
Aluminum (Al)-Total	mg/L	-	0.017	0.0734				
Antimony (Sb)-Total	mg/L	-	<0.00050	0.00065				
Arsenic (As)-Total	mg/L	-	0.00517	0.00295				
Barium (Ba)-Total	mg/L	-	0.498	0.307				
Beryllium (Be)-Total	mg/L	-	<0.00050	<0.00010				
Bismuth	mg/L	-	<0.00025	<0.000050				
Boron (B)-Total	mg/L	-	0.438	0.596				
Cadmium (Cd)-Total	mg/L	0.1	0.000092	0.000019				
Calcium (Ca)-Total	mg/L	-	105	115				
Cesium (Cs) - Total	mg/L	-	0.000827	0.000645				
Chromium (Cr)-Total	mg/L	-	0.00133	0.00403				
Cobalt (Co)-Total	mg/L	-	0.00253	0.00313				
Copper (Cu)-Total	mg/L	-	0.0097	0.00103				
Iron (Fe)-Total	mg/L	6	12.10	13.500				
Lead (Pb)-Total	mg/L	-	0.00052	0.000098				
Lithium (Li)-Total	mg/L	-	<0.0050	0.0013				
Magnesium (Mg)-Total	mg/L	-	10.6	14.9				
Manganese (Mn)-Total	mg/L	-	20.5	10.6				
Mercury (Hg)-Total	mg/L	-	<0.000050	<0.0000050				
Molybdenum (Mo)-Total	mg/L	-	0.00031	0.000302				
Nickel (Ni)-Total	mg/L	-	0.0047	0.00606				
Phosphorus - Total	mg/L	-	0.36	2.01				
Potassium (K)-Total	mg/L	-	29.2	47.2				
Rubidium (Rb) - Total	mg/L	-	0.0355	0.0509				
Selenium (Se)-Total	mg/L	-	<0.00025	0.000132				
Silicon - Total	mg/L	-	3.84	3.08				
Silver (Ag)-Total	mg/L	-	<0.000050	<0.000010				
Sodium (Na)-Total	mg/L	-	62.1	90.7				
Strontium - Total	mg/L	-	0.513	0.484				
Sulfur - Total	mg/L	-	<2.5	1.93				
Tellurium - Total	mg/L	-	<0.0010	<0.00020				
Thallium (Tl)-Total	mg/L	-	<0.000050	<0.000010				
Thorium - Total	mg/L	-	<0.00050	<0.00010				
Tin (Sn)-Total	mg/L	-	<0.00050	0.00012				
Titanium (Ti)-Total	mg/L	-	<0.0015	0.00585				
Tungston (W) - Total	mg/L	-	<0.00050	0.00011				
Uranium (U)-Total	mg/L	-	<0.000050	0.000023				
Vanadium (V)-Total	mg/L	-	<0.0025	0.00326				
Zinc (Zn)-Total	mg/L	100	0.06	0.0118				
Zirconium - Total	mg/L	-	<0.00030	0.000204				
<b>Dissolved Metals</b>								
Aluminum (Al)-Dissolved	mg/L	-	-	-				
Antimony (Sb)-Dissolved	mg/L	-	-	-				
Arsenic (As)-Dissolved	mg/L	-	-	-				
Barium (Ba)-Dissolved	mg/L	-	-	-				
Beryllium (Be)-Dissolved	mg/L	-	-	-				
Bismuth - Dissolved	mg/L	-	-	-				
Boron (B)-Dissolved	mg/L	-	-	-				
Cadmium (Cd)-Dissolved	mg/L	-	-	-				
Calcium (Ca)-Dissolved	mg/L	-	-	-				
Cesium (Cs) - Dissolved	mg/L	-	-	-				
Chromium (Cr)-Dissolved	mg/L	-	-	-				
Cobalt (Co)-Dissolved	mg/L	-	-	-				
Copper (Cu)-Dissolved	mg/L	-	-	-				
Iron (Fe)-Dissolved	mg/L	-	-	-				
Lead (Pb)-Dissolved	mg/L	-	-	-				
Lithium (Li)-Dissolved	mg/L	-	-	-				
Magnesium (Mg)-Dissolved	mg/L	-	-	-				
Manganese (Mn)-Dissolved	mg/L	-	-	-				
Mercury (Hg)-Dissolved	mg/L	-	-	-				
Molybdenum (Mo)-Dissolved	mg/L	-	-	-				
Nickel (Ni)-Dissolved	mg/L	-	-	-				
Phosphorus - Dissolved	mg/L	-	-	-				
Potassium (K)-Dissolved	mg/L	-	-	-				
Rubidium (Rd) - Dissolved	mg/L	-	-	-				
Selenium (Se)-Dissolved	mg/L	-	-	-				
Silicon - Dissolved	mg/L	-	-	-				
Silver (Ag)-Dissolved	mg/L	-	-	-				
Sodium (Na)-Dissolved	mg/L	-	-	-				
Strontium - Dissolved	mg/L	-	-	-				
Sulfur- Dissolved	mg/L	-	-	-				
Tellurium - Dissolved	mg/L	-	-	-				
Thallium (Tl)-Dissolved	mg/L	-	-	-				
Thorium - Dissolved	mg/L	-	-	-				
Tin (Sn)-Dissolved	mg/L	-	-	-				
Titanium (Ti)-Dissolved	mg/L	-	-	-				
Tungston (W) - Dissolved	mg/L	-	-	-				
Uranium (U)-Dissolved	mg/L	-	-	-				
Vanadium (V)-Dissolved	mg/L	-	-	-				
Zinc (Zn)-Dissolved	mg/L	-	-	-				
Zirconium - Dissolved	mg/L	-	-	-				

OC Criteria Shaded Value Means Exceeded Discharge Criteria (OC)



Table 26: Leachate Water Quality Results, F6, Compost

		MC MOE OC Criteria	7-Nov-17	18-May-18	16-Apr-19		
Field	Units						
Conductivity	uS/cm	-	-	15,220	11930	-	-
pH	pH	-	-	4.8	4.76	-	-
Temperature	°C	-	-	8.0	7.5	-	-
Dissolved Oxygen	mg/kg	-	-	-	5.6	-	-
Turbidity	NTU	-	-	-	-	-	-
<b>Analyte</b>	<b>Units</b>						
Conductivity	uS/cm	-	-	-	-	-	-
Hardness (as CaCO3)	mg/L	-	4550	-	6880	-	-
pH	pH	6.5 - 8.5	4.6	-	4.73	-	-
Total Suspended Solids	mg/L			-	-	-	-
Total Dissolved Solids	mg/L			-	-	-	-
Alkalinity, Bicarbonate (as CaCO3)	mg/L			-	-	-	-
Alkalinity, Carbonate (as CaCO3)	mg/L			-	-	-	-
Alkalinity, Hydroxide (as CaCO3)	mg/L			-	-	-	-
Alkalinity, Total (as CaCO3)	mg/L		483	-	1580	-	-
Ammonia, Total (as N)	mg/L	214	586	-	791	-	-
Total Nitrogen as N	mg/L			-	-	-	-
Bromide (Br)	mg/L		17.1	-	13.6	-	-
Chloride (Cl)	mg/L	5000	1470	-	1760	-	-
Fluoride (F)	mg/L	-	<23	-	<6.0	-	-
Nitrate (as N)	mg/L	-	<0.50	-	<0.50	-	-
Nitrite (as N)	mg/L	-	<0.10	-	<0.10	-	-
Sulfate (SO4)	mg/L	-	0.0039	-	439	-	-
Orthophosphorus (P)	mg/L	-	247	-	299	-	-
Total Organic Carbon	mg/L	-	15100	-	21800	-	-
BOD	mg/L	-	-	-	-	-	-
COD	mg/L	-	42800	-	71500	-	-
<b>Total Metals</b>							
Aluminum (Al)-Total	mg/L	-	11.6	-	19.7	-	-
Antimony (Sb)-Total	mg/L	-	0.00700	-	0.0084	-	-
Arsenic (As)-Total	mg/L	-	0.06130	-	0.0621	-	-
Barium (Ba)-Total	mg/L	-	0.582	-	0.745	-	-
Beryllium (Be)-Total	mg/L	-	<0.0010	-	<0.0010	-	-
Bismuth	mg/L	-	<0.00050	-	<0.00050	-	-
Boron (B)-Total	mg/L	-	0.900	-	0.93	-	-
Cadmium (Cd)-Total	mg/L	0.1	0.0054400	-	0.00738	-	-
Calcium (Ca)-Total	mg/L	-	1420.0	-	2230	-	-
Cesium (Cs) - Total	mg/L	-	0.007600	-	0.00676	-	-
Chromium (Cr)-Total	mg/L	-	0.06080	-	0.0995	-	-
Cobalt (Co)-Total	mg/L	-	0.05350	-	0.0557	-	-
Copper (Cu)-Total	mg/L	-	0.11000	-	0.118	-	-
Iron (Fe)-Total	mg/L	6	86.1	109.0	96.3	-	-
Lead (Pb)-Total	mg/L	-	0.007850	-	0.0148	-	-
Lithium (Li)-Total	mg/L	-	0.043	-	0.055	-	-
Magnesium (Mg)-Total	mg/L	-	243.00	-	318	-	-
Manganese (Mn)-Total	mg/L	-	25.0	-	29.3	-	-
Mercury (Hg)-Total	mg/L	-	<0.00050	-	0.0003	-	-
Molybdenum (Mo)-Total	mg/L	-	0.028000	-	0.0276	-	-
Nickel (Ni)-Total	mg/L	-	0.17200	-	0.201	-	-
Phosphorus - Total	mg/L	-	387.00	-	472	-	-
Potassium (K)-Total	mg/L	-	2190.0	-	2100	-	-
Rubidium (Rb) - Total	mg/L	-	1.5200	-	1.6	-	-
Selenium (Se)-Total	mg/L	-	0.008670	-	0.0137	-	-
Silicon - Total	mg/L	-	40.40	-	41.2	-	-
Silver (Ag)-Total	mg/L	-	0.00015	-	0.00029	-	-
Sodium (Na)-Total	mg/L	-	918.0	-	1220	-	-
Strontium - Total	mg/L	-	3.170	-	4.46	-	-
Sulfur - Total	mg/L	-	175.00	-	195	-	-
Tellurium - Total	mg/L	-	<0.0020	-	<0.0020	-	-
Thallium (Tl)-Total	mg/L	-	0.000410	-	0.00064	-	-
Thorium - Total	mg/L	-	<0.0010	-	<0.0010	-	-
Tin (Sn)-Total	mg/L	-	0.00290	-	0.0025	-	-
Titanium (Ti)-Total	mg/L	-	0.34100	-	0.438	-	-
Tungston (W) - Total	mg/L	-	0.00430	-	0.0063	-	-
Uranium (U)-Total	mg/L	-	0.000560	-	0.00112	-	-
Vanadium (V)-Total	mg/L	-	0.06660	-	0.0648	-	-
Zinc (Zn)-Total	mg/L	100	3.2600	-	5.57	-	-
Zirconium - Total	mg/L	-	0.004530	-	0.00736	-	-

OC Criteria RDKS - Discharge Criteria (OC)

Table 4: Groundwater Quality Results Sampling Location MW-1 (E251530)

QA/QC Check		BC MoE Guidelines CSR-DW (2)	22-Oct-12	2-Apr-13	5-Apr-17	6-Jul-17	2-Oct-17	14-Nov-17	9-Apr-18	18-Jul-18	20-Nov-18	25-Mar-19
Field	Units		Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample
Conductivity	uS/cm	-	-	-	129	28.8	34.4	32.6	29.3	36	42	28.3
SPC	uS/cm	-	-	-	-	-	-	-	-	-	-	-
pH	pH	-	-	-	7.9	8.3	6.49	6.33	5.81	5.75	6.15	6.74
Dissolved Oxygen	mg/L	-	-	-	2.5	-	9.8	8.6	7.3	0.8	10.5	10.5
Temperature	°C	-	-	-	5.8	6.8	5	4.7	4.8	5.1	5	5
Depth to Water	m	-	-	-	-	-	-	-	45.91	44.74	46.54	46.84
Depth to Bottom	m	-	-	-	-	-	-	-	-	-	-	-
Elevation of Well	m	-	-	-	-	-	-	-	-	-	-	-
Height of Casing	m	-	-	-	-	-	-	-	-	-	-	-
<b>Analyte</b>	<b>Units</b>											
Conductivity	uS/cm	-	15.2	-	-	-	58.9	-	-	-	-	-
Hardness (as CaCO3)	mg/L	-	-	10.4	13.1	6.15	-	23.1	19.7	19.3	15.8	14
Hardness (as CaCO3), dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	-
pH	pH	-	6.8	7	6.7	6	6.8	7.26	7.52	-	-	6.68
Total Suspended Solids	mg/L	-	-	-	230	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	7	-	-	-	29	-	-	-	-	-
Alkalinity, Total (as CaCO3)	mg/L	-	10.2	13.6	18	12	-	27	28.1	1	21.9	15.7
Ammonia, Total (as N)	mg/L	-	0.19	-	<0.03	0.06	<0.03	<0.005	0.0066	0.0082	<0.0050	0.0117
Total Nitrogen as N	mg/L	-	0.322	-	-	-	0.175	-	-	-	-	-
Total Kjeldahl nitrogen (TKN)	mg/L	-	-	-	-	-	-	-	-	-	-	-
Bromide (Br)	mg/L	-	-	-	-	-	-	-	-	<0.050	<0.050	<0.050
Chloride (Cl)	mg/L	250 <sup>(2)</sup>	ND	ND	<1.0	1.3	<1.0	<0.5	<0.50	<0.50	<0.50	0.56
Fluoride (F)	mg/L	1.5 <sup>(2)</sup>	ND	ND	<0.10	<0.10	-	0.044	0.051	0.047	0.043	0.034
Nitrate (as N)	mg/L	10 <sup>(2)</sup>	ND	ND	0.041	0.2	<0.01	0.156	0.148	0.166	0.166	0.0216
Nitrite (as N)	mg/L	1.0 <sup>(2)</sup>	ND	ND	<0.01	<0.01	-	<0.001	<0.0010	<0.0010	<0.0010	<0.0010
Sulfate (SO4)	mg/L	500 <sup>(2)</sup>	-	1.06	1.1	<1.0	<1.0	0.64	0.66	0.65	0.67	1.07
Total Organic Carbon	mg/L	-	-	2.14	0.59	1.1	-	0.52	3.76	1.95	5.2	4.46
BOD	mg/L	-	-	-	-	-	-	-	-	-	-	-
COD	mg/L	-	-	-	-	-	-	<20	<20	<20	23	<20
<b>Dissolved Metals</b>												
Aluminum (Al)-Dissolved	mg/L	9.5 <sup>(2)</sup>	ND	ND	<0.0050	<0.0050	<0.005	0.0024	0.0024	0.0039	0.0038	0.0035
Antimony (Sb)-Dissolved	mg/L	0.006 <sup>(2)</sup>	ND	0.000056	<0.00010	<0.00010	<0.0002	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	mg/L	0.01 <sup>(2)</sup>	ND	0.000201	<0.00050	<0.00050	<0.0005	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Barium (Ba)-Dissolved	mg/L	1.0 <sup>(2)</sup>	0.0013	0.00155	0.0137	<0.0050	0.0071	0.00683	0.0057	0.00587	0.00563	0.00551
Beryllium (Be)-Dissolved	mg/L	0.008 <sup>(2)</sup>	ND	ND	<0.00010	<0.00010	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth - Dissolved	mg/L	-	ND	ND	<0.00010	<0.00010	<0.0001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved	mg/L	5.0 <sup>(2)</sup>	ND	ND	0.008	<0.0050	<0.005	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved	mg/L	0.005 <sup>(2)</sup>	0.000016	0.000008	0.00002	0.000034	0.000023	0.0000573	0.0000309	0.0000183	0.0000939	0.0000906
Calcium (Ca)-Dissolved	mg/L	-	-	-	4.49	2.23	-	8.01	6.53	6.33	5.24	4.74
Cesium (Cs)-Dissolved	mg/L	-	-	-	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chromium (Cr)-Dissolved	mg/L	0.05 - 6.0 <sup>(2)</sup>	ND	ND	<0.0005	<0.00050	<0.0005	<0.00010	0.00013	0.00014	0.00012	0.00016
Cobalt (Co)-Dissolved	mg/L	0.001 <sup>(2)</sup>	ND	0.000764	0.00211	0.0002	0.00014	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved	mg/L	1.5 <sup>(2)</sup> AO	0.00069	ND	0.0005	0.00022	<0.0004	<0.00020	<0.00020	<0.00020	0.00024	<0.00020
Iron (Fe)-Dissolved	mg/L	6.5 <sup>(2)</sup>	0.0082	0.0923	0.735	<0.010	<0.01	0.012	<0.010	<0.010	0.011	0.011
Lead (Pb)-Dissolved	mg/L	0.01 <sup>(2)</sup>	ND	ND	<0.0001	<0.00010	<0.0002	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Dissolved	mg/L	0.008 <sup>(2)</sup>	ND	ND	<0.0001	0.00055	<0.0001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium (Mg)-Dissolved	mg/L	-	0.149	0.31	0.457	0.213	0.79	0.755	0.831	0.849	0.66	0.534
Manganese (Mn)-Dissolved	mg/L	1.5 <sup>(2)</sup>	0.374	0.339	0.39	0.356	0.032	0.0198	0.00776	0.00517	0.00575	0.00319
Mercury (Hg)-Dissolved	mg/L	0.001 <sup>(2)</sup>	ND	ND	<0.00002	<0.000020	<0.00001	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000057
Molybdenum (Mo)-Dissolved	mg/L	0.25 <sup>(2)</sup>	ND	0.000284	0.00016	<0.00010	<0.0001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel (Ni)-Dissolved	mg/L	0.08 <sup>(2)</sup>	-	-	0.0065	0.00105	<0.0004	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus - Dissolved	mg/L	-	-	-	<0.05	<0.050	<0.05	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	mg/L	-	-	-	0.27	1.09	-	0.270	0.25	0.273	0.27	0.255
Rubidium (Rb) - Dissolved	mg/L	-	-	-	-	-	-	-	0.00036	0.00039	0.00037	0.00037
Selenium (Se)-Dissolved	mg/L	0.01 <sup>(2)</sup>	ND	0.000056	<0.00050	<0.00050	<0.0005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon - Dissolved	mg/L	-	0.481	0.22	2.8	1.1	5.4	5.10	5.23	4.93	5.28	5.47
Silver (Ag)-Dissolved	mg/L	0.02 <sup>(2)</sup>	ND	ND	<0.00005	<0.000050	<0.00005	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L	200 <sup>(2)</sup>	1.70	1.35	1.57	1.95	1.4	1.29	1.4	1.5	1.55	1.4
Strontium - Dissolved	mg/L	-	0.0153	0.0326	0.0393	0.0161	0.0423	0.0439	0.0454	0.0446	0.0408	0.0434
Sulfur - Dissolved	mg/L	-	-	-	<3.0	<3.0	<3	<0.50	<0.50	<0.50	<0.50	<0.50
Tellurium - Dissolved	mg/L	-	-	-	<0.00020	<0.00020	<0.0005	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Dissolved	mg/L	-	-	-	<0.00002	<0.000020	<0.00002	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium - Dissolved	mg/L	-	-	-	<0.00010	<0.00010	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L	2.5 <sup>(2)</sup>	ND	ND	<0.00020	<0.00020	<0.0002	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L	-	-	-	<0.0050	<0.0050	-	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Tungsten (W) - Dissolved	mg/L	0.003 <sup>(2)</sup>	-	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Dissolved	mg/L	0.020	ND	ND	<0.00002	<0.000020	<0.00002	-	<0.000010	<0.000010	<0.000010	<0.000010
Vanadium (V)-Dissolved	mg/L	0.020 <sup>(2)</sup>	ND	ND	<0.0010	<0.0010	<0.001	-	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved	mg/L	3.0 <sup>(2)</sup>	ND	ND	0.0178	<0.0040	<0.004	-	<0.0010	<0.0010	0.0011	<0.0010
Zirconium - Dissolved	mg/L	-	ND	ND	<0.00010	<0.00010	<0.0001	-	<0.000060	<0.000060	<0.000060	<0.000060

NOTES

- (1) BC MoE Approved and Working Water Quality Guidelines, last updated March 2018
- (2) BC Contaminated Sites Regulation (CSR) for drinking water, Schedule 3.2, last updated January 2019
- (3) All criteria limits for BCWQG - Drinking Quality Guidelines based on Total Metal Concentration except Aluminum (Dissolved)
- (4) BC MoE Water Quality Guidelines for Protection of Wildlife
- (a) Range based on max pH 8.5 to min pH 6.5 at temperature of 6.0 °C
- (b) at pH less than 6.5, limit is determined by regression equation, else limit is 0.1 mg/L.
- (c) Limit for dissolved metals, not total metals
- (d) Limit dependent upon hardness.
- (e) Limit for chromium(VI) - data reported by lab as total chromium - limit assumes 100% chromium VI in sample
- (f) Where hardness data was unavailable, 50 mg/L was assumed
- (g) Maximum value
- (h) Limit dependent upon chloride concentration
- (i) Change of 25 mg/L from background for a duration of 24 hours during clear flows. Change of 10% of background during turbid flows

\* Criteria exceeds detection limit  
 MAC = Maximum Acceptable Concentration  
 AO = Aesthetic Objective

CSR-DW BC Contaminated Sites Regulation Water Quality Guidelines for Drinking Water



Table 4: Groundwater Quality Results Sampling Location MW-1 (E251530)

QA/QC Check		BC MoE Guidelines CSR-DW (2)	26-Jun-19	11-Jun-19	29-Jun-20	14-Aug-20	4-Nov-20	4-Nov-20		29-Mar-21	23-Jun-21	26-Aug-21	4-Nov-21
Field	Units		Sample	Monitor	Monitor	Monitor	sample	Dup	RPD	Monitor	Monitor	Monitor	Sample
Conductivity	uS/cm	-	38	37	40	-	23.6	-	-	24.9	46	45	52
SPC	uS/cm	-	-	-	-	-	36.8	-	-	40.2	-	-	33.4
pH	pH	-	6.29	-	-	-	5.73	-	-	6.17	-	-	5.96
Dissolved Oxygen	mg/L	-	9.5	-	-	-	9.8	-	-	14.5	-	-	9.1
Temperature	°C	-	5.4	5.1	5.9	-	5.1	-	-	5.3	5.8	5.2	5.5
Depth to Water	m	-	46.83	46.84	57	>60	47.08	-	-	42.03	38.83	40.49	42.1
Depth to Bottom	m	-	-	-	-	-	>60.00	-	-	61.98	>60.00	>60.00	>60.00
Elevation of Well	m	-	-	-	-	-	243	-	-	243	243	243	243
Height of Casing	m	-	-	-	-	-	0.98	-	-	-	-	1.16	1.15
<b>Analyte</b>	<b>Units</b>												
Conductivity	uS/cm	-	-	-	-	-	36.9	36.8	0%	-	-	-	32.8
Hardness (as CaCO3)	mg/L	-	14.1	-	-	-	-	-	-	-	-	-	-
Hardness (as CaCO3), dissolved	mg/L	-	-	-	-	-	14.9	14.9	0%	-	-	-	12.2
pH	pH	-	7.34	-	-	-	6.98	6.98	0%	-	-	-	6.5
Total Suspended Solids	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Alkalinity, Total (as CaCO3)	mg/L	-	15.3	-	-	-	16.1	17.2	7%	-	-	-	14.9
Ammonia, Total (as N)	mg/L	-	<0.0050	-	-	-	<0.0050	<0.0050	-	-	-	-	<0.0050
Total Nitrogen as N	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Total Kjeldahl nitrogen (TKN)	mg/L	-	-	-	-	-	0.145	0.106	31%	-	-	-	0.072
Bromide (Br)	mg/L	-	<0.050	-	-	-	-	-	-	-	-	-	<0.050
Chloride (Cl)	mg/L	250 <sup>(2)</sup>	<0.50	-	-	-	<0.50	<0.50	-	-	-	-	<0.50
Fluoride (F)	mg/L	1.5 <sup>(2)</sup>	0.047	-	-	-	0.044	0.045	2%	-	-	-	0.044
Nitrate (as N)	mg/L	10 <sup>(2)</sup>	0.168	-	-	-	0.195	0.192	2%	-	-	-	0.176
Nitrite (as N)	mg/L	1.0 <sup>(2)</sup>	0.003	-	-	-	<0.0010	<0.0010	-	-	-	-	<0.0010
Sulfate (SO4)	mg/L	500 <sup>(2)</sup>	0.78	-	-	-	0.67	0.68	1%	-	-	-	1.14
Total Organic Carbon	mg/L	-	3.19	-	-	-	2.1	2.09	0%	-	-	-	3.49
BOD	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
COD	mg/L	-	<20	-	-	-	<20	<20	-	-	-	-	<20
<b>Dissolved Metals</b>													
Aluminum (Al)-Dissolved	mg/L	9.5 <sup>(2)</sup>	0.0032	-	-	-	0.0084	0.0082	2%	-	-	-	0.0035
Antimony (Sb)-Dissolved	mg/L	0.006 <sup>(2)</sup>	<0.00010	-	-	-	<0.00010	<0.00010	-	-	-	-	<0.00010
Arsenic (As)-Dissolved	mg/L	0.01 <sup>(2)</sup>	<0.00010	-	-	-	<0.00010	<0.00010	-	-	-	-	<0.00010
Barium (Ba)-Dissolved	mg/L	1.0 <sup>(2)</sup>	0.00603	-	-	-	0.00542	0.00552	2%	-	-	-	0.00398
Beryllium (Be)-Dissolved	mg/L	0.008 <sup>(2)</sup>	<0.00010	-	-	-	<0.000100	<0.000100	-	-	-	-	<0.000100
Bismuth - Dissolved	mg/L	-	<0.000050	-	-	-	<0.000050	<0.000050	-	-	-	-	<0.000050
Boron (B)-Dissolved	mg/L	5.0 <sup>(2)</sup>	<0.010	-	-	-	<0.010	<0.010	-	-	-	-	<0.010
Cadmium (Cd)-Dissolved	mg/L	0.005 <sup>(2)</sup>	0.00018	-	-	-	0.000264	0.000424	47%	-	-	-	0.000175
Calcium (Ca)-Dissolved	mg/L	-	4.81	-	-	-	5.14	5.16	0%	-	-	-	4.26
Cesium (Cs)-Dissolved	mg/L	-	<0.000010	-	-	-	<0.000010	<0.000010	-	-	-	-	<0.000010
Chromium (Cr)-Dissolved	mg/L	0.05 - 6.0 <sup>(2)</sup>	0.00014	-	-	-	0.00019	0.0002	5%	-	-	-	<0.00050
Cobalt (Co)-Dissolved	mg/L	0.001 <sup>(2)</sup>	<0.00010	-	-	-	<0.00010	<0.00010	-	-	-	-	<0.00010
Copper (Cu)-Dissolved	mg/L	1.5 <sup>(2)</sup> AO	<0.00020	-	-	-	<0.00020	0.00044	-	-	-	-	0.00067
Iron (Fe)-Dissolved	mg/L	6.5 <sup>(2)</sup>	<0.010	-	-	-	0.04	0.032	-22%	-	-	-	<0.010
Lead (Pb)-Dissolved	mg/L	0.01 <sup>(2)</sup>	<0.000050	-	-	-	<0.000050	<0.000050	#VALUE!	-	-	-	<0.000050
Lithium (Li)-Dissolved	mg/L	0.008 <sup>(2)</sup>	<0.0010	-	-	-	<0.0010	<0.0010	#VALUE!	-	-	-	<0.0010
Magnesium (Mg)-Dissolved	mg/L	-	0.512	-	-	-	0.502	0.501	0%	-	-	-	0.393
Manganese (Mn)-Dissolved	mg/L	1.5 <sup>(2)</sup>	0.00364	-	-	-	0.00502	0.00493	-2%	-	-	-	0.00123
Mercury (Hg)-Dissolved	mg/L	0.001 <sup>(2)</sup>	<0.0000050	-	-	-	<0.0000050	<0.0000050	#VALUE!	-	-	-	<0.0000050
Molybdenum (Mo)-Dissolved	mg/L	0.25 <sup>(2)</sup>	<0.000050	-	-	-	<0.000050	0.000079	#VALUE!	-	-	-	<0.000050
Nickel (Ni)-Dissolved	mg/L	0.08 <sup>(2)</sup>	<0.00050	-	-	-	<0.00050	<0.00050	#VALUE!	-	-	-	<0.00050
Phosphorus - Dissolved	mg/L	-	<0.050	-	-	-	<0.050	<0.050	#VALUE!	-	-	-	<0.050
Potassium (K)-Dissolved	mg/L	-	0.263	-	-	-	0.299	0.285	-5%	-	-	-	0.245
Rubidium (Rb) - Dissolved	mg/L	-	0.00041	-	-	-	0.0004	0.00037	-8%	-	-	-	0.00034
Selenium (Se)-Dissolved	mg/L	0.01 <sup>(2)</sup>	<0.000050	-	-	-	<0.000050	<0.000050	#VALUE!	-	-	-	0.000066
Silicon - Dissolved	mg/L	-	5.03	-	-	-	5.34	5.33	0%	-	-	-	5.05
Silver (Ag)-Dissolved	mg/L	0.02 <sup>(2)</sup>	<0.000010	-	-	-	<0.000010	<0.000010	#VALUE!	-	-	-	<0.000010
Sodium (Na)-Dissolved	mg/L	200 <sup>(2)</sup>	1.49	-	-	-	1.59	1.6	1%	-	-	-	1.37
Strontium - Dissolved	mg/L	-	0.0465	-	-	-	0.0528	0.0537	2%	-	-	-	0.0408
Sulfur - Dissolved	mg/L	-	<0.50	-	-	-	<0.50	<0.50	#VALUE!	-	-	-	<0.50
Tellurium - Dissolved	mg/L	-	<0.00020	-	-	-	<0.00020	<0.00020	#VALUE!	-	-	-	<0.00020
Thallium (Tl)-Dissolved	mg/L	-	<0.000010	-	-	-	<0.000010	<0.000010	#VALUE!	-	-	-	<0.000010
Thorium - Dissolved	mg/L	-	<0.00010	-	-	-	<0.00010	<0.00010	#VALUE!	-	-	-	<0.00010
Tin (Sn)-Dissolved	mg/L	2.5 <sup>(2)</sup>	<0.00010	-	-	-	<0.00010	<0.00010	#VALUE!	-	-	-	<0.00010
Titanium (Ti)-Dissolved	mg/L	-	<0.00030	-	-	-	0.00031	<0.00030	#VALUE!	-	-	-	<0.00030
Tungsten (W) - Dissolved	mg/L	0.003 <sup>(2)</sup>	<0.00010	-	-	-	<0.00010	<0.00010	#VALUE!	-	-	-	<0.00010
Uranium (U)-Dissolved	mg/L	0.020	<0.000010	-	-	-	<0.000010	<0.000010	#VALUE!	-	-	-	<0.000010
Vanadium (V)-Dissolved	mg/L	0.020 <sup>(2)</sup>	<0.00050	-	-	-	<0.00050	<0.00050	#VALUE!	-	-	-	<0.00050
Zinc (Zn)-Dissolved	mg/L	3.0 <sup>(2)</sup>	<0.0010	-	-	-	<0.0010	0.0013	#VALUE!	-	-	-	<0.0010
Zirconium - Dissolved	mg/L	-	<0.00020	-	-	-	<0.00020	<0.00020	#VALUE!	-	-	-	<0.00020

NOTES

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- (3) All criteria limits for BCWQG - Drinking Quality Guidelines based on Total Metal Concentration
- (4) BC MoE Water Quality Guidelines for Protection of Wildlife
- (a) Range based on max pH 8.5 to min pH 6.5 at temperature of 6.0 °C
- (b) at pH less than 6.5, limit is determined by regression equation, else limit is 0.1 mg/L.
- (c) Limit for dissolved metals, not total metals
- (d) Limit dependent upon hardness.
- (e) Limit for chromium(VI) - data reported by lab as total chromium - limit assumes 100% chromium
- (f) Where hardness data was unavailable, 50 mg/L was assumed
- (g) Maximum value
- (h) Limit dependent upon chloride concentration
- (i) Change of 25 mg/L from background for a duration of 24 hours during clear flows. Change of 10

\* Criteria exceeds detection limit  
 MAC = Maximum Acceptable Concentration  
 AO = Aesthetic Objective

CSR-DW BC Contaminated Sites Regulation Water Quality

Table 4: Groundwater Quality Results Sampling Location MW-1 (E251530)

QA/QC Check		BC MoE Guidelines
Field	Units	CSR-DW (2)
Conductivity	uS/cm	-
SPC	uS/cm	-
pH	pH	-
Dissolved Oxygen	mg/L	-
Temperature	°C	-
Depth to Water	m	-
Depth to Bottom	m	-
Elevation of Well	m	-
Height of Casing	m	-
<b>Analyte</b>	<b>Units</b>	
Conductivity	uS/cm	-
Hardness (as CaCO3)	mg/L	-
Hardness (as CaCO3), dissolved	mg/L	-
pH	pH	-
Total Suspended Solids	mg/L	-
Total Dissolved Solids	mg/L	-
Alkalinity, Total (as CaCO3)	mg/L	-
Ammonia, Total (as N)	mg/L	-
Total Nitrogen as N	mg/L	-
Total Kjeldahl nitrogen (TKN)	mg/L	-
Bromide (Br)	mg/L	-
Chloride (Cl)	mg/L	250 <sup>(2)</sup>
Fluoride (F)	mg/L	1.5 <sup>(2)</sup>
Nitrate (as N)	mg/L	10 <sup>(2)</sup>
Nitrite (as N)	mg/L	1.0 <sup>(2)</sup>
Sulfate (SO4)	mg/L	500 <sup>(2)</sup>
Total Organic Carbon	mg/L	-
BOD	mg/L	-
COD	mg/L	-
<b>Dissolved Metals</b>		
Aluminum (Al)-Dissolved	mg/L	9.5 <sup>(2)</sup>
Antimony (Sb)-Dissolved	mg/L	0.006 <sup>(2)</sup>
Arsenic (As)-Dissolved	mg/L	0.01 <sup>(2)</sup>
Barium (Ba)-Dissolved	mg/L	1.0 <sup>(2)</sup>
Beryllium (Be)-Dissolved	mg/L	0.008 <sup>(2)</sup>
Bismuth - Dissolved	mg/L	-
Boron (B)-Dissolved	mg/L	5.0 <sup>(2)</sup>
Cadmium (Cd)-Dissolved	mg/L	0.005 <sup>(2)</sup>
Calcium (Ca)-Dissolved	mg/L	-
Cesium (Cs)- Dissolved	mg/L	-
Chromium (Cr)-Dissolved	mg/L	0.05 - 6.0 <sup>(2)</sup>
Cobalt (Co)-Dissolved	mg/L	0.001 <sup>(2)</sup>
Copper (Cu)-Dissolved	mg/L	1.5 <sup>(2)</sup> AO
Iron (Fe)-Dissolved	mg/L	6.5 <sup>(2)</sup>
Lead (Pb)-Dissolved	mg/L	0.01 <sup>(2)</sup>
Lithium (Li)-Dissolved	mg/L	0.008 <sup>(2)</sup>
Magnesium (Mg)-Dissolved	mg/L	-
Manganese (Mn)-Dissolved	mg/L	1.5 <sup>(2)</sup>
Mercury (Hg)-Dissolved	mg/L	0.001 <sup>(2)</sup>
Molybdenum (Mo)-Dissolved	mg/L	0.25 <sup>(2)</sup>
Nickel (Ni)-Dissolved	mg/L	0.08 <sup>(2)</sup>
Phosphorus - Dissolved	mg/L	-
Potassium (K)-Dissolved	mg/L	-
Rubidium (Rb) - Dissolved	mg/L	-
Selenium (Se)-Dissolved	mg/L	0.01 <sup>(2)</sup>
Silicon - Dissolved	mg/L	-
Silver (Ag)-Dissolved	mg/L	0.02 <sup>(2)</sup>
Sodium (Na)-Dissolved	mg/L	200 <sup>(2)</sup>
Strontium - Dissolved	mg/L	-
Sulfur - Dissolved	mg/L	-
Tellurium - Dissolved	mg/L	-
Thallium (Tl)-Dissolved	mg/L	-
Thorium - Dissolved	mg/L	-
Tin (Sn)-Dissolved	mg/L	2.5 <sup>(2)</sup>
Titanium (Ti)-Dissolved	mg/L	-
Tungston (W) - Dissolved	mg/L	0.003 <sup>(2)</sup>
Uranium (U)-Dissolved	mg/L	0.020
Vanadium (V)-Dissolved	mg/L	0.020 <sup>(2)</sup>
Zinc (Zn)-Dissolved	mg/L	3.0 <sup>(2)</sup>
Zirconium - Dissolved	mg/L	-

**NOTES**

- (1) BC MoE Approved and Working Water Quality Guidelines, last updated March 2018
- (2) BC Contaminated Sites Regulation (CSR) for drinking water, Schedule 3.2, last updated January
- (3) All criteria limits for BCWQG - Drinking Quality Guidelines based on Total Metal Concentration
- (4) BC MoE Water Quality Guidelines for Protection of Wildlife
- (a) Range based on max pH 8.5 to min pH 6.5 at temperature of 6.0 °C
- (b) at pH less than 6.5, limit is determined by regression equation, else limit is 0.1 mg/L.
- (c) Limit for dissolved metals, not total metals
- (d) Limit dependent upon hardness.
- (e) Limit for chromium(VI) - data reported by lab as total chromium - limit assumes 100% chromium
- (f) Where hardness data was unavailable, 50 mg/L was assumed
- (g) Maximum value
- (h) Limit dependent upon chloride concentration
- (i) Change of 25 mg/L from background for a duration of 24 hours during clear flows. Change of 10

\* Criteria exceeds detection limit  
 MAC = Maximum Acceptable Concentration  
 AO = Aesthetic Objective

CSR-DW BC Contaminated Sites Regulation Water Quality

Table 2: Groundwater Quality Results Sampling Location MW-2 (E251531)

Date		BC MoE Guidelines	22-Oct-12	2-Apr-13	2-Oct-17	14-Nov-17	10-Apr-18	19-Jul-18	20-Nov-18	27-Mar-19	26-Jun-19	11-Jun-19
QA/QC Check		CSR-DW (2)										
Field	Units		Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Monitor
Conductivity	uS/cm	-	-	-	29.1	29.9	28	49	57	36.4	50	51
SPC	uS/cm	-	-	-	-	-	-	-	-	-	-	-
pH	pH	-	-	-	6.36	6.31	5.84	5.97	6.48	7.02	6.57	-
Dissolved Oxygen	mg/L	-	-	-	9.7	-	9.2	8.2	1	8.4	9.7	-
Temperature	°C	-	-	-	4.3	4.5	4	4	4.4	4.4	4.6	4.6
Depth to Water	m	-	-	-	-	-	45.79	44.54	46.83	46.12	46.54	46.31
Depth to Bottom	m	-	-	-	-	-	-	-	-	-	-	-
Elevation of Well	m	-	-	-	-	-	-	-	-	-	-	-
Casing Height	m	-	-	-	-	-	-	-	-	-	-	-
Analyte	Units											
Conductivity	uS/cm	-	18.8	-	-	-	-	-	-	-	-	-
Hardness (as CaCO3)	mg/L	-	-	7.42	24.7	-	17.8	22.8	25.9	21.9	22	-
Hardness (as CaCO3), dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	-
pH	pH	-	7	7	6.6	7.21	7.43	-	-	7.22	7.08	-
Total Suspended Solids	mg/L	-	-	-	270	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	9	-	24	-	-	-	-	-	-	-
Alkalinity, Total (as CaCO3)	mg/L	-	12.6	13	24	-	-	31.1	25.2	22.6	27.2	-
Ammonia, Total (as N)	mg/L	-	0.06	-	<0.003	<0.0050	<0.0050	0.0058	0.0134	0.0117	<0.0050	-
Total Nitrogen as N	mg/L	-	0.317	-	0.383	-	-	-	-	-	-	-
TKN	mg/L	-	-	-	-	-	-	-	-	-	-	-
Bromide (Br)	mg/L	-	-	-	-	-	-	-	<0.050	<0.050	<0.050	-
Chloride (Cl)	mg/L	250 <sup>(2)</sup>	ND	ND	<1	0.51	<0.50	<0.50	<0.50	<0.50	<0.50	-
Fluoride (F)	mg/L	1.5 <sup>(2)</sup>	ND	ND	<0.1	-	0.021	0.027	0.023	0.049	0.025	-
Nitrate (as N)	mg/L	10 <sup>(2)</sup>	ND	ND	<0.1	0.212	0.227	0.227	0.227	<0.0050	0.21	-
Nitrite (as N)	mg/L	1.0 <sup>(2)</sup>	ND	ND	<0.1	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
Sulfate (SO4)	mg/L	500 <sup>(2)</sup>	-	1.3	1.3	1.13	1.03	1.06	0.98	0.55	1.04	-
Total Organic Carbon	mg/L	-	-	ND	-	-	0.85	8.43	6.4	3.85	1.22	-
BOD	mg/L	-	-	-	-	-	-	-	-	-	-	-
COD	mg/L	-	-	-	-	-	37	49	28	<20	<20	-
Dissolved Metals												
Aluminum (Al)-Dissolved	mg/L	9.5 <sup>(2)</sup>	ND	ND	<0.005	0.0015	0.0015	0.002	0.0047	0.003	0.0028	-
Antimony (Sb)-Dissolved	mg/L	0.006 <sup>(2)</sup>	ND	ND	<0.0002	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-
Arsenic (As)-Dissolved	mg/L	0.01 <sup>(2)</sup>	ND	0.000048	0.0005	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-
Barium (Ba)-Dissolved	mg/L	1.0 <sup>(2)</sup>	0.0018	0.0014	0.0085	0.0192	0.00867	0.0092	0.00828	0.00967	0.0114	-
Beryllium (Be)-Dissolved	mg/L	0.008 <sup>(2)</sup>	ND	ND	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-
Bismuth - Dissolved	mg/L	-	ND	ND	<0.0001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-
Boron (B)-Dissolved	mg/L	5.0 <sup>(2)</sup>	ND	ND	<0.005	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-
Cadmium (Cd)-Dissolved	mg/L	0.005 <sup>(2)</sup>	0.000074	ND	0.000014	0.0000129	0.000029	0.0000234	0.00008	0.0000456	0.0000367	-
Calcium (Ca)-Dissolved	mg/L	-	-	-	5.99	-	6.12	7.75	8.8	7.58	7.58	-
Cesium (Cs) - Dissolved	mg/L	-	-	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-
Chromium (Cr)-Dissolved	mg/L	0.05 - 6.0 <sup>(2)</sup>	ND	ND	<0.0005	<0.00010	<0.00010	<0.00010	0.00011	0.00012	<0.00010	-
Cobalt (Co)-Dissolved	mg/L	0.001 <sup>(2)</sup>	ND	0.00003	0.00012	0.00016	0.00014	0.00015	<0.00010	0.00024	0.00032	-
Copper (Cu)-Dissolved	mg/L	1.5 <sup>(2)</sup> AO	0.00071	ND	<0.0004	<0.00020	<0.00020	<0.00020	<0.00034	<0.00020	<0.00020	-
Iron (Fe)-Dissolved	mg/L	6.5 <sup>(2)</sup>	ND	0.953	<0.01	0.060	0.074	<0.010	0.014	0.048	0.125	-
Lead (Pb)-Dissolved	mg/L	0.01 <sup>(2)</sup>	ND	ND	<0.0002	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-
Lithium (Li)-Dissolved	mg/L	0.008 <sup>(2)</sup>	ND	ND	0.00012	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
Magnesium (Mg)-Dissolved	mg/L	-	0.118	ND	0.763	0.658	0.62	0.832	0.956	0.724	0.741	-
Manganese (Mn)-Dissolved	mg/L	1.5 <sup>(2)</sup>	0.137	0.153	0.0313	0.0461	0.032	0.0613	0.0495	0.0508	0.0613	-
Mercury (Hg)-Dissolved	mg/L	0.001 <sup>(2)</sup>	ND	ND	<0.00001	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000074	<0.0000050	-
Molybdenum (Mo)-Dissolved	mg/L	0.25 <sup>(2)</sup>	ND	0.000125	<0.0001	0.000062	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-
Nickel (Ni)-Dissolved	mg/L	0.08 <sup>(2)</sup>	-	-	0.00055	0.00059	0.00073	0.00061	0.00071	0.00055	0.00054	-
Phosphorus - Dissolved	mg/L	-	-	-	<0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	-
Potassium (K)-Dissolved	mg/L	-	-	-	0.35	-	0.367	0.423	0.444	0.393	0.411	-
Rubidium (Rb) - Dissolved	mg/L	-	-	-	-	-	0.00036	0.0005	0.0005	0.00042	0.00043	-
Selenium (Se)-Dissolved	mg/L	0.01 <sup>(2)</sup>	ND	ND	<0.0005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-
Silicon - Dissolved	mg/L	-	0.276	0.156	6.1	5.66	5.7	5.62	5.54	6.09	5.75	-
Silver (Ag)-Dissolved	mg/L	0.02 <sup>(2)</sup>	ND	ND	<0.00005	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-
Sodium (Na)-Dissolved	mg/L	200 <sup>(2)</sup>	1.89	1.64	1.66	2.03	1.6	1.64	1.71	1.64	1.68	-
Strontium - Dissolved	mg/L	-	0.0185	0.0193	0.0417	0.0432	0.0483	0.0557	0.0483	0.0536	0.058	-
Sulfur - Dissolved	mg/L	-	-	-	<3	<50	<50	<50	<50	<50	<50	-
Tellurium - Dissolved	mg/L	-	-	-	<0.0005	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	-
Thallium (Tl)-Dissolved	mg/L	-	-	-	<0.00002	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-
Thorium - Dissolved	mg/L	-	-	-	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-
Tin (Sn)-Dissolved	mg/L	2.5 <sup>(2)</sup>	ND	ND	<0.0002	<0.00010	<0.00010	<0.00010	0.00028	<0.00010	<0.00010	-
Titanium (Ti)-Dissolved	mg/L	-	-	-	<0.005	-	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	-
Tungsten (W) - Dissolved	mg/L	0.003 <sup>(2)</sup>	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-
Uranium (U)-Dissolved	mg/L	0.020	ND	ND	<0.00002	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-
Vanadium (V)-Dissolved	mg/L	0.020 <sup>(2)</sup>	ND	ND	<0.001	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-
Zinc (Zn)-Dissolved	mg/L	3.0 <sup>(2)</sup>	ND	ND	<0.004	0.0013	<0.0010	<0.0010	<0.0010	<0.0010	0.001	-
Zirconium - Dissolved	mg/L	-	ND	ND	<0.0001	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060	<0.00020	-

NOTES

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- (3) All criteria limits for BCWQG - Drinking Quality Guidelines based on Total Metal Concentration except Aluminum (Dissolved)
- (4) BC MoE Water Quality Guidelines for Protection of Wildlife
- (a) Range based on max pH 8.5 to min pH 6.5 at temperature of 6.0 °C
- (b) at pH less than 6.5, limit is determined by regression equation, else limit is 0.1 mg/L.
- (c) Limit for dissolved metals, not total metals
- (d) Limit dependent upon hardness.
- (e) Limit for chromium(VI) - data reported by lab as total chromium - limit assumes 100% chromium VI in sample
- (f) Where hardness data was unavailable, 50 mg/L was assumed
- (g) Maximum value
- (h) Limit dependent upon chloride concentration
- (i) Change of 25 mg/L from background for a duration of 24 hours during clear flows. Change of 10% of background during turbid flows

\* Criteria exceeds detection limit  
 MAC = Maximum Acceptable Concentration  
 AO = Aesthetic Objective

CSR-DW BC Contaminated Sites Regulation Water Quality Guidelines for Drinking Water

Table 2: Groundwater Quality Results Sampling Location MW-2 (E251531)

Date		BC MoE Guidelines	29-Jun-20	14-Aug-20	3-Nov-20	30-Mar-21	24-Jun-21	25-Aug-21	3-Nov-21	3-Nov-21	RPD
QA/QC Check		CSR-DW (2)									
Field	Units		Monitor	Monitor	Sample	Monitor	Monitor	Monitor	Sample	DUP	
Conductivity	uS/cm	-	60	64	28.7	32.6	66	78	36.8	-	-
SPC	uS/cm	-	-	-	47	53.8	-	-	59.1	-	-
pH	pH	-	-	-	5.95	5.91	-	-	6.21	-	-
Dissolved Oxygen	mg/L	-	-	-	7.9	7.5	-	-	9.4	-	-
Temperature	°C	-	4	4.2	4.2	4.4	4.2	4.2	5.3	-	-
Depth to Water	m	-	55.93	55.9	46.8	40.75	53.98	53.01	41.52	-	-
Depth to Bottom	m	-	-	-	-	56.46	56.48	56.55	56.27	-	-
Elevation of Well	m	-	-	-	240	-	-	-	-	-	-
Casing Height	m	-	-	-	0.83	-	-	0.88	0.79	-	-
Analyte	Units										
Conductivity	uS/cm	-	-	-	48.5	-	-	-	57.2	58.5	2.25%
Hardness (as CaCO3)	mg/L	-	-	-	-	-	-	-	-	-	-
Hardness (as CaCO3), dissolved	mg/L	-	-	-	20.3	-	-	-	23.1	24.2	4.85%
pH	pH	-	-	-	6.93	-	-	-	6.66	6.54	1.82%
Total Suspended Solids	mg/L	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	-	-	-	-	-	-	-	-	-
Alkalinity, Total (as CaCO3)	mg/L	-	-	-	20.9	-	-	-	31.4	32.5	3.44%
Ammonia, Total (as N)	mg/L	-	-	-	0.0771	-	-	-	0.0066	0.0055	18.18%
Total Nitrogen as N	mg/L	-	-	-	-	-	-	-	-	-	-
TKN	mg/L	-	-	-	0.260	-	-	-	0.180	0.139	25.71%
Bromide (Br)	mg/L	-	-	-	-	-	-	-	<0.050	-	-
Chloride (Cl)	mg/L	250 <sup>(2)</sup>	-	-	<0.50	-	-	-	<0.50	<0.50	#VALUE!
Fluoride (F)	mg/L	1.5 <sup>(2)</sup>	-	-	<0.020	-	-	-	0.023	0.022	4.44%
Nitrate (as N)	mg/L	10 <sup>(2)</sup>	-	-	0.256	-	-	-	0.369	0.371	0.54%
Nitrite (as N)	mg/L	1.0 <sup>(2)</sup>	-	-	<0.0010	-	-	-	<0.0010	<0.0010	#VALUE!
Sulfate (SO4)	mg/L	500 <sup>(2)</sup>	-	-	0.93	-	-	-	0.82	0.82	0.00%
Total Organic Carbon	mg/L	-	-	-	1.57	-	-	-	9.16	7.24	23.41%
BOD	mg/L	-	-	-	-	-	-	-	-	-	-
COD	mg/L	-	-	-	<20	-	-	-	41	39	5.00%
Dissolved Metals											
Aluminum (Al)-Dissolved	mg/L	9.5 <sup>(2)</sup>	-	-	0.0024	-	-	-	0.0038	0.0035	8.22%
Antimony (Sb)-Dissolved	mg/L	0.006 <sup>(2)</sup>	-	-	<0.00010	-	-	-	<0.00010	<0.00010	#VALUE!
Arsenic (As)-Dissolved	mg/L	0.01 <sup>(2)</sup>	-	-	0.00014	-	-	-	<0.00010	<0.00010	#VALUE!
Barium (Ba)-Dissolved	mg/L	1.0 <sup>(2)</sup>	-	-	0.0114	-	-	-	0.0108	0.00964	11.35%
Beryllium (Be)-Dissolved	mg/L	0.008 <sup>(2)</sup>	-	-	<0.000100	-	-	-	<0.000100	<0.000100	#VALUE!
Bismuth - Dissolved	mg/L	-	-	-	<0.000050	-	-	-	<0.000050	<0.000050	#VALUE!
Boron (B)-Dissolved	mg/L	5.0 <sup>(2)</sup>	-	-	<0.010	-	-	-	<0.010	<0.010	#VALUE!
Cadmium (Cd)-Dissolved	mg/L	0.005 <sup>(2)</sup>	-	-	0.0000787	-	-	-	0.0000198	0.0000251	23.61%
Calcium (Ca)-Dissolved	mg/L	-	-	-	7.13	-	-	-	7.87	8.29	5.20%
Cesium (Cs) - Dissolved	mg/L	-	-	-	<0.000010	-	-	-	<0.000010	<0.000010	#VALUE!
Chromium (Cr)-Dissolved	mg/L	0.05 - 6.0 <sup>(2)</sup>	-	-	<0.00010	-	-	-	<0.00050	<0.00050	#VALUE!
Cobalt (Co)-Dissolved	mg/L	0.001 <sup>(2)</sup>	-	-	0.00016	-	-	-	0.00024	0.00025	4.08%
Copper (Cu)-Dissolved	mg/L	1.5 <sup>(2)</sup> AO	-	-	0.00163	-	-	-	0.00234	0.00037	145.39%
Iron (Fe)-Dissolved	mg/L	6.5 <sup>(2)</sup>	-	-	0.059	-	-	-	0.072	0.054	28.57%
Lead (Pb)-Dissolved	mg/L	0.01 <sup>(2)</sup>	-	-	<0.000050	-	-	-	<0.000050	<0.000050	#VALUE!
Lithium (Li)-Dissolved	mg/L	0.008 <sup>(2)</sup>	-	-	<0.0010	-	-	-	<0.0010	<0.0010	#VALUE!
Magnesium (Mg)-Dissolved	mg/L	-	-	-	0.610	-	-	-	0.843	0.853	1.18%
Manganese (Mn)-Dissolved	mg/L	1.5 <sup>(2)</sup>	-	-	0.0346	-	-	-	0.0456	0.0469	2.81%
Mercury (Hg)-Dissolved	mg/L	0.001 <sup>(2)</sup>	-	-	<0.000050	-	-	-	<0.000050	<0.000050	#VALUE!
Molybdenum (Mo)-Dissolved	mg/L	0.25 <sup>(2)</sup>	-	-	<0.000050	-	-	-	<0.000050	<0.000050	#VALUE!
Nickel (Ni)-Dissolved	mg/L	0.08 <sup>(2)</sup>	-	-	<0.00050	-	-	-	0.00053	0.00050	5.83%
Phosphorus - Dissolved	mg/L	-	-	-	<0.050	-	-	-	<0.050	<0.050	#VALUE!
Potassium (K)-Dissolved	mg/L	-	-	-	0.444	-	-	-	0.423	0.436	3.03%
Rubidium (Rb) - Dissolved	mg/L	-	-	-	0.00044	-	-	-	0.00050	0.00047	6.19%
Selenium (Se)-Dissolved	mg/L	0.01 <sup>(2)</sup>	-	-	<0.000050	-	-	-	<0.000050	<0.000050	#VALUE!
Silicon - Dissolved	mg/L	-	-	-	5.83	-	-	-	5.83	5.96	2.21%
Silver (Ag)-Dissolved	mg/L	0.02 <sup>(2)</sup>	-	-	<0.000010	-	-	-	<0.000010	<0.000010	#VALUE!
Sodium (Na)-Dissolved	mg/L	200 <sup>(2)</sup>	-	-	1.80	-	-	-	1.85	1.84	0.54%
Strontium - Dissolved	mg/L	-	-	-	0.0638	-	-	-	0.0635	0.0670	5.36%
Sulfur - Dissolved	mg/L	-	-	-	<0.50	-	-	-	<0.50	<0.50	#VALUE!
Tellurium - Dissolved	mg/L	-	-	-	<0.00020	-	-	-	<0.00020	<0.00020	#VALUE!
Thallium (Tl)-Dissolved	mg/L	-	-	-	<0.000010	-	-	-	<0.000010	<0.000010	#VALUE!
Thorium - Dissolved	mg/L	-	-	-	<0.00010	-	-	-	<0.00010	<0.00010	#VALUE!
Tin (Sn)-Dissolved	mg/L	2.5 <sup>(2)</sup>	-	-	<0.00010	-	-	-	0.00010	<0.00010	#VALUE!
Titanium (Ti)-Dissolved	mg/L	-	-	-	<0.00030	-	-	-	<0.00030	<0.00030	#VALUE!
Tungsten (W) - Dissolved	mg/L	0.003 <sup>(2)</sup>	-	-	<0.00010	-	-	-	<0.00010	<0.00010	#VALUE!
Uranium (U)-Dissolved	mg/L	0.020	-	-	<0.000010	-	-	-	<0.000010	<0.000010	#VALUE!
Vanadium (V)-Dissolved	mg/L	0.020 <sup>(2)</sup>	-	-	<0.00050	-	-	-	<0.00050	<0.00050	#VALUE!
Zinc (Zn)-Dissolved	mg/L	3.0 <sup>(2)</sup>	-	-	0.0032	-	-	-	0.0037	<0.0010	#VALUE!
Zirconium - Dissolved	mg/L	-	-	-	<0.00020	-	-	-	<0.00020	<0.00020	#VALUE!

NOTES

- (1) BC MoE Approved and Working Water Quality Guidelines, last updated March 2018
- (2) BC Contaminated Sites Regulation (CSR) for drinking water, Schedule 3.2, last updated January
- (3) All criteria limits for BCWQG - Drinking Quality Guidelines based on Total Metal Concentration
- (4) BC MoE Water Quality Guidelines for Protection of Wildlife
- (a) Range based on max pH 8.5 to min pH 6.5 at temperature of 6.0 °C
- (b) at pH less than 6.5, limit is determined by regression equation, else limit is 0.1 mg/L.
- (c) Limit for dissolved metals, not total metals
- (d) Limit dependent upon hardness.
- (e) Limit for chromium(VI) - data reported by lab as total chromium - limit assumes 100% chromium
- (f) Where hardness data was unavailable, 50 mg/L was assumed
- (g) Maximum value
- (h) Limit dependent upon chloride concentration
- (i) Change of 25 mg/L from background for a duration of 24 hours during clear flows. Change of 10

\* Criteria exceeds detection limit  
 MAC = Maximum Acceptable Concentration  
 AO = Aesthetic Objective

CSR-DW BC Contaminated Sites Regulation Water Quality

Table 5: Groundwater Quality Results Sampling Location MW-3 (E251532)

QA/QC Check		BC MoE Guidelines CSR-DW (2)	22-Oct-12	2-Apr-13	6-Apr-17	6-Jul-17	2-Oct-17	14-Nov-17	10-Apr-18	20-Nov-18	25-Mar-19	26-Jun-19
Field	Units		Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample
Conductivity	uS/cm	-	-	-	132	108	82	78.6	66.5	79.9	79.6	99.6
SPC	uS/cm	-	-	-	-	-	-	-	-	-	-	-
pH	pH	-	-	-	7.6	8.7	8.15	8.92	7.33	7.9	8.15	7.98
Dissolved Oxygen	mg/L	-	-	-	12	16.6	6	7.6	8.2	0.6	8.8	6.8
Temperature	°C	-	-	-	-	3.7	-	3	4.6	8.1	3.2	13.9
Depth to Water	m	-	-	-	-	-	-	-	44.53	-	-	-
Depth to Bottom	m	-	-	-	-	-	-	-	-	-	-	-
Elevation of Well	m	-	-	-	-	-	-	-	-	-	-	-
Casing Height	m	-	-	-	-	-	-	-	-	-	-	-
<b>Analyte</b>	<b>Units</b>											
Conductivity	uS/cm	-	29.3	-	-	-	121	-	-	-	-	-
Hardness (as CaCO3)	mg/L	-	-	14.9	62	52.5	-	54.1	47.3	60	53.6	67.6
Hardness (as CaCO3), dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	-
pH	pH	-	8.7	8.7	8.1	8.8	7.6	8.23	7.93	-	8.08	8.05
Total Suspended Solids	mg/L	-	-	-	<1.0	-	1	-	-	-	-	-
Total Dissolved Solids	mg/L	-	13	-	-	-	60	-	-	-	-	-
Alkalinity, Total (as CaCO3)	mg/L	-	17.3	18.1	65	61	-	56.4	53.4	60.9	58.4	67.7
Ammonia, Total (as N)	mg/L	-	0.03	-	<0.03	<0.03	<0.03	<0.0050	0.0055	<0.0050	<0.0050	<0.0050
Total Nitrogen as N	mg/L	-	0.233	-	-	-	0.0848	-	-	-	-	-
TKN	mg/L	-	-	-	-	-	-	-	-	-	-	-
Bromide (Br)	mg/L	-	-	-	-	-	-	-	-	<0.050	<0.050	<0.050
Chloride (Cl)	mg/L	250 <sup>(2)</sup>	1	ND	<1.0	<1.0	<1	<0.50	<0.50	<0.50	0.9	<0.50
Fluoride (F)	mg/L	1.5 <sup>(2)</sup>	0.13	0.12	<0.10	<0.01	-	0.039	0.041	0.045	0.028	0.048
Nitrate (as N)	mg/L	10 <sup>(2)</sup>	ND	ND	0.034	0.01	<0.01	0.0061	0.0104	0.036	0.0473	0.0337
Nitrite (as N)	mg/L	1.0 <sup>(2)</sup>	ND	ND	<0.01	<0.01	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Sulfate (SO4)	mg/L	500 <sup>(2)</sup>	-	1.13	1.5	1.6	1.5	1.15	0.93	1.04	0.37	1.34
Total Organic Carbon	mg/L	-	-	ND	<0.50	<0.50	-	<0.50	<0.50	<0.50	<0.50	<0.50
BOD	mg/L	-	-	-	-	-	-	-	-	-	-	-
COD	mg/L	-	-	-	-	-	-	<20	<20	<20	<20	<20
<b>Dissolved Metals</b>												
Aluminum (Al)-Dissolved	mg/L	9.5 <sup>(2)</sup>	ND	0.0101	<0.0050	0.0073	0.0146	0.0038	0.0022	0.0024	0.0023	0.0032
Antimony (Sb)-Dissolved	mg/L	0.006 <sup>(2)</sup>	ND	ND	<0.00010	<0.00010	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	mg/L	0.01 <sup>(2)</sup>	ND	0.00052	0.00065	0.0006	0.00093	0.00051	0.00058	0.00113	0.00079	0.00098
Barium (Ba)-Dissolved	mg/L	1.0 <sup>(2)</sup>	ND	0.00058	0.00087	0.0061	0.00631	0.00797	0.0111	0.0103	0.0108	0.0108
Beryllium (Be)-Dissolved	mg/L	0.008 <sup>(2)</sup>	ND	ND	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth - Dissolved	mg/L	-	ND	ND	<0.00010	<0.00010	<0.00010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved	mg/L	5.0 <sup>(2)</sup>	ND	ND	<0.004	0.0241	<0.0050	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved	mg/L	0.005 <sup>(2)</sup>	ND	ND	<0.00001	<0.000010	0.000021	0.000338	0.000322	<0.000050	<0.000050	0.0000129
Calcium (Ca)-Dissolved	mg/L	-	-	-	21.5	11.9	-	13.5	16.8	21.8	19.1	23.5
Cesium (Cs) - Dissolved	mg/L	-	-	-	-	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010
Chromium (Cr)-Dissolved	mg/L	0.05 - 6.0 <sup>(2)</sup>	ND	ND	<0.0005	0.00069	<0.00050	0.00019	0.00035	0.00029	0.00015	0.00031
Cobalt (Co)-Dissolved	mg/L	0.001 <sup>(2)</sup>	ND	ND	<0.00005	0.00079	<0.00010	0.00025	<0.00010	<0.00010	<0.00010	0.00015
Copper (Cu)-Dissolved	mg/L	1.5 <sup>(2)</sup> AO	0.00093	ND	0.0079	0.00841	0.0209	0.0211	0.00366	0.00315	0.00199	0.00249
Iron (Fe)-Dissolved	mg/L	6.5 <sup>(2)</sup>	ND	ND	0.016	<0.010	<0.010	0.012	0.014	<0.010	0.025	<0.010
Lead (Pb)-Dissolved	mg/L	0.01 <sup>(2)</sup>	ND	ND	0.0006	0.00028	0.00086	0.000922	0.000051	0.000135	0.000065	0.000085
Lithium (Li)-Dissolved	mg/L	0.008 <sup>(2)</sup>	ND	ND	0.0007	0.00464	0.00078	0.0017	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium (Mg)-Dissolved	mg/L	-	0.277	ND	1.36	5.52	1.38	4.95	1.32	1.33	1.45	1.64
Manganese (Mn)-Dissolved	mg/L	1.5 <sup>(2)</sup>	0.0178	0.0053	0.00569	0.00496	0.00885	0.0145	0.0316	0.00025	0.00597	0.00289
Mercury (Hg)-Dissolved	mg/L	0.001 <sup>(2)</sup>	ND	ND	<0.00002	<0.000020	<0.000010	<0.0000050	<0.0000050	<0.0000050	0.0000231	<0.0000050
Molybdenum (Mo)-Dissolved	mg/L	0.25 <sup>(2)</sup>	ND	0.000222	<0.00010	0.00013	0.00012	0.000129	0.000251	0.000052	0.000152	0.00009
Nickel (Ni)-Dissolved	mg/L	0.08 <sup>(2)</sup>	-	-	<0.0002	0.00174	0.00115	0.00120	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus - Dissolved	mg/L	-	-	-	<0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	mg/L	-	-	-	0.51	0.46	-	0.563	0.505	0.524	0.53	0.553
Rubidium (Rd) - Dissolved	mg/L	-	-	-	-	-	-	-	0.00028	0.00032	0.00031	0.00034
Selenium (Se)-Dissolved	mg/L	0.01 <sup>(2)</sup>	ND	ND	<0.00050	<0.00050	<0.00050	0.000080	<0.000050	0.00008	0.000111	0.000101
Silicon - Dissolved	mg/L	-	ND	ND	5.1	4.5	5.2	4.14	4.01	5.11	4.01	4.65
Silver (Ag)-Dissolved	mg/L	0.02 <sup>(2)</sup>	ND	ND	<0.00005	<0.000050	<0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L	200 <sup>(2)</sup>	1.43	1.28	1.74	1.68	1.78	1.62	1.67	1.77	1.67	1.75
Strontium - Dissolved	mg/L	-	0.0286	0.0283	0.0803	0.0424	0.0761	0.0496	0.0705	0.0794	0.0829	0.0922
Sulfur - Dissolved	mg/L	-	-	-	<3.0	<3.0	<3.0	<5.0	0.58	<5.0	<5.0	<5.0
Tellurium - Dissolved	mg/L	-	-	-	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Dissolved	mg/L	-	-	-	<0.00002	<0.000020	<0.000020	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium - Dissolved	mg/L	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L	2.5 <sup>(2)</sup>	ND	ND	<0.00020	<0.00020	<0.00020	0.00081	0.00026	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L	-	-	-	<0.0050	<0.0050	-	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Tungsten (W) - Dissolved	mg/L	0.003 <sup>(2)</sup>	-	-	-	-	-	0.00012	0.00028	<0.00010	0.00066	0.00029
Uranium (U)-Dissolved	mg/L	0.020	ND	ND	<0.00002	<0.000020	0.000026	-	0.000013	0.000022	0.000017	0.000021
Vanadium (V)-Dissolved	mg/L	0.020 <sup>(2)</sup>	ND	ND	<0.0010	<0.0010	<0.0010	-	<0.00050	0.00099	0.00074	0.00077
Zinc (Zn)-Dissolved	mg/L	3.0 <sup>(2)</sup>	ND	ND	0.0111	0.0169	0.0302	-	0.0158	0.0073	0.0054	0.0053
Zirconium - Dissolved	mg/L	-	ND	ND	<0.00010	<0.00010	<0.00010	-	<0.000060	<0.000060	<0.000060	<0.00020

NOTES

- (1) BC MoE Approved and Working Water Quality Guidelines, last updated March 2018
- (2) BC Contaminated Sites Regulation (CSR) for drinking water, Schedule 3.2, last updated January 2019
- (3) All criteria limits for BCWQG - Drinking Quality Guidelines based on Total Metal Concentration except Aluminum (Dissolved)
- (4) BC MoE Water Quality Guidelines for Protection of Wildlife
- (a) Range based on max pH 8.5 to min pH 6.5 at temperature of 6.0 °C
- (b) at pH less than 6.5, limit is determined by regression equation, else limit is 0.1 mg/L.
- (c) Limit for dissolved metals, not total metals
- (d) Limit dependent upon hardness.
- (e) Limit for chromium(VI) - data reported by lab as total chromium - limit assumes 100% chromium VI in sample
- (f) Where hardness data was unavailable, 50 mg/L was assumed
- (g) Maximum value
- (h) Limit dependent upon chloride concentration
- (i) Change of 25 mg/L from background for a duration of 24 hours during clear flows. Change of 10% of background during turbid flows

\* Criteria exceeds detection limit  
 MAC = Maximum Acceptable Concentration  
 AO = Aesthetic Objective

CSR-DW BC Contaminated Sites Regulation Water Quality Guidelines for Drinking Water

Table 5: Groundwater Quality Results Sampling Location MW-3 (E251532)

QA/QC Check		BC MoE Guidelines CSR-DW (2)	11-Jun-19	29-Jun-20	14-Aug-20	4-Nov-20	3-Mar-21	24-Jun-21	24-Aug-21	3-Nov-21
Field	Units		Dry Well	Monitor	Monitor	Sample	Monitor	Monitor	Monitor	Sample
Conductivity	uS/cm	-	-	84	102	85.4	76.7	93	89.6	78.6
SPC	uS/cm	-	-	-	-	128.6	122.1	-	109.8	129.8
pH	pH	-	-	-	-	8.23	8.24	-	8.36	8.41
Dissolved Oxygen	mg/L	-	-	-	-	7	10.6	-	9.4	11.4
Temperature	°C	-	-	5.3	5.2	5.2	5.4	5.7	15.3	7
Depth to Water	m	-	-	44.47	47.42	45.69	41.14	38.43	No results	41.12
Depth to Bottom	m	-	-	-	-	-	44.84	54.12	Around 40.4	49.29
Elevation of Well	m	-	-	-	-	225	-	-	-	-
Casing Height	m	-	-	-	-	-	-	0.77	1.07	1.07
<b>Analyte</b>	<b>Units</b>									
Conductivity	uS/cm	-	-	-	-	137	-	-	-	120
Hardness (as CaCO3)	mg/L	-	-	-	-	-	-	-	-	-
Hardness (as CaCO3), dissolved	mg/L	-	-	-	-	65.3	-	-	-	55.6
pH	pH	-	-	-	-	8.02	-	-	-	7.96
Total Suspended Solids	mg/L	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	-	-	-	-	-	-	-	-
Alkalinity, Total (as CaCO3)	mg/L	-	-	-	-	66.8	-	-	-	66
Ammonia, Total (as N)	mg/L	-	-	-	-	0.006	-	-	-	<0.0050
Total Nitrogen as N	mg/L	-	-	-	-	-	-	-	-	-
TKN	mg/L	-	-	-	-	<0.050	-	-	-	<0.050
Bromide (Br)	mg/L	-	-	-	-	-	-	-	-	<0.050
Chloride (Cl)	mg/L	250 <sup>(2)</sup>	-	-	-	<0.50	-	-	-	<0.50
Fluoride (F)	mg/L	1.5 <sup>(2)</sup>	-	-	-	0.047	-	-	-	0.056
Nitrate (as N)	mg/L	10 <sup>(2)</sup>	-	-	-	0.0353	-	-	-	0.0338
Nitrite (as N)	mg/L	1.0 <sup>(2)</sup>	-	-	-	0.0013	-	-	-	<0.0010
Sulfate (SO4)	mg/L	500 <sup>(2)</sup>	-	-	-	1.45	-	-	-	1.33
Total Organic Carbon	mg/L	-	-	-	-	0.74	-	-	-	1.06
BOD	mg/L	-	-	-	-	-	-	-	-	-
COD	mg/L	-	-	-	-	<20	-	-	-	<20
<b>Dissolved Metals</b>										
Aluminum (Al)-Dissolved	mg/L	9.5 <sup>(2)</sup>	-	-	-	0.0032	-	-	-	0.0028
Antimony (Sb)-Dissolved	mg/L	0.006 <sup>(2)</sup>	-	-	-	<0.00010	-	-	-	<0.00010
Arsenic (As)-Dissolved	mg/L	0.01 <sup>(2)</sup>	-	-	-	0.0012	-	-	-	0.00113
Barium (Ba)-Dissolved	mg/L	1.0 <sup>(2)</sup>	-	-	-	0.0112	-	-	-	0.00980
Beryllium (Be)-Dissolved	mg/L	0.008 <sup>(2)</sup>	-	-	-	<0.000100	-	-	-	<0.000100
Bismuth - Dissolved	mg/L	-	-	-	-	<0.000050	-	-	-	<0.000050
Boron (B)-Dissolved	mg/L	5.0 <sup>(2)</sup>	-	-	-	<0.010	-	-	-	<0.010
Cadmium (Cd)-Dissolved	mg/L	0.005 <sup>(2)</sup>	-	-	-	<0.000050	-	-	-	<0.000050
Calcium (Ca)-Dissolved	mg/L	-	-	-	-	23.6	-	-	-	20.1
Cesium (Cs) - Dissolved	mg/L	-	-	-	-	<0.000010	-	-	-	<0.000010
Chromium (Cr)-Dissolved	mg/L	0.05 - 6.0 <sup>(2)</sup>	-	-	-	0.0033	-	-	-	<0.00050
Cobalt (Co)-Dissolved	mg/L	0.001 <sup>(2)</sup>	-	-	-	<0.00010	-	-	-	<0.00010
Copper (Cu)-Dissolved	mg/L	1.5 <sup>(2)</sup> AO	-	-	-	0.00137	-	-	-	0.00113
Iron (Fe)-Dissolved	mg/L	6.5 <sup>(2)</sup>	-	-	-	<0.010	-	-	-	<0.010
Lead (Pb)-Dissolved	mg/L	0.01 <sup>(2)</sup>	-	-	-	<0.000050	-	-	-	<0.000050
Lithium (Li)-Dissolved	mg/L	0.008 <sup>(2)</sup>	-	-	-	<0.0010	-	-	-	<0.0010
Magnesium (Mg)-Dissolved	mg/L	-	-	-	-	1.54	-	-	-	1.31
Manganese (Mn)-Dissolved	mg/L	1.5 <sup>(2)</sup>	-	-	-	0.00056	-	-	-	0.00328
Mercury (Hg)-Dissolved	mg/L	0.001 <sup>(2)</sup>	-	-	-	<0.0000050	-	-	-	<0.0000050
Molybdenum (Mo)-Dissolved	mg/L	0.25 <sup>(2)</sup>	-	-	-	<0.000050	-	-	-	0.000054
Nickel (Ni)-Dissolved	mg/L	0.08 <sup>(2)</sup>	-	-	-	<0.00050	-	-	-	<0.00050
Phosphorus - Dissolved	mg/L	-	-	-	-	<0.050	-	-	-	<0.050
Potassium (K)-Dissolved	mg/L	-	-	-	-	0.576	-	-	-	0.522
Rubidium (Rd) - Dissolved	mg/L	-	-	-	-	0.00033	-	-	-	0.00030
Selenium (Se)-Dissolved	mg/L	0.01 <sup>(2)</sup>	-	-	-	0.0015	-	-	-	0.000084
Silicon - Dissolved	mg/L	-	-	-	-	5.08	-	-	-	4.98
Silver (Ag)-Dissolved	mg/L	0.02 <sup>(2)</sup>	-	-	-	<0.000010	-	-	-	<0.000010
Sodium (Na)-Dissolved	mg/L	200 <sup>(2)</sup>	-	-	-	1.86	-	-	-	1.67
Strontium - Dissolved	mg/L	-	-	-	-	0.0964	-	-	-	0.0801
Sulfur - Dissolved	mg/L	-	-	-	-	0.58	-	-	-	<0.50
Tellurium - Dissolved	mg/L	-	-	-	-	<0.00020	-	-	-	<0.00020
Thallium (Tl)-Dissolved	mg/L	-	-	-	-	<0.000010	-	-	-	<0.000010
Thorium - Dissolved	mg/L	-	-	-	-	<0.00010	-	-	-	<0.00010
Tin (Sn)-Dissolved	mg/L	2.5 <sup>(2)</sup>	-	-	-	<0.00010	-	-	-	<0.00010
Titanium (Ti)-Dissolved	mg/L	-	-	-	-	<0.00030	-	-	-	<0.00030
Tungston (W)- Dissolved	mg/L	0.003 <sup>(2)</sup>	-	-	-	<0.00010	-	-	-	0.00013
Uranium (U)-Dissolved	mg/L	0.020	-	-	-	0.000022	-	-	-	0.000020
Vanadium (V)-Dissolved	mg/L	0.020 <sup>(2)</sup>	-	-	-	0.00096	-	-	-	0.00098
Zinc (Zn)-Dissolved	mg/L	3.0 <sup>(2)</sup>	-	-	-	0.0023	-	-	-	0.0035
Zirconium - Dissolved	mg/L	-	-	-	-	<0.00020	-	-	-	<0.00020

NOTES

- (1) BC MoE Approved and Working Water Quality Guidelines, last updated March 2018
- (2) BC Contaminated Sites Regulation (CSR) for drinking water, Schedule 3.2, last updated January
- (3) All criteria limits for BCWQG - Drinking Quality Guidelines based on Total Metal Concentration
- (4) BC MoE Water Quality Guidelines for Protection of Wildlife
- (a) Range based on max pH 8.5 to min pH 6.5 at temperature of 6.0 °C
- (b) at pH less than 6.5, limit is determined by regression equation, else limit is 0.1 mg/L.
- (c) Limit for dissolved metals, not total metals
- (d) Limit dependent upon hardness.
- (e) Limit for chromium(VI) - data reported by lab as total chromium - limit assumes 100% chromium
- (f) Where hardness data was unavailable, 50 mg/L was assumed
- (g) Maximum value
- (h) Limit dependent upon chloride concentration
- (i) Change of 25 mg/L from background for a duration of 24 hours during clear flows. Change of 10

\* Criteria exceeds detection limit  
 MAC = Maximum Acceptable Concentration  
 AO = Aesthetic Objective

CSR-DW BC Contaminated Sites Regulation Water Quality



Table 8: Groundwater Quality Results Sampling Location MW-4 (E251533)

Date		BC MoE Guidelines CSR-DW (2)	22-Oct-12	2-Apr-13	13-Jun-13	6-Apr-17	7-Jul-17	3-Oct-17	15-Nov-17	11-Apr-18	18-Jul-18	20-Nov-18	27-Mar-19	11-Jun-19
QA/QC Check														
Field	Units		Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Monitor
Conductivity	uS/cm	-	-	-	-	57	61	33.5	33.3	40.8	66	68	47.9	68
SPC	uS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-
pH	pH	-	-	-	-	7.8	7.9	8.2	8.04	7.96	7.33	6.6	7.66	-
Dissolved Oxygen	mg/L	-	-	-	-	-	1.5	8.9	6.4	5.9	5.5	8.6	8	-
Temperature	°C	-	-	-	-	6.3	5.6	6.1	5	5.3	5.5	5.5	4.6	5.6
Depth to Water	m	-	-	-	-	-	-	-	24.4	24.62	24.19	24.99	25.57	25.71
Depth to Bottom	m	-	-	-	-	-	-	-	-	-	-	-	-	-
Elevation of Well	m	-	-	-	-	-	-	-	-	-	-	-	-	-
Casing Height	m	-	-	-	-	-	-	-	-	-	-	-	-	-
Analyte	Units													
Conductivity	uS/cm	-	47.5	-	-	59.5	-	-	-	-	-	-	-	-
Hardness (as CaCO3)	mg/L	-	-	22.9	-	-	22.5	22.1	19.1	26.9	31.1	28.2	36	-
Hardness (as CaCO3), dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
pH	pH	-	8.5	7.4	-	8.3	8.2	8.1	7.62	7.65	-	-	7.79	-
Total Suspended Solids	mg/L	-	-	-	-	270	-	66	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	20	-	-	41	-	28	-	-	-	-	-	-
Alkalinity, Total (as CaCO3)	mg/L	-	24.3	28.7	-	-	34	28	27.7	33.2	39	32.9	37.5	-
Ammonia, Total (as N)	mg/L	-	0.06	-	-	<0.03	0.05	0.03	0.0229	0.0295	0.0266	0.0102	0.0129	-
Total Nitrogen as N	mg/L	-	0.332	-	-	-	-	0.285	-	-	-	-	-	-
TKN	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromide (Br)	mg/L	-	-	-	-	-	-	-	-	<0.050	<0.050	<0.050	<0.050	-
Chloride (Cl)	mg/L	250 <sup>(2)</sup>	ND	ND	-	<1.0	1.8	1.1	1.61	0.54	<0.50	<0.50	<0.50	-
Fluoride (F)	mg/L	1.5 <sup>(2)</sup>	0.16	0.2	-	-	<0.10	0.11	0.09	0.076	0.048	0.045	<0.020	-
Nitrate (as N)	mg/L	10 <sup>(2)</sup>	ND	ND	-	<0.01	0.071	<0.0100	0.0139	0.129	0.0618	0.0466	<0.0050	-
Nitrite (as N)	mg/L	1.0 <sup>(2)</sup>	ND	ND	-	-	<0.01	<0.01	<0.001	<0.0010	<0.0010	<0.0010	<0.0010	-
Sulfate (SO4)	mg/L	500 <sup>(2)</sup>	-	0.81	-	<1.0	<1.0	<1.0	<0.30	0.34	0.75	<0.30	<0.30	-
Total Organic Carbon	mg/L	-	-	0.75	-	-	1.41	<0.50	3.45	0.54	1.42	4.9	5.27	-
BOD	mg/L	-	-	-	-	-	-	4.4	-	-	-	-	-	-
COD	mg/L	-	-	-	-	-	-	<20	<20	<20	21	43	<20	-
Dissolved Metals														
Aluminum (Al)-Dissolved	mg/L	9.5 <sup>(2)</sup>	ND	0.0055	<0.0050	<0.0050	<0.0050	0.0178	0.0049	0.0012	0.0251	0.0036	0.0078	-
Antimony (Sb)-Dissolved	mg/L	0.006 <sup>(2)</sup>	ND	ND	<0.00050	<0.00010	<0.00010	<0.00020	0.00082	<0.00010	<0.00010	<0.00010	<0.00010	-
Arsenic (As)-Dissolved	mg/L	0.01 <sup>(2)</sup>	ND	0.000076	-	<0.00050	<0.00050	<0.00050	0.00094	<0.00010	0.00011	<0.00010	0.0001	-
Barium (Ba)-Dissolved	mg/L	1.0 <sup>(2)</sup>	0.0060	0.0052	-	0.0375	0.0098	0.0079	0.00681	0.00503	0.00998	0.00994	0.00837	-
Beryllium (Be)-Dissolved	mg/L	0.008 <sup>(2)</sup>	ND	ND	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-
Bismuth - Dissolved	mg/L	-	ND	ND	-	<0.00010	<0.00010	<0.00010	0.000601	<0.000050	<0.000050	<0.000050	0.000082	-
Boron (B)-Dissolved	mg/L	5.0 <sup>(2)</sup>	ND	ND	-	0.006	<0.0050	<0.0050	<0.010	<0.010	<0.010	<0.010	<0.010	-
Cadmium (Cd)-Dissolved	mg/L	0.005 <sup>(2)</sup>	ND	0.00002	-	<0.00001	<0.000010	0.000482	0.000484	<0.000050	0.0000125	0.0000446	0.000186	-
Calcium (Ca)-Dissolved	mg/L	-	-	-	-	-	7.46	6.4	6.16	9.37	10.9	9.86	11.7	-
Cesium (Cs) - Dissolved	mg/L	-	-	-	-	-	-	-	0.000042	<0.000010	<0.000010	<0.000010	<0.000010	-
Chromium (Cr)-Dissolved	mg/L	0.05 - 6.0 <sup>(2)</sup>	ND	ND	-	<0.0005	<0.00050	<0.00050	0.00021	<0.00010	<0.00010	<0.00010	<0.00010	-
Cobalt (Co)-Dissolved	mg/L	0.001 <sup>(2)</sup>	ND	0.0076	-	<0.00005	<0.00010	<0.00010	0.00025	<0.00010	<0.00010	<0.00010	<0.00010	-
Copper (Cu)-Dissolved	mg/L	1.5 <sup>(2)</sup> AO	0.00066	ND	-	0.0077	0.00035	0.0021	0.00372	<0.00020	0.0066	0.00177	0.00114	-
Iron (Fe)-Dissolved	mg/L	6.5 <sup>(2)</sup>	ND	0.0338	-	0.011	<0.010	<0.010	0.018	<0.010	0.536	0.022	0.073	-
Lead (Pb)-Dissolved	mg/L	0.01 <sup>(2)</sup>	ND	ND	-	<0.0001	<0.00010	<0.00020	0.000450	<0.000050	0.000302	<0.000050	<0.000050	-
Lithium (Li)-Dissolved	mg/L	0.008 <sup>(2)</sup>	ND	ND	-	0.0004	0.00072	0.00054	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
Magnesium (Mg)-Dissolved	mg/L	-	0.729	0.68	-	0.742	0.938	0.921	0.895	0.837	0.964	0.874	1.61	-
Manganese (Mn)-Dissolved	mg/L	1.5 <sup>(2)</sup>	0.0963	0.348	-	0.0237	<0.00020	0.0558	0.0674	0.0067	0.0152	0.0647	0.00344	-
Mercury (Hg)-Dissolved	mg/L	0.001 <sup>(2)</sup>	ND	ND	-	<0.00002	<0.000020	<0.000010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-
Molybdenum (Mo)-Dissolved	mg/L	0.25 <sup>(2)</sup>	ND	0.000116	-	0.00014	<0.00010	0.00014	0.000355	0.000122	0.000136	0.000085	<0.000050	-
Nickel (Ni)-Dissolved	mg/L	0.08 <sup>(2)</sup>	-	-	-	0.0005	0.00022	0.00071	0.00122	<0.00050	<0.00050	<0.00050	<0.00050	-
Phosphorus - Dissolved	mg/L	-	-	-	-	<0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	-
Potassium (K)-Dissolved	mg/L	-	-	-	-	-	1.17	0.93	1.16	0.757	0.759	0.79	1.06	-
Rubidium (Rd) - Dissolved	mg/L	-	-	-	-	-	-	-	0.00061	0.00025	0.00027	0.00023	0.00031	-
Selenium (Se)-Dissolved	mg/L	0.01 <sup>(2)</sup>	ND	ND	-	<0.00050	<0.00050	<0.00050	0.000866	<0.000050	<0.000050	<0.000050	0.000058	-
Silicon - Dissolved	mg/L	-	ND	ND	-	0.9	<1.0	<1.0	0.718	1.33	2.08	1.33	3.69	-
Silver (Ag)-Dissolved	mg/L	0.02 <sup>(2)</sup>	ND	ND	-	<0.00005	<0.000050	<0.000050	0.000017	<0.000010	<0.000010	<0.000010	<0.000010	-
Sodium (Na)-Dissolved	mg/L	200 <sup>(2)</sup>	1.81	1.52	-	2.34	2.71	2.46	3.13	2.04	1.9	1.93	2.62	-
Strontium - Dissolved	mg/L	-	0.0484	0.0503	-	0.0502	0.0614	0.0573	0.0536	0.0591	0.0635	0.0604	0.0729	-
Sulfur - Dissolved	mg/L	-	-	-	-	<3.0	<3.0	<3.0	<0.50	<0.50	<0.50	<0.50	0.55	-
Tellurium - Dissolved	mg/L	-	-	-	-	<0.00020	<0.00020	<0.00050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	-
Thallium (Tl)-Dissolved	mg/L	-	-	-	-	<0.00002	<0.000020	<0.000020	0.000851	<0.000010	<0.000010	<0.000010	<0.000010	-
Thorium - Dissolved	mg/L	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-
Tin (Sn)-Dissolved	mg/L	2.5 <sup>(2)</sup>	ND	ND	-	<0.00020	<0.00020	<0.00020	0.00235	<0.00010	<0.00010	0.0009	0.00069	-
Titanium (Ti)-Dissolved	mg/L	-	-	-	-	-	<0.0050	<0.0050	<0.00030	<0.00030	0.00056	<0.00030	<0.00030	-
Tungsten (W) - Dissolved	mg/L	0.003 <sup>(2)</sup>	-	-	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-
Uranium (U)-Dissolved	mg/L	0.020	ND	ND	-	<0.00002	<0.000020	-	<0.000010	<0.000010	0.00011	<0.000010	0.000013	-
Vanadium (V)-Dissolved	mg/L	0.020 <sup>(2)</sup>	ND	ND	-	<0.0010	<0.0010	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-
Zinc (Zn)-Dissolved	mg/L	3.0 <sup>(2)</sup>	ND	ND	-	0.008	<0.0040	-	0.0038	<0.0010	0.0058	<0.0010	0.002	-
Zirconium - Dissolved	mg/L	-	ND	ND	-	<0.00010	<0.00010	-	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060	-

NOTES

- (1) BC MoE Approved and Working Water Quality Guidelines, last updated March 2018
- (2) BC Contaminated Sites Regulation (CSR) for drinking water, Schedule 3.2, last updated January 2019
- (3) All criteria limits for BCWQG - Drinking Quality Guidelines based on Total Metal Concentration except Aluminum (Dissolved)
- (4) BC MoE Water Quality Guidelines for Protection of Wildlife
- (a) Range based on max pH 8.5 to min pH 6.5 at temperature of 6.0 °C
- (b) at pH less than 6.5, limit is determined by regression equation, else limit is 0.1 mg/L.
- (c) Limit for dissolved metals, not total metals
- (d) Limit dependent upon hardness.
- (e) Limit for chromium(VI) - data reported by lab as total chromium - limit assumes 100% chromium VI in sample
- (f) Where hardness data was unavailable, 50 mg/L was assumed
- (g) Maximum value
- (h) Limit dependent upon chloride concentration
- (i) Change of 25 mg/L from background for a duration of 24 hours during clear flows. Change of 10% of background during turbid flows

\* Criteria exceeds detection limit  
 MAC = Maximum Acceptable Concentration  
 AO = Aesthetic Objective

CSR-DW BC Contaminated Sites Regulation Water Quality Guidelines for Drinking Water

Table 8: Groundwater Quality Results Sampling Location MW-4 (E251533)

Date		BC MoE Guidelines CSR-DW (2)	26-Mar-19	29-Jun-20	14-Aug-20	3-Nov-20	31-Mar-21	24-Jun-21	26-Aug-21	3-Nov-21
QA/QC Check			Dry							HS
Field	Units		Well Dry	Monitor	Monitor	Insufficient water for sample	Monitor (see note)	Monitor	Monitor	Sample
Conductivity	uS/cm	-	68	68	79	101	-	62	62	37.5
SPC	uS/cm	-	-	-	-	-	-	-	-	50.2
pH	pH	-	-	-	-	-	-	-	-	8.92
Dissolved Oxygen	mg/L	-	-	-	-	-	-	-	-	6.5
Temperature	°C	-	5.8	5.8	5.5	5.5	-	5.5	5.6	5.6
Depth to Water	m	-	25.87	25.83	26.02	25.72	-	24.85	20.38	21.44
Depth to Bottom	m	-	-	-	-	-	-	26.36	26.44	26.08
Elevation of Well	m	-	-	-	-	193	-	-	-	-
Casing Height	m	-	-	-	-	1.14	-	1.1	1.19	1.19
<b>Analyte</b>	<b>Units</b>									
Conductivity	uS/cm	-	-	-	-	-	-	-	-	69.5
Hardness (as CaCO3)	mg/L	-	-	-	-	-	-	-	-	-
Hardness (as CaCO3), dissolved	mg/L	-	-	-	-	-	-	-	-	27.1
pH	pH	-	-	-	-	-	-	-	-	8.1
Total Suspended Solids	mg/L	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	-	-	-	-	-	-	-	-
Alkalinity, Total (as CaCO3)	mg/L	-	-	-	-	-	-	-	-	44.3
Ammonia, Total (as N)	mg/L	-	-	-	-	-	-	-	-	0.0292
Total Nitrogen as N	mg/L	-	-	-	-	-	-	-	-	-
TKN	mg/L	-	-	-	-	-	-	-	-	0.178
Bromide (Br)	mg/L	-	-	-	-	-	-	-	-	<0.050
Chloride (Cl)	mg/L	250 <sup>(2)</sup>	-	-	-	-	-	-	-	<0.50
Fluoride (F)	mg/L	1.5 <sup>(2)</sup>	-	-	-	-	-	-	-	0.083
Nitrate (as N)	mg/L	10 <sup>(2)</sup>	-	-	-	-	-	-	-	0.0316
Nitrite (as N)	mg/L	1.0 <sup>(2)</sup>	-	-	-	-	-	-	-	<0.0010
Sulfate (SO4)	mg/L	500 <sup>(2)</sup>	-	-	-	-	-	-	-	1.13
Total Organic Carbon	mg/L	-	-	-	-	-	-	-	-	6.71
BOD	mg/L	-	-	-	-	-	-	-	-	-
COD	mg/L	-	-	-	-	-	-	-	-	81
<b>Dissolved Metals</b>										
Aluminum (Al)-Dissolved	mg/L	9.5 <sup>(2)</sup>	-	-	-	-	-	-	-	0.0143
Antimony (Sb)-Dissolved	mg/L	0.006 <sup>(2)</sup>	-	-	-	-	-	-	-	<0.00010
Arsenic (As)-Dissolved	mg/L	0.01 <sup>(2)</sup>	-	-	-	-	-	-	-	<0.00010
Barium (Ba)-Dissolved	mg/L	1.0 <sup>(2)</sup>	-	-	-	-	-	-	-	0.00629
Beryllium (Be)-Dissolved	mg/L	0.008 <sup>(2)</sup>	-	-	-	-	-	-	-	<0.000100
Bismuth - Dissolved	mg/L	-	-	-	-	-	-	-	-	<0.000050
Boron (B)-Dissolved	mg/L	5.0 <sup>(2)</sup>	-	-	-	-	-	-	-	<0.010
Cadmium (Cd)-Dissolved	mg/L	0.005 <sup>(2)</sup>	-	-	-	-	-	-	-	0.0000168
Calcium (Ca)-Dissolved	mg/L	-	-	-	-	-	-	-	-	9.40
Cesium (Cs) - Dissolved	mg/L	-	-	-	-	-	-	-	-	<0.000010
Chromium (Cr)-Dissolved	mg/L	0.05 - 6.0 <sup>(2)</sup>	-	-	-	-	-	-	-	<0.00050
Cobalt (Co)-Dissolved	mg/L	0.001 <sup>(2)</sup>	-	-	-	-	-	-	-	<0.00010
Copper (Cu)-Dissolved	mg/L	1.5 <sup>(2)</sup> AO	-	-	-	-	-	-	-	0.00088
Iron (Fe)-Dissolved	mg/L	6.5 <sup>(2)</sup>	-	-	-	-	-	-	-	0.819
Lead (Pb)-Dissolved	mg/L	0.01 <sup>(2)</sup>	-	-	-	-	-	-	-	0.000090
Lithium (Li)-Dissolved	mg/L	0.008 <sup>(2)</sup>	-	-	-	-	-	-	-	<0.0010
Magnesium (Mg)-Dissolved	mg/L	-	-	-	-	-	-	-	-	0.884
Manganese (Mn)-Dissolved	mg/L	1.5 <sup>(2)</sup>	-	-	-	-	-	-	-	0.0129
Mercury (Hg)-Dissolved	mg/L	0.001 <sup>(2)</sup>	-	-	-	-	-	-	-	<0.000050
Molybdenum (Mo)-Dissolved	mg/L	0.25 <sup>(2)</sup>	-	-	-	-	-	-	-	0.000051
Nickel (Ni)-Dissolved	mg/L	0.08 <sup>(2)</sup>	-	-	-	-	-	-	-	<0.00050
Phosphorus - Dissolved	mg/L	-	-	-	-	-	-	-	-	<0.050
Potassium (K)-Dissolved	mg/L	-	-	-	-	-	-	-	-	0.893
Rubidium (Rd) - Dissolved	mg/L	-	-	-	-	-	-	-	-	0.00024
Selenium (Se)-Dissolved	mg/L	0.01 <sup>(2)</sup>	-	-	-	-	-	-	-	<0.000050
Silicon - Dissolved	mg/L	-	-	-	-	-	-	-	-	1.96
Silver (Ag)-Dissolved	mg/L	0.02 <sup>(2)</sup>	-	-	-	-	-	-	-	<0.000010
Sodium (Na)-Dissolved	mg/L	200 <sup>(2)</sup>	-	-	-	-	-	-	-	1.89
Strontium - Dissolved	mg/L	-	-	-	-	-	-	-	-	0.0603
Sulfur - Dissolved	mg/L	-	-	-	-	-	-	-	-	<0.50
Tellurium - Dissolved	mg/L	-	-	-	-	-	-	-	-	<0.00020
Thallium (Tl)-Dissolved	mg/L	-	-	-	-	-	-	-	-	<0.000010
Thorium - Dissolved	mg/L	-	-	-	-	-	-	-	-	<0.00010
Tin (Sn)-Dissolved	mg/L	2.5 <sup>(2)</sup>	-	-	-	-	-	-	-	0.00012
Titanium (Ti)-Dissolved	mg/L	-	-	-	-	-	-	-	-	0.00034
Tungston (W) - Dissolved	mg/L	0.003 <sup>(2)</sup>	-	-	-	-	-	-	-	<0.00010
Uranium (U)-Dissolved	mg/L	0.020	-	-	-	-	-	-	-	<0.000010
Vanadium (V)-Dissolved	mg/L	0.020 <sup>(2)</sup>	-	-	-	-	-	-	-	<0.00050
Zinc (Zn)-Dissolved	mg/L	3.0 <sup>(2)</sup>	-	-	-	-	-	-	-	0.0010
Zirconium - Dissolved	mg/L	-	-	-	-	-	-	-	-	<0.00020

NOTES

- (1) BC MoE Approved and Working Water Quality Guidelines, last updated March 2018
- (2) BC Contaminated Sites Regulation (CSR) for drinking water, Schedule 3.2, last updated
- (3) All criteria limits for BCWQG - Drinking Quality Guidelines based on Total Metal Cc
- (4) BC MoE Water Quality Guidelines for Protection of Wildlife
- (a) Range based on max pH 8.5 to min pH 6.5 at temperature of 6.0 °C
- (b) at pH less than 6.5, limit is determined by regression equation, else limit is 0.1 mg/L.
- (c) Limit for dissolved metals, not total metals
- (d) Limit dependent upon hardness.
- (e) Limit for chromium(VI) - data reported by lab as total chromium - limit assumes 100%
- (f) Where hardness data was unavailable, 50 mg/L was assumed
- (g) Maximum value
- (h) Limit dependent upon chloride concentration
- (i) Change of 25 mg/L from background for a duration of 24 hours during clear flows. CA

\* Criteria exceeds detection limit  
 MAC = Maximum Acceptable Concentration  
 AO = Aesthetic Objective

CSR-DW BC Contaminated Sites Regulation Water Quali



Table 12: Groundwater Quality Results Sampling Location MW-5 (E251534)

		BC MoE Guidelines	22-Oct-12	3-Apr-13	13-Jun-13	5-Apr-17	11-Jun-19	29-Jun-20	14-Aug-20	4-Nov-20	31-Mar-21	24-Jun-21
								Well locked, no access	Well locked, no access	Well locked, no access	Well locked, no access	Well locked, no access
Field	Units	CSR-DW (2)	Sample	Sample	Sample	Sample	Well Dry	Monitor	Monitor	Monitor	Monitor	Monitor
Conductivity	uS/cm	-	-	-	-	116	-	-	-	-	-	-
pH	pH	-	-	-	-	7.4	-	-	-	-	-	-
Dissolved Oxygen	mg/L	-	-	-	-	-	-	-	-	-	-	-
Temperature	°C	-	-	-	-	-	-	-	-	-	-	-
Depth to Water	m	-	-	-	-	-	-	-	-	-	-	-
Depth to Bottom	m	-	-	-	-	-	-	-	-	-	-	-
Well Elevation	m	-	-	-	-	-	-	-	-	206	-	-
Casing Height	m	-	-	-	-	-	-	-	-	-	-	-
<b>Analyte</b>	<b>Units</b>											
Conductivity	uS/cm	-	102	-	-	116	-	-	-	-	-	-
Hardness (as CaCO3)	mg/L	-	-	52.3	-	-	-	-	-	-	-	-
Hardness (as CaCO3), dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	-
pH	pH	-	7.5	7.3	-	7.4	-	-	-	-	-	-
Total Suspended Solids	mg/L	-	-	-	-	7.7	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	48	-	-	70	-	-	-	-	-	-
Alkalinity, Total (as CaCO3)	mg/L	-	53.1	57.8	-	-	-	-	-	-	-	-
Ammonia, Total (as N)	mg/L	-	ND	-	-	<0.03	-	-	-	-	-	-
Chloride (Cl)	mg/L	-	ND	ND	<0.50	<1.0	-	-	-	-	-	-
Fluoride (F)	mg/L	250 <sup>(2)</sup>	ND	ND	-	<0.1	-	-	-	-	-	-
Nitrate (as N)	mg/L	1.5 <sup>(2)</sup>	ND	0.021	-	-	-	-	-	-	-	-
Nitrite (as N)	mg/L	10 <sup>(2)</sup>	ND	ND	-	<0.01	-	-	-	-	-	-
Sulfate (SO4)	mg/L	1.0 <sup>(2)</sup>	ND	2.03	-	-	-	-	-	-	-	-
Total Organic Carbon	mg/L	500 <sup>(2)</sup>	-	ND	-	<0.50	-	-	-	-	-	-
BOD	mg/L	-	-	-	-	-	-	-	-	-	-	-
COD	mg/L	-	-	-	-	-	-	-	-	-	-	-
<b>Dissolved Metals</b>												
Aluminum (Al)-Dissolved	mg/L	9.5 <sup>(2)</sup>	ND	0.0036	<0.0050	<0.0050	-	-	-	-	-	-
Antimony (Sb)-Dissolved	mg/L	0.006 <sup>(2)</sup>	ND	0.000106	<0.00050	<0.00010	-	-	-	-	-	-
Arsenic (As)-Dissolved	mg/L	0.01 <sup>(2)</sup>	ND	0.000074	<0.00050	<0.00050	-	-	-	-	-	-
Barium (Ba)-Dissolved	mg/L	1.0 <sup>(2)</sup>	0.0060	0.0044	-	<0.0050	-	-	-	-	-	-
Beryllium (Be)-Dissolved	mg/L	0.008 <sup>(2)</sup>	ND	ND	-	<0.00010	-	-	-	-	-	-
Bismuth - Dissolved	mg/L	-	ND	ND	-	<0.00010	-	-	-	-	-	-
Boron (B)-Dissolved	mg/L	5.0 <sup>(2)</sup>	ND	ND	-	0.004	-	-	-	-	-	-
Cadmium (Cd)-Dissolved	mg/L	0.005 <sup>(2)</sup>	ND	0.000016	-	<0.00001	-	-	-	-	-	-
Calcium (Ca)-Dissolved	mg/L	-	6.40	18.20	-	18.8	-	-	-	-	-	-
Cesium (Cs)- Dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	-
Chromium (Cr)-Dissolved	mg/L	0.05 - 6.0 <sup>(2)</sup>	-	-	-	-	-	-	-	-	-	-
Cobalt (Co)-Dissolved	mg/L	0.001 <sup>(2)</sup>	ND	ND	-	<0.00005	-	-	-	-	-	-
Copper (Cu)-Dissolved	mg/L	1.5 <sup>(2)</sup> AO	0.00066	0.00678	-	0.0034	-	-	-	-	-	-
Iron (Fe)-Dissolved	mg/L	6.5 <sup>(2)</sup>	ND	ND	-	0.01	-	-	-	-	-	-
Lead (Pb)-Dissolved	mg/L	0.01 <sup>(2)</sup>	ND	ND	-	<0.0001	-	-	-	-	-	-
Lithium (Li)-Dissolved	mg/L	0.008 <sup>(2)</sup>	ND	0.0008	-	0.0009	-	-	-	-	-	-
Magnesium (Mg)-Dissolved	mg/L	-	0.729	1.29	-	1.35	-	-	-	-	-	-
Manganese (Mn)-Dissolved	mg/L	1.5 <sup>(2)</sup>	0.0963	0.0115	-	0.0757	-	-	-	-	-	-
Mercury (Hg)-Dissolved	mg/L	0.001 <sup>(2)</sup>	ND	ND	-	<0.00002	-	-	-	-	-	-
Molybdenum (Mo)-Dissolved	mg/L	0.25 <sup>(2)</sup>	ND	ND	-	<0.00010	-	-	-	-	-	-
Nickel (Ni)-Dissolved	mg/L	0.08 <sup>(2)</sup>	ND	0.0129	-	0.005	-	-	-	-	-	-
Phosphorus - Dissolved	mg/L	-	-	-	-	<0.05	-	-	-	-	-	-
Potassium (K)-Dissolved	mg/L	-	-	-	-	0.46	-	-	-	-	-	-
Rubidium (Rb) - Dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	-
Selenium (Se)-Dissolved	mg/L	0.01 <sup>(2)</sup>	-	-	-	-	-	-	-	-	-	-
Silicon - Dissolved	mg/L	-	ND	3.9	-	4.1	-	-	-	-	-	-
Silver (Ag)-Dissolved	mg/L	0.02 <sup>(2)</sup>	ND	ND	-	<0.00005	-	-	-	-	-	-
Sodium (Na)-Dissolved	mg/L	200 <sup>(2)</sup>	1.81	1.51	-	1.62	-	-	-	-	-	-
Strontium - Dissolved	mg/L	-	0.0484	0.0705	-	0.0694	-	-	-	-	-	-
Sulfur- Dissolved	mg/L	-	ND	ND	-	<3.0	-	-	-	-	-	-
Tellurium - Dissolved	mg/L	-	-	-	-	<0.00020	-	-	-	-	-	-
Thallium (Tl)-Dissolved	mg/L	-	-	-	-	<0.00002	-	-	-	-	-	-
Thorium - Dissolved	mg/L	-	-	-	-	<0.00010	-	-	-	-	-	-
Tin (Sn)-Dissolved	mg/L	2.5 <sup>(2)</sup>	-	-	-	<0.00020	-	-	-	-	-	-
Titanium (Ti)-Dissolved	mg/L	-	ND	ND	-	<0.0050	-	-	-	-	-	-
Tungston (W) - Dissolved	mg/L	0.003 <sup>(2)</sup>	-	-	-	-	-	-	-	-	-	-
Uranium (U)-Dissolved	mg/L	0.020	-	-	-	-	-	-	-	-	-	-
Vanadium (V)-Dissolved	mg/L	0.020 <sup>(2)</sup>	ND	ND	-	<0.0010	-	-	-	-	-	-
Zinc (Zn)-Dissolved	mg/L	3.0 <sup>(2)</sup>	ND	0.0703	-	0.0426	-	-	-	-	-	-
Zirconium - Dissolved	mg/L	-	ND	ND	-	<0.00010	-	-	-	-	-	-

**NOTES**

- (1) BC MoE Approved and Working Water Quality Guidelines, last updated March 2018
- (2) BC Contaminated Sites Regulation (CSR) for drinking water, Schedule 3.2, last updated January 2019
- (3) All criteria limits for BCWQG - Drinking Quality Guidelines based on Total Metal Concentration except Aluminum (Dissolved)
- (4) BC MoE Water Quality Guidelines for Protection of Wildlife
- (5) BC Contaminated Sites Regulation (CSR) for drinking water, Schedule 3.2
- (a) Range based on max pH 8.5 to min pH 6.5 at temperature of 6.0 °C
- (b) at pH less than 6.5, limit is determined by regression equation, else limit is 0.1 mg/L.
- (c) Limit for dissolved metals, not total metals
- (d) Limit dependent upon hardness.
- (e) Limit for chromium(VI) - data reported by lab as total chromium - limit assumes 100% chromium VI in sample
- (f) Where hardness data was unavailable, 50 mg/L was assumed
- (g) Maximum value
- (h) Limit dependent upon chloride concentration
- (i) Change of 25 mg/L from background for a duration of 24 hours during clear flows. Change of 10% of background during turbid flows

\* Criteria exceeds detection limit  
 MAC = Maximum Acceptable Concentration  
 AO = Aesthetic Objective

CSR-DW BC Contaminated Sites Regulation Water Quality Guidelines for Drinking Water

Table 12: Groundwater Quality Results Sampling Location MW-5 (E251534)

		BC MoE Guidelines	26-Aug-21	3-Nov-21
Field	Units	CSR-DW (2)	Monitor	Monitor
Conductivity	uS/cm	-	-	-
pH	pH	-	-	-
Dissolved Oxygen	mg/L	-	-	-
Temperature	°C	-	-	-
Depth to Water	m	-	-	44.33
Depth to Bottom	m	-	-	>50.36
Well Elevation	m	-	-	-
Casing Height	m	-	-	0.87
<b>Analyte</b>	<b>Units</b>			
Conductivity	uS/cm	-	-	-
Hardness (as CaCO3)	mg/L	-	-	-
Hardness (as CaCO3), dissolved	mg/L	-	-	-
pH	pH	-	-	-
Total Suspended Solids	mg/L	-	-	-
Total Dissolved Solids	mg/L	-	-	-
Alkalinity, Total (as CaCO3)	mg/L	-	-	-
Ammonia, Total (as N)	mg/L	-	-	-
Chloride (Cl)	mg/L	-	-	-
Fluoride (F)	mg/L	250 <sup>(2)</sup>	-	-
Nitrate (as N)	mg/L	1.5 <sup>(2)</sup>	-	-
Nitrite (as N)	mg/L	10 <sup>(2)</sup>	-	-
Sulfate (SO4)	mg/L	1.0 <sup>(2)</sup>	-	-
Total Organic Carbon	mg/L	500 <sup>(2)</sup>	-	-
BOD	mg/L	-	-	-
COD	mg/L	-	-	-
<b>Dissolved Metals</b>				
Aluminum (Al)-Dissolved	mg/L	9.5 <sup>(2)</sup>	-	-
Antimony (Sb)-Dissolved	mg/L	0.006 <sup>(2)</sup>	-	-
Arsenic (As)-Dissolved	mg/L	0.01 <sup>(2)</sup>	-	-
Barium (Ba)-Dissolved	mg/L	1.0 <sup>(2)</sup>	-	-
Beryllium (Be)-Dissolved	mg/L	0.008 <sup>(2)</sup>	-	-
Bismuth - Dissolved	mg/L	-	-	-
Boron (B)-Dissolved	mg/L	5.0 <sup>(2)</sup>	-	-
Cadmium (Cd)-Dissolved	mg/L	0.005 <sup>(2)</sup>	-	-
Calcium (Ca)-Dissolved	mg/L	-	-	-
Cesium (Cs)- Dissolved	mg/L	-	-	-
Chromium (Cr)-Dissolved	mg/L	0.05 - 6.0 <sup>(2)</sup>	-	-
Cobalt (Co)-Dissolved	mg/L	0.001 <sup>(2)</sup>	-	-
Copper (Cu)-Dissolved	mg/L	1.5 <sup>(2)</sup> AO	-	-
Iron (Fe)-Dissolved	mg/L	6.5 <sup>(2)</sup>	-	-
Lead (Pb)-Dissolved	mg/L	0.01 <sup>(2)</sup>	-	-
Lithium (Li)-Dissolved	mg/L	0.008 <sup>(2)</sup>	-	-
Magnesium (Mg)-Dissolved	mg/L	-	-	-
Manganese (Mn)-Dissolved	mg/L	1.5 <sup>(2)</sup>	-	-
Mercury (Hg)-Dissolved	mg/L	0.001 <sup>(2)</sup>	-	-
Molybdenum (Mo)-Dissolved	mg/L	0.25 <sup>(2)</sup>	-	-
Nickel (Ni)-Dissolved	mg/L	0.08 <sup>(2)</sup>	-	-
Phosphorus - Dissolved	mg/L	-	-	-
Potassium (K)-Dissolved	mg/L	-	-	-
Rubidium (Rb) - Dissolved	mg/L	-	-	-
Selenium (Se)-Dissolved	mg/L	0.01 <sup>(2)</sup>	-	-
Silicon - Dissolved	mg/L	-	-	-
Silver (Ag)-Dissolved	mg/L	0.02 <sup>(2)</sup>	-	-
Sodium (Na)-Dissolved	mg/L	200 <sup>(2)</sup>	-	-
Strontium - Dissolved	mg/L	-	-	-
Sulfur- Dissolved	mg/L	-	-	-
Tellurium - Dissolved	mg/L	-	-	-
Thallium (Tl)-Dissolved	mg/L	-	-	-
Thorium - Dissolved	mg/L	-	-	-
Tin (Sn)-Dissolved	mg/L	2.5 <sup>(2)</sup>	-	-
Titanium (Ti)-Dissolved	mg/L	-	-	-
Tungston (W) - Dissolved	mg/L	0.003 <sup>(2)</sup>	-	-
Uranium (U)-Dissolved	mg/L	0.020	-	-
Vanadium (V)-Dissolved	mg/L	0.020 <sup>(2)</sup>	-	-
Zinc (Zn)-Dissolved	mg/L	3.0 <sup>(2)</sup>	-	-
Zirconium - Dissolved	mg/L	-	-	-

**NOTES**

- (1) BC MoE Approved and Working Water Quality Guidelines, last updated March 2018
- (2) BC Contaminated Sites Regulation (CSR) for drinking water, Schedule 3.2, last updated January
- (3) All criteria limits for BCWQG - Drinking Quality Guidelines based on Total Metal Concentration
- (4) BC MoE Water Quality Guidelines for Protection of Wildlife
- (5) BC Contaminated Sites Regulation (CSR) for drinking water, Schedule 3.2
- (a) Range based on max pH 8.5 to min pH 6.5 at temperature of 6.0 °C
- (b) at pH less than 6.5, limit is determined by regression equation, else limit is 0.1 mg/L.
- (c) Limit for dissolved metals, not total metals
- (d) Limit dependent upon hardness.
- (e) Limit for chromium(VI) - data reported by lab as total chromium - limit assumes 100% chromium
- (f) Where hardness data was unavailable, 50 mg/L was assumed
- (g) Maximum value
- (h) Limit dependent upon chloride concentration
- (i) Change of 25 mg/L from background for a duration of 24 hours during clear flows. Change of 10

\* Criteria exceeds detection limit  
 MAC = Maximum Acceptable Concentration  
 AO = Aesthetic Objective

CSR-DW BC Contaminated Sites Regulation Water §

Groundwater Quality Results Sampling Location MW-6 (E251535)

		BC MoE Guidelines	29-Jun-20	14-Aug-20	4-Nov-20	29-Mar-21	23-Jun-21	26-Aug-21	4-Nov-21
Field	Units	CSR-DW (2)	well dry	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Conductivity	uS/cm	-	-	137	131	-	201	152	121
SPC	uS/cm	-	-	-	-	-	-	-	-
pH	pH	-	-	-	-	-	-	-	-
Dissolved Oxygen	mg/L	-	-	-	-	-	-	-	-
Temperature	°C	-	8.6	6.1	6	-	6	6	6
Depth to Water	m	-	-	33.77	34.08	31.51	29.84	29.62	30.15
Depth to Bottom	m	-	-	-	-	35.68	37.51	34.31	37.55
Elevation of Well	m	-	-	-	208	-	208	-	-
Casing Height	m	-	-	-	-	-	1.16	1.15	1.15
<b>Analyte</b>	<b>Units</b>								
Conductivity	uS/cm	-	-	-	-	-	-	-	-
Hardness (as CaCO3)	mg/L	-	-	-	-	-	-	-	-
Hardness (as CaCO3), dissolved	mg/L	-	-	-	-	-	-	-	-
pH	pH	-	-	-	-	-	-	-	-
Total Suspended Solids	mg/L	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	-	-	-	-	-	-	-
Alkalinity, Total (as CaCO3)	mg/L	-	-	-	-	-	-	-	-
Ammonia, Total (as N)	mg/L	-	-	-	-	-	-	-	-
Total Nitrogen as N	mg/L	-	-	-	-	-	-	-	-
TKN	mg/L	-	-	-	-	-	-	-	-
Bromide (Br)	mg/L	-	-	-	-	-	-	-	-
Chloride (Cl)	mg/L	-	-	-	-	-	-	-	-
Fluoride (F)	mg/L	250 <sup>(2)</sup>	-	-	-	-	-	-	-
Nitrate (as N)	mg/L	1.5 <sup>(2)</sup>	-	-	-	-	-	-	-
Nitrite (as N)	mg/L	10 <sup>(2)</sup>	-	-	-	-	-	-	-
Sulfate (SO4)	mg/L	1.0 <sup>(2)</sup>	-	-	-	-	-	-	-
Total Organic Carbon	mg/L	500 <sup>(2)</sup>	-	-	-	-	-	-	-
BOD	mg/L	-	-	-	-	-	-	-	-
COD	mg/L	-	-	-	-	-	-	-	-
<b>Dissolved Metals</b>									
Aluminum (Al)-Dissolved	mg/L	9.5 <sup>(2)</sup>	-	-	-	-	-	-	-
Antimony (Sb)-Dissolved	mg/L	0.006 <sup>(2)</sup>	-	-	-	-	-	-	-
Arsenic (As)-Dissolved	mg/L	0.01 <sup>(2)</sup>	-	-	-	-	-	-	-
Barium (Ba)-Dissolved	mg/L	1.0 <sup>(2)</sup>	-	-	-	-	-	-	-
Beryllium (Be)-Dissolved	mg/L	0.008 <sup>(2)</sup>	-	-	-	-	-	-	-
Bismuth - Dissolved	mg/L	-	-	-	-	-	-	-	-
Boron (B)-Dissolved	mg/L	5.0 <sup>(2)</sup>	-	-	-	-	-	-	-
Cadmium (Cd)-Dissolved	mg/L	0.005 <sup>(2)</sup>	-	-	-	-	-	-	-
Calcium (Ca)-Dissolved	mg/L	-	-	-	-	-	-	-	-
Cesium (Cs) - Dissolved	mg/L	-	-	-	-	-	-	-	-
Chromium (Cr)-Dissolved	mg/L	0.05 - 6.0 <sup>(2)</sup>	-	-	-	-	-	-	-
Cobalt (Co)-Dissolved	mg/L	0.001 <sup>(2)</sup>	-	-	-	-	-	-	-
Copper (Cu)-Dissolved	mg/L	1.5 <sup>(2)</sup> AO	-	-	-	-	-	-	-
Iron (Fe)-Dissolved	mg/L	6.5 <sup>(2)</sup>	-	-	-	-	-	-	-
Lead (Pb)-Dissolved	mg/L	0.01 <sup>(2)</sup>	-	-	-	-	-	-	-
Lithium (Li)-Dissolved	mg/L	0.008 <sup>(2)</sup>	-	-	-	-	-	-	-
Magnesium (Mg)-Dissolved	mg/L	-	-	-	-	-	-	-	-
Manganese (Mn)-Dissolved	mg/L	1.5 <sup>(2)</sup>	-	-	-	-	-	-	-
Mercury (Hg)-Dissolved	mg/L	0.001 <sup>(2)</sup>	-	-	-	-	-	-	-
Molybdenum (Mo)-Dissolved	mg/L	0.25 <sup>(2)</sup>	-	-	-	-	-	-	-
Nickel (Ni)-Dissolved	mg/L	0.08 <sup>(2)</sup>	-	-	-	-	-	-	-
Phosphorus - Dissolved	mg/L	-	-	-	-	-	-	-	-
Potassium (K)-Dissolved	mg/L	-	-	-	-	-	-	-	-
Rubidium (Rb) - Dissolved	mg/L	-	-	-	-	-	-	-	-
Selenium (Se)-Dissolved	mg/L	0.01 <sup>(2)</sup>	-	-	-	-	-	-	-
Silicon - Dissolved	mg/L	-	-	-	-	-	-	-	-
Silver (Ag)-Dissolved	mg/L	0.02 <sup>(2)</sup>	-	-	-	-	-	-	-
Sodium (Na)-Dissolved	mg/L	200 <sup>(2)</sup>	-	-	-	-	-	-	-
Strontium - Dissolved	mg/L	-	-	-	-	-	-	-	-
Sulfur - Dissolved	mg/L	-	-	-	-	-	-	-	-
Tellurium - Dissolved	mg/L	-	-	-	-	-	-	-	-
Thallium (Tl)-Dissolved	mg/L	-	-	-	-	-	-	-	-
Thorium - Dissolved	mg/L	-	-	-	-	-	-	-	-
Tin (Sn)-Dissolved	mg/L	2.5 <sup>(2)</sup>	-	-	-	-	-	-	-
Titanium (Ti)-Dissolved	mg/L	-	-	-	-	-	-	-	-
Tungsten (W) - Dissolved	mg/L	0.003 <sup>(2)</sup>	-	-	-	-	-	-	-
Uranium (U)-Dissolved	mg/L	0.020	-	-	-	-	-	-	-
Vanadium (V)-Dissolved	mg/L	0.020 <sup>(2)</sup>	-	-	-	-	-	-	-
Zinc (Zn)-Dissolved	mg/L	3.0 <sup>(2)</sup>	-	-	-	-	-	-	-
Zirconium - Dissolved	mg/L	-	-	-	-	-	-	-	-

NOTES

- (1) BC MoE Approved and Working Water Quality Guidelines, last updated March 2018
- (2) BC Contaminated Sites Regulation (CSR) for drinking water, Schedule 3.2, last updated January 2019
- (3) All criteria limits for BCWQG - Drinking Quality Guidelines based on Total Metal Concentration except Aluminum (Dissolved)
- (4) BC MoE Water Quality Guidelines for Protection of Wildlife
- (5) BC Contaminated Sites Regulation (CSR) for drinking water, Schedule 3.2
- (a) Range based on max pH 8.5 to min pH 6.5 at temperature of 6.0 °C
- (b) at pH less than 6.5, limit is determined by regression equation, else limit is 0.1 mg/L.
- (c) Limit for dissolved metals, not total metals
- (d) Limit dependent upon hardness.
- (e) Limit for chromium(VI) - data reported by lab as total chromium - limit assumes 100% chromium VI in sample
- (f) Where hardness data was unavailable, 50 mg/L was assumed
- (g) Maximum value
- (h) Limit dependent upon chloride concentration
- (i) Change of 25 mg/L from background for a duration of 24 hours during clear flows. Change of 10% of background during turbid flows

\* Criteria exceeds detection limit  
 MAC = Maximum Acceptable Concentration  
 AO = Aesthetic Objective

CSR-DW BC Contaminated Sites Regulation Water Quality Guidelines for Drinking Water

Table 9: Groundwater Quality Results Sampling Location MW-7 (E287379)

Date	QC/QC Check	BC MoE Guidelines CSRDW (2)	22-Oct-12	3-Apr-13	6-Apr-17	27-Mar-19	6-Jul-17	11-Jun-19	26-Jun-19	29-Jun-20	14-Aug-20	4-Nov-20	30-Mar-21	24-Jun-21	25-Aug-21	3-Nov-21
Unit	Units		Sample	Sample	Sample	DRY WELL	Sample	Dry	Dry	Monitor (almost dry)	Monitor (almost dry)	Dry	Monitor	Monitor	Monitor	Sample
Conductivity	µS/cm	-	-	-	124	-	-	-	205	235	230	-	65.5	66	70	38.6
pH	pH	-	-	-	7.8	-	-	-	-	-	-	-	8.66	-	-	8.66
Dissolved Oxygen	mg/L	-	-	-	-	-	78.3	-	-	-	-	-	12.6	-	-	13.6
Temperature	°C	-	-	-	-	-	5.6	-	9.1	6.2	6.1	-	5.8	5.7	5.7	6
Depth to Water	m	-	-	-	-	-	-	-	45.26	45.38	45.38	-	42.3	40.79	41.08	42.45
Depth to Bottom	m	-	-	-	-	-	-	-	-	-	-	3.0	45.9	45.89	45.95	45.97
Elevation of Well	m	-	-	-	-	-	-	-	-	-	-	0.9	230	230	1.11	1.11
Casing Height	m	-	-	-	-	-	-	-	-	-	-	0.9	230	230	1.11	1.11
Analysis	Units	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Conductivity	µS/cm	-	59.2	-	-	-	-	-	-	-	-	-	-	-	-	60.9
Hardness (as CaCO <sub>3</sub> )	mg/L	-	-	67.3	51.2	-	40.1	-	-	-	-	-	-	-	-	60.9
Hardness (as CaCO <sub>3</sub> ) dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26.3
pH	pH	-	8.5	8.6	8.1	-	8.4	-	-	-	-	-	-	-	-	7.87
Total Suspended Solids	mg/L	-	-	-	34	-	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	28	-	67	-	-	-	-	-	-	-	-	-	-	-
Alkalinity, Total (as CaCO <sub>3</sub> )	mg/L	-	29.6	-	38.1	-	58	-	-	-	-	-	-	-	-	11.6
Ammonia, Total (as N)	mg/L	-	ND	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Nitrogen as N	mg/L	-	0.26	-	-	-	-	-	-	-	-	-	-	-	-	-
TKN	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromide (Br)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloride (Cl)	mg/L	-	240 <sup>(g)</sup>	1.3	ND	-	-	1.3	-	-	-	-	-	-	-	-
Fluoride (F)	mg/L	-	1.4 <sup>(h)</sup>	ND	ND	-	-	0.1	-	-	-	-	-	-	-	0.033
Nitrate (as N)	mg/L	-	10 <sup>(h)</sup>	ND	ND	-	0.061	0.055	-	-	-	-	-	-	-	0.099
Nitrite (as N)	mg/L	-	1.0 <sup>(h)</sup>	ND	ND	-	-	-	-	-	-	-	-	-	-	-
Sulfate (SO <sub>4</sub> )	mg/L	-	500 <sup>(h)</sup>	-	1.68	1.4	-	1.4	-	-	-	-	-	-	-	1.24
Total Organic Carbon	mg/L	-	-	-	4.89	0.68	-	0.79	-	-	-	-	-	-	-	1.48
DOC	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COD	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Metals																
Aluminum (Al)-Dissolved	mg/L	-	0.0183	0.0198	0.012	-	0.0143	-	-	-	-	-	-	-	-	0.0139
Antimony (Sb)-Dissolved	mg/L	-	0.002 <sup>(i)</sup>	ND	0.000158	-	-	0.00039	-	-	-	-	-	-	-	-
Arsenic (As)-Dissolved	mg/L	-	0.01 <sup>(j)</sup>	0.00090	0.00060	-	-	-	-	-	-	-	-	-	-	0.00097
Barium (Ba)-Dissolved	mg/L	-	1.0 <sup>(k)</sup>	0.0056	0.00609	0.0119	-	0.0129	-	-	-	-	-	-	-	0.0064
Beryllium (Be)-Dissolved	mg/L	-	0.008 <sup>(l)</sup>	ND	ND	-	-	-	-	-	-	-	-	-	-	-
Bismuth - Dissolved	mg/L	-	-	ND	ND	-	-	-	-	-	-	-	-	-	-	-
Boron (B)-Dissolved	mg/L	-	5.0 <sup>(m)</sup>	ND	ND	0.005	-	-	-	-	-	-	-	-	-	-
Calcium (Ca)-Dissolved	mg/L	-	0.005 <sup>(n)</sup>	0.000017	0.000012	-	0.000011	-	-	-	-	-	-	-	-	-
Calcium (Ca)-Dissolved	mg/L	-	-	-	-	18.8	-	15.2	-	-	-	-	-	-	-	-
Caesium (Cs)-Dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium (Cr)-Dissolved	mg/L	-	0.05 - 6.0 <sup>(o)</sup>	ND	ND	-	-	-	-	-	-	-	-	-	-	-
Cobalt (Co)-Dissolved	mg/L	-	0.001 <sup>(p)</sup>	ND	0.0001	0.00005	-	-	-	-	-	-	-	-	-	-
Copper (Cu)-Dissolved	mg/L	-	1.5 <sup>(q)</sup>	0.00118	0.00049	0.0002	-	0.00055	-	-	-	-	-	-	-	0.00128
Iron (Fe)-Dissolved	mg/L	-	6.0 <sup>(r)</sup>	ND	0.0069	-	-	-	-	-	-	-	-	-	-	0.012
Lead (Pb)-Dissolved	mg/L	-	0.01 <sup>(s)</sup>	ND	ND	-	-	-	-	-	-	-	-	-	-	-
Lithium (Li)-Dissolved	mg/L	-	0.008 <sup>(t)</sup>	ND	ND	0.0007	-	0.00085	-	-	-	-	-	-	-	-
Magnesium (Mg)-Dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese (Mn)-Dissolved	mg/L	-	1.0 <sup>(u)</sup>	ND	0.00082	0.00323	-	0.00025	-	-	-	-	-	-	-	0.00085
Mercury (Hg)-Dissolved	mg/L	-	0.001 <sup>(v)</sup>	ND	ND	-	-	-	-	-	-	-	-	-	-	-
Molybdenum (Mo)-Dissolved	mg/L	-	0.26 <sup>(w)</sup>	ND	0.00015	0.0009	-	0.00015	-	-	-	-	-	-	-	0.000188
Nickel (Ni)-Dissolved	mg/L	-	0.08 <sup>(x)</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-
Phosphorus - Dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium (K)-Dissolved	mg/L	-	-	-	0.66	-	-	0.57	-	-	-	-	-	-	-	0.348
Rubidium (Rb) - Dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium (Se)-Dissolved	mg/L	-	0.01 <sup>(y)</sup>	ND	0.000051	-	-	-	-	-	-	-	-	-	-	-
Silicon - Dissolved	mg/L	-	4.24	3.79	4.7	-	4.3	-	-	-	-	-	-	-	-	4.02
Silver (Ag)-Dissolved	mg/L	-	0.01 <sup>(z)</sup>	ND	ND	-	-	-	-	-	-	-	-	-	-	-
Sodium (Na)-Dissolved	mg/L	-	200 <sup>(aa)</sup>	1.85	1.28	1.5	-	1.46	-	-	-	-	-	-	-	1.19
Strontium - Dissolved	mg/L	-	0.0325	0.0361	0.0668	-	0.0542	-	-	-	-	-	-	-	-	0.0322
Sulfur - Dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tellurium - Dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium (Tl)-Dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thorium - Dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tin (Sn)-Dissolved	mg/L	-	2.5 <sup>(ab)</sup>	ND	ND	-	-	-	-	-	-	-	-	-	-	-
Titanium (Ti)-Dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tungsten (W) - Dissolved	mg/L	-	0.001 <sup>(ac)</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-
Uranium (U)-Dissolved	mg/L	-	0.020	ND	0.00002	0.00004	-	0.000023	-	-	-	-	-	-	-	0.000018
Vanadium (V)-Dissolved	mg/L	-	0.020 <sup>(ad)</sup>	ND	0.00003	-	-	-	-	-	-	-	-	-	-	-
Zinc (Zn)-Dissolved	mg/L	-	3.0 <sup>(ae)</sup>	ND	0.0119	0.0125	-	-	-	-	-	-	-	-	-	-
Zirconium - Dissolved	mg/L	-	-	ND	ND	-	-	-	-	-	-	-	-	-	-	-

NOTES  
 (1) BC MoE Approval and Working Water Quality Guidelines, last updated March 2018  
 (2) BC Contaminated Sites Regulation (CSR) for drinking water, Schedule 3-2, last updated January 2019  
 (3) All criteria limits for BC MoE - Drinking Water Quality Guidelines based on Total Metal Concentration except Aluminum (Dissolved)  
 (4) BC MoE Water Quality Guidelines for Protection of Wildlife  
 (a) Range based on max pH 8.3 to min pH 6.5 at temperature of 6.0 °C  
 (b) At pH less than 6.5, limit is determined by regression equation, else limit is 0.1 mg/L  
 (c) Limit for dissolved metals, not total metals  
 (d) Limit dependent upon hardness  
 (e) Limit for chromium VI - data reported by lab as total chromium - limit assumes 100% chromium VI in sample  
 (f) Where hardness data was unavailable, 50 mg/L was assumed  
 (g) Maximum value  
 (h) Limit dependent upon chloride concentration  
 (i) Change of 25 mg/L from background for a duration of 24 hours during clear flows. Change of 10% of background during turbid flows

\* Criteria exceeds detection limit  
 MAC - Maximum Acceptable Concentration  
 AO - Aesthetic Objective

CSRDW - BC Contaminated Sites Regulation Water Quality Guidelines for Drinking Water

Table 10: Groundwater Quality Results Sampling Location MW-8 (E287380)

		BC MoE Guidelines CSR-DW (2)	22-Oct-12	3-Apr-13	13-Jun-13	6-Jul-17	3-Oct-17	15-Nov-17	10-Apr-18	18-Jul-18	21-Nov-18	25-Mar-19
QA/QC Check	Units		Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample
Field												
Conductivity	uS/cm	-	-	-	-	34	22.4	22.6	22.4	34	34	36
SPC	uS/cm	-	-	-	-	-	-	-	-	-	-	-
pH	pH	-	-	-	-	8.2	6.45	6.43	5.98	6.49	7.49	7.13
Dissolved Oxygen	mg/L	-	-	-	-	6.6	-	9.6	11.6	8.1	0.3	11.3
Temperature	°C	-	-	-	-	6.5	5.9	5.5	5.8	6.3	6.1	6.3
Depth to Water	m	-	-	-	-	-	-	-	10.31	9.95	10.94	11.58
Depth to Bottom	m	-	-	-	-	-	-	-	-	-	-	-
Elevation of Well	m	-	-	-	-	-	-	-	-	-	-	-
Casing Height	m	-	-	-	-	-	-	-	-	-	-	-
Analyte	Units											
Conductivity	uS/cm	-	27.5	-	-	-	24.8	-	-	-	-	-
Hardness (as CaCO3)	mg/L	-	-	14.1	-	10.6	-	12	11.4	12.5	12.2	12.9
Hardness (as CaCO3), dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	-
pH	pH	-	6.5	6.3	-	6.1	6.2	6.94	7.37	-	-	6.67
Total Suspended Solids	mg/L	-	-	-	-	-	190	-	-	-	-	-
Total Dissolved Solids	mg/L	-	13	-	-	-	12	-	-	-	-	-
Alkalinity, Total (as CaCO3)	mg/L	-	16	16.5	-	16	-	16.3	16.9	17.8	15.1	17.5
Ammonia, Total (as N)	mg/L	-	ND	-	-	<0.03	<0.03	<0.005	0.0056	0.0089	<0.0050	0.0266
Total Nitrogen as N	mg/L	-	0.311	-	-	-	0.168	-	-	-	-	-
TKN	mg/L	-	-	-	-	-	-	-	-	-	-	-
Bromide (Br)	mg/L	-	-	-	-	-	-	-	<0.050	<0.050	<0.050	<0.050
Chloride (Cl)	mg/L	250 <sup>(2)</sup>	ND	ND	-	2.7	2.2	1.13	1.13	1.4	1.4	<0.50
Fluoride (F)	mg/L	1.5 <sup>(2)</sup>	ND	ND	-	<0.10	-	0.024	0.023	0.022	0.021	0.027
Nitrate (as N)	mg/L	10 <sup>(2)</sup>	ND	ND	-	0.17	<0.100	0.016	0.0153	0.0233	0.0225	0.235
Nitrite (as N)	mg/L	1.0 <sup>(2)</sup>	ND	ND	-	<0.01	-	<0.001	<0.0010	<0.0010	<0.0010	<0.0010
Sulfate (SO4)	mg/L	500 <sup>(2)</sup>	-	1.31	-	<1.0	<1.0	<0.3	<0.30	<0.30	<0.30	1.08
Total Organic Carbon	mg/L	-	-	2.67	-	<0.50	-	<0.50	0.6	3.31	1.28	3.06
BOD	mg/L	-	-	-	-	-	-	-	-	-	-	-
COD	mg/L	-	-	-	-	-	-	<20	<20	25	<20	<20
Dissolved Metals												
Aluminum (Al)-Dissolved	mg/L	9.5 <sup>(2)</sup>	ND	0.0033	<0.0050	<0.0050	0.0067	0.0024	0.0036	0.0144	0.004	0.0073
Antimony (Sb)-Dissolved	mg/L	0.006 <sup>(2)</sup>	ND	ND	<0.00050	0.00018	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	mg/L	0.01 <sup>(2)</sup>	0.00019	0.000172	-	<0.00050	<0.00050	0.00010	<0.00010	0.00015	0.00011	0.00016
Barium (Ba)-Dissolved	mg/L	0.01 <sup>(2)</sup>	0.0044	0.00416	-	0.0051	<0.0050	0.0103	0.00516	0.00549	0.00508	0.00633
Beryllium (Be)-Dissolved	mg/L	0.008 <sup>(2)</sup>	ND	ND	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth - Dissolved	mg/L	-	ND	ND	-	<0.00010	<0.00010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved	mg/L	5.0 <sup>(2)</sup>	ND	ND	-	<0.0050	0.0063	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved	mg/L	0.005 <sup>(2)</sup>	0.000011	0.000012	-	0.000213	0.000029	0.0000439	0.000186	0.000123	0.0000829	0.000282
Calcium (Ca)-Dissolved	mg/L	-	-	-	-	3.15	-	4.09	3.98	4.33	4.28	4.4
Cesium (Cs)-Dissolved	mg/L	-	-	-	-	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010
Chromium (Cr)-Dissolved	mg/L	0.05 - 6.0 <sup>(2)</sup>	ND	ND	-	<0.00050	<0.00050	0.00021	0.00025	0.00021	0.00018	0.00021
Cobalt (Co)-Dissolved	mg/L	0.001 <sup>(2)</sup>	ND	0.000011	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved	mg/L	1.5 <sup>(2)</sup> AO	0.00058	ND	-	0.00194	<0.00040	<0.00020	0.00097	0.00037	<0.00020	0.00114
Iron (Fe)-Dissolved	mg/L	6.5 <sup>(2)</sup>	ND	ND	-	<0.010	<0.010	<0.010	<0.010	0.016	<0.010	<0.010
Lead (Pb)-Dissolved	mg/L	0.01 <sup>(2)</sup>	ND	ND	-	<0.00010	<0.00020	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Dissolved	mg/L	0.008 <sup>(2)</sup>	ND	ND	-	0.00025	0.00018	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium (Mg)-Dissolved	mg/L	-	0.416	0.37	-	0.27	0.363	0.445	0.366	0.407	0.377	0.463
Manganese (Mn)-Dissolved	mg/L	1.5 <sup>(2)</sup>	ND	0.0098	-	<0.00020	0.0011	0.00117	0.00204	0.0101	0.00233	0.00342
Mercury (Hg)-Dissolved	mg/L	0.001 <sup>(2)</sup>	ND	ND	-	<0.000020	<0.000010	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved	mg/L	0.25 <sup>(2)</sup>	ND	0.000054	-	<0.00010	0.00022	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel (Ni)-Dissolved	mg/L	0.08 <sup>(2)</sup>	-	-	-	0.00049	<0.00040	<0.00050	0.0005	<0.00050	0.00052	<0.00050
Phosphorus - Dissolved	mg/L	-	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	mg/L	-	-	-	-	0.48	-	0.254	0.316	0.335	0.274	0.314
Rubidium (Rb) - Dissolved	mg/L	-	-	-	-	-	-	-	0.00045	0.00043	0.00035	0.00045
Selenium (Se)-Dissolved	mg/L	0.01 <sup>(2)</sup>	ND	0.000059	-	<0.00050	<0.00050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon - Dissolved	mg/L	-	5.93	5.44	-	5.9	6.4	6.27	6.09	5.91	6.32	6.59
Silver (Ag)-Dissolved	mg/L	0.02 <sup>(2)</sup>	ND	ND	-	<0.000050	<0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L	200 <sup>(2)</sup>	1.68	1.58	-	3.07	2.19	2.33	2.39	2.44	2.4	2.16
Strontium - Dissolved	mg/L	-	0.0368	0.0423	-	0.0425	0.0472	0.0516	0.0525	0.047	0.0513	0.0453
Sulfur - Dissolved	mg/L	-	-	-	-	<3.0	<3.0	<0.50	<0.50	<0.50	<0.50	<0.50
Tellurium - Dissolved	mg/L	-	-	-	-	<0.00020	<0.00050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Dissolved	mg/L	-	-	-	-	<0.000020	<0.000020	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium - Dissolved	mg/L	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L	2.5 <sup>(2)</sup>	ND	ND	-	<0.00020	<0.00020	<0.00010	0.00065	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L	-	-	-	-	<0.0050	-	<0.00030	<0.00030	0.00066	<0.00030	<0.00030
Tungsten (W) - Dissolved	mg/L	0.003 <sup>(2)</sup>	-	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Dissolved	mg/L	0.020	ND	ND	-	<0.00020	<0.00020	-	<0.000010	<0.000010	<0.000010	<0.000010
Vanadium (V)-Dissolved	mg/L	0.020 <sup>(2)</sup>	ND	ND	-	<0.0010	<0.0010	-	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved	mg/L	3.0 <sup>(2)</sup>	ND	0.0014	-	0.0064	<0.0040	-	0.0041	<0.0010	<0.0010	0.0033
Zirconium - Dissolved	mg/L	-	ND	ND	-	<0.00010	<0.00010	-	<0.000060	<0.000060	<0.000060	<0.000060

NOTES

- (1) BC MoE Approved and Working Water Quality Guidelines, last updated March 2018
- (2) BC Contaminated Sites Regulation (CSR) for drinking water, Schedule 3.2, last updated January 2019
- (3) All criteria limits for BCWQG - Drinking Quality Guidelines based on Total Metal Concentration except Aluminum (Dissolved)
- (4) BC MoE Water Quality Guidelines for Protection of Wildlife
- (a) Range based on max pH 8.5 to min pH 6.5 at temperature of 6.0 °C
- (b) at pH less than 6.5, limit is determined by regression equation, else limit is 0.1 mg/L.
- (c) Limit for dissolved metals, not total metals
- (d) Limit dependent upon hardness.
- (e) Limit for chromium(VI) - data reported by lab as total chromium - limit assumes 100% chromium VI in sample
- (f) Where hardness data was unavailable, 50 mg/L was assumed
- (g) Maximum value
- (h) Limit dependent upon chloride concentration
- (i) Change of 25 mg/L from background for a duration of 24 hours during clear flows. Change of 10% of background during turbid flows

\* Criteria exceeds detection limit  
 MAC = Maximum Acceptable Concentration  
 AO = Aesthetic Objective

CSR-DW BC Contaminated Sites Regulation Water Quality Guidelines for Drinking Water

Table 10: Groundwater Quality Results Sampling Location MW-8 (E287380)

QA/QC Check	Units	BC MoE Guidelines CSR-DW (2)	26-Jun-19	11-Jun-19	29-Jun-20	14-Aug-20	4-Nov-20	31-Mar-21	23-Jun-21	25-Aug-21	3-Nov-21
			Sample	Monitor	Monitor	Monitor	Sample	Monitor	Monitor	Monitor	Sample
Conductivity	uS/cm	-	34	33	284	109	97.6	12.2	125	115	21.9
SPC	uS/cm	-	-	-	-	-	152.6	67.1	-	-	34.2
pH	pH	-	7.02	-	-	-	5.93	6.32	-	-	6.42
Dissolved Oxygen	mg/L	-	11.9	-	-	-	10	10.5	-	-	7.5
Temperature	°C	-	6.4	6.1	6.7	6.3	6.2	5.5	5.7	6.4	6.2
Depth to Water	m	-	11.42	11.41	13.8	12.74	12	7.74	49.02	6.68	7.69
Depth to Bottom	m	-	-	-	-	-	-	15.25	15.27	15.54	15.57
Elevation of Well	m	-	-	-	-	-	202	-	-	-	-
Casing Height	m	-	-	-	-	-	0.8	-	-	1.03	1.02
<b>Analyte</b>	<b>Units</b>										
Conductivity	uS/cm	-	-	-	-	-	160	-	-	-	38.1
Hardness (as CaCO3)	mg/L	-	12.3	-	-	-	-	-	-	-	-
Hardness (as CaCO3), dissolved	mg/L	-	-	-	-	-	59.7	-	-	-	13.7
pH	pH	-	7.34	-	-	-	6.70	-	-	-	6.89
Total Suspended Solids	mg/L	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	-	-	-	-	-	-	-	-	-
Alkalinity, Total (as CaCO3)	mg/L	-	16.5	-	-	-	13.3	-	-	-	20.4
Ammonia, Total (as N)	mg/L	-	<0.0050	-	-	-	0.0089	-	-	-	<0.0050
Total Nitrogen as N	mg/L	-	-	-	-	-	-	-	-	-	-
TKN	mg/L	-	-	-	-	-	0.141	-	-	-	<0.050
Bromide (Br)	mg/L	-	<0.050	-	-	-	-	-	-	-	<0.050
Chloride (Cl)	mg/L	250 <sup>(2)</sup>	0.92	-	-	-	5.89	-	-	-	0.57
Fluoride (F)	mg/L	1.5 <sup>(2)</sup>	0.026	-	-	-	<0.020	-	-	-	0.031
Nitrate (as N)	mg/L	10 <sup>(2)</sup>	0.0895	-	-	-	12.7	-	-	-	0.0628
Nitrite (as N)	mg/L	1.0 <sup>(2)</sup>	<0.0010	-	-	-	<0.0010	-	-	-	<0.0010
Sulfate (SO4)	mg/L	500 <sup>(2)</sup>	0.37	-	-	-	<0.30	-	-	-	0.52
Total Organic Carbon	mg/L	-	0.8	-	-	-	1.84	-	-	-	1.23
BOD	mg/L	-	-	-	-	-	-	-	-	-	-
COD	mg/L	-	<20	-	-	-	25	-	-	-	<20
<b>Dissolved Metals</b>											
Aluminum (Al)-Dissolved	mg/L	9.5 <sup>(2)</sup>	0.0065	-	-	-	0.179	-	-	-	0.0018
Antimony (Sb)-Dissolved	mg/L	0.006 <sup>(2)</sup>	<0.00010	-	-	-	<0.00010	-	-	-	<0.00010
Arsenic (As)-Dissolved	mg/L	0.01 <sup>(2)</sup>	0.00011	-	-	-	0.00026	-	-	-	0.00013
Barium (Ba)-Dissolved	mg/L	1.0 <sup>(2)</sup>	0.00624	-	-	-	0.0267	-	-	-	0.00450
Beryllium (Be)-Dissolved	mg/L	0.008 <sup>(2)</sup>	<0.00010	-	-	-	<0.000100	-	-	-	<0.000100
Bismuth - Dissolved	mg/L	-	<0.000050	-	-	-	<0.000050	-	-	-	<0.000050
Boron (B)-Dissolved	mg/L	5.0 <sup>(2)</sup>	<0.010	-	-	-	<0.010	-	-	-	<0.010
Cadmium (Cd)-Dissolved	mg/L	0.005 <sup>(2)</sup>	0.0002	-	-	-	0.000109	-	-	-	0.000169
Calcium (Ca)-Dissolved	mg/L	-	4.26	-	-	-	20.5	-	-	-	4.85
Cesium (Cs)-Dissolved	mg/L	-	<0.000010	-	-	-	0.000020	-	-	-	<0.000010
Chromium (Cr)-Dissolved	mg/L	0.05 - 6.0 <sup>(2)</sup>	0.00023	-	-	-	0.00048	-	-	-	<0.00050
Cobalt (Co)-Dissolved	mg/L	0.001 <sup>(2)</sup>	<0.00010	-	-	-	0.00031	-	-	-	<0.00010
Copper (Cu)-Dissolved	mg/L	1.5 <sup>(2)</sup> AO	0.00077	-	-	-	0.00253	-	-	-	0.00036
Iron (Fe)-Dissolved	mg/L	6.5 <sup>(2)</sup>	<0.010	-	-	-	0.358	-	-	-	<0.010
Lead (Pb)-Dissolved	mg/L	0.01 <sup>(2)</sup>	<0.000050	-	-	-	0.000171	-	-	-	<0.000050
Lithium (Li)-Dissolved	mg/L	0.008 <sup>(2)</sup>	<0.0010	-	-	-	<0.0010	-	-	-	<0.0010
Magnesium (Mg)-Dissolved	mg/L	-	0.407	-	-	-	2.06	-	-	-	0.390
Manganese (Mn)-Dissolved	mg/L	1.5 <sup>(2)</sup>	0.00218	-	-	-	0.0188	-	-	-	0.00098
Mercury (Hg)-Dissolved	mg/L	0.001 <sup>(2)</sup>	<0.0000050	-	-	-	<0.0000050	-	-	-	<0.0000050
Molybdenum (Mo)-Dissolved	mg/L	0.25 <sup>(2)</sup>	<0.000050	-	-	-	<0.000050	-	-	-	<0.000050
Nickel (Ni)-Dissolved	mg/L	0.08 <sup>(2)</sup>	<0.00050	-	-	-	0.00128	-	-	-	<0.00050
Phosphorus - Dissolved	mg/L	-	<0.050	-	-	-	<0.050	-	-	-	<0.050
Potassium (K)-Dissolved	mg/L	-	0.308	-	-	-	0.603	-	-	-	0.252
Rubidium (Rb) - Dissolved	mg/L	-	0.00036	-	-	-	0.00079	-	-	-	0.00032
Selenium (Se)-Dissolved	mg/L	0.01 <sup>(2)</sup>	<0.000050	-	-	-	<0.000050	-	-	-	0.00065
Silicon - Dissolved	mg/L	-	6.19	-	-	-	6.55	-	-	-	6.11
Silver (Ag)-Dissolved	mg/L	0.02 <sup>(2)</sup>	<0.000010	-	-	-	<0.000010	-	-	-	<0.000010
Sodium (Na)-Dissolved	mg/L	200 <sup>(2)</sup>	2.34	-	-	-	4.26	-	-	-	1.90
Strontium - Dissolved	mg/L	-	0.0529	-	-	-	0.272	-	-	-	0.0473
Sulfur - Dissolved	mg/L	-	<0.50	-	-	-	<0.50	-	-	-	<0.50
Tellurium - Dissolved	mg/L	-	<0.00020	-	-	-	<0.00020	-	-	-	<0.00020
Thallium (Tl)-Dissolved	mg/L	-	<0.000010	-	-	-	<0.000010	-	-	-	<0.000010
Thorium - Dissolved	mg/L	-	<0.00010	-	-	-	<0.00010	-	-	-	<0.00010
Tin (Sn)-Dissolved	mg/L	2.5 <sup>(2)</sup>	<0.00010	-	-	-	<0.00010	-	-	-	<0.00010
Titanium (Ti)-Dissolved	mg/L	-	<0.00030	-	-	-	0.00591	-	-	-	<0.00030
Tungsten (W) - Dissolved	mg/L	0.003 <sup>(2)</sup>	<0.00010	-	-	-	<0.00010	-	-	-	<0.00010
Uranium (U)-Dissolved	mg/L	0.020	<0.000010	-	-	-	<0.000010	-	-	-	<0.000010
Vanadium (V)-Dissolved	mg/L	0.020 <sup>(2)</sup>	<0.00050	-	-	-	<0.00050	-	-	-	<0.00050
Zinc (Zn)-Dissolved	mg/L	3.0 <sup>(2)</sup>	0.0059	-	-	-	0.0037	-	-	-	<0.0010
Zirconium - Dissolved	mg/L	-	<0.00020	-	-	-	<0.00020	-	-	-	<0.00020

NOTES

- (1) BC MoE Approved and Working Water Quality Guidelines, last updated March 2018
- (2) BC Contaminated Sites Regulation (CSR) for drinking water, Schedule 3.2, last updated January
- (3) All criteria limits for BCWQG - Drinking Quality Guidelines based on Total Metal Concentration
- (4) BC MoE Water Quality Guidelines for Protection of Wildlife
- (a) Range based on max pH 8.5 to min pH 6.5 at temperature of 6.0 °C
- (b) at pH less than 6.5, limit is determined by regression equation, else limit is 0.1 mg/L.
- (c) Limit for dissolved metals, not total metals
- (d) Limit dependent upon hardness.
- (e) Limit for chromium(VI) - data reported by lab as total chromium - limit assumes 100% chromium
- (f) Where hardness data was unavailable, 50 mg/L was assumed
- (g) Maximum value
- (h) Limit dependent upon chloride concentration
- (i) Change of 25 mg/L from background for a duration of 24 hours during clear flows. Change of 10

\* Criteria exceeds detection limit  
 MAC = Maximum Acceptable Concentration  
 AO = Aesthetic Objective

CSR-DW BC Contaminated Sites Regulation Water Quality

Table 11: Groundwater Quality Results Sampling Location MW-9 (E287381)

		BC MoE Guidelines	22-Oct-12	2-Apr-13	6-Jul-17	15-Nov-17	19-Jul-18	20-Nov-18	25-Mar-19	11-Jun-19	26-Jun-19	29-Jun-20	14-Aug-20	3-Nov-20
												well dry		insufficient water for sample
Field	Units	CSR-DW (2)	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Monitor	Sample	Monitor	Monitor	Monitor
Conductivity	uS/cm	-	-	-	43	24.7	28.8	42	43	42	87	56	65	-
SPC	uS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-
pH	pH	-	-	-	7.7	7.4	5.99	6.83	7.05	-	7.95	-	-	-
Dissolved Oxygen	mg/L	-	-	-	8.0	9.0	6.9	3.1	11.6	-	12.8	-	-	-
Temperature	°C	-	-	-	6.0	4.8	5.5	5.4	5.5	5.5	6	5.8	5.5	5.5
Depth to Water	m	-	-	-	-	50.41	50.58	51.15	51.86	51.74	51.83	53.61	53.42	52.27
Depth to Bottom	m	-	-	-	-	-	-	-	-	-	-	-	-	-
Elevation of well	m	-	-	-	-	-	-	-	-	-	-	-	-	207
Casing height	m	-	-	-	-	-	-	-	-	-	-	-	-	0.9
<b>Analyte</b>	<b>Units</b>													
Conductivity	uS/cm	-	63.7	-	42	-	-	-	-	-	-	-	-	-
Hardness (as CaCO3)	mg/L	-	-	20.4	14.6	13	16	16.9	15.2	-	15.2	-	-	-
Hardness (as CaCO3), dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
pH	pH	-	6.7	6.9	6.6	7.08	-	-	7.01	-	7.39	-	-	-
Total Suspended Solids	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	30	-	22	-	-	-	-	-	-	-	-	-
Alkalinity, Total (as CaCO3)	mg/L	-	30.6	24.5	20	16.4	25.4	20.9	17.2	-	17.8	-	-	-
Ammonia, Total (as N)	mg/L	-	ND	-	<0.03	-	0.0162	<0.0050	0.0205	-	<0.0050	-	-	-
Total Nitrogen as N	mg/L	-	0.213	-	0.149	-	-	-	-	-	-	-	-	-
TKN	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromide (Br)	mg/L	-	-	-	-	-	-	<0.050	<0.050	-	<0.050	-	-	-
Chloride (Cl)	mg/L	250 <sup>(2)</sup>	ND	2.4	<1.0	0.5	<0.50	<0.50	<0.50	-	0.63	-	-	-
Fluoride (F)	mg/L	1.5 <sup>(2)</sup>	ND	ND	<0.10	0.031	0.032	0.026	0.06	-	0.034	-	-	-
Nitrate (as N)	mg/L	10 <sup>(2)</sup>	0.022	0.039	0.046	0.0343	0.0205	0.0215	0.0169	-	0.0228	-	-	-
Nitrite (as N)	mg/L	1.0 <sup>(2)</sup>	ND	ND	<0.01	<0.001	<0.0010	<0.0010	<0.0010	-	<0.0010	-	-	-
Sulfate (SO4)	mg/L	500 <sup>(2)</sup>	-	1.83	1.3	0.98	1.07	0.93	1.21	-	1.13	-	-	-
Total Organic Carbon	mg/L	-	-	2.67	<0.50	3.06	8.36	2.14	7.25	-	1.37	-	-	-
BOD	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
COD	mg/L	-	-	-	-	<20	45	<20	23	-	<20	-	-	-
<b>Dissolved Metals</b>														
Aluminum (Al)-Dissolved	mg/L	9.5 <sup>(2)</sup>	ND	0.0033	<0.0050	0.0037	0.0427	0.0069	0.0188	-	0.0034	-	-	-
Antimony (Sb)-Dissolved	mg/L	0.006 <sup>(2)</sup>	ND	0.000137	0.00014	<0.00010	0.00011	0.00013	<0.00010	-	<0.00010	-	-	-
Arsenic (As)-Dissolved	mg/L	0.01 <sup>(2)</sup>	0.00023	0.000286	<0.00050	0.00022	0.0009	0.00038	0.00062	-	0.00016	-	-	-
Barium (Ba)-Dissolved	mg/L	1.0 <sup>(2)</sup>	0.0074	0.00512	<0.0050	0.0149	0.00818	0.00573	0.0245	-	0.00489	-	-	-
Beryllium (Be)-Dissolved	mg/L	0.008 <sup>(2)</sup>	ND	ND	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-	<0.00010	-	-	-
Bismuth - Dissolved	mg/L	-	ND	ND	<0.00010	<0.000050	<0.000050	<0.000050	<0.000050	-	<0.000050	-	-	-
Boron (B)-Dissolved	mg/L	5.0 <sup>(2)</sup>	ND	ND	<0.0050	<0.010	<0.010	<0.010	<0.010	-	<0.010	-	-	-
Cadmium (Cd)-Dissolved	mg/L	0.005 <sup>(2)</sup>	0.00065	0.00015	0.00022	0.0003550	0.000178	0.000771	0.000155	-	0.000555	-	-	-
Calcium (Ca)-Dissolved	mg/L	-	-	-	5.04	4.34	5.35	5.7	5.1	-	5.14	-	-	-
Cesium (Cs)-Dissolved	mg/L	-	-	-	-	<0.000010	0.000012	<0.000010	<0.000010	-	<0.000010	-	-	-
Chromium (Cr)-Dissolved	mg/L	0.05 - 6.0 <sup>(2)</sup>	ND	0.000029	<0.00050	0.00021	0.0002	0.00019	0.00017	-	0.00012	-	-	-
Cobalt (Co)-Dissolved	mg/L	0.001 <sup>(2)</sup>	ND	0.00047	<0.00010	<0.00010	0.00075	0.00015	0.00023	-	<0.00010	-	-	-
Copper (Cu)-Dissolved	mg/L	1.5 <sup>(2)</sup> AO	0.00086	ND	0.00025	0.00064	0.00081	0.00202	0.00282	-	0.0006	-	-	-
Iron (Fe)-Dissolved	mg/L	6.5 <sup>(2)</sup>	ND	ND	<0.010	<0.010	0.312	0.021	0.044	-	<0.010	-	-	-
Lead (Pb)-Dissolved	mg/L	0.01 <sup>(2)</sup>	ND	ND	<0.00010	<0.000050	0.00012	<0.000050	0.000157	-	<0.000050	-	-	-
Lithium (Li)-Dissolved	mg/L	0.008 <sup>(2)</sup>	ND	ND	0.00051	<0.00010	<0.00010	<0.00010	<0.00010	-	<0.00010	-	-	-
Magnesium (Mg)-Dissolved	mg/L	-	0.924	0.55	0.496	0.532	0.651	0.652	0.605	-	0.583	-	-	-
Manganese (Mn)-Dissolved	mg/L	1.5 <sup>(2)</sup>	0.0048	0.0038	<0.00020	0.01530	0.234	0.0258	0.0565	-	0.00028	-	-	-
Mercury (Hg)-Dissolved	mg/L	0.001 <sup>(2)</sup>	ND	ND	<0.000020	<0.000050	<0.000050	<0.000050	<0.000050	-	<0.000050	-	-	-
Molybdenum (Mo)-Dissolved	mg/L	0.25 <sup>(2)</sup>	ND	0.000096	<0.00010	0.000084	0.000156	0.000057	0.000093	-	0.000061	-	-	-
Nickel (Ni)-Dissolved	mg/L	0.08 <sup>(2)</sup>	-	-	0.00046	<0.00050	0.00056	<0.00050	<0.00050	-	<0.00050	-	-	-
Phosphorus (P)- Dissolved	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	-	<0.050	-	-	-
Potassium (K)-Dissolved	mg/L	-	-	-	0.33	0.285	0.323	0.371	0.364	-	0.334	-	-	-
Rubidium (Rb) -Dissolved	mg/L	-	-	-	-	<0.00020	0.00032	0.00025	0.00033	-	<0.00020	-	-	-
Selenium (Se)-Dissolved	mg/L	0.01 <sup>(2)</sup>	ND	0.000053	<0.00050	<0.000050	<0.000050	<0.000050	<0.000050	-	<0.000050	-	-	-
Silicon - Dissolved	mg/L	-	4.10	4.74	6.00	5.89	5.94	5.98	6.12	-	5.79	-	-	-
Silver (Ag)-Dissolved	mg/L	0.02 <sup>(2)</sup>	ND	ND	<0.000050	<0.000010	<0.000010	<0.000010	<0.000010	-	<0.000010	-	-	-
Sodium (Na)-Dissolved	mg/L	200 <sup>(2)</sup>	2.21	1.95	1.76	1.670	1.77	1.84	1.52	-	1.67	-	-	-
Strontium - Dissolved	mg/L	-	0.0480	0.0328	0.0244	0.0235	0.0303	0.0335	0.0328	-	0.0351	-	-	-
Sulfur - Dissolved	mg/L	-	-	-	<3.0	<0.50	<0.50	<0.50	<0.50	-	<0.50	-	-	-
Tellurium (Te) - Dissolved	mg/L	-	-	-	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	-	<0.00020	-	-	-
Thallium (Tl)-Dissolved	mg/L	-	-	-	<0.000020	<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	-	-	-
Tin (Sn)-Dissolved	mg/L	2.5 <sup>(2)</sup>	ND	ND	<0.00020	<0.00010	<0.00010	0.00091	<0.00010	-	<0.00010	-	-	-
Titanium (Ti)-Dissolved	mg/L	-	-	-	<0.0050	<0.0030	0.00305	<0.00030	0.00061	-	<0.00030	-	-	-
Tungston (W) - Dissolved	mg/L	0.003 <sup>(2)</sup>	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010	-	<0.00010	-	-	-
Uranium (U)-Dissolved	mg/L	0.020	ND	ND	<0.000020	<0.000010	<0.000010	<0.000010	<0.000010	-	<0.000010	-	-	-
Vanadium (V)-Dissolved	mg/L	0.020 <sup>(2)</sup>	ND	0.00072	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	-	<0.00050	-	-	-
Zinc (Zn)-Dissolved	mg/L	3.0 <sup>(2)</sup>	ND	0.0022	<0.0040	0.0013	0.0018	0.0032	0.0075	-	0.0015	-	-	-
Zirconium - Dissolved	mg/L	-	ND	ND	<0.00010	<0.000060	<0.000060	<0.000060	<0.000060	-	<0.000060	-	-	-

**NOTES**

proved and Working Water Quality Guidelines, last updated March 2018

tes Regulation (CSR) for drinking water, Schedule 3.2, last updated January 2019

inking Quality Guidelines based on Total Metal Concentration except Aluminum (Dissolved)

BC MoE Water Quality Guidelines for Protection of Wildlife

ge based on max pH 8.5 to min pH 6.5 at temperature of 6.0 °C

an 6.5, limit is determined by regression equation, else limit is 0.1 mg/L.

(c) Limit for dissolved metals, not total metals

(d) Limit dependent upon hardness.

data reported by lab as total chromium - limit assumes 100% chromium VI in sample

Where hardness data was unavailable, 50 mg/L was assumed

(g) Maximum value

(h) Limit dependent upon chloride concentration

for a duration of 24 hours during clear flows. Change of 10% of background during turbid flows

\* Criteria exceeds detection limit

MAC = Maximum Acceptable Concentration

AO = Aesthetic Objective

BCWQG-AW	elines for Protection of Aquatic Life
BCWQG-DW/WL	uidelines for Drinking Water or Wildlife
CSR-DW	m Water Quality Guidelines for Drinking Water

Table 11: Groundwater Quality Results Sampling Location MW-9 (E287381)

		BC MoE Guidelines	31-Mar-21	24-Jun-21	26-Aug-21	3-Nov-21
Field	Units	CSR-DW (2)	Monitor	Monitor	Monitor	Sample
Conductivity	uS/cm	-	35	64	84	48.2
SPC	uS/cm	-	56	-	-	76.4
pH	pH	-	6.7	-	-	6.94
Dissolved Oxygen	mg/L	-	11.5	-	-	11.6
Temperature	°C	-	5.4	5.7	5.7	5.7
Depth to Water	m	-	49.18	49.02	47.61	48.22
Depth to Bottom	m	-	53.21	53.91	53.58	53.44
Elevation of well	m	-	207	-	-	-
Casing height	m	-	-	-	1.04	1.03
<b>Analyte</b>	<b>Units</b>					
Conductivity	uS/cm	-	-	-	-	76.3
Hardness (as CaCO3)	mg/L	-	-	-	-	-
Hardness (as CaCO3), dissolved	mg/L	-	-	-	-	17.9
pH	pH	-	-	-	-	7.02
Total Suspended Solids	mg/L	-	-	-	-	-
Total Dissolved Solids	mg/L	-	-	-	-	-
Alkalinity, Total (as CaCO3)	mg/L	-	-	-	-	37.5
Ammonia, Total (as N)	mg/L	-	-	-	-	<0.0050
Total Nitrogen as N	mg/L	-	-	-	-	-
TKN	mg/L	-	-	-	-	<0.050
Bromide (Br)	mg/L	-	-	-	-	<0.050
Chloride (Cl)	mg/L	250 <sup>(2)</sup>	-	-	-	2.07
Fluoride (F)	mg/L	1.5 <sup>(2)</sup>	-	-	-	0.039
Nitrate (as N)	mg/L	10 <sup>(2)</sup>	-	-	-	0.0373
Nitrite (as N)	mg/L	1.0 <sup>(2)</sup>	-	-	-	<0.0010
Sulfate (SO4)	mg/L	500 <sup>(2)</sup>	-	-	-	1.07
Total Organic Carbon	mg/L	-	-	-	-	1.98
BOD	mg/L	-	-	-	-	-
COD	mg/L	-	-	-	-	<20
<b>Dissolved Metals</b>						
Aluminum (Al)-Dissolved	mg/L	9.5 <sup>(2)</sup>	-	-	-	0.0266
Antimony (Sb)-Dissolved	mg/L	0.006 <sup>(2)</sup>	-	-	-	<0.00010
Arsenic (As)-Dissolved	mg/L	0.01 <sup>(2)</sup>	-	-	-	0.00038
Barium (Ba)-Dissolved	mg/L	1.0 <sup>(2)</sup>	-	-	-	0.00650
Beryllium (Be)-Dissolved	mg/L	0.008 <sup>(2)</sup>	-	-	-	<0.000100
Bismuth - Dissolved	mg/L	-	-	-	-	<0.000050
Boron (B)-Dissolved	mg/L	5.0 <sup>(2)</sup>	-	-	-	<0.010
Cadmium (Cd)-Dissolved	mg/L	0.005 <sup>(2)</sup>	-	-	-	0.0000114
Calcium (Ca)-Dissolved	mg/L	-	-	-	-	6.18
Cesium (Cs)-Dissolved	mg/L	-	-	-	-	<0.000010
Chromium (Cr)-Dissolved	mg/L	0.05 - 6.0 <sup>(2)</sup>	-	-	-	0.00052
Cobalt (Co)-Dissolved	mg/L	0.001 <sup>(2)</sup>	-	-	-	0.00010
Copper (Cu)-Dissolved	mg/L	1.5 <sup>(2)</sup> AO	-	-	-	0.00038
Iron (Fe)-Dissolved	mg/L	6.5 <sup>(2)</sup>	-	-	-	0.054
Lead (Pb)-Dissolved	mg/L	0.01 <sup>(2)</sup>	-	-	-	0.000066
Lithium (Li)-Dissolved	mg/L	0.008 <sup>(2)</sup>	-	-	-	<0.0010
Magnesium (Mg)-Dissolved	mg/L	-	-	-	-	0.592
Manganese (Mn)-Dissolved	mg/L	1.5 <sup>(2)</sup>	-	-	-	0.00765
Mercury (Hg)-Dissolved	mg/L	0.001 <sup>(2)</sup>	-	-	-	<0.0000050
Molybdenum (Mo)-Dissolved	mg/L	0.25 <sup>(2)</sup>	-	-	-	<0.000050
Nickel (Ni)-Dissolved	mg/L	0.08 <sup>(2)</sup>	-	-	-	<0.00050
Phosphorus (P) - Dissolved	mg/L	-	-	-	-	<0.050
Potassium (K)-Dissolved	mg/L	-	-	-	-	0.416
Rubidium (Rb) -Dissolved	mg/L	-	-	-	-	0.00022
Selenium (Se)-Dissolved	mg/L	0.01 <sup>(2)</sup>	-	-	-	0.000057
Silicon - Dissolved	mg/L	-	-	-	-	4.57
Silver (Ag)-Dissolved	mg/L	0.02 <sup>(2)</sup>	-	-	-	<0.000010
Sodium (Na)-Dissolved	mg/L	200 <sup>(2)</sup>	-	-	-	8.97
Strontium - Dissolved	mg/L	-	-	-	-	0.0332
Sulfur - Dissolved	mg/L	-	-	-	-	<0.50
Tellurium (Te) - Dissolved	mg/L	-	-	-	-	<0.00020
Thallium (Tl)-Dissolved	mg/L	-	-	-	-	<0.000010
Thorium (Th)- Dissolved	mg/L	-	-	-	-	<0.00010
Tin (Sn)-Dissolved	mg/L	2.5 <sup>(2)</sup>	-	-	-	<0.00010
Titanium (Ti)-Dissolved	mg/L	-	-	-	-	0.00132
Tungsten (W) - Dissolved	mg/L	0.003 <sup>(2)</sup>	-	-	-	<0.00010
Uranium (U)-Dissolved	mg/L	0.020	-	-	-	<0.000010
Vanadium (V)-Dissolved	mg/L	0.020 <sup>(2)</sup>	-	-	-	<0.00050
Zinc (Zn)-Dissolved	mg/L	3.0 <sup>(2)</sup>	-	-	-	<0.0010
Zirconium - Dissolved	mg/L	-	-	-	-	<0.00020

**NOTES**

proved and Working Water Quality Guidelines, last updated March 2018

tes Regulation (CSR) for drinking water, Schedule 3.2, last updated January 2019

inking Quality Guidelines based on Total Metal Concentration except Aluminum (Dissolved)

BC MoE Water Quality Guidelines for Protection of Wildlife

ge based on max pH 8.5 to min pH 6.5 at temperature of 6.0 °C

an 6.5, limit is determined by regression equation, else limit is 0.1 mg/L.

(c) Limit for dissolved metals, not total metals

(d) Limit dependent upon hardness.

data reported by lab as total chromium - limit assumes 100% chromium VI in sample

Where hardness data was unavailable, 50 mg/L was assumed

(g) Maximum value

(h) Limit dependent upon chloride concentration

for a duration of 24 hours during clear flows. Change of 10% of background during turbid flows

\* Criteria exceeds detection limit

MAC = Maximum Acceptable Concentration

AO = Aesthetic Objective

BCWQG-AW	delines for Protection of Aquatic Life
BCWQG-DW/WL	Guidelines for Drinking Water or Wildlife
CSR-DW	m Water Quality Guidelines for Drinking W



Table 13: Groundwater Quality Results Sampling Location MW-10 (E287382)

Field	Units	BC Met. Guidelines	22-Oct-12	2-Apr-13	11-Jun-19	29-Jun-20	14-Aug-20	4-Nov-20	29-Mar-21	23-Jun-21	25-Aug-21	4-Nov-21
		CSR-DW (2)	Sample	Sample	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Conductivity	uS/cm	-	-	-	113	152	126	223	-	121	89	47
SPC	uS/cm	-	-	-	-	-	-	-	-	-	-	-
pH	pH	-	-	-	-	-	-	-	-	-	-	-
Dissolved Oxygen	mg/L	-	-	-	-	-	-	-	-	-	-	-
Temperature	°C	-	-	-	6.1	6.1	5.8	5.9	-	5.7	5.8	5.7
Depth to Water	m	-	-	-	29	29.04	28.66	29	26.05	28.4	23.98	24.88
Depth to Bottom	m	-	-	-	-	-	-	-	29.5	29.47	29.01	29.26
Elevation of Well	m	-	-	-	-	-	-	207	-	207	-	-
Casing Height	m	-	-	-	-	-	-	0.88	-	-	1.1	1.1
<b>Analyte</b>	<b>Units</b>											
Conductivity	uS/cm	-	37.1	-	-	-	-	-	-	-	-	-
Hardness (as CaCO3)	mg/L	-	-	90.4	-	-	-	-	-	-	-	-
Hardness (as CaCO3), dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	-
pH	pH	-	6.9	7	-	-	-	-	-	-	-	-
Total Suspended Solids	mg/L	-	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	17	-	-	-	-	-	-	-	-	-
Alkalinity, Total (as CaCO3)	mg/L	-	17.6	21.7	-	-	-	-	-	-	-	-
Ammonia, Total (as N)	mg/L	-	ND	-	-	-	-	-	-	-	-	-
Total Nitrogen as N	mg/L	-	0.622	-	-	-	-	-	-	-	-	-
TKN	mg/L	-	-	-	-	-	-	-	-	-	-	-
Bromide (Br)	mg/L	-	-	-	-	-	-	-	-	-	-	-
Chloride (Cl)	mg/L	250 <sup>(1)</sup>	ND	ND	-	-	-	-	-	-	-	-
Fluoride (F)	mg/L	1.5 <sup>(2)</sup>	ND	ND	-	-	-	-	-	-	-	-
Nitrate (as N)	mg/L	10 <sup>(2)</sup>	0.023	0.038	-	-	-	-	-	-	-	-
Nitrite (as N)	mg/L	1.0 <sup>(2)</sup>	ND	ND	-	-	-	-	-	-	-	-
Sulfate (SO4)	mg/L	500 <sup>(2)</sup>	-	1.59	-	-	-	-	-	-	-	-
Total Organic Carbon	mg/L	-	-	1.53	-	-	-	-	-	-	-	-
BOD	mg/L	-	-	-	-	-	-	-	-	-	-	-
COD	mg/L	-	-	-	-	-	-	-	-	-	-	-
<b>Dissolved Metals</b>												
Aluminum (Al)-Dissolved	mg/L	9.5 <sup>(2)</sup>	0.0058	0.0138	-	-	-	-	-	-	-	-
Antimony (Sb)-Dissolved	mg/L	0.006 <sup>(2)</sup>	ND	ND	-	-	-	-	-	-	-	-
Arsenic (As)-Dissolved	mg/L	0.01 <sup>(2)</sup>	0.00021	0.000167	-	-	-	-	-	-	-	-
Barium (Ba)-Dissolved	mg/L	1.0 <sup>(2)</sup>	0.0069	0.00541	-	-	-	-	-	-	-	-
Beryllium (Be)-Dissolved	mg/L	0.008 <sup>(2)</sup>	ND	ND	-	-	-	-	-	-	-	-
Bismuth - Dissolved	mg/L	-	ND	ND	-	-	-	-	-	-	-	-
Boron (B)-Dissolved	mg/L	5.0 <sup>(2)</sup>	ND	ND	-	-	-	-	-	-	-	-
Cadmium (Cd)-Dissolved	mg/L	0.005 <sup>(2)</sup>	0.00114	0.000021	-	-	-	-	-	-	-	-
Calcium (Ca)-Dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	-
Cesium (Cs)-Dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	-
Chromium (Cr)-Dissolved	mg/L	0.05 - 6.0 <sup>(3)</sup>	ND	0.00061	-	-	-	-	-	-	-	-
Cobalt (Co)-Dissolved	mg/L	0.001 <sup>(2)</sup>	ND	0.000018	-	-	-	-	-	-	-	-
Copper (Cu)-Dissolved	mg/L	1.5 <sup>(2)</sup> AO	0.00267	0.00028	-	-	-	-	-	-	-	-
Iron (Fe)-Dissolved	mg/L	5.0 <sup>(2)</sup>	0.0107	0.0263	-	-	-	-	-	-	-	-
Lead (Pb)-Dissolved	mg/L	0.01 <sup>(2)</sup>	ND	ND	-	-	-	-	-	-	-	-
Lithium (Li)-Dissolved	mg/L	0.008 <sup>(2)</sup>	ND	ND	-	-	-	-	-	-	-	-
Magnesium (Mg)-Dissolved	mg/L	-	0.956	0.77	-	-	-	-	-	-	-	-
Manganese (Mn)-Dissolved	mg/L	1.5 <sup>(2)</sup>	0.0036	0.00104	-	-	-	-	-	-	-	-
Mercury (Hg)-Dissolved	mg/L	0.001 <sup>(2)</sup>	ND	ND	-	-	-	-	-	-	-	-
Molybdenum (Mo)-Dissolved	mg/L	0.25 <sup>(2)</sup>	ND	0.000135	-	-	-	-	-	-	-	-
Nickel (Ni)-Dissolved	mg/L	0.08 <sup>(2)</sup>	-	-	-	-	-	-	-	-	-	-
Phosphorus - Dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	-
Potassium (K)-Dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	-
Rubidium (Rb) - Dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	-
Selenium (Se)-Dissolved	mg/L	0.01 <sup>(2)</sup>	0.00016	0.00004	-	-	-	-	-	-	-	-
Silicon - Dissolved	mg/L	-	5.70	5.20	-	-	-	-	-	-	-	-
Silver (Ag)-Dissolved	mg/L	0.02 <sup>(2)</sup>	ND	ND	-	-	-	-	-	-	-	-
Sodium (Na)-Dissolved	mg/L	200 <sup>(2)</sup>	3.65	1.68	-	-	-	-	-	-	-	-
Strontium - Dissolved	mg/L	-	0.0390	0.0295	-	-	-	-	-	-	-	-
Sulfur - Dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	-
Tellurium - Dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	-
Thallium (Tl)-Dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	-
Thorium - Dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	-
Tin (Sn)-Dissolved	mg/L	3.5 <sup>(2)</sup>	ND	0.00029	-	-	-	-	-	-	-	-
Titanium (Ti)-Dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	-
Tungsten (W) - Dissolved	mg/L	0.003 <sup>(2)</sup>	-	-	-	-	-	-	-	-	-	-
Uranium (U)-Dissolved	mg/L	0.020	0.00046	0.00009	-	-	-	-	-	-	-	-
Vanadium (V)-Dissolved	mg/L	0.020 <sup>(2)</sup>	ND	0.00075	-	-	-	-	-	-	-	-
Zinc (Zn)-Dissolved	mg/L	3.0 <sup>(2)</sup>	0.0065	ND	-	-	-	-	-	-	-	-
Zirconium - Dissolved	mg/L	-	ND	ND	-	-	-	-	-	-	-	-

**NOTES**

- (1) BC MoE Approved and Working Water Quality Guidelines, last updated March 2018
- (2) BC Contaminated Sites Regulation (CSR) for drinking water, Schedule 3.2, last updated January 2019
- (3) All criteria limits for BCPDG - Drinking Quality Guidelines based on Total Metal Concentration except Aluminum (Dissolved)
- (4) BC MoE Water Quality Guidelines for Protection of Wildlife
- (5) BC Contaminated Sites Regulation (CSR) for drinking water, Schedule 3.2
- (a) Range based on max pH 8.5 to min pH 6.5 at temperature of 6.0 °C
- (b) at pH less than 6.5, limit is determined by regression equation, else limit is 0.1 mg/L
- (c) Limit for dissolved metals, not total metals
- (d) Limit dependent upon hardness
- (e) Limit for chromium(VI) - data reported by lab as total chromium - limit assumes 100% chromium VI in sample
- (f) Where hardness data was unavailable, 50 mg/L was assumed
- (g) Maximum value
- (h) Limit dependent upon chloride concentration
- (i) Change of 25 mg/L from background for a duration of 24 hours during clear flows. Change of 10% of background during turbid flows

\* Criteria exceeds detection limit  
 MAC = Maximum Acceptable Concentration  
 AO = Aesthetic Objective

CSR-DW BC Contaminated Sites Regulation Water Quality Guidelines for Drinking Water

Groundwater Quality Results Sampling Location MW-11 (E287383)

		BC MoE Guidelines	29-Jun-20	14-Aug-20	4-Nov-20	29-Mar-21	23-Jun-21	25-Aug-21	3-Nov-21
Field	Units	CSR-DW (2)	well dry	well dry	Monitor	Monitor	Monitor	Monitor	Monitor
Conductivity	uS/cm	-	-	64	93	-	75	65	64
SPC	uS/cm	-	-	-	-	-	-	-	-
pH	pH	-	-	-	-	-	-	-	-
Dissolved Oxygen	mg/L	-	-	-	-	-	-	-	-
Temperature	°C	-	5.6	5.6	5.4	-	5.6	5.5	5.6
Depth to Water	m	-	-	39.14	36.77	35.66	37.58	35.25	35.53
Depth to Bottom	m	-	-	-	-	39.4	38.69	39.37	39.44
Elevation of Well	m	-	-	-	207	-	207	-	-
Casing Height	m	-	-	-	0.89	-	0.775	1.01	0.99
<b>Analyte</b>	<b>Units</b>								
Conductivity	uS/cm	-	-	-	-	-	-	-	-
Hardness (as CaCO3)	mg/L	-	-	-	-	-	-	-	-
Hardness (as CaCO3), dissolved	mg/L	-	-	-	-	-	-	-	-
pH	pH	-	-	-	-	-	-	-	-
Total Suspended Solids	mg/L	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	-	-	-	-	-	-	-
Alkalinity, Total (as CaCO3)	mg/L	-	-	-	-	-	-	-	-
Ammonia, Total (as N)	mg/L	-	-	-	-	-	-	-	-
Total Nitrogen as N	mg/L	-	-	-	-	-	-	-	-
TKN	mg/L	-	-	-	-	-	-	-	-
Bromide (Br)	mg/L	-	-	-	-	-	-	-	-
Chloride (Cl)	mg/L	-	-	-	-	-	-	-	-
Fluoride (F)	mg/L	250 <sup>(2)</sup>	-	-	-	-	-	-	-
Nitrate (as N)	mg/L	1.5 <sup>(2)</sup>	-	-	-	-	-	-	-
Nitrite (as N)	mg/L	10 <sup>(2)</sup>	-	-	-	-	-	-	-
Sulfate (SO4)	mg/L	1.0 <sup>(2)</sup>	-	-	-	-	-	-	-
Total Organic Carbon	mg/L	500 <sup>(2)</sup>	-	-	-	-	-	-	-
BOD	mg/L	-	-	-	-	-	-	-	-
COD	mg/L	-	-	-	-	-	-	-	-
<b>Dissolved Metals</b>									
Aluminum (Al)-Dissolved	mg/L	9.5 <sup>(2)</sup>	-	-	-	-	-	-	-
Antimony (Sb)-Dissolved	mg/L	0.006 <sup>(2)</sup>	-	-	-	-	-	-	-
Arsenic (As)-Dissolved	mg/L	0.01 <sup>(2)</sup>	-	-	-	-	-	-	-
Barium (Ba)-Dissolved	mg/L	1.0 <sup>(2)</sup>	-	-	-	-	-	-	-
Beryllium (Be)-Dissolved	mg/L	0.008 <sup>(2)</sup>	-	-	-	-	-	-	-
Bismuth - Dissolved	mg/L	-	-	-	-	-	-	-	-
Boron (B)-Dissolved	mg/L	5.0 <sup>(2)</sup>	-	-	-	-	-	-	-
Cadmium (Cd)-Dissolved	mg/L	0.005 <sup>(2)</sup>	-	-	-	-	-	-	-
Calcium (Ca)-Dissolved	mg/L	-	-	-	-	-	-	-	-
Cesium (Cs)- Dissolved	mg/L	-	-	-	-	-	-	-	-
Chromium (Cr)-Dissolved	mg/L	0.05 - 6.0 <sup>(2)</sup>	-	-	-	-	-	-	-
Cobalt (Co)-Dissolved	mg/L	0.001 <sup>(2)</sup>	-	-	-	-	-	-	-
Copper (Cu)-Dissolved	mg/L	1.5 <sup>(2)</sup> AO	-	-	-	-	-	-	-
Iron (Fe)-Dissolved	mg/L	6.5 <sup>(2)</sup>	-	-	-	-	-	-	-
Lead (Pb)-Dissolved	mg/L	0.01 <sup>(2)</sup>	-	-	-	-	-	-	-
Lithium (Li)-Dissolved	mg/L	0.008 <sup>(2)</sup>	-	-	-	-	-	-	-
Magnesium (Mg)-Dissolved	mg/L	-	-	-	-	-	-	-	-
Manganese (Mn)-Dissolved	mg/L	1.5 <sup>(2)</sup>	-	-	-	-	-	-	-
Mercury (Hg)-Dissolved	mg/L	0.001 <sup>(2)</sup>	-	-	-	-	-	-	-
Molybdenum (Mo)-Dissolved	mg/L	0.25 <sup>(2)</sup>	-	-	-	-	-	-	-
Nickel (Ni)-Dissolved	mg/L	0.08 <sup>(2)</sup>	-	-	-	-	-	-	-
Phosphorus - Dissolved	mg/L	-	-	-	-	-	-	-	-
Potassium (K)-Dissolved	mg/L	-	-	-	-	-	-	-	-
Rubidium (Rb) - Dissolved	mg/L	-	-	-	-	-	-	-	-
Selenium (Se)-Dissolved	mg/L	0.01 <sup>(2)</sup>	-	-	-	-	-	-	-
Silicon - Dissolved	mg/L	-	-	-	-	-	-	-	-
Silver (Ag)-Dissolved	mg/L	0.02 <sup>(2)</sup>	-	-	-	-	-	-	-
Sodium (Na)-Dissolved	mg/L	200 <sup>(2)</sup>	-	-	-	-	-	-	-
Strontium - Dissolved	mg/L	-	-	-	-	-	-	-	-
Sulfur- Dissolved	mg/L	-	-	-	-	-	-	-	-
Tellurium - Dissolved	mg/L	-	-	-	-	-	-	-	-
Thallium (Tl)-Dissolved	mg/L	-	-	-	-	-	-	-	-
Thorium - Dissolved	mg/L	-	-	-	-	-	-	-	-
Tin (Sn)-Dissolved	mg/L	2.5 <sup>(2)</sup>	-	-	-	-	-	-	-
Titanium (Ti)-Dissolved	mg/L	-	-	-	-	-	-	-	-
Tungston (W) - Dissolved	mg/L	0.003 <sup>(2)</sup>	-	-	-	-	-	-	-
Uranium (U)-Dissolved	mg/L	0.020	-	-	-	-	-	-	-
Vanadium (V)-Dissolved	mg/L	0.020 <sup>(2)</sup>	-	-	-	-	-	-	-
Zinc (Zn)-Dissolved	mg/L	3.0 <sup>(2)</sup>	-	-	-	-	-	-	-
Zirconium - Dissolved	mg/L	-	-	-	-	-	-	-	-

NOTES

- (1) BC MoE Approved and Working Water Quality Guidelines, last updated March 2018
- (2) BC Contaminated Sites Regulation (CSR) for drinking water, Schedule 3.2, last updated January 2019
- (3) All criteria limits for BCWQG - Drinking Quality Guidelines based on Total Metal Concentration except Aluminum (Dissolved)
- (4) BC MoE Water Quality Guidelines for Protection of Wildlife
- (5) BC Contaminated Sites Regulation (CSR) for drinking water, Schedule 3.2
- (a) Range based on max pH 8.5 to min pH 6.5 at temperature of 6.0 °C
- (b) at pH less than 6.5, limit is determined by regression equation, else limit is 0.1 mg/L.
- (c) Limit for dissolved metals, not total metals
- (d) Limit dependent upon hardness.
- (e) Limit for chromium(VI) - data reported by lab as total chromium - limit assumes 100% chromium VI in sample
- (f) Where hardness data was unavailable, 50 mg/L was assumed
- (g) Maximum value
- (h) Limit dependent upon chloride concentration
- (i) Change of 25 mg/L from background for a duration of 24 hours during clear flows. Change of 10% of background during turbid flows

\* Criteria exceeds detection limit  
 MAC = Maximum Acceptable Concentration  
 AO = Aesthetic Objective

CSR-DW BC Contaminated Sites Regulation Water Quality Guidelines for Drinking Water

Table 14: Groundwater Quality Results Sampling Location MW-12 (E287384)

Item / OAVOC Check	Units	BC Met. Guidelines	22-Oct-12	3-Apr-13	19-Jul-18	25-Mar-19	11-Jun-19	29-Jun-20	14-Aug-20	4-Nov-20	29-Mar-21	23-Jun-21	25-Aug-21	4-Nov-21
Field	Units	CSR-DW (1)	Sample	Sample	Sample	Sample	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Conductivity	µS/cm	-	-	-	-	62.8	163	148	172	210	-	144	168	179
SFC	µS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-
pH	pH	-	-	-	-	6.9	-	-	-	-	-	-	-	-
Dissolved Oxygen	mg/L	-	-	-	-	11.3	-	-	-	-	-	-	-	-
Temperature	°C	-	-	-	-	7.3	7.4	7.5	7.3	7.5	41.27	39.42	39.39	40.03
Depth to Water	m	-	-	-	-	43.96	43.84	44.84	43.72	44.38	43.29	44.41	44.41	44.28
Depth to Bottom	m	-	-	-	-	-	-	-	-	-	218	218	218	218
Elevation of Well	m	-	-	-	-	-	-	-	-	-	0.85	-	0.86	1.04
Casing Height	Units	-	-	-	-	-	-	-	-	-	-	-	-	-
Analyte	Units	-	-	-	-	-	-	-	-	-	-	-	-	-
Conductivity	µS/cm	-	140	-	-	-	-	-	-	-	-	-	-	-
Hardness (as CaCO <sub>3</sub> )	mg/L	-	-	76.5	50.9	53.8	-	-	-	-	-	-	-	-
Hardness (as CaCO <sub>3</sub> ) dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
pH	pH	-	8	7.9	-	7.84	-	-	-	-	-	-	-	-
Total Suspended Solids	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	66	-	-	-	-	-	-	-	-	-	-	-
Alkalinity, Total (as CaCO <sub>3</sub> )	mg/L	-	72.3	75.5	70.5	51.2	-	-	-	-	-	-	-	-
Ammonia, Total (as N)	mg/L	-	-	-	-0.0050	0.0112	-	-	-	-	-	-	-	-
Total Nitrogen as N	mg/L	-	0.105	-	-	-	-	-	-	-	-	-	-	-
TKN	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (Fe)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloride (Cl)	mg/L	249 <sup>(b)</sup>	1	1.3	-0.50	-0.050	-	-	-	-	-	-	-	-
Fluoride (F)	mg/L	1.5 <sup>(b)</sup>	ND	ND	0.059	0.046	-	-	-	-	-	-	-	-
Nitrate (as N)	mg/L	10 <sup>(b)</sup>	0.026	0.041	0.0271	0.0247	-	-	-	-	-	-	-	-
Nitrite (as N)	mg/L	1.0 <sup>(b)</sup>	ND	ND	-0.0010	-0.0010	-	-	-	-	-	-	-	-
Sulfate (SO <sub>4</sub> )	mg/L	300 <sup>(b)</sup>	-	2.34	1.02	1.1	-	-	-	-	-	-	-	-
Total Organic Carbon	mg/L	-	-	4.01	1.7	2.29	-	-	-	-	-	-	-	-
BOD	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
COD	mg/L	-	-	-	-20	-20	-	-	-	-	-	-	-	-
Dissolved Metals	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminum (Al)-Dissolved	mg/L	0.5 <sup>(b)</sup>	0.0043	0.0074	0.0072	0.0059	-	-	-	-	-	-	-	-
Antimony (Sb)-Dissolved	mg/L	0.005 <sup>(b)</sup>	ND	0.00134	-0.0010	-0.0010	-	-	-	-	-	-	-	-
Arsenic (As)-Dissolved	mg/L	0.01 <sup>(b)</sup>	ND	0.00142	-0.0010	0.0031	-	-	-	-	-	-	-	-
Barium (Ba)-Dissolved	mg/L	1.0 <sup>(b)</sup>	0.0143	0.0155	0.0156	0.0154	-	-	-	-	-	-	-	-
Beryllium (Be)-Dissolved	mg/L	0.000 <sup>(b)</sup>	ND	ND	-0.00010	-0.00010	-	-	-	-	-	-	-	-
Bismuth (Bi)-Dissolved	mg/L	-	ND	ND	-0.00050	-0.00050	-	-	-	-	-	-	-	-
Boron (B)-Dissolved	mg/L	1.0 <sup>(b)</sup>	ND	ND	-0.010	-0.010	-	-	-	-	-	-	-	-
Calcium (Ca)-Dissolved	mg/L	0.005 <sup>(b)</sup>	0.00020	0.00054	0.00144	0.00017	-	-	-	-	-	-	-	-
Calcium (Ca)-Dissolved	mg/L	-	-	-	18	19.3	-	-	-	-	-	-	-	-
Cadmium (Cd)-Dissolved	mg/L	0.01 - 0.1 <sup>(b)</sup>	ND	0.00139	0.00045	0.0004	-	-	-	-	-	-	-	-
Cobalt (Co)-Dissolved	mg/L	0.001 <sup>(b)</sup>	ND	0.00037	-0.00010	-0.00010	-	-	-	-	-	-	-	-
Copper (Cu)-Dissolved	mg/L	1.5 <sup>(b)</sup> AO	0.00085	0.0013	0.00044	-0.00020	-	-	-	-	-	-	-	-
Iron (Fe)-Dissolved	mg/L	6.5 <sup>(b)</sup>	ND	0.0148	0.011	0.011	-	-	-	-	-	-	-	-
Lead (Pb)-Dissolved	mg/L	0.01 <sup>(b)</sup>	ND	ND	-0.00050	-0.00050	-	-	-	-	-	-	-	-
Lithium (Li)-Dissolved	mg/L	0.008 <sup>(b)</sup>	ND	0.00066	-0.0010	-0.0010	-	-	-	-	-	-	-	-
Magnesium (Mg)-Dissolved	mg/L	-	2.00	1.74	1.45	1.39	-	-	-	-	-	-	-	-
Manganese (Mn)-Dissolved	mg/L	1.5 <sup>(b)</sup>	0.0016	0.00178	0.00205	0.00205	-	-	-	-	-	-	-	-
Mercury (Hg)-Dissolved	mg/L	0.001 <sup>(b)</sup>	ND	ND	-0.000050	0.000013	-	-	-	-	-	-	-	-
Molybdenum (Mo)-Dissolved	mg/L	0.32 <sup>(b)</sup>	ND	0.0002	0.00009	0.000165	-	-	-	-	-	-	-	-
Nickel (Ni)-Dissolved	mg/L	0.08 <sup>(b)</sup>	-	-	-0.00050	-0.00050	-	-	-	-	-	-	-	-
Phosphorus - Dissolved	mg/L	-	-	-	-0.050	-0.050	-	-	-	-	-	-	-	-
Phosphorus (P)-Dissolved	mg/L	-	-	-	0.42	0.357	-	-	-	-	-	-	-	-
Radium (Ra)-Dissolved	mg/L	-	-	-	0.00036	0.00043	-	-	-	-	-	-	-	-
Selenium (Se)-Dissolved	mg/L	0.01 <sup>(b)</sup>	ND	0.000061	-0.00050	0.000063	-	-	-	-	-	-	-	-
Silicon - Dissolved	mg/L	5.91	5.17	5.29	5.29	5.74	-	-	-	-	-	-	-	-
Silver (Ag)-Dissolved	mg/L	0.02 <sup>(b)</sup>	ND	ND	-0.000010	-0.000010	-	-	-	-	-	-	-	-
Sodium (Na)-Dissolved	mg/L	200 <sup>(b)</sup>	2.11	1.92	1.65	1.52	-	-	-	-	-	-	-	-
Strontium - Dissolved	mg/L	-	0.0758	0.0782	0.0757	0.0804	-	-	-	-	-	-	-	-
Sulfur - Dissolved	mg/L	-	-	-	-9.50	-9.50	-	-	-	-	-	-	-	-
Tellurium - Dissolved	mg/L	-	-	-	-0.00020	-0.00020	-	-	-	-	-	-	-	-
Thallium (Tl)-Dissolved	mg/L	-	-	-	-0.00010	-0.00010	-	-	-	-	-	-	-	-
Thorium - Dissolved	mg/L	-	-	-	-0.00010	-0.00010	-	-	-	-	-	-	-	-
Tin (Sn)-Dissolved	mg/L	2.5 <sup>(b)</sup>	ND	ND	0.00054	-0.00010	-	-	-	-	-	-	-	-
Titanium (Ti)-Dissolved	mg/L	-	-	-	-0.00030	-0.00030	-	-	-	-	-	-	-	-
Tungsten (W)-Dissolved	mg/L	0.001 <sup>(b)</sup>	-	-	-0.00010	-0.00010	-	-	-	-	-	-	-	-
Uranium (U)-Dissolved	mg/L	0.020	ND	0.000018	-0.00010	0.000021	-	-	-	-	-	-	-	-
Vanadium (V)-Dissolved	mg/L	0.020 <sup>(b)</sup>	ND	0.00068	-0.00050	-0.00050	-	-	-	-	-	-	-	-
Zinc (Zn)-Dissolved	mg/L	3.0 <sup>(b)</sup>	ND	ND	0.0015	-0.0010	-	-	-	-	-	-	-	-
Zirconium - Dissolved	mg/L	-	ND	ND	-0.00060	-0.00060	-	-	-	-	-	-	-	-

NOTES  
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 (2) BC Contaminated Sites Regulation (CSR) for drinking water, Schedule 3.2, last updated January 2019  
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 (4) BC Met. Water Quality Guidelines for Protection of Wildlife  
 (5) BC Contaminated Sites Regulation (CSR) for drinking water, Schedule 3.2  
 (a) Range based on max pH 8.5 to min pH 6.5 at temperature of 6.0 °C  
 (b) At pH less than 6.5, limit is determined by regression equation, else limit is 0.1 mg/L  
 (c) Limit for dissolved metals, not total metals  
 (d) Limit dependent upon hardness  
 (e) Limit for chromium(VI) - data reported by lab as total chromium - limit assumes 100% chromium VI in sample  
 (f) Where hardness data was unavailable, 50 mg/L was assumed  
 (g) Maximum value  
 (h) Limit dependent upon chloride concentration  
 (i) Change of 25 mg/L from background for a duration of 24 hours during clear flows. Change of 10% of background during turbid flows  
 \* Criteria exceeds detection limit  
 M&C - Maximum Acceptable Concentration  
 AO - Aesthetic Objective

Table 3: Groundwater Quality Results Sampling Location MW-13 (E287385)

		BC MoE Guidelines	22-Oct-12	3-Apr-13	12-Jun-13	5-Apr-17	6-Jul-17	14-Nov-17	11-Jun-19	26-Jun-19	29-Jun-20	14-Aug-20	3-Nov-20
Field	Units	CSR-DW (2)	Sample	Sample	Sample	Sample	Sample	Sample	Dry	Dry	Monitor	Dry	Monitor
Conductivity	uS/cm	-	-	-	-	31	81	17.7	-	-	30	-	-
SPC	uS/cm	-	-	-	-	-	-	-	-	-	-	-	-
pH	pH	-	-	-	-	6.5	7.8	5.88	-	-	-	-	-
Temperature	°C	-	-	-	-	4.5	4.7	4.1	-	-	3.8	-	-
Dissolved Oxygen	mg/L	-	-	-	-	-	4.3	11	-	-	-	-	-
Depth to Water	m	-	-	-	-	-	-	-	-	44	43.53	-	-
Depth to Bottom	m	-	-	-	-	-	-	-	-	-	-	-	-
Elevation of Well	m	-	-	-	-	-	-	-	-	-	-	-	243
Casing Height	m	-	-	-	-	-	-	-	-	-	-	-	0.78
<b>Analyte</b>	<b>Units</b>												
Conductivity	uS/cm	-	17.2	-	-	145	-	-	-	-	-	-	-
Hardness (as CaCO3)	mg/L	-	-	27.3	-	-	25.5	11.6	-	-	-	-	-
Hardness (as CaCO3) dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
pH	pH	-	6	6.7	-	8	8	6.86	-	-	-	-	-
Total Suspended Solids	mg/L	-	-	-	-	1.1	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	8	-	-	82	-	-	-	-	-	-	-
Alkalinity, Total (as CaCO3)	mg/L	-	10.6	32	56.7	-	37	12.2	-	-	-	-	-
Ammonia, Total (as N)	mg/L	-	ND	-	<0.03	<0.03	<0.03	0.0127	-	-	-	-	-
Total Nitrogen as N	mg/L	-	0.25	-	-	-	-	-	-	-	-	-	-
TKN	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Bromide (Br)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Chloride (Cl)	mg/L	250 <sup>(2)</sup>	ND	ND	-	1.1	1.4	<0.50	-	-	-	-	-
Fluoride (F)	mg/L	1.5 <sup>(2)</sup>	ND	ND	-	-	<0.10	0.023	-	-	-	-	-
Nitrate (as N)	mg/L	10 <sup>(2)</sup>	0.047	0.057	-	<0.01	<0.01	0.14	-	-	-	-	-
Nitrite (as N)	mg/L	1.0 <sup>(2)</sup>	0.0052	ND	-	-	0.15	<0.0010	-	-	-	-	-
Sulfate (SO4)	mg/L	500 <sup>(2)</sup>	-	1.52	-	2.6	2.6	0.48	-	-	-	-	-
Total Organic Carbon	mg/L	-	-	ND	-	-	<0.50	1.89	-	-	-	-	-
BOD	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
COD	mg/L	-	-	-	-	-	-	<20	-	-	-	-	-
<b>Dissolved Metals</b>													
Aluminum (Al)-Dissolved	mg/L	9.5 <sup>(2)</sup>	0.0170	0.0096	-	<0.0050	0.0468	0.0309	-	-	-	-	-
Antimony (Sb)-Dissolved	mg/L	0.006 <sup>(2)</sup>	ND	0.000082	-	<0.00010	0.00035	<0.00010	-	-	-	-	-
Arsenic (As)-Dissolved	mg/L	0.01 <sup>(2)</sup>	ND	0.00068	-	0.00159	<0.00050	<0.00010	-	-	-	-	-
Barium (Ba)-Dissolved	mg/L	1.0 <sup>(2)</sup>	0.0145	0.0101	-	0.018	<0.0050	0.0187	-	-	-	-	-
Beryllium (Be)-Dissolved	mg/L	0.008 <sup>(2)</sup>	ND	ND	-	<0.00010	<0.00010	<0.00010	-	-	-	-	-
Bismuth - Dissolved	mg/L	-	ND	ND	-	<0.00010	<0.00010	<0.000050	-	-	-	-	-
Boron (B)-Dissolved	mg/L	5.0 <sup>(2)</sup>	ND	ND	-	<0.004	<0.0050	<0.010	-	-	-	-	-
Cadmium (Cd)-Dissolved	mg/L	0.005 <sup>(2)</sup>	0.000053	0.000127	-	<0.00001	0.00008	0.000119	-	-	-	-	-
Calcium (Ca)-Dissolved	mg/L	-	-	-	-	-	8.92	4.05	-	-	-	-	-
Cesium - Di	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Chromium (Cr)-Dissolved	mg/L	0.05 - 6.0 <sup>(2)</sup>	ND	ND	-	<0.0005	<0.00050	<0.00010	-	-	-	-	-
Cobalt (Co)-Dissolved	mg/L	0.001 <sup>(2)</sup>	ND	0.000022	-	<0.00005	<0.00010	<0.00010	-	-	-	-	-
Copper (Cu)-Dissolved	mg/L	1.5 <sup>(2)</sup> AO	0.00120	0.02020	-	<0.0002	0.00033	<0.00020	-	-	-	-	-
Iron (Fe)-Dissolved	mg/L	6.5 <sup>(2)</sup>	ND	ND	-	<0.010	<0.010	<0.010	-	-	-	-	-
Lead (Pb)-Dissolved	mg/L	0.01 <sup>(2)</sup>	ND	0.000159	-	<0.0001	<0.00010	<0.000050	-	-	-	-	-
Lithium (Li)-Dissolved	mg/L	0.008 <sup>(2)</sup>	ND	ND	-	0.001	0.00012	<0.00010	-	-	-	-	-
Magnesium (Mg)-Dissolved	mg/L	-	0.290	0.860	-	1.82	0.21	0.370	-	-	-	-	-
Manganese (Mn)-Dissolved	mg/L	1.5 <sup>(2)</sup>	0.0036	0.00937	-	0.00026	0.00287	0.00121	-	-	-	-	-
Mercury (Hg)-Dissolved	mg/L	0.001 <sup>(2)</sup>	ND	ND	-	<0.00002	<0.000020	<0.0000050	-	-	-	-	-
Molybdenum (Mo)-Dissolved	mg/L	0.25 <sup>(2)</sup>	ND	0.000059	-	0.0003	0.00471	<0.000050	-	-	-	-	-
Nickel (Ni)-Dissolved	mg/L	0.08 <sup>(2)</sup>	-	-	-	<0.0002	0.00021	<0.00050	-	-	-	-	-
Phosphorus - Dissolved	mg/L	-	-	-	-	<0.05	<0.050	<0.050	-	-	-	-	-
Potassium (K)-Dissolved	mg/L	-	-	-	-	-	0.87	0.225	-	-	-	-	-
Rubidium (Rb)- Dissolved	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Selenium (Se)-Dissolved	mg/L	0.01 <sup>(2)</sup>	ND	ND	-	<0.00050	<0.00050	0.000076	-	-	-	-	-
Silicon - Dissolved	mg/L	-	2.98	3.21	-	4.8	<1.0	2.98	-	-	-	-	-
Silver (Ag)-Dissolved	mg/L	0.02 <sup>(2)</sup>	ND	ND	-	<0.00005	<0.000050	<0.000010	-	-	-	-	-
Sodium (Na)-Dissolved	mg/L	200 <sup>(2)</sup>	1.02	1.28	-	1.69	5.55	0.825	-	-	-	-	-
Strontium - Dissolved	mg/L	-	0.0375	0.0605	-	0.0864	0.0629	0.0510	-	-	-	-	-
Sulfur - Dissolved	mg/L	-	-	-	-	<3.0	<3.0	<0.50	-	-	-	-	-
Tellurium (Te) - Dissolved	mg/L	-	-	-	-	<0.00020	<0.00020	<0.00020	-	-	-	-	-
Thallium (Tl)-Dissolved	mg/L	-	-	-	-	<0.00002	<0.000020	<0.000010	-	-	-	-	-
Thorium (Th)- Dissolved	mg/L	-	-	-	-	<0.00010	<0.00010	<0.00010	-	-	-	-	-
Tin (Sn)-Dissolved	mg/L	2.5 <sup>(2)</sup>	ND	ND	-	<0.00020	0.00975	<0.00010	-	-	-	-	-
Titanium (Ti)-Dissolved	mg/L	-	-	-	-	-	<0.0050	<0.00030	-	-	-	-	-
Tungsten (W) - Dissolved	mg/L	0.003 <sup>(2)</sup>	-	-	-	-	-	<0.00010	-	-	-	-	-
Uranium (U)-Dissolved	mg/L	0.020	ND	0.000044	-	0.0001	<0.000020	-	-	-	-	-	-
Vanadium (V)-Dissolved	mg/L	0.020 <sup>(2)</sup>	ND	ND	-	<0.0010	<0.0010	-	-	-	-	-	-
Zinc (Zn)-Dissolved	mg/L	3.0 <sup>(2)</sup>	ND	0.379	-	<0.0040	<0.0040	-	-	-	-	-	-
Zirconium - Dissolved	mg/L	-	ND	ND	-	<0.00010	<0.00010	-	-	-	-	-	-

NOTES

- (1) BC MoE Approved and Working Water Quality Guidelines, last updated March 2018
- (2) BC Contaminated Sites Regulation (CSR) for drinking water, Schedule 3.2, last updated January 2019
- (3) All criteria limits for BCWQG - Drinking Quality Guidelines based on Total Metal Concentration except Aluminum (Dissolved)
- (4) BC MoE Water Quality Guidelines for Protection of Wildlife
- (a) Range based on max pH 8.5 to min pH 6.5 at temperature of 6.0 °C
- (b) at pH less than 6.5, limit is determined by regression equation, else limit is 0.1 mg/L.
- (c) Limit for dissolved metals, not total metals
- (d) Limit dependent upon hardness.
- (e) Limit for chromium(VI) - data reported by lab as total chromium - limit assumes 100% chromium VI in sample
- (f) Where hardness data was unavailable, 50 mg/L was assumed
- (g) Maximum value
- (h) Limit dependent upon chloride concentration
- (i) Change of 25 mg/L from background for a duration of 24 hours during clear flows. Change of 10% of background during turbid flows

\* Criteria exceeds detection limit  
 MAC = Maximum Acceptable Concentration  
 AO = Aesthetic Objective

CSR-DW BC Contaminated Sites Regulation Water Quality Guidelines for Drinking Water

Table 3: Groundwater Quality Results Sampling Location MW-13 (E287385)

		BC MoE Guidelines	30-Mar-21	24-Jun-21	25-Aug-21	4-Nov-21
Field	Units	CSR-DW (2)	Monitor	Monitor	Monitor	Monitor
Conductivity	uS/cm	-	17.7	32	34	179
SPC	uS/cm	-	-	-	-	-
pH	pH	-	5.49	-	-	-
Temperature	°C	-	3.7	4.1	4.4	5.4
Dissolved Oxygen	mg/L	-	11.2	-	-	-
Depth to Water	m	-	37.06	36.3	40.44	40.03
Depth to Bottom	m	-	44.91	44.37	44.73	45.28
Elevation of Well	m	-	243	243	-	-
Casing Height	m	-	-	0.82	1.03	1.04
<b>Analyte</b>	<b>Units</b>					
Conductivity	uS/cm	-	-	-	-	-
Hardness (as CaCO3)	mg/L	-	-	-	-	-
Hardness (as CaCO3) dissolved	mg/L	-	-	-	-	-
pH	pH	-	-	-	-	-
Total Suspended Solids	mg/L	-	-	-	-	-
Total Dissolved Solids	mg/L	-	-	-	-	-
Alkalinity, Total (as CaCO3)	mg/L	-	-	-	-	-
Ammonia, Total (as N)	mg/L	-	-	-	-	-
Total Nitrogen as N	mg/L	-	-	-	-	-
TKN	mg/L	-	-	-	-	-
Bromide (Br)	mg/L	-	-	-	-	-
Chloride (Cl)	mg/L	250 <sup>(2)</sup>	-	-	-	-
Fluoride (F)	mg/L	1.5 <sup>(2)</sup>	-	-	-	-
Nitrate (as N)	mg/L	10 <sup>(2)</sup>	-	-	-	-
Nitrite (as N)	mg/L	1.0 <sup>(2)</sup>	-	-	-	-
Sulfate (SO4)	mg/L	500 <sup>(2)</sup>	-	-	-	-
Total Organic Carbon	mg/L	-	-	-	-	-
BOD	mg/L	-	-	-	-	-
COD	mg/L	-	-	-	-	-
<b>Dissolved Metals</b>						
Aluminum (Al)-Dissolved	mg/L	9.5 <sup>(2)</sup>	-	-	-	-
Antimony (Sb)-Dissolved	mg/L	0.006 <sup>(2)</sup>	-	-	-	-
Arsenic (As)-Dissolved	mg/L	0.01 <sup>(2)</sup>	-	-	-	-
Barium (Ba)-Dissolved	mg/L	1.0 <sup>(2)</sup>	-	-	-	-
Beryllium (Be)-Dissolved	mg/L	0.008 <sup>(2)</sup>	-	-	-	-
Bismuth - Dissolved	mg/L	-	-	-	-	-
Boron (B)-Dissolved	mg/L	5.0 <sup>(2)</sup>	-	-	-	-
Cadmium (Cd)-Dissolved	mg/L	0.005 <sup>(2)</sup>	-	-	-	-
Calcium (Ca)-Dissolved	mg/L	-	-	-	-	-
Cesium - Di	mg/L	-	-	-	-	-
Chromium (Cr)-Dissolved	mg/L	0.05 - 6.0 <sup>(2)</sup>	-	-	-	-
Cobalt (Co)-Dissolved	mg/L	0.001 <sup>(2)</sup>	-	-	-	-
Copper (Cu)-Dissolved	mg/L	1.5 <sup>(2)</sup> AO	-	-	-	-
Iron (Fe)-Dissolved	mg/L	6.5 <sup>(2)</sup>	-	-	-	-
Lead (Pb)-Dissolved	mg/L	0.01 <sup>(2)</sup>	-	-	-	-
Lithium (Li)-Dissolved	mg/L	0.008 <sup>(2)</sup>	-	-	-	-
Magnesium (Mg)-Dissolved	mg/L	-	-	-	-	-
Manganese (Mn)-Dissolved	mg/L	1.5 <sup>(2)</sup>	-	-	-	-
Mercury (Hg)-Dissolved	mg/L	0.001 <sup>(2)</sup>	-	-	-	-
Molybdenum (Mo)-Dissolved	mg/L	0.25 <sup>(2)</sup>	-	-	-	-
Nickel (Ni)-Dissolved	mg/L	0.08 <sup>(2)</sup>	-	-	-	-
Phosphorus - Dissolved	mg/L	-	-	-	-	-
Potassium (K)-Dissolved	mg/L	-	-	-	-	-
Rubidium (Rb)- Dissolved	mg/L	-	-	-	-	-
Selenium (Se)-Dissolved	mg/L	0.01 <sup>(2)</sup>	-	-	-	-
Silicon - Dissolved	mg/L	-	-	-	-	-
Silver (Ag)-Dissolved	mg/L	0.02 <sup>(2)</sup>	-	-	-	-
Sodium (Na)-Dissolved	mg/L	200 <sup>(2)</sup>	-	-	-	-
Strontium - Dissolved	mg/L	-	-	-	-	-
Sulfur - Dissolved	mg/L	-	-	-	-	-
Tellurium (Te) - Dissolved	mg/L	-	-	-	-	-
Thallium (Tl)-Dissolved	mg/L	-	-	-	-	-
Thorium (Th)- Dissolved	mg/L	-	-	-	-	-
Tin (Sn)-Dissolved	mg/L	2.5 <sup>(2)</sup>	-	-	-	-
Titanium (Ti)-Dissolved	mg/L	-	-	-	-	-
Tungsten (W) - Dissolved	mg/L	0.003 <sup>(2)</sup>	-	-	-	-
Uranium (U)-Dissolved	mg/L	0.020	-	-	-	-
Vanadium (V)-Dissolved	mg/L	0.020 <sup>(2)</sup>	-	-	-	-
Zinc (Zn)-Dissolved	mg/L	3.0 <sup>(2)</sup>	-	-	-	-
Zirconium - Dissolved	mg/L	-	-	-	-	-

NOTES

- (1) BC MoE Approved and Working Water Quality Guidelines, last updated March .
- (2) BC Contaminated Sites Regulation (CSR) for drinking water, Schedule 3.2, last updated March .
- (3) All criteria limits for BCWQG - Drinking Quality Guidelines based on Total Metals.
- (4) BC MoE Water Quality Guidelines for Protection of Wildlife
- (a) Range based on max pH 8.5 to min pH 6.5 at temperature of 6.0 °C
- (b) at pH less than 6.5, limit is determined by regression equation, else limit is 0.1 mg/L
- (c) Limit for dissolved metals, not total metals
- (d) Limit dependent upon hardness.
- (e) Limit for chromium(VI) - data reported by lab as total chromium - limit assumes hexavalent chromium
- (f) Where hardness data was unavailable, 50 mg/L was assumed
- (g) Maximum value
- (h) Limit dependent upon chloride concentration
- (i) Change of 25 mg/L from background for a duration of 24 hours during clear flow

\* Criteria exceeds detection limit  
 MAC = Maximum Acceptable Concentration  
 AO = Aesthetic Objective

CSR-DW BC Contaminated Sites Regulation Water Quality

Groundwater Quality Results Sampling Location MW-14 (E287386)

		BC MoE Guidelines	29-Jun-20	14-Aug-20	4-Nov-20	29-Mar-21	23-Jun-21	26-Aug-21	4-Nov-21
Field	Units	CSR-DW (2)	Monitor	Well Dry	Well Dry	Monitor	Monitor	Monitor	Monitor
Conductivity	uS/cm	-	65	-	-	-	34	36	42
SPC	uS/cm	-	-	-	-	-	-	-	-
pH	pH	-	-	-	-	-	-	-	-
Dissolved Oxygen	mg/L	-	-	-	-	-	-	-	-
Temperature	°C	-	5.8	-	-	-	6.3	6.1	5.8
Depth to Water	m	-	28.08	-	-	17.68	18.21	21.77	23.59
Depth to Bottom	m	-	-	-	-	36.41	36.47	36.84	36.52
Elevation of Well	m	-	-	-	224	-	224	-	224
Casing Height	m	-	-	-	0.89	-	-	0.99	1
<b>Analyte</b>	<b>Units</b>								
Conductivity	uS/cm	-	-	-	-	-	-	-	-
Hardness (as CaCO3)	mg/L	-	-	-	-	-	-	-	-
Hardness (as CaCO3), dissolved	mg/L	-	-	-	-	-	-	-	-
pH	pH	-	-	-	-	-	-	-	-
Total Suspended Solids	mg/L	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	-	-	-	-	-	-	-
Alkalinity, Total (as CaCO3)	mg/L	-	-	-	-	-	-	-	-
Ammonia, Total (as N)	mg/L	-	-	-	-	-	-	-	-
Total Nitrogen as N	mg/L	-	-	-	-	-	-	-	-
TKN	mg/L	-	-	-	-	-	-	-	-
Bromide (Br)	mg/L	-	-	-	-	-	-	-	-
Chloride (Cl)	mg/L	-	-	-	-	-	-	-	-
Fluoride (F)	mg/L	250 <sup>(2)</sup>	-	-	-	-	-	-	-
Nitrate (as N)	mg/L	1.5 <sup>(2)</sup>	-	-	-	-	-	-	-
Nitrite (as N)	mg/L	10 <sup>(2)</sup>	-	-	-	-	-	-	-
Sulfate (SO4)	mg/L	1.0 <sup>(2)</sup>	-	-	-	-	-	-	-
Total Organic Carbon	mg/L	500 <sup>(2)</sup>	-	-	-	-	-	-	-
BOD	mg/L	-	-	-	-	-	-	-	-
COD	mg/L	-	-	-	-	-	-	-	-
<b>Dissolved Metals</b>									
Aluminum (Al)-Dissolved	mg/L	9.5 <sup>(2)</sup>	-	-	-	-	-	-	-
Antimony (Sb)-Dissolved	mg/L	0.006 <sup>(2)</sup>	-	-	-	-	-	-	-
Arsenic (As)-Dissolved	mg/L	0.01 <sup>(2)</sup>	-	-	-	-	-	-	-
Barium (Ba)-Dissolved	mg/L	1.0 <sup>(2)</sup>	-	-	-	-	-	-	-
Beryllium (Be)-Dissolved	mg/L	0.008 <sup>(2)</sup>	-	-	-	-	-	-	-
Bismuth - Dissolved	mg/L	-	-	-	-	-	-	-	-
Boron (B)-Dissolved	mg/L	5.0 <sup>(2)</sup>	-	-	-	-	-	-	-
Cadmium (Cd)-Dissolved	mg/L	0.005 <sup>(2)</sup>	-	-	-	-	-	-	-
Calcium (Ca)-Dissolved	mg/L	-	-	-	-	-	-	-	-
Cesium (Cs) - Dissolved	mg/L	-	-	-	-	-	-	-	-
Chromium (Cr)-Dissolved	mg/L	0.05 - 6.0 <sup>(2)</sup>	-	-	-	-	-	-	-
Cobalt (Co)-Dissolved	mg/L	0.001 <sup>(2)</sup>	-	-	-	-	-	-	-
Copper (Cu)-Dissolved	mg/L	1.5 <sup>(2)</sup> AO	-	-	-	-	-	-	-
Iron (Fe)-Dissolved	mg/L	6.5 <sup>(2)</sup>	-	-	-	-	-	-	-
Lead (Pb)-Dissolved	mg/L	0.01 <sup>(2)</sup>	-	-	-	-	-	-	-
Lithium (Li)-Dissolved	mg/L	0.008 <sup>(2)</sup>	-	-	-	-	-	-	-
Magnesium (Mg)-Dissolved	mg/L	-	-	-	-	-	-	-	-
Manganese (Mn)-Dissolved	mg/L	1.5 <sup>(2)</sup>	-	-	-	-	-	-	-
Mercury (Hg)-Dissolved	mg/L	0.001 <sup>(2)</sup>	-	-	-	-	-	-	-
Molybdenum (Mo)-Dissolved	mg/L	0.25 <sup>(2)</sup>	-	-	-	-	-	-	-
Nickel (Ni)-Dissolved	mg/L	0.08 <sup>(2)</sup>	-	-	-	-	-	-	-
Phosphorus - Dissolved	mg/L	-	-	-	-	-	-	-	-
Potassium (K)-Dissolved	mg/L	-	-	-	-	-	-	-	-
Rubidium (Rb) - Dissolved	mg/L	-	-	-	-	-	-	-	-
Selenium (Se)-Dissolved	mg/L	0.01 <sup>(2)</sup>	-	-	-	-	-	-	-
Silicon - Dissolved	mg/L	-	-	-	-	-	-	-	-
Silver (Ag)-Dissolved	mg/L	0.02 <sup>(2)</sup>	-	-	-	-	-	-	-
Sodium (Na)-Dissolved	mg/L	200 <sup>(2)</sup>	-	-	-	-	-	-	-
Strontium - Dissolved	mg/L	-	-	-	-	-	-	-	-
Sulfur - Dissolved	mg/L	-	-	-	-	-	-	-	-
Tellurium - Dissolved	mg/L	-	-	-	-	-	-	-	-
Thallium (Tl)-Dissolved	mg/L	-	-	-	-	-	-	-	-
Thorium - Dissolved	mg/L	-	-	-	-	-	-	-	-
Tin (Sn)-Dissolved	mg/L	2.5 <sup>(2)</sup>	-	-	-	-	-	-	-
Titanium (Ti)-Dissolved	mg/L	-	-	-	-	-	-	-	-
Tungsten (W) - Dissolved	mg/L	0.003 <sup>(2)</sup>	-	-	-	-	-	-	-
Uranium (U)-Dissolved	mg/L	0.020	-	-	-	-	-	-	-
Vanadium (V)-Dissolved	mg/L	0.020 <sup>(2)</sup>	-	-	-	-	-	-	-
Zinc (Zn)-Dissolved	mg/L	3.0 <sup>(2)</sup>	-	-	-	-	-	-	-
Zirconium - Dissolved	mg/L	-	-	-	-	-	-	-	-

NOTES

- (1) BC MoE Approved and Working Water Quality Guidelines, last updated March 2018
- (2) BC Contaminated Sites Regulation (CSR) for drinking water, Schedule 3.2, last updated January 2019
- (3) All criteria limits for BCWQG - Drinking Quality Guidelines based on Total Metal Concentration except Aluminum (Dissolved)
- (4) BC MoE Water Quality Guidelines for Protection of Wildlife
- (5) BC Contaminated Sites Regulation (CSR) for drinking water, Schedule 3.2
- (a) Range based on max pH 8.5 to min pH 6.5 at temperature of 6.0 °C
- (b) at pH less than 6.5, limit is determined by regression equation, else limit is 0.1 mg/L.
- (c) Limit for dissolved metals, not total metals
- (d) Limit dependent upon hardness.
- (e) Limit for chromium(VI) - data reported by lab as total chromium - limit assumes 100% chromium VI in sample
- (f) Where hardness data was unavailable, 50 mg/L was assumed
- (g) Maximum value
- (h) Limit dependent upon chloride concentration
- (i) Change of 25 mg/L from background for a duration of 24 hours during clear flows. Change of 10% of background during turbid flows

\* Criteria exceeds detection limit  
 MAC = Maximum Acceptable Concentration  
 AO = Aesthetic Objective

CSR-DW BC Contaminated Sites Regulation Water Quality Guidelines for Drinking Water

Table 6: Groundwater Quality Results Sampling Location MW-15 (302210)

QA/QC Check	Units	BC MoE Guidelines CSR-DW (2)	2-Oct-17	14-Nov-17	9-Apr-18	18-Jul-18	21-Nov-18	21-Nov-18	26-Mar-19	11-Jun-19
			Sample	Sample	Sample	Sample	DUP	Sample	Sample	Monitor
Conductivity	uS/cm	-	90.3	96.2	97.6	157	-	157	174	164
SPC	uS/cm	-	-	-	-	-	-	-	-	-
pH	pH	-	8.39	8.29	7.8	7.51	-	7.9	6.5	-
Dissolved Oxygen	mg/L	-	14.2	10.5	9.8	7.1	-	0.3	8.7	-
Temperature	°C	-	5.5	5.0	4.9	5.3	-	5.1	5.1	5.4
Depth to Water	m	-	-	-	44.66	43.8	-	45.37	44.72	45.73
Depth to Bottom	m	-	-	-	-	-	-	-	-	-
Elevation of Well	m	-	-	-	-	-	-	-	-	-
Casing Height	m	-	-	-	-	-	-	-	-	-
<b>Analyte</b>	<b>Units</b>									
Conductivity	uS/cm	-	152	-	-	-	-	-	-	-
Hardness (as CaCO3)	mg/L	-	-	72.9	75.7	79.5	80.2	79.2	82.5	-
Hardness (as CaCO3), dissolved	mg/L	-	-	-	-	-	-	-	-	-
pH	pH	-	7.9	8.1	8.17	-	-	-	8.18	-
Total Suspended Solids	mg/L	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	75	-	-	-	-	-	-	-
Alkalinity, Total (as CaCO3)	mg/L	-	77	78.1	82.4	83.6	87.4	77.5	83.4	-
Ammonia, Total (as N)	mg/L	-	<0.03	-	0.0052	<0.0050	<0.0050	<0.0050	<0.0050	-
Total Nitrogen as N	mg/L	-	0.0827	-	-	-	-	-	-	-
TKN	mg/L	-	-	-	-	-	-	-	-	-
Bromide (Br)	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	-
Chloride (Cl)	mg/L	250 <sup>(2)</sup>	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	-
Fluoride (F)	mg/L	1.5 <sup>(2)</sup>	<0.1	0.032	0.034	0.034	0.027	0.027	0.039	-
Nitrate (as N)	mg/L	10 <sup>(2)</sup>	<0.01	0.089	0.0908	0.0873	0.0949	0.0941	0.0732	-
Nitrite (as N)	mg/L	1.0 <sup>(2)</sup>	<0.01	<0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
Sulfate (SO4)	mg/L	500 <sup>(2)</sup>	-	1.08	1.03	1.02	0.93	0.91	1.17	-
Total Organic Carbon	mg/L	-	-	<0.50	<0.50	<0.50	<0.50	<0.50	0.5	-
BOD	mg/L	-	-	-	-	-	-	-	-	-
COD	mg/L	-	-	-	<20	<20	<20	<20	<20	-
<b>Dissolved Metals</b>										
Aluminum (Al)-Dissolved	mg/L	9.5 <sup>(2)</sup>	<0.0050	0.0026	0.0023	0.0029	0.0057	0.005	0.0031	-
Antimony (Sb)-Dissolved	mg/L	0.006 <sup>(2)</sup>	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00016	-
Arsenic (As)-Dissolved	mg/L	0.01 <sup>(2)</sup>	0.00072	0.00082	0.00074	0.00078	0.0007	0.0007	0.00081	-
Barium (Ba)-Dissolved	mg/L	1.0 <sup>(2)</sup>	0.0139	0.0200	0.0165	0.0165	0.0176	0.0167	0.0183	-
Beryllium (Be)-Dissolved	mg/L	0.008 <sup>(2)</sup>	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-
Bismuth - Dissolved	mg/L	-	<0.00010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-
Boron (B)-Dissolved	mg/L	5.0 <sup>(2)</sup>	<0.0050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-
Cadmium (Cd)-Dissolved	mg/L	0.005 <sup>(2)</sup>	<0.00010	<0.000050	0.0000177	0.0000149	0.000225	0.000229	<0.000050	-
Calcium (Ca)-Dissolved	mg/L	-	-	-	28.2	29.6	29.9	29.5	30.5	-
Cesium (Cs) - Dissolved	mg/L	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-
Chromium (Cr)-Dissolved	mg/L	0.05 - 6.0 <sup>(2)</sup>	<0.00050	0.00039	0.00021	0.00035	0.00042	0.00039	0.0004	-
Cobalt (Co)-Dissolved	mg/L	0.001 <sup>(2)</sup>	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-
Copper (Cu)-Dissolved	mg/L	1.5 <sup>(2)</sup> AO	<0.00040	<0.00020	<0.00020	<0.00020	0.00025	0.00024	<0.00020	-
Iron (Fe)-Dissolved	mg/L	6.5 <sup>(2)</sup>	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-
Lead (Pb)-Dissolved	mg/L	0.01 <sup>(2)</sup>	<0.00020	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-
Lithium (Li)-Dissolved	mg/L	0.008 <sup>(2)</sup>	0.00079	0.0011	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
Magnesium (Mg)-Dissolved	mg/L	-	1.22	1.33	1.27	1.39	1.34	1.35	1.53	-
Manganese (Mn)-Dissolved	mg/L	1.5 <sup>(2)</sup>	0.00032	0.00014	0.0001	0.00014	0.00059	0.00055	0.00012	-
Mercury (Hg)-Dissolved	mg/L	0.001 <sup>(2)</sup>	<0.000010	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	-
Molybdenum (Mo)-Dissolved	mg/L	0.25 <sup>(2)</sup>	<0.00010	<0.000050	<0.000050	<0.00010	<0.000050	<0.000050	<0.000050	-
Nickel (Ni)-Dissolved	mg/L	0.08 <sup>(2)</sup>	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-
Phosphorus - Dissolved	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	-
Potassium (K)-Dissolved	mg/L	-	-	-	0.543	0.602	0.588	0.589	0.579	-
Rubidium (Rd) - Dissolved	mg/L	-	-	-	0.00022	<0.00020	0.00024	0.00021	0.00022	-
Selenium (Se)-Dissolved	mg/L	0.01 <sup>(2)</sup>	<0.00050	0.000080	0.000069	0.000082	<0.000050	<0.000050	0.000074	-
Silicon - Dissolved	mg/L	-	5.7	5.49	5.47	5.05	5.64	5.68	6.1	-
Silver (Ag)-Dissolved	mg/L	0.02 <sup>(2)</sup>	<0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-
Sodium (Na)-Dissolved	mg/L	200 <sup>(2)</sup>	1.47	1.39	1.51	1.59	1.65	1.66	1.56	-
Strontium - Dissolved	mg/L	-	0.0799	0.0852	0.0948	0.0894	0.0925	0.0932	0.0987	-
Sulfur - Dissolved	mg/L	-	-	-	<0.50	<0.50	<0.50	<0.50	<0.50	-
Tellurium - Dissolved	mg/L	-	-	-	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	-
Thallium (Tl)-Dissolved	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-
Thorium - Dissolved	mg/L	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-
Tin (Sn)-Dissolved	mg/L	2.5 <sup>(2)</sup>	<0.00020	<0.00010	<0.00010	<0.00010	0.00018	0.00018	<0.00010	-
Titanium (Ti)-Dissolved	mg/L	-	-	-	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	-
Tungsten (W) - Dissolved	mg/L	0.003 <sup>(2)</sup>	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-
Uranium (U)-Dissolved	mg/L	0.020	0.000027	0.000022	0.000026	0.00003	0.00003	0.00003	0.000025	-
Vanadium (V)-Dissolved	mg/L	0.020 <sup>(2)</sup>	<0.0010	0.00082	0.00075	0.00077	0.00074	0.00072	0.00083	-
Zinc (Zn)-Dissolved	mg/L	3.0 <sup>(2)</sup>	<0.0040	<0.0010	<0.0010	<0.0010	0.005	0.0044	<0.0010	-
Zirconium - Dissolved	mg/L	-	<0.00010	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060	-

NOTES

- (1) BC MoE Approved and Working Water Quality Guidelines, last updated March 2018
- (2) BC Contaminated Sites Regulation (CSR) for drinking water, Schedule 3.2, last updated January 2019
- (3) All criteria limits for BCWQG - Drinking Quality Guidelines based on Total Metal Concentration except Aluminum (Dissolved)
- (4) BC MoE Water Quality Guidelines for Protection of Wildlife
- (a) Range based on max pH 8.5 to min pH 6.5 at temperature of 6.0 °C
- (b) at pH less than 6.5, limit is determined by regression equation, else limit is 0.1 mg/L.
- (c) Limit for dissolved metals, not total metals
- (d) Limit dependent upon hardness.
- (e) Limit for chromium(VI) - data reported by lab as total chromium - limit assumes 100% chromium VI in sample
- (f) Where hardness data was unavailable, 50 mg/L was assumed
- (g) Maximum value
- (h) Limit dependent upon chloride concentration
- (i) Change of 25 mg/L from background for a duration of 24 hours during clear flows. Change of 10% of background during turbid flows

\* Criteria exceeds detection limit  
 MAC = Maximum Acceptable Concentration  
 AO = Aesthetic Objective

CSR-DW BC Contaminated Sites Regulation Water Quality Guidelines for Drinking Water

Table 6: Groundwater Quality Results Sampling Location MW-15 (302210)

		BC MoE Guidelines	26-Jun-19	29-Jun-20	14-Aug-20	3-Nov-20	31-Mar-21	23-Jun-21	26-Aug-21	4-Nov-21
QA/QC Check										
Field	Units	CSR-DW (2)	Sample	Monitor	Monitor	Sample	Monitor	Monitor	Monitor	Sample
Conductivity	uS/cm	-	164	166	170	135.2	147.5	280	484	307.4
SPC	uS/cm	-	-	-	-	215.5	239.6	-	-	490.6
pH	pH	-	7.67	-	-	7.75	7.96	-	-	7.34
Dissolved Oxygen	mg/L	-	10.4	-	-	10.4	9	-	-	10.5
Temperature	°C	-	5.8	5.2	5.1	4.8	4.9	4.9	5	5.5
Depth to Water	m	-	45.78	44.85	45.09	45.84	41.1	38.21	39.52	41.06
Depth to Bottom	m	-	-	-	-	-	62.04	>59.83	>60	>60
Elevation of Well	m	-	-	-	-	227	227	-	-	-
Casing Height	m	-	-	-	-	1.04	-	-	1.23	1.23
Analyte	Units									
Conductivity	uS/cm	-	-	-	-	226	-	-	-	490
Hardness (as CaCO3)	mg/L	-	87.4	-	-	-	-	-	-	-
Hardness (as CaCO3), dissolved	mg/L	-	-	-	-	116	-	-	-	243
pH	pH	-	8.22	-	-	8.17	-	-	-	7.84
Total Suspended Solids	mg/L	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	-	-	-	-	-	-	-	-
Alkalinity, Total (as CaCO3)	mg/L	-	85.2	-	-	115	-	-	-	266
Ammonia, Total (as N)	mg/L	-	<0.0050	-	-	<0.0050	-	-	-	<0.0050
Total Nitrogen as N	mg/L	-	-	-	-	-	-	-	-	-
TKN	mg/L	-	-	-	-	0.109	-	-	-	0.19
Bromide (Br)	mg/L	-	<0.050	-	-	-	-	-	-	<0.050
Chloride (Cl)	mg/L	250 <sup>(2)</sup>	<0.50	-	-	2.94	-	-	-	13.7
Fluoride (F)	mg/L	1.5 <sup>(2)</sup>	0.033	-	-	0.028	-	-	-	<0.020
Nitrate (as N)	mg/L	10 <sup>(2)</sup>	0.096	-	-	0.278	-	-	-	1.06
Nitrite (as N)	mg/L	1.0 <sup>(2)</sup>	<0.0010	-	-	0.0016	-	-	-	<0.0010
Sulfate (SO4)	mg/L	500 <sup>(2)</sup>	0.95	-	-	1.24	-	-	-	1.8
Total Organic Carbon	mg/L	-	1.11	-	-	0.78	-	-	-	1.39
BOD	mg/L	-	-	-	-	-	-	-	-	-
COD	mg/L	-	<20	-	-	<20	-	-	-	<20
Dissolved Metals										
Aluminum (Al)-Dissolved	mg/L	9.5 <sup>(2)</sup>	0.0036	-	-	0.0058	-	-	-	<0.0010
Antimony (Sb)-Dissolved	mg/L	0.006 <sup>(2)</sup>	<0.00010	-	-	<0.00010	-	-	-	<0.00010
Arsenic (As)-Dissolved	mg/L	0.01 <sup>(2)</sup>	0.00079	-	-	0.00055	-	-	-	0.00034
Barium (Ba)-Dissolved	mg/L	1.0 <sup>(2)</sup>	0.0175	-	-	0.0256	-	-	-	0.0643
Beryllium (Be)-Dissolved	mg/L	0.008 <sup>(2)</sup>	<0.00010	-	-	<0.000100	-	-	-	<0.000100
Bismuth - Dissolved	mg/L	-	<0.000050	-	-	<0.000050	-	-	-	<0.000050
Boron (B)-Dissolved	mg/L	5.0 <sup>(2)</sup>	<0.010	-	-	<0.010	-	-	-	<0.010
Cadmium (Cd)-Dissolved	mg/L	0.005 <sup>(2)</sup>	0.0000712	-	-	<0.000050	-	-	-	<0.000050
Calcium (Ca)-Dissolved	mg/L	-	32.4	-	-	42.9	-	-	-	88.8
Cesium (Cs) - Dissolved	mg/L	-	<0.000010	-	-	<0.000010	-	-	-	<0.000010
Chromium (Cr)-Dissolved	mg/L	0.05 - 6.0 <sup>(2)</sup>	0.00036	-	-	0.00045	-	-	-	0.00055
Cobalt (Co)-Dissolved	mg/L	0.001 <sup>(2)</sup>	<0.00010	-	-	<0.00010	-	-	-	<0.00010
Copper (Cu)-Dissolved	mg/L	1.5 <sup>(2)</sup> AO	0.0002	-	-	0.0005	-	-	-	0.00032
Iron (Fe)-Dissolved	mg/L	6.5 <sup>(2)</sup>	<0.010	-	-	0.012	-	-	-	<0.010
Lead (Pb)-Dissolved	mg/L	0.01 <sup>(2)</sup>	<0.000050	-	-	<0.000050	-	-	-	<0.000050
Lithium (Li)-Dissolved	mg/L	0.008 <sup>(2)</sup>	<0.0010	-	-	0.0013	-	-	-	0.0033
Magnesium (Mg)-Dissolved	mg/L	-	1.54	-	-	2.1	-	-	-	5.15
Manganese (Mn)-Dissolved	mg/L	1.5 <sup>(2)</sup>	0.00025	-	-	0.00238	-	-	-	0.00025
Mercury (Hg)-Dissolved	mg/L	0.001 <sup>(2)</sup>	<0.0000050	-	-	<0.0000050	-	-	-	<0.0000050
Molybdenum (Mo)-Dissolved	mg/L	0.25 <sup>(2)</sup>	<0.000050	-	-	<0.000050	-	-	-	<0.000050
Nickel (Ni)-Dissolved	mg/L	0.08 <sup>(2)</sup>	<0.00050	-	-	<0.00050	-	-	-	<0.00050
Phosphorus - Dissolved	mg/L	-	<0.050	-	-	<0.050	-	-	-	<0.050
Potassium (K)-Dissolved	mg/L	-	0.622	-	-	0.768	-	-	-	1.09
Rubidium (Rd) - Dissolved	mg/L	-	0.00024	-	-	0.00027	-	-	-	0.00043
Selenium (Se)-Dissolved	mg/L	0.01 <sup>(2)</sup>	0.00007	-	-	0.000053	-	-	-	0.000090
Silicon - Dissolved	mg/L	-	5.86	-	-	6.03	-	-	-	7.88
Silver (Ag)-Dissolved	mg/L	0.02 <sup>(2)</sup>	<0.000010	-	-	<0.000010	-	-	-	<0.000010
Sodium (Na)-Dissolved	mg/L	200 <sup>(2)</sup>	1.66	-	-	1.95	-	-	-	2.97
Strontium - Dissolved	mg/L	-	0.103	-	-	0.15	-	-	-	0.332
Sulfur - Dissolved	mg/L	-	<0.50	-	-	<0.50	-	-	-	<0.50
Tellurium - Dissolved	mg/L	-	<0.00020	-	-	<0.00020	-	-	-	<0.00020
Thallium (Tl)-Dissolved	mg/L	-	<0.000010	-	-	<0.000010	-	-	-	<0.000010
Thorium - Dissolved	mg/L	-	<0.00010	-	-	<0.00010	-	-	-	<0.00010
Tin (Sn)-Dissolved	mg/L	2.5 <sup>(2)</sup>	<0.00010	-	-	<0.00010	-	-	-	<0.00010
Titanium (Ti)-Dissolved	mg/L	-	<0.00030	-	-	<0.00030	-	-	-	<0.00030
Tungston (W) - Dissolved	mg/L	0.003 <sup>(2)</sup>	<0.00010	-	-	<0.00010	-	-	-	<0.00010
Uranium (U)-Dissolved	mg/L	0.020	0.000027	-	-	0.000031	-	-	-	0.000044
Vanadium (V)-Dissolved	mg/L	0.020 <sup>(2)</sup>	0.00074	-	-	0.00068	-	-	-	<0.00050
Zinc (Zn)-Dissolved	mg/L	3.0 <sup>(2)</sup>	<0.0010	-	-	<0.0010	-	-	-	<0.0010
Zirconium - Dissolved	mg/L	-	<0.00020	-	-	<0.00020	-	-	-	<0.00020

NOTES

- (1) BC MoE Approved and Working Water Quality Guidelines, last updated March 2018
- (2) BC Contaminated Sites Regulation (CSR) for drinking water, Schedule 3.2, last updated January 201
- (3) All criteria limits for BCWQG - Drinking Quality Guidelines based on Total Metal Concentration ex.
- (4) BC MoE Water Quality Guidelines for Protection of Wildlife
- (a) Range based on max pH 8.5 to min pH 6.5 at temperature of 6.0 °C
- (b) at pH less than 6.5, limit is determined by regression equation, else limit is 0.1 mg/L.
- (c) Limit for dissolved metals, not total metals
- (d) Limit dependent upon hardness.
- (e) Limit for chromium(VI) - data reported by lab as total chromium - limit assumes 100% chromium VI.
- (f) Where hardness data was unavailable, 50 mg/L was assumed
- (g) Maximum value
- (h) Limit dependent upon chloride concentration
- (i) Change of 25 mg/L from background for a duration of 24 hours during clear flows. Change of 10% of

\* Criteria exceeds detection limit  
 MAC = Maximum Acceptable Concentration  
 AO = Aesthetic Objective

CSR-DW BC Contaminated Sites Regulation Water Qual



Table 7: Groundwater Quality Results Sampling Location MW-16 (E02211)

		BC MoE Guidelines	5-Apr-17	2-Oct-17	14-Nov-17	9-Apr-18	18-Jul-18	21-Nov-18	26-Mar-19	26-Jun-19	11-Jun-19
Field	Units	CSR-DW (2)	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Monitor
Conductivity	uS/cm	-	124	94.3	90.7	90.3	146	147	159	152	154
SPC	uS/cm	-	-	-	-	-	-	-	-	-	-
pH	pH	-	7.8	8.37	8.23	7.24	7.81	7.81	7.52	7.64	-
Dissolved Oxygen	mg/L	-	-	14.2	9.8	12.1	7.9	0.3	9.9	14.0	-
Temperature	°C	-	-	5.8	4.6	4.8	5.6	5	5	5.9	5.3
Depth to Water	m	-	-	-	44.6	45.15	44.31	45.03	46.21	46.27	46.2
Depth to Bottom	m	-	-	-	-	-	-	-	-	-	-
Elevation of Well	m	-	-	-	-	-	-	-	-	-	-
Casing Height	m	-	-	-	-	-	-	-	-	-	-
Analyte	Units										
Conductivity	uS/cm	-	137	-	-	-	-	-	-	-	-
Hardness (as CaCO3)	mg/L	-	-	75	72.9	71.1	72.8	72.9	77.6	83.9	-
Hardness (as CaCO3), dissolved	mg/L	-	-	-	-	-	-	-	-	-	-
pH	pH	-	8	8	8.08	8.13	-	-	8.16	8.21	-
Total Suspended Solids	mg/L	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	81	-	-	-	-	-	-	-	-
Alkalinity, Total (as CaCO3)	mg/L	-	94	80	77.8	77.2	77.7	77.5	78	84	-
Ammonia, Total (as N)	mg/L	-	<0.03	-	<0.005	0.0061	<0.0050	<0.0050	<0.0050	<0.0050	-
Total Nitrogen as N	mg/L	-	-	-	-	-	-	-	-	-	-
TKN	mg/L	-	-	-	-	-	-	-	-	-	-
Bromide (Br)	mg/L	-	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	-
Chloride (Cl)	mg/L	250 <sup>(2)</sup>	<1.0	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	-
Fluoride (F)	mg/L	1.5 <sup>(2)</sup>	<0.1	<0.1	0.036	0.039	0.039	0.038	0.036	0.036	-
Nitrate (as N)	mg/L	10 <sup>(2)</sup>	0.028	<0.01	0.0793	0.0686	0.0747	0.0767	0.137	0.0757	-
Nitrite (as N)	mg/L	1.0 <sup>(2)</sup>	<0.01	<0.01	<0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
Sulfate (SO4)	mg/L	500 <sup>(2)</sup>	-	1.3	1.01	1.02	0.96	0.92	0.61	0.88	-
Total Organic Carbon	mg/L	-	-	-	<0.50	<0.50	<0.50	<0.50	0.68	<0.50	-
BOD	mg/L	-	-	-	-	-	-	-	-	-	-
COD	mg/L	-	-	-	<20	<20	<20	<20	<20	<20	-
Dissolved Metals											
Aluminum (Al)-Dissolved	mg/L	9.5 <sup>(2)</sup>	0.0106	<0.0050	0.0054	0.0036	0.0028	0.0037	0.0181	0.0024	-
Antimony (Sb)-Dissolved	mg/L	0.006 <sup>(2)</sup>	<0.00010	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	0.00016	<0.00010	-
Arsenic (As)-Dissolved	mg/L	0.01 <sup>(2)</sup>	0.00052	0.00055	0.00063	0.00061	0.00057	0.00058	0.00066	0.00058	-
Barium (Ba)-Dissolved	mg/L	1.0 <sup>(2)</sup>	0.138	0.0161	0.01780	0.01910	0.01810	0.01810	0.01950	0.01940	-
Beryllium (Be)-Dissolved	mg/L	0.008 <sup>(2)</sup>	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-
Bismuth - Dissolved	mg/L	-	<0.00010	<0.00010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-
Boron (B)-Dissolved	mg/L	5.0 <sup>(2)</sup>	0.014	<0.0050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-
Cadmium (Cd)-Dissolved	mg/L	0.005 <sup>(2)</sup>	0.00003	0.000018	<0.000050	0.00003	0.00001	0.00008	0.00017	0.00004	-
Calcium (Ca)-Dissolved	mg/L	-	-	-	26.90000	26.30000	26.90000	27.10000	28.60000	30.70000	-
Cesium (Cs)- Dissolved	mg/L	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-
Chromium (Cr)-Dissolved	mg/L	0.05 - 6.0 <sup>(2)</sup>	0.0005	<0.00050	0.00038	0.00026	0.00037	0.00038	0.00055	0.00036	-
Cobalt (Co)-Dissolved	mg/L	0.001 <sup>(2)</sup>	0.00012	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-
Copper (Cu)-Dissolved	mg/L	1.5 <sup>(2)</sup> AO	0.0042	<0.00040	<0.00020	<0.00020	<0.00020	<0.00020	0.00056	<0.00020	-
Iron (Fe)-Dissolved	mg/L	6.5 <sup>(2)</sup>	<0.010	<0.010	0.01000	<0.010	<0.010	<0.010	0.01500	<0.010	-
Lead (Pb)-Dissolved	mg/L	0.01 <sup>(2)</sup>	<0.0001	<0.00020	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-
Lithium (Li)-Dissolved	mg/L	0.008 <sup>(2)</sup>	0.0007	0.00096	0.00110	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-
Magnesium (Mg)-Dissolved	mg/L	-	0.992	1.37	1.40	1.29	1.38	1.27	1.51	1.53	-
Manganese (Mn)-Dissolved	mg/L	1.5 <sup>(2)</sup>	0.0371	0.00752	0.00651	0.00314	0.00211	0.00186	0.00240	0.00046	-
Mercury (Hg)-Dissolved	mg/L	0.001 <sup>(2)</sup>	<0.00002	<0.000010	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	-
Molybdenum (Mo)-Dissolved	mg/L	0.25 <sup>(2)</sup>	0.00027	<0.00010	0.00005	0.00006	<0.00010	0.00005	0.00006	0.00006	-
Nickel (Ni)-Dissolved	mg/L	0.08 <sup>(2)</sup>	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-
Phosphorus - Dissolved	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	-
Potassium (K)-Dissolved	mg/L	-	-	-	0.60800	0.62500	0.64400	0.60200	0.62100	0.62400	-
Rubidium (Rd) - Dissolved	mg/L	-	-	-	0.00039	0.00043	0.00042	0.00042	0.00041	0.00036	-
Selenium (Se)-Dissolved	mg/L	0.01 <sup>(2)</sup>	<0.00050	<0.00050	0.00009	0.00009	0.00007	0.00010	0.00009	0.00007	-
Silicon - Dissolved	mg/L	-	4.5	5.5	5.28000	5.46000	5.15000	5.29000	5.54000	5.47000	-
Silver (Ag)-Dissolved	mg/L	0.02 <sup>(2)</sup>	<0.00005	<0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-
Sodium (Na)-Dissolved	mg/L	200 <sup>(2)</sup>	1.75	1.55	1.41	1.51	1.61	1.60	1.66	1.67	-
Strontium - Dissolved	mg/L	-	0.0715	0.0912	0.0918	0.0953	0.0916	0.0886	0.1010	0.1110	-
Sulfur - Dissolved	mg/L	-	-	-	<0.50	0.57000	<0.50	<0.50	<0.50	<0.50	-
Tellurium - Dissolved	mg/L	-	-	-	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	-
Thallium (Tl)-Dissolved	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-
Thorium - Dissolved	mg/L	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-
Tin (Sn)-Dissolved	mg/L	2.5 <sup>(2)</sup>	0.00049	<0.00020	<0.00010	<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	<0.00030	-
Tungsten (W)- Dissolved	mg/L	0.003 <sup>(2)</sup>	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-
Uranium (U)-Dissolved	mg/L	0.020	0.00005	0.000059	0.00004	0.00004	0.00004	0.00004	0.00004	0.00004	-
Vanadium (V)-Dissolved	mg/L	0.020 <sup>(2)</sup>	<0.0010	<0.0010	0.00057	0.00061	0.00069	0.00062	0.00078	0.00053	-
Zinc (Zn)-Dissolved	mg/L	3.0 <sup>(2)</sup>	0.0157	<0.0040	<0.0010	0.00110	<0.0010	<0.0010	0.00460	<0.0010	-
Zirconium - Dissolved	mg/L	-	<0.00010	<0.00010	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060	<0.000060	-

NOTES

- (1) BC MoE Approved and Working Water Quality Guidelines, last updated March 2018
- (2) BC Contaminated Sites Regulation (CSR) for drinking water, Schedule 3.2, last updated January 2019
- (3) All criteria limits for BCWQG - Drinking Quality Guidelines based on Total Metal Concentration except Aluminum (Dissolved)
- (4) BC MoE Water Quality Guidelines for Protection of Wildlife
- (a) Range based on max pH 8.5 to min pH 6.5 at temperature of 6.0 °C
- (b) at pH less than 6.5, limit is determined by regression equation, else limit is 0.1 mg/L.
- (c) Limit for dissolved metals, not total metals
- (d) Limit dependent upon hardness.
- (e) Limit for chromium(VI) - data reported by lab as total chromium - limit assumes 100% chromium VI in sample
- (f) Where hardness data was unavailable, 50 mg/L was assumed
- (g) Maximum value
- (h) Limit dependent upon chloride concentration
- (i) Change of 25 mg/L from background for a duration of 24 hours during clear flows. Change of 10% of background during turbid flows

\* Criteria exceeds detection limit  
 MAC = Maximum Acceptable Concentration  
 AO = Aesthetic Objective

CSR-DW BC Contaminated Sites Regulation Water Quality Guidelines for Drinking Water

Table 7: Groundwater Quality Results Sampling Location MW-16 (E02211)

		BC MoE Guidelines	29-Jun-20	14-Aug-20	3-Nov-20	31-Mar-21	23-Jun-21	26-Aug-21	4-Nov-21
Field	Units	CSR-DW (2)	Monitor	Monitor	Sample	Monitor	Monitor	Monitor	Sample
Conductivity	uS/cm	-	235	163	106.8	110.7	180	224	128.3
SPC	uS/cm	-	-	-	171.5	180.6	-	-	204.8
pH	pH	-	-	-	8	8.19	-	-	8.14
Dissolved Oxygen	mg/L	-	-	-	10	6.9	-	-	9.8
Temperature	°C	-	6.2	5	4.5	4.7	5.6	4.8	5.1
Depth to Water	m	-	45.38	45.45	46.33	41.71	38.69	40.12	41.63
Depth to Bottom	m	-	-	-	-	62.1	>59.80	>60	>60
Elevation of Well	m	-	-	-	225	-	-	-	-
Casing Height	m	-	-	-	0.98	-	1.11	1.25	1.24
<b>Analyte</b>	<b>Units</b>								
Conductivity	uS/cm	-	-	-	180	-	-	-	202
Hardness (as CaCO3)	mg/L	-	-	-	-	-	-	-	-
Hardness (as CaCO3), dissolved	mg/L	-	-	-	89.5	-	-	-	100
pH	pH	-	-	-	8.15	-	-	-	8.03
Total Suspended Solids	mg/L	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	-	-	-	-	-	-	-
Alkalinity, Total (as CaCO3)	mg/L	-	-	-	90.9	-	-	-	111
Ammonia, Total (as N)	mg/L	-	-	-	<0.0050	-	-	-	<0.0050
Total Nitrogen as N	mg/L	-	-	-	-	-	-	-	-
TKN	mg/L	-	-	-	0.084	-	-	-	0.056
Bromide (Br)	mg/L	-	-	-	-	-	-	-	<0.050
Chloride (Cl)	mg/L	250 <sup>(2)</sup>	-	-	0.52	-	-	-	2.03
Fluoride (F)	mg/L	1.5 <sup>(2)</sup>	-	-	0.035	-	-	-	0.031
Nitrate (as N)	mg/L	10 <sup>(2)</sup>	-	-	0.1	-	-	-	0.287
Nitrite (as N)	mg/L	1.0 <sup>(2)</sup>	-	-	<0.0010	-	-	-	<0.0010
Sulfate (SO4)	mg/L	500 <sup>(2)</sup>	-	-	1.11	-	-	-	1.38
Total Organic Carbon	mg/L	-	-	-	1.63	-	-	-	1.12
BOD	mg/L	-	-	-	-	-	-	-	-
COD	mg/L	-	-	-	27	-	-	-	<20
<b>Dissolved Metals</b>									
Aluminum (Al)-Dissolved	mg/L	9.5 <sup>(2)</sup>	-	-	0.0024	-	-	-	0.0030
Antimony (Sb)-Dissolved	mg/L	0.006 <sup>(2)</sup>	-	-	<0.00010	-	-	-	<0.00010
Arsenic (As)-Dissolved	mg/L	0.01 <sup>(2)</sup>	-	-	0.00059	-	-	-	0.00048
Barium (Ba)-Dissolved	mg/L	1.0 <sup>(2)</sup>	-	-	0.0193	-	-	-	0.0213
Beryllium (Be)-Dissolved	mg/L	0.008 <sup>(2)</sup>	-	-	<0.000100	-	-	-	<0.000100
Bismuth - Dissolved	mg/L	-	-	-	<0.000050	-	-	-	<0.000050
Boron (B)-Dissolved	mg/L	5.0 <sup>(2)</sup>	-	-	<0.010	-	-	-	<0.010
Cadmium (Cd)-Dissolved	mg/L	0.005 <sup>(2)</sup>	-	-	<0.000050	-	-	-	0.000050
Calcium (Ca)-Dissolved	mg/L	-	-	-	33	-	-	-	37.0
Cesium (Cs)- Dissolved	mg/L	-	-	-	<0.000010	-	-	-	<0.000010
Chromium (Cr)-Dissolved	mg/L	0.05 - 6.0 <sup>(2)</sup>	-	-	0.0004	-	-	-	<0.00050
Cobalt (Co)-Dissolved	mg/L	0.001 <sup>(2)</sup>	-	-	<0.00010	-	-	-	<0.00010
Copper (Cu)-Dissolved	mg/L	1.5 <sup>(2)</sup> AO	-	-	<0.00020	-	-	-	<0.00020
Iron (Fe)-Dissolved	mg/L	6.5 <sup>(2)</sup>	-	-	<0.010	-	-	-	<0.010
Lead (Pb)-Dissolved	mg/L	0.01 <sup>(2)</sup>	-	-	<0.000050	-	-	-	<0.000050
Lithium (Li)-Dissolved	mg/L	0.008 <sup>(2)</sup>	-	-	0.001	-	-	-	0.0010
Magnesium (Mg)-Dissolved	mg/L	-	-	-	1.7	-	-	-	1.91
Manganese (Mn)-Dissolved	mg/L	1.5 <sup>(2)</sup>	-	-	0.00059	-	-	-	0.00067
Mercury (Hg)-Dissolved	mg/L	0.001 <sup>(2)</sup>	-	-	<0.0000050	-	-	-	<0.0000050
Molybdenum (Mo)-Dissolved	mg/L	0.25 <sup>(2)</sup>	-	-	<0.000050	-	-	-	<0.000050
Nickel (Ni)-Dissolved	mg/L	0.08 <sup>(2)</sup>	-	-	<0.00050	-	-	-	<0.00050
Phosphorus - Dissolved	mg/L	-	-	-	<0.050	-	-	-	<0.050
Potassium (K)-Dissolved	mg/L	-	-	-	0.659	-	-	-	0.683
Rubidium (Rd) - Dissolved	mg/L	-	-	-	0.00038	-	-	-	0.00038
Selenium (Se)-Dissolved	mg/L	0.01 <sup>(2)</sup>	-	-	0.000077	-	-	-	0.000052
Silicon - Dissolved	mg/L	-	-	-	5.31	-	-	-	5.70
Silver (Ag)-Dissolved	mg/L	0.02 <sup>(2)</sup>	-	-	<0.000010	-	-	-	<0.000010
Sodium (Na)-Dissolved	mg/L	200 <sup>(2)</sup>	-	-	1.8	-	-	-	1.92
Strontium - Dissolved	mg/L	-	-	-	0.129	-	-	-	0.137
Sulfur - Dissolved	mg/L	-	-	-	<0.50	-	-	-	<0.50
Tellurium - Dissolved	mg/L	-	-	-	<0.00020	-	-	-	<0.00020
Thallium (Tl)-Dissolved	mg/L	-	-	-	<0.000010	-	-	-	<0.000010
Thorium - Dissolved	mg/L	-	-	-	<0.00010	-	-	-	<0.00010
Tin (Sn)-Dissolved	mg/L	2.5 <sup>(2)</sup>	-	-	<0.00010	-	-	-	<0.00010
Titanium (Ti)-Dissolved	mg/L	-	-	-	<0.00030	-	-	-	<0.00030
Tungston (W)- Dissolved	mg/L	0.003 <sup>(2)</sup>	-	-	<0.00010	-	-	-	<0.00010
Uranium (U)-Dissolved	mg/L	0.020	-	-	0.000039	-	-	-	0.000040
Vanadium (V)-Dissolved	mg/L	0.020 <sup>(2)</sup>	-	-	0.00062	-	-	-	0.00058
Zinc (Zn)-Dissolved	mg/L	3.0 <sup>(2)</sup>	-	-	<0.0010	-	-	-	<0.0010
Zirconium - Dissolved	mg/L	-	-	-	<0.00020	-	-	-	<0.00020

NOTES

- (1) BC MoE Approved and Working Water Quality Guidelines, last updated March 2018
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- (f) Where hardness data was unavailable, 50 mg/L was assumed
- (g) Maximum value
- (h) Limit dependent upon chloride concentration
- (i) Change of 25 mg/L from background for a duration of 24 hours during clear flows. Change of 10

\* Criteria exceeds detection limit  
 MAC = Maximum Acceptable Concentration  
 AO = Aesthetic Objective

CSR-DW BC Contaminated Sites Regulation Water Quality

## Appendix D      Photographs





Photo 1: Forceman Ridge Waste Management Facility SW-01, looking NW on Onion Lake, March 30, 2022



Photo 2: Forceman Ridge Waste Management Facility SW-01, looking West over Onion Lake, November 22, 2022





**Photo 3: Forceman Ridge Waste Management Facility SW-02, looking upstream, March 30, 2022**



**Photo 4: Forceman Ridge Waste Management Facility SW-02, looking downstream, March 30, 2022**



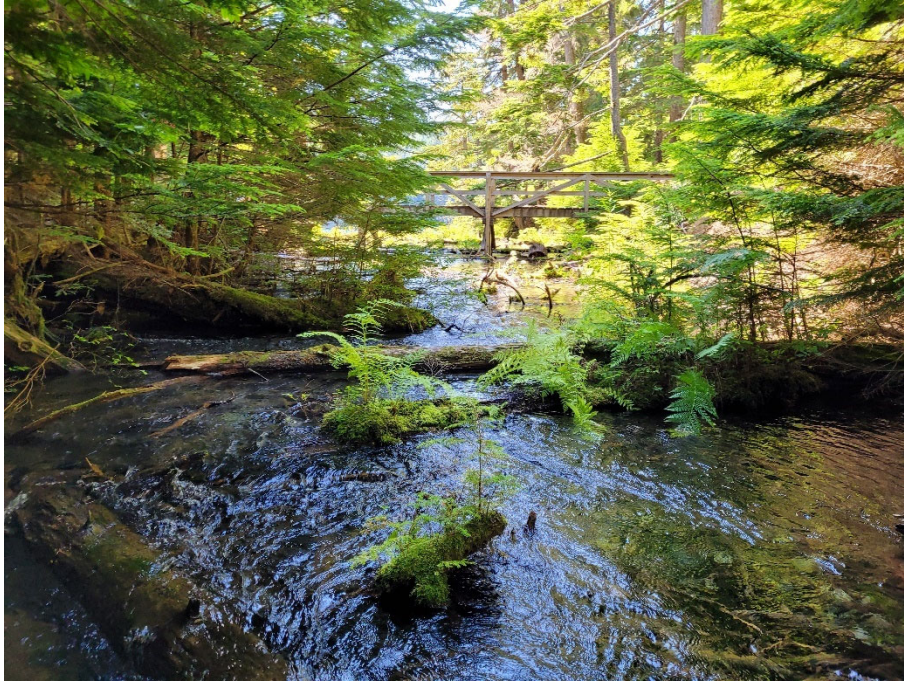


Photo 5: Forceman Ridge Waste Management Facility SW-02, looking upstream, July 22, 2022



Photo 6: Forceman Ridge Waste Management Facility SW-02, looking downstream, July 22, 2022





Photo 7: Forceman Ridge Waste Management Facility SW-02, looking upstream, November 22, 2022



Photo 8: Forceman Ridge Waste Management Facility SW-02, looking downstream, November 22, 2022





Photo 9: Forceman Ridge Waste Management Facility SW-03, looking upstream, March 30, 2022



Photo 10: Forceman Ridge Waste Management Facility SW-03, looking downstream, March 30, 2022





**Photo 4: Forceman Ridge Waste Management Facility SW-03, looking upstream, July 22, 2022**



**Photo 12: Forceman Ridge Waste Management Facility SW-03, looking downstream, July 22, 2022**





Photo 13: Forceman Ridge Waste Management Facility SW-03, looking upstream, November 22, 2022



Photo 14: Forceman Ridge Waste Management Facility SW-03, looking downstream, November 22, 2022





Photo 15: Forceman Ridge Waste Management Facility SW-04, looking upstream, March 30, 2022



Photo 16: Forceman Ridge Waste Management Facility SW-04, looking downstream, March 30, 2022





Photo 17: Forceman Ridge Waste Management Facility SW-04, looking upstream, July 22, 2022



Photo 18: Forceman Ridge Waste Management Facility SW-04, looking downstream, July 22, 2022





**Photo 19: Forceman Ridge Waste Management Facility SW-04, looking upstream, November 22, 2022**



**Photo 20: Forceman Ridge Waste Management Facility SW-04, looking downstream, November 22, 2022**





Photo 21: Forceman Ridge Waste Management Facility SW-05, looking upstream, March 31, 2022



Photo 21: Forceman Ridge Waste Management Facility SW-05, looking downstream, March 31, 2022





Photo 22: Forceman Ridge Waste Management Facility SW-05, looking upstream, September 9, 2022



Photo 23: Forceman Ridge Waste Management Facility SW-05, looking downstream, September 9, 2022





Photo 24: Forceman Ridge Waste Management Facility SW-05, looking upstream, November 22, 2022



Photo 25: Forceman Ridge Waste Management Facility SW-05, looking downstream, November 22, 2022





Photo 26: Forceman Ridge Waste Management Facility MW-01, well head, March 25, 2022



Photo 27: Forceman Ridge Waste Management Facility MW-01, well head, September 1, 2022





Photo 28: Forceman Ridge Waste Management Facility MW-01, well head, September 1, 2022



Photo 29: Forceman Ridge Waste Management Facility MW-02, well head, March 25, 2022





**Photo 30: Forceman Ridge Waste Management Facility MW-02, well head, July 26, 2022**



**Photo 31: Forceman Ridge Waste Management Facility MW-02, well head, September 1, 2022**





**Photo 32: Forceman Ridge Waste Management Facility MW-02, well head, November 30, 2022**



**Photo 33: Forceman Ridge Waste Management Facility MW-03, well in wooden casing, August 30, 2022**





Photo 34: Forceman Ridge Waste Management Facility MW-04, well head, March 25, 2022



Photo 35: Forceman Ridge Waste Management Facility MW-04, well head, July 29, 2022





Photo 36: Forceman Ridge Waste Management Facility MW-04, well head, August 31, 2022



Photo 37: Forceman Ridge Waste Management Facility MW-04, well head, November 30, 2022





Photo 38: Forceman Ridge Waste Management Facility MW-05, well head, March 25, 2022



Photo 39: Forceman Ridge Waste Management Facility MW-05, well head, July 29, 2022





**Photo 40: Forceman Ridge Waste Management Facility MW-05, well head, August 31, 2022**



**Photo 41: Forceman Ridge Waste Management Facility MW-05, well head, November 30, 2022**





Photo 42: Forceman Ridge Waste Management Facility MW-06, well head, March 25, 2022



Photo 43: Forceman Ridge Waste Management Facility MW-06, well head, July 27, 2022





Photo 44: Forceman Ridge Waste Management Facility MW-06, well head, September 1, 2022



Photo 45: Forceman Ridge Waste Management Facility MW-06, well head, December 1, 2022





**Photo 46: Forceman Ridge Waste Management Facility MW-07, well head, March 25, 2022**



**Photo 47: Forceman Ridge Waste Management Facility MW-07, well head, July 29, 2022**





**Photo 48: Forceman Ridge Waste Management Facility MW-07, well head, August 31, 2022**



**Photo 49: Forceman Ridge Waste Management Facility MW-07, well head, December 7, 2022**





Photo 50: Forceman Ridge Waste Management Facility MW-08, well head, March 25, 2022



Photo 51: Forceman Ridge Waste Management Facility MW-08, well head, July 29, 2022





**Photo 52: Forceman Ridge Waste Management Facility MW-08, well head, August 31, 2022**



**Photo 53: Forceman Ridge Waste Management Facility MW-08, well head, December 1, 2022**





Photo 54: Forceman Ridge Waste Management Facility MW-09, well head, March 25, 2022



Photo 55: Forceman Ridge Waste Management Facility MW-09, well head, July 29, 2022





Photo 56: Forceman Ridge Waste Management Facility MW-09, well head, August 31, 2022



Photo 57: Forceman Ridge Waste Management Facility MW-09, well head, November 30, 2022





Photo 58: Forceman Ridge Waste Management Facility MW-10, well head, March 25, 2022



Photo 59: Forceman Ridge Waste Management Facility MW-10, well head, July 27, 2022





**Photo 60: Forceman Ridge Waste Management Facility MW-10, well head, September 1, 2022**



**Photo 61: Forceman Ridge Waste Management Facility MW-10, well head, December 1, 2022**





Photo 62: Forceman Ridge Waste Management Facility MW-11, well head, March 25, 2022



Photo 63: Forceman Ridge Waste Management Facility MW-11, well head, July 27, 2022





**Photo 64: Forceman Ridge Waste Management Facility MW-11, well head, September 1, 2022**



**Photo 65: Forceman Ridge Waste Management Facility MW-11, well head, December 1, 2022**





Photo 66: Forceman Ridge Waste Management Facility MW-12, well head, July 27, 2022



Photo 67: Forceman Ridge Waste Management Facility MW-12, well head, August 31, 2022





Photo 68: Forceman Ridge Waste Management Facility MW-13, well head, March 25, 2022



Photo 69: Forceman Ridge Waste Management Facility MW-13, well head, July 26, 2022





**Photo 70: Forceman Ridge Waste Management Facility MW-13, well head, September 1, 2022**



**Photo 71: Forceman Ridge Waste Management Facility MW-13, well head, November 30, 2022**





Photo 72: Forceman Ridge Waste Management Facility MW-14, well head, March 25, 2022



Photo 73: Forceman Ridge Waste Management Facility MW-14, well head, July 27, 2022





**Photo 74: Forceman Ridge Waste Management Facility MW-14, well head, September 1, 2022**



**Photo 75: Forceman Ridge Waste Management Facility MW-14, well head, December 1, 2022**



Photo 76: Forceman Ridge Waste Management Facility MW-15, well head, March 25, 2022



Photo 77: Forceman Ridge Waste Management Facility MW-15, well head, July 27, 2022





**Photo 78: Forceman Ridge Waste Management Facility MW-15, well head, August 31, 2022**



**Photo 79: Forceman Ridge Waste Management Facility MW-15, well head, December 1, 2022**





Photo 80: Forceman Ridge Waste Management Facility MW-16, well head, March 25, 2022



Photo 81: Forceman Ridge Waste Management Facility MW-16, well head, July 29, 2022





**Photo 82: Forceman Ridge Waste Management Facility MW-16, well head, August 31, 2022**



**Photo 83: Forceman Ridge Waste Management Facility MW-16, well head, December 1, 2022**



Photo 84: Forceman Ridge Waste Management Facility Sand Filter, August 31, 2022



Photo 85: Forceman Ridge Waste Management Facility Sand Filter, manhole access, December 1, 2022





**Photo 86: Forceman Ridge Waste Management Facility Sand Filter, surrounding area looking SE, December 1, 2022**



**Photo 87: Forceman Ridge Waste Management Facility Sand Filter, surrounding area looking NE, December 1, 2022**



## Appendix E      Data Summary Tables



**Table 1**  
**Groundwater Field Observations**  
**2022 Annual Environmental Effects Monitoring Report - Forceman Waste Management Facility**  
**Regional District of Kitimat-Stikine**

Monitor Well ID	Date	Depth to Water from T.O.P.* (m)	Depth to bottom from T.O.P.* (m)	Ground Elevation (masl)	Casing Height (mags)	Groundwater Elevation* (masl)	Field Temperature (°C)	Conductivity (µs/cm)	DO (mg/L)	ORP (mV)	Field pH	Apparent NAPL Thickness (mm)
MW-01	4/1/2022	39.8	60.0	222.0	1.1	183.3	4.9	-	-	-	-	nil
	7/26/2022	40.8	60.0		1.2	182.3	5.4	-	-	-	-	nil
	9/1/2022	41.8	60.0		1.1	181.4	6.1	19.9	11.5	234.4	5.9	nil
	11/30/2022	43.6	60.0		1.1	179.5	4.4	19.1	14.7	355.5	6.0	nil
MW-02	3/25/2022	56.6	58.5	240.0	0.9	184.3	4.6	-	-	-	-	nil
	7/26/2022	41.1	56.7		0.9	199.8	6.6	38.1	3.8	215.4	6.1	nil
	9/1/2022	42.1	56.7		0.9	FALSE	6.1	37.2	7.6	210.5	6.1	nil
MW-03	4/1/2022	-	-	225.0	-	-	6.7	80.1	-	-	8.0	nil
	7/29/2022	-	-		-	-	14.5	106.4	10.6	202.3	7.9	nil
	8/31/2022	-	-		-	-	12.3	102.4	8.3	214.3	8.1	nil
	12/1/2022	-	-		-	-	6.6	80.9	6.3	282.7	7.4	nil
MW-04	3/25/2022	25.3	26.3	193.0	1.4	169.1	5.6	-	-	-	-	nil
	7/29/2022	20.4	26.2		1.6	174.2	8.2	41.9	4.0	190.3	8.4	nil
	8/31/2022	20.8	26.3		1.2	173.3	8.0	55.2	9.5	202.5	8.7	nil
	12/1/2022	25.2	28.3		1.4	169.2	4.7	36.3	7.3	276.7	8.5	nil
MW-05	4/1/2022	-	-	206.0	-	-	-	-	-	-	-	nil
	7/29/2022	-	-		-	-	-	-	-	-	-	nil
	8/31/2022	-	-		-	-	-	-	-	-	-	nil
	11/30/2022	-	-		-	-	-	-	-	-	-	nil
MW-06	3/25/2022	29.3	36.6	208.0	1.2	179.9	6.0	-	-	-	-	nil
	7/27/2022	29.1	37.0		1.2	180.1	6.7	-	-	-	-	nil
	9/1/2022	29.4	36.9		1.2	179.7	7.1	-	-	-	-	nil
	12/1/2022	30.6	36.7		1.2	178.6	6.3	-	-	-	-	nil
MW-07	4/1/2022	40.4	46.2	230.0	1.1	190.7	5.7	-	-	-	-	nil
	7/29/2022	41.4	46.0		1.1	189.7	6.0	42.3	14.0	162.1	8.9	nil
	8/31/2022	41.1	46.0		1.1	190.0	7.0	39.9	12.2	200.7	9.0	nil
	11/30/2022	43.9	46.2		1.1	187.2	5.7	-	-	-	-	nil
	12/9/2022	43.9	46.5		1.1	187.2	6.2	-	-	-	-	nil
MW-08	4/1/2022	6.5	15.5	202.0	1.0	196.5	6.4	-	-	-	-	nil
	7/29/2022	14.4	15.6		1.0	188.6	9.4	15.6	15.2	169.8	6.6	nil
	8/31/2022	7.5	15.5		1.0	195.5	8.9	22.8	12.5	213.4	6.5	nil
	12/1/2022	8.7	15.5		1.0	194.4	6.2	-	-	-	-	nil
	12/9/2022	8.8	15.5		1.0	194.3	5.7	15.5	15.0	257.2	6.6	nil
MW-09	3/25/2022	50.9	53.3	207.0	1.4	157.5	5.7	-	-	-	-	nil
	7/29/2022	46.9	53.8		1.0	161.1	7.1	44.8	11.8	182.4	6.5	nil
	8/31/2022	47.4	53.9		1.0	160.7	7.9	49.1	10.1	221.5	6.6	nil
	12/1/2022	48.6	53.6		1.0	159.4	6.2	45.7	13.3	307.0	7.7	nil
MW-10	3/25/2022	23.9	28.6	207.0	1.1	184.2	5.7	-	-	-	-	nil
	7/27/2022	28.6	29.7		1.1	179.5	6.1	-	-	-	-	nil
	9/1/2022	24.3	29.6		1.1	183.8	7.1	-	-	-	-	nil
	12/1/2022	29.3	29.6		1.1	178.8	6.2	-	-	-	-	nil
MW-11	3/25/2022	35.1	39.3	207.0	1.0	173.0	5.6	-	-	-	-	nil
	7/27/2022	36.3	39.4		1.0	171.8	5.8	-	-	-	-	nil
	9/1/2022	35.1	39.4		1.0	172.9	6.7	-	-	-	-	nil
	12/1/2022	35.8	39.6		1.0	172.3	5.7	-	-	-	-	nil
MW-12	3/25/2022	31.1	45.1	218.0	1.0	187.9	5.5	-	-	-	-	nil
	7/27/2022	38.9	45.2		1.0	180.2	5.7	-	-	-	-	nil
	8/31/2022	39.2	45.3		1.0	179.8	6.3	-	-	-	-	nil
	11/30/2022	40.5	45.5		1.0	178.5	5.4	-	-	-	-	nil
MW-13	3/25/2022	35.1	44.5	243.0	1.1	208.9	3.8	-	-	-	-	nil
	7/27/2022	40.8	45.5		1.0	203.2	7.1	15.8	4.1	234.2	5.5	nil
	9/1/2022	41.9	45.4		1.0	202.2	54.0	15.1	8.8	233.9	5.6	nil
	12/1/2022	41.3	44.5		1.0	202.7	3.7	14.7	11.7	338.0	6.2	nil
MW-14	3/25/2022	17.7	36.6	224.0	1.0	207.4	5.4	-	-	-	-	nil
	7/27/2022	21.9	36.9		1.0	203.1	6.1	-	-	-	-	nil
	9/1/2022	23.4	36.8		1.0	201.6	7.3	-	-	-	-	nil
	12/1/2022	25.5	36.8		1.0	199.5	5.8	-	-	-	-	nil
MW-15	4/1/2022	39.2	60.0	227.0	1.2	189.1	5.4	-	-	-	-	nil
	7/27/2022	-	-		1.2	-	7.5	255.3	6.2	278.0	7.3	nil
	8/31/2022	40.6	60.0		1.2	187.6	6.8	262.9	9.8	223.8	7.3	nil
	12/1/2022	42.5	60.0		1.2	185.7	-	-	-	-	-	nil
	12/8/2022	42.5	60.0		1.2	185.7	5.3	246.2	8.2	248.5	7.2	nil
MW-16	4/1/2022	39.9	60.0	225.0	1.2	186.4	4.9	-	-	-	-	nil
	7/29/2022	40.4	60.0		1.2	185.8	5.2	-	-	-	-	nil
	8/31/2022	41.2	60.0		1.2	185.0	8.0	179.1	71.0	219.2	7.9	nil
	12/1/2022	43.1	60.0		1.2	183.2	4.9	-	-	-	-	nil
	12/8/2022	43.1	60.0		1.2	183.1	5.0	157.3	9.1	287.5	8.0	nil

\* Groundwater elevation was calculated based on the most recent measured casing height

- Notes:
- LTDL - Less than instrument detection limit
  - NAPL - Non aqueous phase liquid
  - m - Meters
  - masl- meters above sea level
  - mm - Millimeters
  - mags - Meters above ground surface
  - T.O.P - Top of pipe
  - MW - Monitoring Well sampling for groundwater
  - nil- not observed

**Table 2**  
**Surface Water Field Observations**  
**2022 Annual Environmental Effects Monitoring Report**  
**Regional District of Kitimat-Stikine**

Surface Water Location	Date	Field Temperature (°C)	Conductivity (µs/cm)	DO (mg/L)	ORP (mV)	Field pH	Apparent NAPL Thickness (mm)
SW-01	3/28/2022	4.8	38.1	11	237	7.61	nil
	9/2/2022	19.8	52	55	176.9	7.54	nil
	11/22/2022	4.6	49.8	6.7	254.6	7.46	nil
SW-02	9/2/2022	12.3	156.9	88	213.1	7.95	nil
	11/22/2022	3.8	157.7	10.4	319.3	8.57	nil
SW-03	3/28/2022	6	147.6	12.7	240.5	7	nil
	9/2/2022	12.3	152.1	96	209.5	7.93	nil
SW-04	9/2/2022	9.7	89.1	103	214.4	7.56	nil
	11/22/2022	3.9	74.1	12.5	348.2	7.76	nil
SW-05	3/31/2022	6.1	148.6	11.7	-	7.5	nil
	9/2/2022	11	153.7	104	220.2	7.91	nil
	11/22/2022	4.2	152.6	13.5	10.4	8.7	nil

Notes:

- NAPL - Non aqueous phase liquid
- Not measured
- DO - Dissolved Oxygen
- ORP - Oxidation Reduction Potential
- SW - Surface water
- nil - Not observed

**Table 3**  
**Leachate Field Observations**  
**2022 Annual Environmental Effects Monitoring Report**  
**Regional District of Kitimat-Stikine**

Leachate Monitoring Location	Date	Field Temperature (°C)	Conductivity (µs/cm)	DO (mg/L)	ORP (mV)	Field pH	Apparent NAPL Thickness (mm)
Sand Cyclone	7/29/2022	22.5	1228.0	1.3	186.7	7.3	nil
	8/18/2022	17.5	998.0	3.4	207.4	7.5	nil
Sand Filter	3/31/2022	7.1	902.0	0.0	181.3	7.5	nil
	12/1/2022	Monitoring data was not collected. The water at the sand filter was too low to be monitored during December monitoring event.					

Notes:

- NAPL - Non aqueous phase liquid
- Not measured
- DO - Dissolved Oxygen
- ORP - Oxidation Reduction Potential
- nil - Not observed



**Table 4**  
**Summary of Groundwater Analytical Results**  
**2022 Annual Environmental Effects Monitoring Report-Forceman Waste Management Facility**  
**Regional District of Kitimat-Stikine**

Sample Location			MW-01	MW-02	MW-03	MW-04	MW-09	MW-13				
Sample Date			30-Nov-22	30-Nov-22	1-Dec-22	30 Nov 2022	30 Nov 2022	30-Nov-22	30-Nov-22			
Sample ID			MW-01	MW-02	MW-03	MW-04	MW-09	MW-13	MW-09			1-Dec-22
Sampling Company			RDKS	RDKS	RDKS	RDKS	RDKS	RDKS	RDKS			Field Blank
Laboratory			ALS	ALS	ALS	ALS	ALS	ALS	ALS			RDKS
Laboratory Work Order			VA22C9420	VA22C9420	VA22C9420	VA22C9420	VA22C9420	VA22C9420	VA22C9420			VA22C9420
Laboratory Sample ID			VA22C9420-004	VA22C9420-003	VA22C9420-005	VA22C9420-006	VA22C9420-007	VA22C9420-001	VA22C9420-002	RPD		VA22C9420-008
Sample Type	Units	A B							Field Duplicate	%		Trip Blank
		CSR-Schedule 3.2										
<b>Inorganics</b>												
Alkalinity, Total	mg/L	n/v	12.8	22.8	66.2	33.6	35.6	10.1	10.3	2%		< 1.0
Alkalinity (total) as CaCO3	mg/L	n/v	-	-	-	-	-	-	-	nc		< 1.1
pH, lab	S.U.	n/v	6.28	6.14	7.82	8.38	7.15	6.09	6.11	0%		5.51
Electrical Conductivity, Lab	µmhos/cm	n/v	32.6	52.0	129	70.4	77.0	26.1	25.7	2%		< 2.0
Total Hardness as CaCO3	mg/L	n/v	-	-	-	-	-	-	-	nc		-
Dissolved Hardness (as CaCO3)	mg/L	n/v	11.9	20.4	57.9	27.2	25.5	9.68	9.73	1%		< 0.60
Total Sulfate	mg/L	1,280/2,180/3,090/4,290 <sub>S12</sub> <sup>A</sup> 500 <sup>B</sup>	-	-	-	-	-	-	-	nc		-
Dissolved Sulfate	mg/L	1,280/2,180/3,090/4,290 <sub>S12</sub> <sup>A</sup> 500 <sup>B</sup>	0.72	0.73	1.21	1.24	1.10	0.53	0.52	2%		< 0.30
Ammonia (as N)	mg/L	1.3/18.4 <sub>S1</sub> <sup>A</sup>	<0.0050	0.0077	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	nc		< 0.0050
Bromide	mg/L	n/v	<50	<50	-	<50	<50	<50	<0.050	nc		< 0.0051
Total Chloride	mg/L	1,500 <sup>A</sup> 250 <sup>B</sup>	-	-	-	-	-	-	-	nc		-
Dissolved Chloride	mg/L	1,500 <sup>A</sup> 250 <sup>B</sup>	<0.50	<0.50	<0.50	0.51	1.14	<0.50	<0.50	nc		< 0.51
Chemical Oxygen Demand	mg/L	n/v	<10	<10	<10	<10	<10	<10	<10	nc		-
Fluoride	mg/L	2.0/3.0 <sub>S5</sub> <sup>A</sup> 1.5 <sup>B</sup>	0.047	<0.020	0.036	0.080	0.075	0.026	0.022	17%		< 0.020
Total Kjeldahl Nitrogen	mg/L	n/v	0.082	0.175	<0.050	0.060	<0.050	<0.050	<0.050	nc		-
Nitrate (as N)	mg/L	400 <sup>A</sup> 10 <sup>B</sup>	0.183	0.423	0.0252	0.0075	0.0374	0.110	0.110	0%		< 0.0050
Nitrite (as N)	mg/L	0.20/0.40/0.60/0.80-2.0 <sub>S8</sub> <sup>A</sup> 1.0 <sup>B</sup>	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	nc		< 0.0011
Sodium	mg/L	200 <sup>B</sup>	1.49	1.97	1.98	1.70	5.28	0.969	5.28	1%		< 0.050
Orthophosphate (as P)	mg/L	n/v	0.0024	<0.0010	<0.0010	<0.0010	0.0038	<0.0010	<0.0010	nc		-
<b>Organic</b>												
Dissolved Organic Carbon (DOC)	mg/L	n/v	0.52	<0.50	<0.50	<0.50	0.56	0.96	1.01	5%		< 0.50
Total Organic Carbon	mg/L	n/v	1.72	1.20	<0.50	0.81	0.70	0.82	0.80	2%		-
<b>Dissolved metals</b>												
Aluminum	mg/L	9.5 <sup>B</sup>	0.0031	0.0021	0.0033	0.0084	0.0012	0.0168	0.0181	7%		0.0028
Antimony	mg/L	0.090 <sup>A</sup> 0.0060 <sup>B</sup>	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	nc		< 0.00010
Arsenic	mg/L	0.050 <sup>A</sup> 0.010 <sup>B</sup>	<0.00010	<0.00010	0.00036	<0.00010	0.00040	<0.00010	<0.00010	nc		< 0.00010
Barium	mg/L	10 <sup>A</sup> 1.0 <sup>B</sup>	0.00407	0.00997	0.0102	0.00730	0.00659	0.0158	0.0164	4%		0.00016
Beryllium	mg/L	0.0015 <sup>A</sup> 0.0080 <sup>B</sup>	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	nc		< 0.000100
Bismuth	mg/L	n/v	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	nc		< 0.000050
Boron	mg/L	12 <sup>A</sup> 5.0 <sup>B</sup>	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	nc		< 0.010
Calcium	mg/L	n/v	4.15	7.19	20.6	9.31	8.87	3.39	3.40	0%		< 0.050
Cadmium	mg/L	0.00050/0.0015/0.0025/0.0035/0.0040 <sub>S3</sub> <sup>A</sup> 0.0050 <sup>B</sup>	0.0000111	0.0000166	<0.0000050	0.0000258	0.0000105	0.0000087	0.0000096	10%		0.0000984
Cesium	mg/L	n/v	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	nc		< 0.000010
Chromium	mg/L	0.010 <sub>S22</sub> <sup>A</sup> 0.050 <sub>S23</sub> <sup>B</sup>	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	nc		< 0.00050
Cobalt	mg/L	0.040 <sup>A</sup> 0.0010 <sup>B</sup>	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	nc		< 0.00010
Copper	mg/L	0.020/0.030/0.040/0.050/0.060-0.090 <sub>S4</sub> <sup>A</sup> 1.5 <sup>B</sup>	<0.00020	<0.00020	0.00363	0.00046	<0.00020	<0.00020	<0.00020	nc		< 0.00020
Iron	mg/L	6.5 <sup>B</sup>	<0.010	0.074	<0.010	0.179	<0.010	<0.010	<0.010	nc		< 0.010
Lead	mg/L	0.040/0.050/0.060/0.11/0.16 <sub>S6</sub> <sup>A</sup> 0.010 <sup>B</sup>	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	nc		< 0.000050
Lithium	mg/L	0.0080 <sup>B</sup>	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	nc		< 0.0010
Magnesium	mg/L	n/v	0.380	0.588	1.58	0.964	0.296	0.301	0.296	2%		< 0.0050
Manganese	mg/L	1.5 <sup>B</sup>	0.00104	0.0206	0.0143	0.0194	<0.00010	0.00074	0.00075	1%		0.00018
Mercury	mg/L	0.00025 <sup>A</sup> 0.0010 <sup>B</sup>	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	nc		< 0.0000050
Molybdenum	mg/L	10 <sup>A</sup> 0.25 <sup>B</sup>	<0.000050	<0.000050	<0.000050	0.000094	<0.000050	<0.000050	<0.000050	nc		< 0.000050
Nickel	mg/L	0.25/0.65/1.1/1.5 <sub>S7</sub> <sup>A</sup> 0.080 <sup>B</sup>	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	nc		< 0.00050
Phosphorus	mg/L	n/v	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	nc		< 0.050
Potassium	mg/L	0.253	n/v	0.429	0.588	0.670	0.418	0.206	0.213	3%		< 0.050
Rubidium	mg/L	n/v	0.00034	0.00047	0.00031	<0.00020	0.00020	0.00036	0.00041	13%		< 0.00020
Selenium	mg/L	0.020 <sup>A</sup> 0.010 <sup>B</sup>	<0.000050	<0.000050	0.000053	<0.000050	<0.000050	<0.000050	<0.000050	nc		< 0.000050
Silicon	mg/L	n/v	5.61	6.71	4.96	1.77	3.38	3.43	3.43	1%		< 0.000050
Silver	mg/L	0.00050/0.015 <sub>S11</sub> <sup>A</sup> 0.020 <sup>B</sup>	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	nc		< 0.000010
Strontium	mg/L	2.5 <sup>B</sup>	0.0389	0.0615	0.0907	0.0567	0.0432	0.0411	0.0424	3%		< 0.00020
Sulfur	mg/L	<0.50	n/v	<0.50	0.59	<0.50	<0.50	<0.50	<0.50	nc		< 0.50
Tellurium	mg/L	n/v	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	nc		< 0.00020
Thallium	mg/L	0.0030 <sup>A</sup>	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	nc		< 0.000010
Thorium	mg/L	n/v	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	nc		< 0.00010
Tin	mg/L	2.5 <sup>B</sup>	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	nc		< 0.00010
Titanium	mg/L	1.0 <sup>A</sup>	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	nc		< 0.00030
Tungsten	mg/L	0.0030 <sup>B</sup>	<0.00010	<0.00010	0.00052	<0.00010	<0.00010	<0.00010	<0.00010	nc		< 0.00010
Uranium	mg/L	0.085 <sup>A</sup> 0.020 <sup>B</sup>	< 0.000010	< 0.000010	0.000022	< 0.000010	< 0.000010	0.000040	0.000043	7%		< 0.000010
Vanadium	mg/L	0.020 <sup>B</sup>	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	nc		< 0.00050
Zinc	mg/L	0.075/0.15/0.90-2.4 <sub>S13</sub> <sup>A</sup> 3.0 <sup>B</sup>	<0.0010	<0.0010	0.0093	0.0016	<0.0010	<0.0010	<0.0010	nc		< 0.0010
Zirconium	mg/L	n/v	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	nc		< 0.00020

See notes last page

**Table 4**  
**Summary of Groundwater Analytical Results**  
**2022 Annual Environmental Effects Monitoring Report-Forceman Waste Management Facility**  
**Regional District of Kitimat-Stikine**

Sample Location			MW-08 09 Dec 2022	MW-15 08 Dec 2022	MW-16 08 Dec 2022
Sample Date					
Sample ID			MW-08	MW-15	MW-16
Sampling Company			RDKS	RDKS	RDKS
Laboratory			ALS	ALS	ALS
Laboratory Work Order			VA22D0097	VA22D0097	VA22D0097
Laboratory Sample ID					
Sample Type	Units	A B CSR-Schedule 3.2			
<b>Inorganics</b>					
Alkalinity, Total	mg/L	n/v	12.2	193	112
Alkalinity (total) as CaCO3	mg/L	n/v	-	-	-
pH, lab	S.U.	n/v	7.00	8.13	8.22
Electrical Conductivity, Lab	µmhos/cm	n/v	26.1	384	253
Total Hardness as CaCO3	mg/L	n/v	10.4	189	124
Dissolved Hardness (as CaCO3)	mg/L	n/v	9.28	199	128
Total Sulfate	mg/L	1,280/2,180/3,090/4,290 <sub>S12</sub> <sup>A</sup> 500 <sup>B</sup>	-	-	-
Dissolved Sulfate	mg/L	1,280/2,180/3,090/4,290 <sub>S12</sub> <sup>A</sup> 500 <sup>B</sup>	0.47	1.12	1.74
Ammonia (as N)	mg/L	1.3/18.4 <sub>S1</sub> <sup>A</sup>	0.0105	<0.0050	0.0074
Bromide	mg/L	n/v	<50	<50	<50
Total Chloride	mg/L	1,500 <sup>A</sup> 250 <sup>B</sup>	-	-	-
Dissolved Chloride	mg/L	1,500 <sup>A</sup> 250 <sup>B</sup>	0.53	6.34	7.66
Chemical Oxygen Demand	mg/L	n/v	10	<10	<10
Fluoride	mg/L	2.0/3.0 <sub>S5</sub> <sup>A</sup> 1.5 <sup>B</sup>	0.031	<0.020	0.025
Total Kjeldahl Nitrogen	mg/L	n/v	0.058	0.128	0.305
Nitrate (as N)	mg/L	400 <sup>A</sup> 10 <sup>B</sup>	0.0328	1.03	1.93
Nitrite (as N)	mg/L	0.20/0.40/0.60/0.80-2.0 <sub>S8</sub> <sup>A</sup> 1.0 <sup>B</sup>	<0.0010	<0.0010	<0.0010
Total Sodium	mg/L	200 <sup>B</sup>	1.70	5.88	2.10
Dissolved Sodium	mg/L	200 <sup>B</sup>	1.72	6.19	2.31
Orthophosphate (as P)	mg/L	n/v	0.0198	0.0013	0.0018
<b>Organic</b>					
Dissolved Organic Carbon (DOC)	mg/L	n/v	<0.50	0.57	<0.50
Total Organic Carbon	mg/L	n/v	0.51	<0.50	1.01
<b>Total metals</b>					
Aluminum	mg/L	9.5 <sup>B</sup>	0.252	0.0264	0.102
Antimony	mg/L	0.090 <sup>A</sup> 0.0060 <sup>B</sup>	0.00017	<0.00010	<0.00010
Arsenic	mg/L	0.050 <sup>A</sup> 0.010 <sup>B</sup>	0.00033	0.00043	0.00057
Barium	mg/L	10 <sup>A</sup> 1.0 <sup>B</sup>	0.00738	0.0549	0.0296
Beryllium	mg/L	0.0015 <sup>A</sup> 0.0080 <sup>B</sup>	<0.000100	<0.000100	<0.000100
Bismuth	mg/L	n/v	<0.000050	<0.000050	<0.000050
Boron	mg/L	12 <sup>A</sup> 5.0 <sup>B</sup>	<0.010	0.026	<0.010
Calcium	mg/L	n/v	3.48	68.3	45.5
Cadmium	mg/L	0.00050/0.0015/0.0025/0.0035/0.0040 <sub>S3</sub> <sup>A</sup> 0.0050 <sup>B</sup>	0.0000804	0.0000073	0.0000329
Cesium	mg/L	n/v	0.000028	<0.000010	0.000012
Chromium	mg/L	0.010 <sub>S23</sub> <sup>A</sup> 0.050 <sub>S23</sub> <sup>B</sup>	0.00131	0.00065	0.00060
Cobalt	mg/L	0.040 <sup>A</sup> 0.0010 <sup>B</sup>	0.00039	<0.00010	0.00038
Copper	mg/L	0.020/0.030/0.040/0.050/0.060-0.090 <sub>S4</sub> <sup>A</sup> 1.5 <sup>B</sup>	0.00106	<0.00050	0.00088
Iron	mg/L	6.5 <sup>B</sup>	0.455	0.096	0.239
Lead	mg/L	0.040/0.050/0.060/0.11/0.16 <sub>S6</sub> <sup>A</sup> 0.010 <sup>B</sup>	0.000392	0.000051	0.000246
Lithium	mg/L	0.0080 <sup>B</sup>	<0.0010	0.0024	0.0013
Magnesium	mg/L	n/v	0.404	4.46	2.43
Manganese	mg/L	1.5 <sup>B</sup>	0.0354	0.0125	0.0261
Mercury	mg/L	0.00025 <sup>A</sup> 0.0010 <sup>B</sup>	<0.000050	<0.000050	<0.000050
Molybdenum	mg/L	10 <sup>A</sup> 0.25 <sup>B</sup>	<0.000050	<0.000050	<0.000050
Nickel	mg/L	0.25/0.65/1.1/1.5 <sub>S7</sub> <sup>A</sup> 0.080 <sup>B</sup>	0.00084	<0.00050	<0.00050
Phosphorus	mg/L	n/v	0.062	<0.050	<0.050
Potassium	mg/L	n/v	0.262	1.10	0.735
Rubidium	mg/L	n/v	0.00047	0.00047	0.00043
Selenium	mg/L	0.020 <sup>A</sup> 0.010 <sup>B</sup>	<0.000050	<0.000050	0.000062
Silicon	mg/L	n/v	6.880	7.820	6.560
Silver	mg/L	0.00050/0.015 <sub>S11</sub> <sup>A</sup> 0.020 <sup>B</sup>	0.000014	<0.000010	<0.000010
Strontium	mg/L	2.5 <sup>B</sup>	0.0399	0.249	0.156
Sulfur	mg/L	n/v	<0.50	<0.50	0.69
Tellurium	mg/L	n/v	<0.20	<0.20	<0.20
Thallium	mg/L	0.0030 <sup>A</sup>	<0.000010	<0.000010	<0.000010
Thorium	mg/L	n/v	0.00015	<0.00010	<0.00010
Tin	mg/L	2.5 <sup>B</sup>	<0.00010	0.00013	<0.00010
Titanium	mg/L	1.0 <sup>A</sup>	0.00813	0.00203	0.00232
Tungsten	mg/L	0.0030 <sup>B</sup>	<0.00010	<0.00010	<0.00010
Uranium	mg/L	0.085 <sup>A</sup> 0.020 <sup>B</sup>	0.012	0.039	0.040
Vanadium	mg/L	0.020 <sup>B</sup>	0.00072	0.00063	0.00086
Zinc	mg/L	0.075/0.15/0.90-2.4 <sub>S13</sub> <sup>A</sup> 3.0 <sup>B</sup>	0.0079	<0.0030	<0.0030
Zirconium	mg/L	n/v	<0.20	<0.20	<0.20

See notes last page

**Table 4**  
**Summary of Groundwater Analytical Results**  
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**Regional District of Kitimat-Stikine**

Sample Location			MW-08 09 Dec 2022	MW-15 08 Dec 2022	MW-16 08 Dec 2022
Sample ID			MW-08	MW-15	MW-16
Sampling Company			RDKS	RDKS	RDKS
Laboratory			ALS	ALS	ALS
Laboratory Work Order			VA22D0097	VA22D0097	VA22D0097
Laboratory Sample ID					
Sample Type	Units	A B CSR-Schedule 3.2			
<b>Dissolved metals</b>					
Aluminum	mg/L	9.5 <sup>B</sup>	0.0014	0.0039	0.0024
Antimony	mg/L	0.090 <sup>A</sup> 0.0060 <sup>B</sup>	<0.00010	<0.00010	<0.00010
Arsenic	mg/L	0.050 <sup>A</sup> 0.010 <sup>B</sup>	0.00012	0.00034	0.00044
Barium	mg/L	10 <sup>A</sup> 1.0 <sup>B</sup>	0.00334	0.0550	0.0260
Beryllium	mg/L	0.0015 <sup>A</sup> 0.0080 <sup>B</sup>	<0.000100	<0.000100	<0.000100
Bismuth	mg/L	n/v	<0.000050	<0.000050	<0.000050
Boron	mg/L	12 <sup>A</sup> 5.0 <sup>B</sup>	<0.010	0.027	<0.010
Calcium	mg/L	n/v	3.22	72.4	47.4
Cadmium	mg/L	0.00050/0.0015/0.0025/0.0035/0.0040 <sub>53</sub> <sup>A</sup> 0.0050 <sup>B</sup>	0.0000081	<0.000050	0.0000129
Cesium	mg/L	n/v	<0.000010	<0.000010	<0.000010
Chromium	mg/L	0.010 <sub>52</sub> <sup>A</sup> 0.050 <sub>523</sub> <sup>B</sup>	<0.00050	0.00056	<0.00050
Cobalt	mg/L	0.040 <sup>A</sup> 0.0010 <sup>B</sup>	<0.00010	<0.00010	<0.00010
Copper	mg/L	0.020/0.030/0.040/0.050/0.060-0.090 <sub>54</sub> <sup>A</sup> 1.5 <sup>B</sup>	<0.00020	<0.00020	<0.00020
Iron	mg/L	6.5 <sup>B</sup>	<0.010	<0.010	<0.010
Lead	mg/L	0.040/0.050/0.060/0.11/0.16 <sub>96</sub> <sup>A</sup> 0.010 <sup>B</sup>	<0.000050	<0.000050	<0.000050
Lithium	mg/L	0.0080 <sup>B</sup>	<0.0010	0.0024	0.0012
Magnesium	mg/L	n/v	0.301	4.50	2.39
Manganese	mg/L	1.5 <sup>B</sup>	0.00057	0.00100	0.00016
Mercury	mg/L	0.00025 <sup>A</sup> 0.0010 <sup>B</sup>	<0.0000050	<0.0000050	<0.0000050
Molybdenum	mg/L	10 <sup>A</sup> 0.25 <sup>B</sup>	<0.000050	<0.000050	<0.000050
Nickel	mg/L	0.25/0.65/1.1/1.5 <sub>57</sub> <sup>A</sup> 0.080 <sup>B</sup>	<0.00050	<0.00050	0.00055
Phosphorus	mg/L	n/v	<0.050	<0.050	<0.050
Potassium	mg/L	n/v	0.204	1.08	0.719
Rubidium	mg/L	n/v	0.00026	0.00036	0.00041
Selenium	mg/L	0.020 <sup>A</sup> 0.010 <sup>B</sup>	<0.000050	0.000056	<0.000050
Silicon	mg/L	n/v	6.34	7.81	6.10
Silver	mg/L	0.00050/0.015 <sub>511</sub> <sup>A</sup> 0.020 <sup>B</sup>	<0.000010	<0.000010	<0.000010
Strontium	mg/L	2.5 <sup>B</sup>	0.0413	0.283	0.169
Sulfur	mg/L	n/v	<0.50	<0.50	0.61
Tellurium	mg/L	n/v	<0.20	<0.20	<0.20
Thallium	mg/L	0.0030 <sup>A</sup>	<0.000010	<0.000010	<0.000010
Thorium	mg/L	n/v	<0.00010	<0.00010	<0.00010
Tin	mg/L	2.5 <sup>B</sup>	<0.00010	<0.00010	<0.00010
Titanium	mg/L	1.0 <sup>A</sup>	<0.00030	<0.00030	<0.00030
Tungsten	mg/L	0.0030 <sup>B</sup>	<0.00010	<0.00010	<0.00010
Uranium	mg/L	0.085 <sup>A</sup> 0.020 <sup>B</sup>	< 0.000010	0.000041	0.00004
Vanadium	mg/L	0.020 <sup>B</sup>	<0.00050	<0.00050	<0.00050
Zinc	mg/L	0.075/0.15/0.90-2.4 <sub>513</sub> <sup>A</sup> 3.0 <sup>B</sup>	<0.0010	<0.0010	<0.0010
Zirconium	mg/L	n/v	< 0.00020	< 0.00020	< 0.00020

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**Table 4**  
**Summary of Groundwater Analytical Results**  
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**Regional District of Kitimat-Stikine**

**Notes:**

↳ Schedule CSR Schedule 3.2 - Generic Numerical Water Standards (Contaminated Sites Regulation [B.C. Reg. 375/96, April 1, 1997: includes amendments up to July 7, 2021 by B.C. Reg. 179/2021])

<sup>A</sup> Generic Standard - Aquatic Life (Freshwater)

<sup>B</sup> Generic Standard - Drinking Water

**6.5<sup>A</sup>** Concentration exceeds the indicated standard.

15.2 Measured concentration did not exceed the indicated standard.

**<0.50** Laboratory reporting limit was greater than the applicable standard.

<0.03 Analyte was not detected at a concentration greater than the laboratory reporting limit.

n/v No standard/guideline value.

- Parameter not analyzed / not available.

<sup>S1</sup> Ammonia, total (as N) varies with pH for freshwater aquatic life. 1310@pH≥8.5, 3700@pH8.0-<8.5, 11300@pH7.5-<8.0, 18500@pH7.0-<7.5, 18400@pH<7.0

<sup>S3</sup> Cadmium varies with hardness for freshwater aquatic life. 0.5 ug/L@H<30 mg/L, 1.5 ug/L@H30-<90 mg/L, 2.5 ug/L@H90-<150 mg/L, 3.5 ug/L@H150-<210 mg/L, 4 ug/L@H≥210 mg/L.

<sup>S4</sup> Copper varies with hardness for freshwater aquatic life. 20 ug/L@H<50 mg/L, 30 ug/L@H=50-<75 mg/L, 40 ug/L@H=75-<100 mg/L, 50 ug/L@H=100-<125 mg/L, 60 ug/L@H=125-<150 mg/L, 70 ug/L@H=150-<175 mg/L, 80 ug/L@H=175-<200 mg/L, 90 ug/L@H≥200 mg/L.

<sup>S5</sup> Fluoride varies with hardness for freshwater aquatic life. 2000@H<50, 3000@H≥50.

<sup>S6</sup> Lead varies with hardness for freshwater aquatic life. 40 ug/L@H<50 mg/L, 50 ug/L@H=50-<100 mg/L, 60 ug/L@H=100-<200 mg/L, 110 ug/L@H=200-<300 mg/L, 160 ug/L@H≥300 mg/L.

<sup>S7</sup> Nickel varies with hardness for freshwater aquatic life. 250 ug/L@H<60 mg/L, 650 ug/L@H60-<120 mg/L, 1100 ug/L@H120-<180 mg/L, 1500 ug/L@H≥180 mg/L.

<sup>S8</sup> Nitrite (as N) varies with Chloride concentration for aquatic life. 200(Cl<2mg/L), 400(Cl<4mg/L), 600(Cl4-<6mg/L), 800(Cl6-<8mg/L), 1000(Cl8<10mg/L), 2000(Cl>10mg/L).

<sup>S11</sup> Silver varies with hardness for freshwater aquatic life. 0.5 ug/L@H≤100 mg/L, 15 ug/L@H>100 mg/L.

<sup>S12</sup> Sulfate varies with hardness for aquatic life. 1280mg/L @ H≤30, 2180mg/L @ H31-75, 3090mg/L @ H76-180, 4290mg/L @ H>180.

<sup>S13</sup> Zinc varies with hardness for freshwater aquatic life. 75 ug/L@H<90 mg/L, 150 ug/L@H=90-<100 mg/L, 900 ug/L@H=100-<200 mg/L, 1650 ug/L@H=200-<300 mg/L, 2400 ug/L@H=300-<400 mg/L.

<sup>AB</sup>  
<sup>S23</sup> The standard is for Chromium Hexavalent.



**Table 5**  
**Summary of Surface Water Analytical Results**  
**2022 Annual Environmental Effects Monitoring Report-Forceman Waste Management Facility**  
**Regional District of Kitimat-Stikine**

Sample Location					SW-01 22-Nov-22	SW-02 22-Nov-22	SW-03 22-Nov-22	SW-04 22-Nov-22	SW-05 22-Nov-22			22-Nov-22 Field Blank	22-Nov-22 Travel Blank
Sample Date					SW-01	SW-02	SW-03	SW-04	SW-05	SW-22		Field Blank	Travel Blank
Sample ID					RDKS	RDKS	RDKS	RDKS	RDKS	RDKS		RDKS	RDKS
Sampling Company					ALS	ALS	ALS	ALS	ALS	ALS		ALS	ALS
Laboratory					VA22C8721	VA22C8721	VA22C8721	VA22C8721	VA22C8721	VA22C8721		VA22C8721	VA22C8721
Laboratory Work Order					VA22C8721-005	VA22C8721-006	VA22C8721-003	VA22C8721-004	VA22C8721-001	VA22C8721-002	RPD	VA22C8721-007	VA22C8721-008
Laboratory Sample ID										Field Duplicate	%	Field Blank	Trip Blank
Sample Type	Units	A BC WQG AW-F 30-day mean (Chronic)	B BC WQG AW-F Maximum (Acute)	C BC WQG Working									
<b>GENERATED - A423</b>													
pH, lab	S.U.	6.5 - 9.0 <sup>A</sup>	6.5 - 9.0 <sup>B</sup>	n/v	6.9	8.18	8.15	7.79	8.17	8.18	0%	5.58	-
Electrical Conductivity, Lab	µmhos/cm	n/v	n/v	n/v	47.1	160	155	74.4	155	155	0%	<2.0	-
Hardness (as CaCO3)	mg/L	n/v	n/v	n/v	6.07	91.3	86.9	33.0	90.1	86.2	4%	<0.60	<0.60
Dissolved Hardness (as CaCO3)	mg/L	n/v	n/v	n/v	-	77.4	74.4	31.0	74.8	-	nc	-	-
total Sulfate	mg/L	n/v	n/v	n/v	-	-	-	-	-	-	-	-	-
Sulfate	mg/L	128 - 309 <sup>A</sup> <sub>S1</sub>	n/v	n/v	0.58	2.56	2.54	1.45	2.80	2.79	0%	-	-
Biochemical Oxygen Demand (BOD)	mg/L	n/v	n/v	n/v	< 2.0	<2.0	<2.0	<2.0	<2.0	< 2.0	nc	-	-
Ammonia (as N)	mg/L	0.57 - 2.0 <sup>A</sup> <sub>S2</sub>	2.9 - 26 <sup>B</sup> <sub>S2</sub>	n/v	0.0115	0.0185	<0.0050	<0.0050	<0.0050	< 0.0050	nc	<0.0050	0.0104
Bromide	mg/L	n/v	n/v	n/v	< 0.050	<50	<50	<50	<50	< 0.050	nc	-	-
Total Chloride	mg/L	n/v	n/v	n/v	-	-	-	-	-	-	nc	-	-
Chloride	mg/L	150 <sup>A</sup>	600 <sup>B</sup>	n/v	10.5	1.07	1.22	1.97	1.35	1.36	1%	<0.50	< 0.50
Chemical Oxygen Demand	mg/L	n/v	n/v	n/v	< 10	<10	<10	<10	<10	< 10	nc	-	-
Fluoride	mg/L	n/v	0.20 - 1.3 <sup>B</sup> <sub>S1</sub>	n/v	0.027	0.049	0.051	0.039	0.052	0.052	0%	-	-
Total Kjeldahl Nitrogen	mg/L	n/v	n/v	n/v	0.328	0.072	<0.050	<0.050	<0.050	0.134	nc	-	-
Nitrate (as N)	mg/L	3 <sup>A</sup>	33 <sup>B</sup>	n/v	0.0121	0.0346	0.0342	0.0116	0.0297	0.0300	1%	-	-
Nitrite (as N)	mg/L	0.02-0.20 <sup>A</sup> <sub>S3</sub>	0.06-0.60 <sup>B</sup> <sub>S3</sub>	n/v	< 0.0010	<0.0010	<0.0010	<0.0010	<0.0010	< 0.0010	nc	-	-
total Sodium	mg/L	n/v	n/v	n/v	6.87	1.96	2.00	2.92	2.40	2.24	7%	-	< 0.050
Sodium	mg/L	n/v	n/v	n/v	6.00	1.78	1.80	2.49	2.03	2.01	1%	-	-
Orthophosphate (as P)	mg/L	n/v	n/v	n/v	< 0.0010	0.0036	0.0025	0.0059	0.0039	0.0037	5%	-	-
Turbidity	NTU	n/v	n/v	n/v	-	-	-	-	-	-	nc	-	-
Dissolved Organic Carbon (DOC)	mg/L	n/v	n/v	n/v	1.68	-	0.67	2.38	0.57	0.60	5%	-	-

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**Table 5**  
**Summary of Surface Water Analytical Results**  
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**Regional District of Kitimat-Stikine**

Sample Location					SW-01	SW-02	SW-03	SW-04	SW-05				
Sample Date					22-Nov-22	22-Nov-22	22-Nov-22	22-Nov-22	22-Nov-22	22-Nov-22	22-Nov-22	22-Nov-22	22-Nov-22
Sample ID					SW-01	SW-02	SW-03	SW-04	SW-05	SW-22		Field Blank	Travel Blank
Sampling Company					RDKS	RDKS	RDKS	RDKS	RDKS	RDKS		RDKS	RDKS
Laboratory					ALS	ALS	ALS	ALS	ALS	ALS		ALS	ALS
Laboratory Work Order					VA22C8721	VA22C8721	VA22C8721	VA22C8721	VA22C8721	VA22C8721		VA22C8721	VA22C8721
Laboratory Sample ID					VA22C8721-005	VA22C8721-006	VA22C8721-003	VA22C8721-004	VA22C8721-001	VA22C8721-002	RPD	VA22C8721-007	VA22C8721-008
Sample Type	Units	A	B	C						Field Duplicate	%	Field Blank	Trip Blank
		BC WQG AW-F	BC WQG AW-F	BC WQG									
		30-day mean	Maximum (Acute)	Working									
		(Chronic)											
<b>Total Metals</b>													
Aluminum	mg/L	n/v	n/v	n/v	0.0080	0.0045	0.0047	0.0574	0.0190	0.0184	3%	< 0.0030	< 0.0030
Antimony	mg/L	n/v	n/v	0.009 <sup>C</sup>	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	nc	< 0.00010	< 0.00010
Arsenic	mg/L	n/v	0.005 <sup>B</sup>	n/v	0.00020	0.00204	0.00196	0.00214	0.00200	0.00194	3%	< 0.00010	< 0.00010
Barium	mg/L	n/v	n/v	1	0.0157	0.0241	0.0231	0.0214	0.0228	0.0220	4%	< 0.00010	< 0.00010
Beryllium	mg/L	n/v	n/v	0.00013 <sup>C</sup>	< 0.000100	< 0.000100	< 0.000100	< 0.000100	< 0.000100	< 0.000100	nc	< 0.000100	< 0.000100
Bismuth	mg/L	n/v	n/v	n/v	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	nc	< 0.000050	< 0.000050
Boron	mg/L	1.2 <sup>A</sup>	n/v	n/v	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	nc	< 0.010	< 0.010
Calcium	mg/L	n/v	n/v	n/v	1.95	32.8	31.2	11.7	32.0	30.6	4%	< 0.050	< 0.050
Cadmium	mg/L	n/v	n/v	n/v	< 0.0000050	< 0.0000050	< 0.0000050	< 0.0000050	< 0.0000050	< 0.0000050	nc	< 0.0000050	< 0.0000050
Cesium	mg/L	n/v	n/v	n/v	< 0.000010	< 0.000010	< 0.000010	< 0.000010	< 0.000010	< 0.000010	nc	< 0.000011	< 0.000011
Chromium	mg/L	n/v	n/v	0.001 <sup>C</sup>	< 0.00050	< 0.00050	< 0.00050	< 0.00050	< 0.00068	< 0.00050	nc	0.00069	0.00069
Cobalt	mg/L	0.004 <sup>A</sup>	0.11 <sup>B</sup>	n/v	0.00015	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	nc	< 0.00010	< 0.00010
Copper	mg/L	n/v	n/v	n/v	< 0.00050	< 0.00050	< 0.00050	< 0.00050	< 0.00050	< 0.00050	nc	< 0.00050	< 0.00050
Iron	mg/L	n/v	1	n/v	0.191	< 0.010	< 0.010	0.072	0.022	0.019	15%	< 0.010	< 0.010
Lead	mg/L	< 0.0061 <sup>A</sup>	0.0030 - 0.071 <sup>B</sup>	n/v	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	nc	< 0.000050	< 0.000050
Lithium	mg/L	n/v	n/v	n/v	< 0.0010	0.0012	0.0011	< 0.0010	0.0012	0.0012	0%	< 0.0010	< 0.0010
Magnesium	mg/L	n/v	n/v	n/v	0.292	2.28	2.19	0.911	2.48	2.37	5%	< 0.0050	< 0.0050
Manganese	mg/L	0.63 - 0.97 <sup>A</sup>	0.60 - 1.5 <sup>B</sup>	n/v	0.178	0.00210	0.00135	0.0179	0.00238	0.00194	20%	< 0.00010	< 0.00010
Mercury	mg/L	0.00001 <sup>A</sup>	n/v	n/v	< 0.0000050	< 0.0000050	< 0.0000050	< 0.0000050	< 0.0000050	< 0.0000050	nc	< 0.0000050	< 0.0000050
Molybdenum	mg/L	7.6	46	n/v	< 0.000050	0.000314	0.000308	0.000199	0.000435	0.000374	15%	0.000458	0.000458
Nickel	mg/L	n/v	n/v	0.025 - 0.110 <sup>C</sup> <sub>S1</sub>	< 0.00050	< 0.00050	< 0.00050	< 0.00050	< 0.00050	< 0.00050	nc	< 0.00050	< 0.00050
Phosphorus, Total	mg/L	n/v	n/v	n/v	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	nc	< 0.050	< 0.050
Potassium	mg/L	n/v	n/v	n/v	0.294	0.856	0.835	0.565	0.956	0.910	5%	< 0.050	< 0.050
Rubidium	mg/L	n/v	n/v	n/v	0.00043	0.00041	0.00032	0.00040	0.00035	0.00034	3%	< 0.00020	< 0.00020
Selenium	mg/L	0.002	n/v	n/v	< 0.000050	0.000123	0.000150	0.000060	0.000172	0.000106	47%	< 0.000050	< 0.000050
Silicon	mg/L	n/v	n/v	n/v	0.44	5.660	5.360	4.390	5.520	5.33	4%	< 0.10	< 0.10
Silver	mg/L	0.000050	0.00010	n/v	< 0.000010	< 0.000010	< 0.000010	< 0.000010	< 0.000010	< 0.000010	nc	< 0.000010	< 0.000010
Strontium	mg/L	n/v	n/v	n/v	0.0161	0.117	0.112	0.0555	0.119	0.118	1%	< 0.00020	< 0.00020
Sulfur	mg/L	n/v	n/v	n/v	< 0.50	0.92	0.78	< 0.50	0.91	0.89	2%	< 0.50	< 0.50
Tellurium	mg/L	n/v	n/v	n/v	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	nc	< 0.00020	< 0.00020
Thallium	mg/L	n/v	n/v	0.0008 <sup>C</sup>	< 0.000010	< 0.000010	< 0.000010	< 0.000010	< 0.000010	< 0.000010	nc	< 0.000010	< 0.000010
Thorium	mg/L	n/v	n/v	n/v	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	nc	< 0.00010	< 0.00010
Tin	mg/L	n/v	n/v	n/v	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	nc	< 0.00010	< 0.00010
Titanium	mg/L	n/v	n/v	n/v	< 0.00030	< 0.00030	< 0.00030	0.00101	0.00050	< 0.00030	nc	< 0.00030	< 0.00030
Tungsten	mg/L	n/v	n/v	n/v	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	nc	< 0.00010	< 0.00010
Uranium	mg/L	n/v	n/v	0.0085 <sup>C</sup>	< 0.000010	0.000110	0.000110	0.000047	0.000149	0.000146	2%	< 0.000010	< 0.000010
Vanadium	mg/L	n/v	n/v	n/v	< 0.00050	0.00117	0.00111	0.00108	0.00118	0.00110	7%	< 0.00050	< 0.00050
Zinc	mg/L	0.0075	0.033	n/v	< 0.0030	< 0.0030	< 0.0030	< 0.0030	< 0.0030	< 0.0030	nc	< 0.0030	< 0.0030
Zirconium	mg/L	n/v	n/v	n/v	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	nc	< 0.00020	< 0.00020

See notes last page

**Table 5**  
**Summary of Surface Water Analytical Results**  
**2022 Annual Environmental Effects Monitoring Report-Forceman Waste Management Facility**  
**Regional District of Kitimat-Stikine**

Sample Location					SW-01	SW-02	SW-03	SW-04	SW-05				
Sample Date					22-Nov-22	22-Nov-22	22-Nov-22	22-Nov-22	22-Nov-22	22-Nov-22		22-Nov-22	22-Nov-22
Sample ID					SW-01	SW-02	SW-03	SW-04	SW-05	SW-22		Field Blank	Travel Blank
Sampling Company					RDKS	RDKS	RDKS	RDKS	RDKS	RDKS		RDKS	RDKS
Laboratory					ALS	ALS	ALS	ALS	ALS	ALS		ALS	ALS
Laboratory Work Order					VA22C8721	VA22C8721	VA22C8721	VA22C8721	VA22C8721	VA22C8721		VA22C8721	VA22C8721
Laboratory Sample ID					VA22C8721-005	VA22C8721-006	VA22C8721-003	VA22C8721-004	VA22C8721-001	VA22C8721-002	RPD	VA22C8721-007	VA22C8721-008
Sample Type	Units	A	B	C						Field Duplicate	%	Field Blank	Trip Blank
		BC WQG AW-F	BC WQG AW-F	BC WQG									
		30-day mean	Maximum (Acute)	Working									
		(Chronic)											
<b>Dissolved metals</b>													
Aluminum	mg/L	0.05	0.1	n/v	0.0065	0.0029	0.0051	0.0271	0.0058	0.0062	7%	-	-
Antimony	mg/L	n/v	n/v	0.009 <sup>C</sup>	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	nc	-	-
Arsenic	mg/L	n/v	n/v	n/v	0.00016	0.00188	0.00170	0.00194	0.00168	0.00174	4%	-	-
Barium	mg/L	n/v	n/v	1	0.0140	0.0225	0.0208	0.0101	0.0206	0.0208	1%	-	-
Beryllium	mg/L	n/v	n/v	0.00013 <sup>C</sup>	< 0.000100	< 0.000100	< 0.000100	< 0.000100	< 0.000100	< 0.000100	nc	-	-
Bismuth	mg/L	n/v	n/v	n/v	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	nc	-	-
Boron	mg/L	n/v	n/v	n/v	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	nc	-	-
Calcium	mg/L	n/v	n/v	n/v	1.91	27.5	26.4	11.0	26.3	25.4	3%	-	-
Cadmium	mg/L	0.00002 - 0.00019 <sup>A</sup>	0.00033 - 0.00053 <sup>S1</sup>	n/v	0.0000062	< 0.0000050	< 0.0000050	< 0.0000050	< 0.0000050	< 0.0000050	nc	-	-
Cesium	mg/L	n/v	n/v	n/v	< 0.000010	< 0.000010	< 0.000010	< 0.000010	< 0.000010	< 0.000010	nc	-	-
Chromium	mg/L	n/v	n/v	0.001 <sup>C</sup>	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	nc	-	-
Cobalt	mg/L	n/v	n/v	n/v	0.00011	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	nc	-	-
Copper	mg/L	0.00020-0.00039 <sup>A</sup>	0.00020-0.00040 <sup>B</sup>	n/v	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	nc	-	-
Iron	mg/L	n/v	0.35	n/v	0.034	< 0.010	< 0.010	0.031	< 0.010	< 0.010	nc	-	-
Lead	mg/L	n/v	n/v	n/v	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	nc	-	-
Lithium	mg/L	n/v	n/v	n/v	< 0.0010	0.0012	0.0011	< 0.0010	0.0011	0.0011	0%	-	-
Magnesium	mg/L	n/v	n/v	n/v	0.268	2.12	2.05	0.850	2.21	2.20	0%	-	-
Manganese	mg/L	n/v	n/v	n/v	0.158	0.00143	0.00185	0.00557	0.00078	0.00081	4%	-	-
Mercury	mg/L	n/v	n/v	n/v	< 0.0000050	< 0.0000050	< 0.0000050	< 0.0000050	< 0.0000050	< 0.0000050	nc	-	-
Molybdenum	mg/L	n/v	n/v	n/v	0.000254	0.000280	0.000289	0.000182	0.000348	0.000352	1%	-	-
Nickel	mg/L	n/v	n/v	0.025 - 0.110 <sup>C</sup> <sub>S1</sub>	< 0.00050	< 0.00050	< 0.00050	< 0.00050	< 0.00050	< 0.00050	nc	-	-
Phosphorus	mg/L	n/v	n/v	n/v	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	nc	-	-
Potassium	mg/L	n/v	n/v	n/v	0.282	0.824	0.810	0.561	0.889	0.900	1%	-	-
Rubidium	mg/L	n/v	n/v	n/v	0.00036	0.00030	0.00036	0.00034	0.00028	0.00035	22%	-	-
Selenium	mg/L	0.002	n/v	n/v	< 0.000050	0.000138	0.000106	< 0.000050	0.000120	0.000153	24%	-	-
Silicon	mg/L	n/v	n/v	n/v	0.370	5.370	5.040	4.150	5.000	5.05	1%	-	-
Silver	mg/L	n/v	n/v	n/v	< 0.000010	< 0.000010	< 0.000010	< 0.000010	< 0.000010	< 0.000010	nc	-	-
Strontium	mg/L	n/v	n/v	n/v	0.0161	0.104	0.100	0.0471	0.104	0.102	2%	-	-
Sulfur	mg/L	n/v	n/v	n/v	< 0.50	0.72	0.66	< 0.50	0.91	0.87	4%	-	-
Tellurium	mg/L	n/v	n/v	n/v	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	nc	-	-
Thallium	mg/L	n/v	n/v	0.0008 <sup>C</sup>	< 0.000010	< 0.000010	< 0.000010	< 0.000010	< 0.000010	< 0.000010	nc	-	-
Thorium	mg/L	n/v	n/v	n/v	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	nc	-	-
Tin	mg/L	n/v	n/v	n/v	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	nc	-	-
Titanium	mg/L	n/v	n/v	n/v	< 0.00030	< 0.00030	< 0.00030	0.00036	< 0.00030	< 0.00030	nc	-	-
Tungsten	mg/L	n/v	n/v	n/v	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	nc	-	-
Uranium	mg/L	n/v	n/v	0.0085 <sup>C</sup>	< 0.000010	0.000107	0.000102	0.000038	0.000140	0.000138	1%	-	-
Vanadium	mg/L	n/v	n/v	n/v	< 0.00050	0.00092	0.00082	0.00069	0.00083	0.00082	1%	-	-
Zinc	mg/L	n/v	n/v	n/v	< 0.0010	0.0012	0.0017	0.0022	0.0035	0.0095	92%	-	-
Zirconium	mg/L	n/v	n/v	n/v	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	nc	-	-

See notes last page

**Table 6**  
**Summary of Leachate Analytical Results**  
**2022 Annual Environmental Effects Monitoring Report-Forceman Waste Management Facility**  
**Regional District of Kitimat-Stikine**

Sample Location Sample Date Sample ID Sampling Company Laboratory Laboratory Work Order Laboratory Sample ID Sample Type	Units	A OCP Leachate Criteria	Sand Cyclone 31 Aug 2022 F-SC RDKS ALS VA22C0792	Sand Filter 31 Mar 2022 PS-05 RDKS ALS VA22A6903
<b>Inorganics</b>				
Alkalinity (total)	mg/L		263	543
pH (Lab)	pH units	6.8 - 8.5 <sup>A</sup>	8.44	8.00
pH (Field)	pH units	6.8 - 8.5 <sup>A</sup>	7.5	7.5
Electrical Conductivity (Lab)	uS/cm		1,130	1,330
Hardness as CaCO3	mg/L		229	286
Sulphate	mg/L		-	
Sulphate (filtered)	mg/L		4.34	2.29
Biochemical Oxygen Demand	mg/L		<2.0	20.2
Ammonia as N	mg/L	214 <sup>A</sup>	1.81	36.7
Bromide	mg/L		0.360	
Chloride	mg/L	5000 <sup>A</sup>	120	99.3
Chemical Oxygen Demand	mg/L		58	150
Fluoride	mg/L		<0.100	<0.100
Kjeldahl Nitrogen Total	mg/L		3.64	40.4
Nitrate (as N)	mg/L		37.2	2.05
Nitrite (as N)	mg/L		0.141	0.0136
Nitrogen (Total)	mg/L	300 <sup>A</sup>	40.6	46.6
Sodium	mg/L		116	102
Orthophosphate (PO4-P)	mg/L		0.0963	0.0310
<b>Organic</b>				
Dissolved Organic Carbon (filtered)	mg/L		17.5	-
Total Organic Carbon	mg/L		17.5	34.2
<b>Metals</b>				
Aluminium	mg/L		0.0129	0.0257
Antimony	mg/L		0.00058	0.00054
Arsenic	mg/L		0.00103	0.00348
Barium	mg/L		0.0494	0.164
Beryllium	mg/L		<0.000100	<0.000100
Bismuth	mg/L		<0.000050	<0.000050
Boron	mg/L		0.940	0.870
Calcium	mg/L		61.2	87.4
Cadmium	mg/L	0.1 <sup>A</sup>	0.000300	0.000214
Cesium	mg/L		0.000241	0.000567
Chromium (III+VI)	mg/L		0.00075	0.00167
Cobalt	mg/L		0.00098	0.00142
Copper	mg/L		0.00558	0.00791
Iron	mg/L	6 <sup>A</sup>	0.136	2.45
Lead	mg/L		0.000282	0.000674
Lithium	mg/L		<0.0010	<0.0010
Magnesium	mg/L		18.6	16.4
Manganese	mg/L		0.379	2.93
Mercury	mg/L		<0.0000050	<0.0000050
Molybdenum	mg/L		0.000322	0.000550
Nickel	mg/L		0.00625	0.00562
Phosphorus	mg/L		0.168	0.697
Potassium	mg/L		51.8	49.6
Rubidium	mg/L		0.0496	0.0492
Selenium	mg/L		0.000113	0.000100
Silicon	mg/L		2.79	3.07
Silver	mg/L		<0.000010	<0.000010
Strontium	mg/L		0.368	0.452
Sulfur	mg/L		2.47	2.19
tellurium	mg/L		<0.00020	<0.00020
Thallium	mg/L		0.000026	0.000042
Thorium	mg/L		<0.00010	<0.00010
Tin	mg/L		0.00010	0.00012
Titanium	mg/L		<0.00030	0.00204
Tungsten	mg/L		<0.00010	0.00011
Uranium	mg/L		0.000070	0.000060
Vanadium	mg/L		0.00102	0.00176
Zinc	mg/L	100 <sup>A</sup>	0.0049	0.0076
Zirconium	mg/L		<0.00020	0.00036

**Notes:**

OCP Leachate Criteria	Operational Permit # 17227 Leachate Discharge Criteria
A	OCP Leachate Criteria
6.5 <sup>A</sup>	Concentration exceeds the indicated standard.
15.2	Measured concentration did not exceed the indicated standard.
<0.50	Laboratory reporting limit was greater than the applicable standard.
<0.03	Analyte was not detected at a concentration greater than the laboratory reporting limit.
n/v	No standard/guideline value.
-	Parameter not analyzed / not available.

**Table 7**  
**Summary of Composite Soil Analytical Results**  
**2022 Annual Environmental Effects Monitoring Report-Forceman Waste Management Facility**  
**Regional District of Kitimat-Stikine**

Sample Location			Phytoremediation Orchard
Sample Date			31-Mar-22
Sample ID			Phytoremediation
Sampling Company			RDKS
Laboratory			ALS
Laboratory Work Order			VA22A6906
Laboratory Sample ID			VA22A6906-001
Sample Type	Units	A B C D E	
CSR-Schedule 3.1-IL			
<b>General Parameters</b>			
Soluble (1:2) pH	S.U.	n/v	6.08
Chloride	mg/kg	600 <sub>N3</sub> <sup>A</sup> 100 <sub>N3</sub> <sup>B</sup> 2,500 <sub>N3</sub> <sup>C</sup>	< 16.3
Chloride	mg/L	n/v	< 20
Sodium	mg/kg	<sub>N9</sub> <sup>A</sup> 15,000 <sub>N9</sub> <sup>B</sup> 1,000 <sub>N9</sub> <sup>C</sup>	161
<b>Salinity</b>			
Sodium Ion (Na+)	mg/kg	<sub>N9</sub> <sup>A</sup> 15,000 <sub>N9</sub> <sup>B</sup> 1,000 <sub>N9</sub> <sup>C</sup>	8.01
Sodium Ion (Na+)	mg/L	n/v	9.8
<b>Metals</b>			
Aluminum	mg/kg	250,000 <sup>D</sup>	28,100
Antimony	mg/kg	40,000 <sup>D</sup> 40 <sup>E</sup>	0.34
Arsenic	mg/kg	10 <sup>AB</sup> 40 <sup>C</sup>	5.26
Barium	mg/kg	3,500 <sup>A</sup> 350 <sup>B</sup> 1,500 <sup>C</sup>	49.3
Beryllium	mg/kg	1.0/500 <sub>PH2</sub> <sup>A</sup> 1.0/2,500 <sub>PH1</sub> <sup>B</sup> 350 <sup>C</sup>	0.32
Bismuth	mg/kg	n/v	<0.20
Boron	mg/kg	1,000,000 <sub>&gt;</sub> <sup>D</sup>	<5.0
Calcium	mg/kg	n/v	2,440
Cadmium	mg/kg	1.0/50 <sub>PH7</sub> <sup>A</sup> 1.0/70 <sub>PH6</sub> <sup>B</sup> 75 <sup>C</sup>	0.066
Chromium	mg/kg	60/300,000 <sub>N5,N6</sub> <sup>A</sup> 60/1,000,000 <sub>N5,&gt;,N6</sub> <sup>B</sup> 250 <sub>N4</sub> <sup>C</sup>	28.4
Cobalt	mg/kg	25 <sup>AB</sup> 200 <sup>C</sup>	7.65
Copper	mg/kg	75/7,500 <sub>PH32</sub> <sup>A</sup> 250/100,000 <sub>PH30</sub> <sup>B</sup> 300 <sup>C</sup>	19.4
Iron	mg/kg	150,000 <sup>D</sup>	37,200
Lead	mg/kg	200/90,000 <sub>PH12</sub> <sup>A</sup> 120/8,500 <sub>PH11</sub> <sup>B</sup> 1,000 <sup>C</sup>	6.90
Lithium	mg/kg	450 <sup>D</sup>	12.6
Magnesium	mg/kg	n/v	6,000
Manganese	mg/kg	2,000 <sup>BC</sup>	508
Mercury	mg/kg	75 <sup>C</sup>	0.0512
Molybdenum	mg/kg	650 <sup>A</sup> 15 <sup>B</sup> 150 <sup>C</sup>	0.74
Nickel	mg/kg	90/9,500 <sub>PH17</sub> <sup>A</sup> 70/500 <sub>PH16</sub> <sup>B</sup> 250 <sup>C</sup>	16.6
Phosphorus, Total	mg/kg	n/v	1,000
Potassium	mg/kg	n/v	720
Selenium	mg/kg	1.0 <sup>A</sup> 1.0 <sub>N2</sub> <sup>B</sup> 2.0 <sup>C</sup>	0.22
Silver	mg/kg	35,000 <sup>D</sup> 40 <sup>E</sup>	0.12
Strontium	mg/kg	150,000 <sup>D</sup>	25.7
Sulfur	mg/kg	n/v	<1,000
Thallium	mg/kg	25 <sup>E</sup>	0.069
Tin	mg/kg	1,000,000 <sub>&gt;</sub> <sup>D</sup> 300 <sup>E</sup>	<2.0
Titanium	mg/kg	n/v	922
Tungsten	mg/kg	200 <sup>D</sup>	<0.50
Uranium	mg/kg	150 <sup>A</sup> 30 <sup>B</sup> 2,000 <sup>C</sup>	0.436
Vanadium	mg/kg	100 <sup>B</sup> 300 <sup>C</sup>	80.2
Zinc	mg/kg	150/3,000 <sub>PH26</sub> <sup>A</sup> 200/5,500 <sub>PH25</sub> <sup>B</sup> 450 <sup>C</sup>	67.7
Zirconium	mg/kg	n/v	9.8

See notes last page



**Table 7  
Summary of Soil Analytical Results  
2022 Annual Environmental Effects Monitoring Report-Forceman Waste Management Facility  
Regional District of Kitimat-Stikine**

**Notes:**

CSR-Schedule 3.1-IL CSR Schedule 3.1 - Part 1,2 & 3 (Contaminated Sites Regulation [B.C. Reg. 375/96, April 1, 1997: includes amendments up to July 7, 2021 by B.C. Reg. 179/2021])

A	Part 1 Matrix Standard - Industrial Land Use (IL) - Groundwater flow to surface water used by aquatic life (freshwater)
B	Part 1 Matrix Standard - Industrial Land Use (IL) - Groundwater used for drinking water
C	Part 1 Matrix Standard - Industrial Land Use (IL) - Toxicity to soil invertebrates and plants (applicable to all sites)
D	Part 2 Generic Human Health Standard - Industrial Land Use (IL)
E	Part 3 Generic Ecological Standard - Industrial Land Use (IL)
<b>6.5<sup>A</sup></b>	Concentration exceeds the indicated standard.
15.2	Measured concentration did not exceed the indicated standard.
<b>&lt;0.50</b>	Laboratory reporting limit was greater than the applicable standard.
<0.03	Analyte was not detected at a concentration greater than the laboratory reporting limit.
n/v	No standard/guideline value.
-	Parameter not analyzed / not available.
>	QUALIFIER DESCRIPTION MISSING
N2	Soil standards protective of groundwater used for drinking water are the same regardless of land use.
N3 <sup>ABC</sup>	Chloride ion standards apply to soluble chloride.
N4	Standard applies to total chromium (all species).
N5, N6	N5 - Standard applies to hexavalent chromium (Cr6+) / N6 - Standard applies to trivalent chromium (Cr3+)
N5, N6 <sup>ABC</sup>	N5 - Standard applies to hexavalent chromium (Cr6+) / N6 - Standard applies to trivalent chromium (Cr3+)
N9	Sodium ion standards apply to soluble sodium.
PH1	Beryllium standards vary with soil pH from 1-2,500 ug/g for groundwater used for drinking water for all land use types. For pH < 5.5 standard = 1 ug/g; For pH 5.5-<6.0 standard = 1.5; For pH 6.0-<6.5 standard = 4 ug/g; For pH 6.5->7.0 standard = 20 ug/g; For pH 7.0->7.5 standard = 150 ug/g; For pH 7.5->8.0 standard = 1,000 ug/g; For pH ≥ 8.0 standard = 2,500 ug/g. Consult CSR Schedule 3.1.1, Matrix 6.
PH2	Beryllium standards vary with soil pH from 1-500 ug/g for groundwater flow to surface water used by aquatic life (freshwater) for all land use types. For pH < 6.5 standard = 1 ug/g; For pH 6.5-<7.0 standard = 4 ug/g; For pH 7.0-<7.5 standard = 30 ug/g; For pH 7.5-<8.0 standard = 250 ug/g; For pH ≥ 8.0 standard = 500 ug/g. Consult CSR Schedule 3.1.1, Matrix 6.
PH6	Cadmium standards vary with soil pH from 1-70 ug/g for groundwater used for drinking water for all land use types. For pH < 7.0 standard = 1 ug/g; For pH 7.0->7.5 standard = 4.5 ug/g; For pH 7.5->8.0 standard = 30 ug/g; For pH ≥ 8.0 standard = 70 ug/g. Consult CSR Schedule 3.1.1, Matrix 7.
PH7	Cadmium standards vary with soil pH from 1-50 ug/g for groundwater flow to surface water used by aquatic life (freshwater) for all land use types. For pH < 7.0 standard = 1 ug/g; For pH 7.0->7.5 standard = 3 ug/g; For pH 7.5->8.0 standard = 20 ug/g; For pH ≥ 8.0 standard = 50 ug/g. Consult CSR Schedule 3.1.1, Matrix 7.
PH11	Lead standards vary with soil pH from 120-8,500 ug/g for groundwater used for drinking water for all land use types. For pH < 5.5 standard = 120 ug/g; For pH 5.5-<6.0 standard = 150 ug/g; For pH 6.0-<6.5 standard = 800 ug/g; For pH 6.5-<7.0 standard = 3,500 ug/g; For pH 7.0-<7.5 standard = 7,500 ug/g; For pH ≥ 7.5 standard = 8,500 ug/g. Consult CSR Schedule 3.1.1, Matrix 18.
PH12	Lead standards vary with soil pH from 200-90,000 ug/g for groundwater flow to surface water used by aquatic life (freshwater) for all land use types. For pH < 5.0 standard = 200 ug/g; For pH 5.0-<5.5 standard = 350 ug/g; For pH 5.5-<6.0 standard = 1,500 ug/g; For pH 6.0-<6.5 standard = 8,500 ug/g; For pH 6.5-<7.0 standard = 35,000 ug/g; For pH 7.0->7.5 standard = 80,000 ug/g; For pH ≥ 7.5 standard = 90,000 ug/g. Consult CSR Schedule 3.1.1, Matrix 18.
PH16	Nickel standards vary with soil pH from 70-500 ug/g for groundwater used for drinking water for all land use types. For pH < 7.5 standard = 70 ug/g; For pH 7.5-<8.0 standard = 250 ug/g; For pH ≥ 8.0 standard = 500 ug/g. Consult CSR Schedule 3.1.1, Matrix 24.
PH17	Nickel standards vary with soil pH from 90-9,500 ug/g for groundwater flow to surface water used by aquatic life (freshwater) for all land use types. For pH < 5.0 standard = 90 ug/g; For pH 5.0-<5.5 standard = 100 ug/g; For pH 5.5-<6.0 standard = 150 ug/g; For pH 6.0-<6.5 standard = 200 ug/g; For pH 6.5-<7.0 standard = 300 ug/g; For pH 7.0->7.5 standard = 900 ug/g; For pH 7.5-<8.0 standard = 5,000 ug/g; For pH ≥ 8.0 standard = 9,500 ug/g. Consult CSR Schedule 3.1.1, Matrix 24.
PH25	Zinc standards vary with soil pH from 200-5,500 ug/g for groundwater used for drinking water for all land use types. For pH < 5.0 standard = 200 ug/g; For pH 5.0-<5.5 standard = 200 ug/g; For pH 5.5-<6.0 standard = 300 ug/g; For pH 6.0-<6.5 standard = 450 ug/g; For pH 6.5-<7.0 standard = 600 ug/g; For pH 7.0->7.5 standard = 1,000 ug/g; For pH 7.5-<8.0 standard = 3,000 ug/g; For pH ≥ 8.0 standard = 5,500 ug/g. Consult CSR Schedule 3.1.1, Matrix 40.
PH26	Zinc standards vary with soil pH from 150-3,000 ug/g for groundwater flow to surface water used by aquatic life (freshwater) for all land use types. For pH < 6.0 standard = 150 ug/g; For pH 6.0-<6.5 standard = 250 ug/g; For pH 6.5-<7.0 standard = 350 ug/g; For pH 7.0->7.5 standard = 600 ug/g; For pH 7.5-<8.0 standard = 1,500 ug/g; For pH ≥ 8.0 standard = 3,000 ug/g. Consult CSR Schedule 3.1.1, Matrix 40.
PH30	Copper standards vary with soil pH from 250-100,000 ug/g for groundwater used for drinking water for all land use types. For pH < 5.0 standard = 250 ug/g; For pH 5.0-<5.5 standard = 500 ug/g; For pH 5.5-<6.0 standard = 2,000 ug/g; For pH 6.0-<6.5 standard = 10,000 ug/g; For pH 6.5-<7.0 standard = 50,000 ug/g; For pH ≥ 7.0 standard = 100,000 ug/g. Consult CSR Schedule 3.1.1, Matrix 11.
PH32	Copper standards vary with soil pH from 75-7,500 ug/g for groundwater flow to surface water used by aquatic life (freshwater) for all land use types. For pH < 5.5 standard = 75 ug/g; For pH 5.5-<6.0 standard = 100 ug/g; For pH 6.0-<6.5 standard = 700 ug/g; For pH 6.5-<7.0 standard = 3,000 ug/g; For pH 7.0-<7.5 standard = 6,500 ug/g; For pH ≥ 7.5 standard = 7,500 ug/g. Consult CSR Schedule 3.1.1, Matrix 11.

## Appendix F      Laboratory Analytical Certificates



## CERTIFICATE OF ANALYSIS

**Work Order** : **VA22A6903**  
**Client** : **Regional District of Kitimat-Stikine**  
**Contact** : Hannah Shinton  
**Address** : # 300 - 4545 Lazelle Avenue  
 Terrace BC Canada V8G 4E1  
**Telephone** : ----  
**Project** : Forceman Facility Sand Filter  
**PO** : ----  
**C-O-C number** : ----  
**Sampler** : Hannah Shinton  
**Site** :  
**Quote number** : Q62338  
**No. of samples received** : 4  
**No. of samples analysed** : 4

**Page** : 1 of 5  
**Laboratory** : Vancouver - Environmental  
**Account Manager** : Amber Springer  
**Address** : 8081 Lougheed Highway  
 Burnaby BC Canada V5A 1W9  
**Telephone** : +1 604 253 4188  
**Date Samples Received** : 01-Apr-2022 22:00  
**Date Analysis Commenced** : 03-Apr-2022  
**Issue Date** : 19-Apr-2022 11:41

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

### Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Caleb Deroche	Lab Analyst	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia



## General Comments

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

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

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

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

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

<i>Unit</i>	<i>Description</i>
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.

## Qualifiers

<i>Qualifier</i>	<i>Description</i>
<i>DLDS</i>	<i>Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.</i>
<i>HTD</i>	<i>Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.</i>



## Analytical Results

Sub-Matrix: Water					Client sample ID	Sand Filter	Facility 1	Field Blank	Travel Blank	----
(Matrix: Water)					Client sampling date / time	31-Mar-2022 14:42	31-Mar-2022 12:00	31-Mar-2022 15:10	31-Mar-2022	----
Analyte	CAS Number	Method	LOR	Unit	VA22A6903-001	VA22A6903-002	VA22A6903-003	VA22A6903-004	-----	
					Result	Result	Result	Result	----	
<b>Physical Tests</b>										
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	543	536	<1.0	<1.0	----	
conductivity	----	E100	2.0	µS/cm	1330	1330	<2.0	<2.0	----	
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L	286	281	<0.60	<0.60	----	
pH	----	E108	0.10	pH units	8.00	7.97	5.37	5.35	----	
<b>Anions and Nutrients</b>										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	36.7	38.2	<0.0050	<0.0050	----	
chloride	16887-00-6	E235.Cl	0.50	mg/L	99.3	99.6	<0.50	----	----	
fluoride	16984-48-8	E235.F	0.020	mg/L	<0.100 <sup>DLDS</sup>	<0.100 <sup>DLDS</sup>	<0.020	----	----	
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	40.4	39.9	<0.050	----	----	
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	2.05	1.26	<0.0050	----	----	
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	0.0136	<0.0050 <sup>DLDS</sup>	<0.0010	----	----	
nitrogen, total	7727-37-9	E366	0.030	mg/L	46.6	48.0	<0.030	----	----	
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	0.0310	0.0263	<0.0010	<0.0010 <sup>HTD</sup>	----	
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	2.29	2.23	<0.30	----	----	
<b>Organic / Inorganic Carbon</b>										
carbon, total organic [TOC]	----	E355-L	0.50	mg/L	34.2	37.1	<0.50	----	----	
<b>Total Metals</b>										
aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0257	0.0281	<0.0030	<0.0030	----	
antimony, total	7440-36-0	E420	0.00010	mg/L	0.00054	0.00057	<0.00010	<0.00010	----	
arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00348	0.00349	<0.00010	<0.00010	----	
barium, total	7440-39-3	E420	0.00010	mg/L	0.164	0.162	<0.00010	<0.00010	----	
beryllium, total	7440-41-7	E420	0.000100	mg/L	<0.000100	<0.000100	<0.000100	<0.000100	----	
bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	----	
boron, total	7440-42-8	E420	0.010	mg/L	0.870	0.864	<0.010	<0.010	----	
cadmium, total	7440-43-9	E420	0.0000050	mg/L	0.000214	0.000213	<0.0000050	<0.0000050	----	
calcium, total	7440-70-2	E420	0.050	mg/L	87.4	85.7	<0.050	<0.050	----	
cesium, total	7440-46-2	E420	0.000010	mg/L	0.000567	0.000570	<0.000010	<0.000010	----	
chromium, total	7440-47-3	E420	0.00050	mg/L	0.00167	0.00164	<0.00050	<0.00050	----	
cobalt, total	7440-48-4	E420	0.00010	mg/L	0.00142	0.00147	<0.00010	<0.00010	----	
copper, total	7440-50-8	E420	0.00050	mg/L	0.00791	0.00778	<0.00050	<0.00050	----	





## Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	Sand Filter	Facility 1	Field Blank	Travel Blank	----
Client sampling date / time					31-Mar-2022 14:42	31-Mar-2022 12:00	31-Mar-2022 15:10	31-Mar-2022	----	
Analyte	CAS Number	Method	LOR	Unit	VA22A6903-001	VA22A6903-002	VA22A6903-003	VA22A6903-004	-----	
					Result	Result	Result	Result	---	
<b>Total Metals</b>										
iron, total	7439-89-6	E420	0.010	mg/L	2.45	2.44	<0.010	<0.010	----	
lead, total	7439-92-1	E420	0.000050	mg/L	0.000674	0.000671	<0.000050	<0.000050	----	
lithium, total	7439-93-2	E420	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	----	
magnesium, total	7439-95-4	E420	0.0050	mg/L	16.4	16.2	<0.0050	<0.0050	----	
manganese, total	7439-96-5	E420	0.00010	mg/L	2.93	2.88	<0.00010	<0.00010	----	
mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	----	
molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.000550	0.000643	<0.000050	<0.000050	----	
nickel, total	7440-02-0	E420	0.00050	mg/L	0.00562	0.00734	<0.00050	<0.00050	----	
phosphorus, total	7723-14-0	E420	0.050	mg/L	0.697	0.833	<0.050	<0.050	----	
potassium, total	7440-09-7	E420	0.050	mg/L	49.6	48.7	<0.050	<0.050	----	
rubidium, total	7440-17-7	E420	0.00020	mg/L	0.0492	0.0485	<0.00020	<0.00020	----	
selenium, total	7782-49-2	E420	0.000050	mg/L	0.000100	0.000092	<0.000050	<0.000050	----	
silicon, total	7440-21-3	E420	0.10	mg/L	3.07	3.03	<0.10	<0.10	----	
silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	0.000010	<0.000010	<0.000010	----	
sodium, total	7440-23-5	E420	0.050	mg/L	102	100	<0.050	<0.050	----	
strontium, total	7440-24-6	E420	0.00020	mg/L	0.452	0.450	<0.00020	<0.00020	----	
sulfur, total	7704-34-9	E420	0.50	mg/L	2.19	2.21	<0.50	<0.50	----	
tellurium, total	13494-80-9	E420	0.00020	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	----	
thallium, total	7440-28-0	E420	0.000010	mg/L	0.000042	0.000042	<0.000010	<0.000010	----	
thorium, total	7440-29-1	E420	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	----	
tin, total	7440-31-5	E420	0.00010	mg/L	0.00012	0.00013	<0.00010	<0.00010	----	
titanium, total	7440-32-6	E420	0.00030	mg/L	0.00204	0.00186	<0.00030	<0.00030	----	
tungsten, total	7440-33-7	E420	0.00010	mg/L	0.00011	0.00011	<0.00010	<0.00010	----	
uranium, total	7440-61-1	E420	0.000010	mg/L	0.000060	0.000073	<0.000010	<0.000010	----	
vanadium, total	7440-62-2	E420	0.00050	mg/L	0.00176	0.00173	<0.00050	<0.00050	----	
zinc, total	7440-66-6	E420	0.0030	mg/L	0.0076	0.0074	<0.0030	<0.0030	----	
zirconium, total	7440-67-7	E420	0.00020	mg/L	0.00036	<0.00020	<0.00020	<0.00020	----	
<b>Aggregate Organics</b>										
biochemical oxygen demand [BOD]	----	E550	2.0	mg/L	20.2	22.1	<2.0	----	----	
chemical oxygen demand [COD]	----	E559	20	mg/L	150	158	<20	----	----	



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

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## QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: <b>VA22A6903</b>	Page	: 1 of 14
Client	: <b>Regional District of Kitimat-Stikine</b>	Laboratory	: Vancouver - Environmental
Contact	: Hannah Shinton	Account Manager	: Amber Springer
Address	: # 300 - 4545 Lazelle Avenue Terrace BC Canada V8G 4E1	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: Forceman Facility Sand Filter	Date Samples Received	: 01-Apr-2022 22:00
PO	: ----	Issue Date	: 19-Apr-2022 11:40
C-O-C number	: ----		
Sampler	: Hannah Shinton		
Site	:		
Quote number	: Q62338		
No. of samples received	: 4		
No. of samples analysed	: 4		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

### Key

**Anonymous:** Refers to samples which are not part of this work order, but which formed part of the QC process lot.

**CAS Number:** Chemical Abstracts Services number is a unique identifier assigned to discrete substances.

**DQO:** Data Quality Objective.

**LOR:** Limit of Reporting (detection limit).

**RPD:** Relative Percent Difference.

### **Workorder Comments**

Holding times are displayed as "----" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

### **Summary of Outliers**

#### **Outliers : Quality Control Samples**

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

#### **Outliers: Reference Material (RM) Samples**

- No Reference Material (RM) Sample outliers occur.

#### **Outliers : Analysis Holding Time Compliance (Breaches)**

- Analysis Holding Time Outliers exist - please see following pages for full details.

## ***Outliers : Frequency of Quality Control Samples***

- No Quality Control Sample Frequency Outliers occur.



## Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Aggregate Organics : Biochemical Oxygen Demand - 5 day</b>										
<b>HDPE [BOD HT 3d]</b> Facility 1	E550	31-Mar-2022	----	----	----		03-Apr-2022	3 days	3 days	✓
<b>Aggregate Organics : Biochemical Oxygen Demand - 5 day</b>										
<b>HDPE [BOD HT 3d]</b> Field Blank	E550	31-Mar-2022	----	----	----		03-Apr-2022	3 days	3 days	✓
<b>Aggregate Organics : Biochemical Oxygen Demand - 5 day</b>										
<b>HDPE [BOD HT 3d]</b> Sand Filter	E550	31-Mar-2022	----	----	----		03-Apr-2022	3 days	3 days	✓
<b>Aggregate Organics : Chemical Oxygen Demand by Colourimetry</b>										
<b>Amber glass total (sulfuric acid)</b> Facility 1	E559	31-Mar-2022	----	----	----		06-Apr-2022	28 days	6 days	✓
<b>Aggregate Organics : Chemical Oxygen Demand by Colourimetry</b>										
<b>Amber glass total (sulfuric acid)</b> Field Blank	E559	31-Mar-2022	----	----	----		06-Apr-2022	28 days	6 days	✓
<b>Aggregate Organics : Chemical Oxygen Demand by Colourimetry</b>										
<b>Amber glass total (sulfuric acid)</b> Sand Filter	E559	31-Mar-2022	----	----	----		06-Apr-2022	28 days	6 days	✓
<b>Anions and Nutrients : Ammonia by Fluorescence</b>										
<b>Amber glass total (sulfuric acid)</b> Facility 1	E298	31-Mar-2022	09-Apr-2022	----	----		11-Apr-2022	28 days	11 days	✓





Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Ammonia by Fluorescence</b>											
<b>Amber glass total (sulfuric acid)</b> Field Blank	E298	31-Mar-2022	09-Apr-2022	----	----		11-Apr-2022	28 days	11 days	✔	
<b>Anions and Nutrients : Ammonia by Fluorescence</b>											
<b>Amber glass total (sulfuric acid)</b> Sand Filter	E298	31-Mar-2022	09-Apr-2022	----	----		11-Apr-2022	28 days	11 days	✔	
<b>Anions and Nutrients : Ammonia by Fluorescence</b>											
<b>Amber glass total (sulfuric acid)</b> Travel Blank	E298	31-Mar-2022	09-Apr-2022	----	----		11-Apr-2022	28 days	11 days	✔	
<b>Anions and Nutrients : Chloride in Water by IC</b>											
<b>HDPE</b> Facility 1	E235.Cl	31-Mar-2022	----	----	----		03-Apr-2022	28 days	3 days	✔	
<b>Anions and Nutrients : Chloride in Water by IC</b>											
<b>HDPE</b> Field Blank	E235.Cl	31-Mar-2022	----	----	----		03-Apr-2022	28 days	3 days	✔	
<b>Anions and Nutrients : Chloride in Water by IC</b>											
<b>HDPE</b> Sand Filter	E235.Cl	31-Mar-2022	----	----	----		03-Apr-2022	28 days	3 days	✔	
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)</b>											
<b>HDPE</b> Facility 1	E378-U	31-Mar-2022	----	----	----		03-Apr-2022	3 days	3 days	✔	
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)</b>											
<b>HDPE</b> Field Blank	E378-U	31-Mar-2022	----	----	----		03-Apr-2022	3 days	3 days	✔	
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)</b>											
<b>HDPE</b> Sand Filter	E378-U	31-Mar-2022	----	----	----		03-Apr-2022	3 days	3 days	✔	



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)</b>											
<b>HDPE</b> Travel Blank	E378-U	31-Mar-2022	----	----	----		06-Apr-2022	3 days	7 days	*	EHT
<b>Anions and Nutrients : Fluoride in Water by IC</b>											
<b>HDPE</b> Facility 1	E235.F	31-Mar-2022	----	----	----		03-Apr-2022	28 days	3 days	✓	
<b>Anions and Nutrients : Fluoride in Water by IC</b>											
<b>HDPE</b> Field Blank	E235.F	31-Mar-2022	----	----	----		03-Apr-2022	28 days	3 days	✓	
<b>Anions and Nutrients : Fluoride in Water by IC</b>											
<b>HDPE</b> Sand Filter	E235.F	31-Mar-2022	----	----	----		03-Apr-2022	28 days	3 days	✓	
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>											
<b>HDPE</b> Facility 1	E235.NO3-L	31-Mar-2022	----	----	----		03-Apr-2022	3 days	3 days	✓	
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>											
<b>HDPE</b> Field Blank	E235.NO3-L	31-Mar-2022	----	----	----		03-Apr-2022	3 days	3 days	✓	
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>											
<b>HDPE</b> Sand Filter	E235.NO3-L	31-Mar-2022	----	----	----		03-Apr-2022	3 days	3 days	✓	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
<b>HDPE</b> Facility 1	E235.NO2-L	31-Mar-2022	----	----	----		03-Apr-2022	3 days	3 days	✓	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
<b>HDPE</b> Field Blank	E235.NO2-L	31-Mar-2022	----	----	----		03-Apr-2022	3 days	3 days	✓	



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
<b>HDPE</b> Sand Filter	E235.NO2-L	31-Mar-2022	----	----	----		03-Apr-2022	3 days	3 days	✓	
<b>Anions and Nutrients : Sulfate in Water by IC</b>											
<b>HDPE</b> Facility 1	E235.SO4	31-Mar-2022	----	----	----		03-Apr-2022	28 days	3 days	✓	
<b>Anions and Nutrients : Sulfate in Water by IC</b>											
<b>HDPE</b> Field Blank	E235.SO4	31-Mar-2022	----	----	----		03-Apr-2022	28 days	3 days	✓	
<b>Anions and Nutrients : Sulfate in Water by IC</b>											
<b>HDPE</b> Sand Filter	E235.SO4	31-Mar-2022	----	----	----		03-Apr-2022	28 days	3 days	✓	
<b>Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)</b>											
<b>Amber glass total (sulfuric acid)</b> Facility 1	E318	31-Mar-2022	09-Apr-2022	----	----		11-Apr-2022	28 days	11 days	✓	
<b>Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)</b>											
<b>Amber glass total (sulfuric acid)</b> Field Blank	E318	31-Mar-2022	09-Apr-2022	----	----		11-Apr-2022	28 days	11 days	✓	
<b>Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)</b>											
<b>Amber glass total (sulfuric acid)</b> Sand Filter	E318	31-Mar-2022	09-Apr-2022	----	----		11-Apr-2022	28 days	11 days	✓	
<b>Anions and Nutrients : Total Nitrogen by Colourimetry</b>											
<b>Amber glass total (sulfuric acid)</b> Facility 1	E366	31-Mar-2022	09-Apr-2022	----	----		12-Apr-2022	28 days	12 days	✓	
<b>Anions and Nutrients : Total Nitrogen by Colourimetry</b>											
<b>Amber glass total (sulfuric acid)</b> Field Blank	E366	31-Mar-2022	09-Apr-2022	----	----		12-Apr-2022	28 days	12 days	✓	



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Total Nitrogen by Colourimetry</b>											
<b>Amber glass total (sulfuric acid)</b> Sand Filter	E366	31-Mar-2022	09-Apr-2022	----	----		12-Apr-2022	28 days	12 days	✓	
<b>Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)</b>											
<b>Amber glass total (sulfuric acid)</b> Facility 1	E355-L	31-Mar-2022	09-Apr-2022	----	----		09-Apr-2022	28 days	9 days	✓	
<b>Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)</b>											
<b>Amber glass total (sulfuric acid)</b> Field Blank	E355-L	31-Mar-2022	09-Apr-2022	----	----		09-Apr-2022	28 days	9 days	✓	
<b>Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)</b>											
<b>Amber glass total (sulfuric acid)</b> Sand Filter	E355-L	31-Mar-2022	09-Apr-2022	----	----		09-Apr-2022	28 days	9 days	✓	
<b>Physical Tests : Alkalinity Species by Titration</b>											
<b>HDPE</b> Facility 1	E290	31-Mar-2022	----	----	----		04-Apr-2022	14 days	4 days	✓	
<b>Physical Tests : Alkalinity Species by Titration</b>											
<b>HDPE</b> Field Blank	E290	31-Mar-2022	----	----	----		04-Apr-2022	14 days	4 days	✓	
<b>Physical Tests : Alkalinity Species by Titration</b>											
<b>HDPE</b> Sand Filter	E290	31-Mar-2022	----	----	----		04-Apr-2022	14 days	4 days	✓	
<b>Physical Tests : Alkalinity Species by Titration</b>											
<b>HDPE</b> Travel Blank	E290	31-Mar-2022	----	----	----		04-Apr-2022	14 days	4 days	✓	
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE</b> Facility 1	E100	31-Mar-2022	----	----	----		04-Apr-2022	28 days	4 days	✓	



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE</b> Field Blank	E100	31-Mar-2022	----	----	----		04-Apr-2022	28 days	4 days	✓	
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE</b> Sand Filter	E100	31-Mar-2022	----	----	----		04-Apr-2022	28 days	4 days	✓	
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE</b> Travel Blank	E100	31-Mar-2022	----	----	----		04-Apr-2022	28 days	4 days	✓	
<b>Physical Tests : pH by Meter</b>											
<b>HDPE</b> Travel Blank	E108	31-Mar-2022	----	----	----		04-Apr-2022	0.25 hrs	102 hrs	* EHTR-FM	
<b>Physical Tests : pH by Meter</b>											
<b>HDPE</b> Field Blank	E108	31-Mar-2022	----	----	----		04-Apr-2022	0.25 hrs	86 hrs	* EHTR-FM	
<b>Physical Tests : pH by Meter</b>											
<b>HDPE</b> Sand Filter	E108	31-Mar-2022	----	----	----		04-Apr-2022	0.25 hrs	87 hrs	* EHTR-FM	
<b>Physical Tests : pH by Meter</b>											
<b>HDPE</b> Facility 1	E108	31-Mar-2022	----	----	----		04-Apr-2022	0.25 hrs	90 hrs	* EHTR-FM	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> Facility 1	E508	31-Mar-2022	----	----	----		06-Apr-2022	28 days	6 days	✓	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> Field Blank	E508	31-Mar-2022	----	----	----		06-Apr-2022	28 days	6 days	✓	





Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> Sand Filter	E508	31-Mar-2022	----	----	----		06-Apr-2022	28 days	6 days	✓	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial - total (lab preserved)</b> Travel Blank	E508	31-Mar-2022	----	----	----		06-Apr-2022	28 days	7 days	✓	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>											
<b>HDPE total (nitric acid)</b> Facility 1	E420	31-Mar-2022	----	----	----		09-Apr-2022	180 days	9 days	✓	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>											
<b>HDPE total (nitric acid)</b> Field Blank	E420	31-Mar-2022	----	----	----		09-Apr-2022	180 days	9 days	✓	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>											
<b>HDPE total (nitric acid)</b> Sand Filter	E420	31-Mar-2022	----	----	----		09-Apr-2022	180 days	9 days	✓	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>											
<b>HDPE - total (lab preserved)</b> Travel Blank	E420	31-Mar-2022	----	----	----		09-Apr-2022	180 days	9 days	✓	

**Legend & Qualifier Definitions**

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).



## Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water** Evaluation: \* = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		Evaluation
			QC	Regular	Actual	Expected	
<b>Analytical Methods</b>							
<b>Laboratory Duplicates (DUP)</b>							
Alkalinity Species by Titration	E290	449171	1	18	5.5	5.0	✓
Ammonia by Fluorescence	E298	454480	1	19	5.2	5.0	✓
Biochemical Oxygen Demand - 5 day	E550	449056	2	22	9.0	5.0	✓
Chemical Oxygen Demand by Colourimetry	E559	451612	1	15	6.6	5.0	✓
Chloride in Water by IC	E235.Cl	449174	1	18	5.5	5.0	✓
Conductivity in Water	E100	449170	1	19	5.2	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	449172	2	27	7.4	5.0	✓
Fluoride in Water by IC	E235.F	449173	1	17	5.8	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	449176	1	17	5.8	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	449177	1	18	5.5	5.0	✓
pH by Meter	E108	449169	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	449178	1	19	5.2	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	454481	1	14	7.1	5.0	✓
Total Mercury in Water by CVAAS	E508	451827	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	454219	1	20	5.0	5.0	✓
Total Nitrogen by Colourimetry	E366	454484	1	3	33.3	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	454483	1	3	33.3	5.0	✓
<b>Laboratory Control Samples (LCS)</b>							
Alkalinity Species by Titration	E290	449171	1	18	5.5	5.0	✓
Ammonia by Fluorescence	E298	454480	1	19	5.2	5.0	✓
Biochemical Oxygen Demand - 5 day	E550	449056	2	22	9.0	5.0	✓
Chemical Oxygen Demand by Colourimetry	E559	451612	1	15	6.6	5.0	✓
Chloride in Water by IC	E235.Cl	449174	1	18	5.5	5.0	✓
Conductivity in Water	E100	449170	1	19	5.2	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	449172	2	27	7.4	5.0	✓
Fluoride in Water by IC	E235.F	449173	1	17	5.8	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	449176	1	17	5.8	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	449177	1	18	5.5	5.0	✓
pH by Meter	E108	449169	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	449178	1	19	5.2	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	454481	1	14	7.1	5.0	✓
Total Mercury in Water by CVAAS	E508	451827	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	454219	1	20	5.0	5.0	✓
Total Nitrogen by Colourimetry	E366	454484	1	3	33.3	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	454483	1	3	33.3	5.0	✓
<b>Method Blanks (MB)</b>							
Alkalinity Species by Titration	E290	449171	1	18	5.5	5.0	✓



Matrix: **Water**

Evaluation: \* = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		
			QC	Regular	Actual	Expected	Evaluation
<b>Analytical Methods</b>							
<b>Method Blanks (MB) - Continued</b>							
Ammonia by Fluorescence	E298	454480	1	19	5.2	5.0	✓
Biochemical Oxygen Demand - 5 day	E550	449056	2	22	9.0	5.0	✓
Chemical Oxygen Demand by Colourimetry	E559	451612	1	15	6.6	5.0	✓
Chloride in Water by IC	E235.Cl	449174	1	18	5.5	5.0	✓
Conductivity in Water	E100	449170	1	19	5.2	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	449172	2	27	7.4	5.0	✓
Fluoride in Water by IC	E235.F	449173	1	17	5.8	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	449176	1	17	5.8	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	449177	1	18	5.5	5.0	✓
Sulfate in Water by IC	E235.SO4	449178	1	19	5.2	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	454481	1	14	7.1	5.0	✓
Total Mercury in Water by CVAAS	E508	451827	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	454219	1	20	5.0	5.0	✓
Total Nitrogen by Colourimetry	E366	454484	1	3	33.3	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	454483	1	3	33.3	5.0	✓
<b>Matrix Spikes (MS)</b>							
Ammonia by Fluorescence	E298	454480	1	19	5.2	5.0	✓
Chemical Oxygen Demand by Colourimetry	E559	451612	1	15	6.6	5.0	✓
Chloride in Water by IC	E235.Cl	449174	1	18	5.5	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	449172	2	27	7.4	5.0	✓
Fluoride in Water by IC	E235.F	449173	1	17	5.8	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	449176	1	17	5.8	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	449177	1	18	5.5	5.0	✓
Sulfate in Water by IC	E235.SO4	449178	1	19	5.2	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	454481	1	14	7.1	5.0	✓
Total Mercury in Water by CVAAS	E508	451827	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	454219	1	20	5.0	5.0	✓
Total Nitrogen by Colourimetry	E366	454484	1	3	33.3	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	454483	1	3	33.3	5.0	✓



## Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Chloride in Water by IC	E235.Cl Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Fluoride in Water by IC	E235.F Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318 Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Total Kjeldahl Nitrogen is determined using block digestion followed by flow-injection analysis with fluorescence detection.



Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L  Vancouver - Environmental	Water	APHA 5310 B (mod)	Total Organic Carbon (Non-Purgeable), also known as NPOC (total), is a direct measurement of TOC after an acidified sample has been purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO <sub>2</sub> . NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of total carbon (TC) is comprised of IC (which is common), this method is more accurate and more reliable than the TOC by subtraction method (i.e. TC minus TIC).
Total Nitrogen by Colourimetry	E366  Vancouver - Environmental	Water	APHA 4500-P J (mod)	Total Nitrogen is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U  Vancouver - Environmental	Water	APHA 4500-P F (mod)	Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.  Field filtration is recommended to ensure test results represent conditions at time of sampling.
Total Metals in Water by CRC ICPMS	E420  Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.  Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Mercury in Water by CVAAS	E508  Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS
Biochemical Oxygen Demand - 5 day	E550  Vancouver - Environmental	Water	APHA 5210 B (mod)	Samples are diluted and incubated for a specified time period, after which the oxygen depletion is measured using a dissolved oxygen meter.  Free chlorine is a negative interference in the BOD method; please advise ALS when free chlorine is present in samples.
Chemical Oxygen Demand by Colourimetry	E559  Vancouver - Environmental	Water	APHA 5220 D (mod)	Samples are analyzed using the closed reflux colourimetric method.
Hardness (Calculated) from Total Ca/Mg	EC100A  Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO <sub>3</sub> ), from total Ca/Mg" is calculated from the sum of total Calcium and Magnesium concentrations, expressed in CaCO <sub>3</sub> equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations. Hardness from total Ca/Mg is normally comparable to Dissolved Hardness in non-turbid waters.
Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298  Vancouver - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.





<i>Preparation Methods</i>	<i>Method / Lab</i>	<i>Matrix</i>	<i>Method Reference</i>	<i>Method Descriptions</i>
Digestion for TKN in water	EP318 Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested using block digestion with Copper Sulfate Digestion Reagent.
Preparation for Total Organic Carbon by Combustion	EP355 Vancouver - Environmental	Water		Preparation for Total Organic Carbon by Combustion
Digestion for Total Nitrogen in water	EP366 Vancouver - Environmental	Water	APHA 4500-P J (mod)	Samples are heated with a persulfate digestion reagent.

## QUALITY CONTROL REPORT

**Work Order** : **VA22A6903**

**Page** : 1 of 14

**Client** : Regional District of Kitimat-Stikine  
**Contact** : Hannah Shinton  
**Address** : # 300 - 4545 Lazelle Avenue  
 Terrace BC Canada V8G 4E1  
**Telephone** : ----  
**Project** : Forceman Facility Sand Filter  
**PO** : ----  
**C-O-C number** : ----  
**Sampler** : Hannah Shinton  
**Site** :  
**Quote number** : Q62338  
**No. of samples received** : 4  
**No. of samples analysed** : 4

**Laboratory** : Vancouver - Environmental  
**Account Manager** : Amber Springer  
**Address** : 8081 Lougheed Highway  
 Burnaby, British Columbia Canada V5A 1W9  
**Telephone** : +1 604 253 4188  
**Date Samples Received** : 01-Apr-2022 22:00  
**Date Analysis Commenced** : 03-Apr-2022  
**Issue Date** : 19-Apr-2022 11:40

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

### *Signatories*

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

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Caleb Deroche	Lab Analyst	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia

Page : 2 of 14  
Work Order : VA22A6903  
Client : Regional District of Kitimat-Stikine  
Project : Forceman Facility Sand Filter

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## **General Comments**

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.

CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.

DQO = Data Quality Objective.

LOR = Limit of Reporting (detection limit).

RPD = Relative Percentage Difference

# = Indicates a QC result that did not meet the ALS DQO.

## **Workorder Comments**

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Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

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### Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: <b>Water</b>					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Physical Tests (QC Lot: 449169)</b>											
FJ2200803-001	Anonymous	pH	----	E108	0.10	pH units	8.21	8.23	0.243%	4%	----
<b>Physical Tests (QC Lot: 449170)</b>											
FJ2200803-001	Anonymous	conductivity	----	E100	2.0	µS/cm	318	329	3.40%	10%	----
<b>Physical Tests (QC Lot: 449171)</b>											
FJ2200803-001	Anonymous	alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	177	177	0.113%	20%	----
<b>Anions and Nutrients (QC Lot: 449172)</b>											
FJ2200803-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	0.0036	0.0029	0.0007	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 449173)</b>											
FJ2200803-001	Anonymous	fluoride	16984-48-8	E235.F	0.020	mg/L	0.083	0.080	0.003	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 449174)</b>											
FJ2200803-001	Anonymous	chloride	16887-00-6	E235.Cl	0.50	mg/L	0.60	0.58	0.03	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 449176)</b>											
FJ2200803-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.0186	0.0184	0.0003	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 449177)</b>											
FJ2200803-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 449178)</b>											
FJ2200803-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	4.54	4.54	0.0826%	20%	----
<b>Anions and Nutrients (QC Lot: 451396)</b>											
FJ2200816-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	0.0026	<0.0010	0.0016	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 454480)</b>											
VA22A6248-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.250	mg/L	24.3	23.9	1.85%	20%	----
<b>Anions and Nutrients (QC Lot: 454481)</b>											
VA22A6249-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 454484)</b>											
VA22A6903-001	Sand Filter	nitrogen, total	7727-37-9	E366	1.50	mg/L	46.6	50.2	7.54%	20%	----
<b>Organic / Inorganic Carbon (QC Lot: 454483)</b>											
VA22A6903-001	Sand Filter	carbon, total organic [TOC]	----	E355-L	0.50	mg/L	34.2	37.5	9.31%	20%	----
<b>Total Metals (QC Lot: 451827)</b>											
VA22A6870-005	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
<b>Total Metals (QC Lot: 454219)</b>											
VA22A6855-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0102	0.0101	0.0001	Diff <2x LOR	----



Sub-Matrix: **Water**

Laboratory Duplicate (DUP) Report

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Total Metals (QC Lot: 454219) - continued</b>											
VA22A6855-001	Anonymous	antimony, total	7440-36-0	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00013	0.00014	0.000002	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.00195	0.00200	2.63%	20%	----
		beryllium, total	7440-41-7	E420	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.050	mg/L	52.1	52.6	1.00%	20%	----
		cesium, total	7440-46-2	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		chromium, total	7440-47-3	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		cobalt, total	7440-48-4	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.000050	mg/L	0.0170	0.0172	1.72%	20%	----
		iron, total	7439-89-6	E420	0.010	mg/L	0.016	0.016	0.0001	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000050	mg/L	0.000140	0.000144	0.000004	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	0.0050	mg/L	4.07	4.11	0.926%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.00087	0.00088	0.00001	Diff <2x LOR	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.000388	0.000408	0.000020	Diff <2x LOR	----
		nickel, total	7440-02-0	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E420	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.050	mg/L	0.152	0.149	0.003	Diff <2x LOR	----
		rubidium, total	7440-17-7	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		selenium, total	7782-49-2	E420	0.000050	mg/L	0.000152	0.000154	0.000002	Diff <2x LOR	----
		silicon, total	7440-21-3	E420	0.10	mg/L	5.64	5.61	0.582%	20%	----
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, total	7440-23-5	E420	0.050	mg/L	1.63	1.63	0.319%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.0864	0.0863	0.0699%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	4.93	4.97	0.04	Diff <2x LOR	----
		tellurium, total	13494-80-9	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		thorium, total	7440-29-1	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		tungsten, total	7440-33-7	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.000096	0.000101	0.000005	Diff <2x LOR	----





Sub-Matrix: **Water**

*Laboratory Duplicate (DUP) Report*

<i>Laboratory sample ID</i>	<i>Client sample ID</i>	<i>Analyte</i>	<i>CAS Number</i>	<i>Method</i>	<i>LOR</i>	<i>Unit</i>	<i>Original Result</i>	<i>Duplicate Result</i>	<i>RPD(%) or Difference</i>	<i>Duplicate Limits</i>	<i>Qualifier</i>
<b>Total Metals (QC Lot: 454219) - continued</b>											
VA22A6855-001	Anonymous	vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	0.0056	0.0056	0.00004	Diff <2x LOR	----
		zirconium, total	7440-67-7	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
<b>Aggregate Organics (QC Lot: 449056)</b>											
VA22A6673-002	Anonymous	biochemical oxygen demand [BOD]	----	E550	2.0	mg/L	<2.0	<2.0	0.0%	30%	----
<b>Aggregate Organics (QC Lot: 449057)</b>											
VA22A6903-003	Field Blank	biochemical oxygen demand [BOD]	----	E550	2.0	mg/L	<2.0	<2.0	0.0%	30%	----
<b>Aggregate Organics (QC Lot: 451612)</b>											
FJ2200815-001	Anonymous	chemical oxygen demand [COD]	----	E559	20	mg/L	<20	<20	0	Diff <2x LOR	----



## Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

### Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Physical Tests (QCLot: 449170)</b>						
conductivity	----	E100	1	µS/cm	<1.0	----
<b>Physical Tests (QCLot: 449171)</b>						
alkalinity, total (as CaCO3)	----	E290	1	mg/L	1.1	----
<b>Anions and Nutrients (QCLot: 449172)</b>						
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	----
<b>Anions and Nutrients (QCLot: 449173)</b>						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
<b>Anions and Nutrients (QCLot: 449174)</b>						
chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
<b>Anions and Nutrients (QCLot: 449176)</b>						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
<b>Anions and Nutrients (QCLot: 449177)</b>						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
<b>Anions and Nutrients (QCLot: 449178)</b>						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
<b>Anions and Nutrients (QCLot: 451396)</b>						
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	----
<b>Anions and Nutrients (QCLot: 454480)</b>						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
<b>Anions and Nutrients (QCLot: 454481)</b>						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
<b>Anions and Nutrients (QCLot: 454484)</b>						
nitrogen, total	7727-37-9	E366	0.03	mg/L	<0.030	----
<b>Organic / Inorganic Carbon (QCLot: 454483)</b>						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
<b>Total Metals (QCLot: 451827)</b>						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----
<b>Total Metals (QCLot: 454219)</b>						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----



Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Total Metals (QCLot: 454219) - continued</b>						
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cesium, total	7440-46-2	E420	0.00001	mg/L	<0.000010	----
chromium, total	7440-47-3	E420	0.0005	mg/L	<0.00050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	<0.00020	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	7440-23-5	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	<0.00020	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
thorium, total	7440-29-1	E420	0.0001	mg/L	<0.00010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	<0.00010	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	<0.00020	----
<b>Aggregate Organics (QCLot: 449056)</b>						
biochemical oxygen demand [BOD]	----	E550	2	mg/L	<2.0	----



Sub-Matrix: **Water**

<i>Analyte</i>	<i>CAS Number</i>	<i>Method</i>	<i>LOR</i>	<i>Unit</i>	<i>Result</i>	<i>Qualifier</i>
<b>Aggregate Organics (QCLot: 449057)</b>						
biochemical oxygen demand [BOD]	---	E550	2	mg/L	<2.0	---
<b>Aggregate Organics (QCLot: 451612)</b>						
chemical oxygen demand [COD]	---	E559	20	mg/L	<20	---



## Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
Analyte	CAS Number	Method	LOR	Unit	Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
<b>Physical Tests (QCLot: 449169)</b>									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
<b>Physical Tests (QCLot: 449170)</b>									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	100	90.0	110	----
<b>Physical Tests (QCLot: 449171)</b>									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	99.7	85.0	115	----
<b>Anions and Nutrients (QCLot: 449172)</b>									
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.03 mg/L	93.8	80.0	120	----
<b>Anions and Nutrients (QCLot: 449173)</b>									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	98.7	90.0	110	----
<b>Anions and Nutrients (QCLot: 449174)</b>									
chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	101	90.0	110	----
<b>Anions and Nutrients (QCLot: 449176)</b>									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	101	90.0	110	----
<b>Anions and Nutrients (QCLot: 449177)</b>									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	99.6	90.0	110	----
<b>Anions and Nutrients (QCLot: 449178)</b>									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	102	90.0	110	----
<b>Anions and Nutrients (QCLot: 451396)</b>									
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.03 mg/L	99.1	80.0	120	----
<b>Anions and Nutrients (QCLot: 454480)</b>									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	104	85.0	115	----
<b>Anions and Nutrients (QCLot: 454481)</b>									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	95.2	75.0	125	----
<b>Anions and Nutrients (QCLot: 454484)</b>									
nitrogen, total	7727-37-9	E366	0.03	mg/L	0.5 mg/L	107	75.0	125	----
<b>Organic / Inorganic Carbon (QCLot: 454483)</b>									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	8.57 mg/L	97.8	80.0	120	----
<b>Total Metals (QCLot: 451827)</b>									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	104	80.0	120	----
<b>Total Metals (QCLot: 454219)</b>									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	98.6	80.0	120	----





Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
<b>Total Metals (QCLot: 454219) - continued</b>									
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	101	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	98.9	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	97.0	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	93.8	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	94.4	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	91.2	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	95.6	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	95.5	80.0	120	----
cesium, total	7440-46-2	E420	0.00001	mg/L	0.05 mg/L	99.5	80.0	120	----
chromium, total	7440-47-3	E420	0.0005	mg/L	0.25 mg/L	95.1	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	96.8	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	95.7	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	100	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	99.1	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	92.2	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	99.0	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	96.5	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	100	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	95.8	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	94.7	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	103	80.0	120	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	0.1 mg/L	103	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	100	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	98.3	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	95.4	80.0	120	----
sodium, total	7440-23-5	E420	0.05	mg/L	50 mg/L	100	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	100	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	102	80.0	120	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	0.1 mg/L	102	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	100.0	80.0	120	----
thorium, total	7440-29-1	E420	0.0001	mg/L	0.1 mg/L	95.6	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	96.8	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	94.4	80.0	120	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	0.1 mg/L	99.4	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	98.4	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	97.7	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	94.7	80.0	120	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.1 mg/L	94.3	80.0	120	----



Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
<b>Aggregate Organics (QCLot: 449056)</b>									
biochemical oxygen demand [BOD]	----	E550	2	mg/L	198 mg/L	88.8	85.0	115	----
<b>Aggregate Organics (QCLot: 449057)</b>									
biochemical oxygen demand [BOD]	----	E550	2	mg/L	198 mg/L	87.0	85.0	115	----
<b>Aggregate Organics (QCLot: 451612)</b>									
chemical oxygen demand [COD]	----	E559	20	mg/L	100 mg/L	110	85.0	115	----



## Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level  $\geq 1 \times$  spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
<b>Anions and Nutrients (QCLot: 449172)</b>										
FJ2200803-002	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0290 mg/L	0.03 mg/L	96.6	70.0	130	----
<b>Anions and Nutrients (QCLot: 449173)</b>										
FJ2200803-002	Anonymous	fluoride	16984-48-8	E235.F	1.04 mg/L	1 mg/L	104	75.0	125	----
<b>Anions and Nutrients (QCLot: 449174)</b>										
FJ2200803-002	Anonymous	chloride	16887-00-6	E235.Cl	104 mg/L	100 mg/L	104	75.0	125	----
<b>Anions and Nutrients (QCLot: 449176)</b>										
FJ2200803-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.61 mg/L	2.5 mg/L	104	75.0	125	----
<b>Anions and Nutrients (QCLot: 449177)</b>										
FJ2200803-002	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.510 mg/L	0.5 mg/L	102	75.0	125	----
<b>Anions and Nutrients (QCLot: 449178)</b>										
FJ2200803-002	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	105 mg/L	100 mg/L	105	75.0	125	----
<b>Anions and Nutrients (QCLot: 451396)</b>										
FJ2200816-002	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0293 mg/L	0.03 mg/L	97.7	70.0	130	----
<b>Anions and Nutrients (QCLot: 454480)</b>										
VA22A6249-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.108 mg/L	0.1 mg/L	108	75.0	125	----
<b>Anions and Nutrients (QCLot: 454481)</b>										
VA22A6249-002	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	2.42 mg/L	2.5 mg/L	96.8	70.0	130	----
<b>Anions and Nutrients (QCLot: 454484)</b>										
VA22A6903-002	Facility 1	nitrogen, total	7727-37-9	E366	ND mg/L	20 mg/L	ND	70.0	130	----
<b>Organic / Inorganic Carbon (QCLot: 454483)</b>										
VA22A6903-002	Facility 1	carbon, total organic [TOC]	----	E355-L	ND mg/L	5 mg/L	ND	70.0	130	----
<b>Total Metals (QCLot: 451827)</b>										
VA22A6870-006	Anonymous	mercury, total	7439-97-6	E508	0.0000910 mg/L	0.0001 mg/L	91.0	70.0	130	----
<b>Total Metals (QCLot: 454219)</b>										
VA22A6855-002	Anonymous	aluminum, total	7429-90-5	E420	0.194 mg/L	0.2 mg/L	97.2	70.0	130	----
		antimony, total	7440-36-0	E420	0.0195 mg/L	0.02 mg/L	97.7	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0198 mg/L	0.02 mg/L	98.9	70.0	130	----
		barium, total	7440-39-3	E420	0.0181 mg/L	0.02 mg/L	90.3	70.0	130	----



Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
<b>Total Metals (QCLot: 454219) - continued</b>										
VA22A6855-002	Anonymous	beryllium, total	7440-41-7	E420	0.0368 mg/L	0.04 mg/L	92.0	70.0	130	----
		bismuth, total	7440-69-9	E420	0.00888 mg/L	0.01 mg/L	88.8	70.0	130	----
		boron, total	7440-42-8	E420	0.082 mg/L	0.1 mg/L	81.7	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00361 mg/L	0.004 mg/L	90.2	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cesium, total	7440-46-2	E420	0.00966 mg/L	0.01 mg/L	96.6	70.0	130	----
		chromium, total	7440-47-3	E420	0.0370 mg/L	0.04 mg/L	92.5	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0184 mg/L	0.02 mg/L	92.2	70.0	130	----
		copper, total	7440-50-8	E420	0.0172 mg/L	0.02 mg/L	85.8	70.0	130	----
		iron, total	7439-89-6	E420	1.88 mg/L	2 mg/L	93.8	70.0	130	----
		lead, total	7439-92-1	E420	0.0183 mg/L	0.02 mg/L	91.7	70.0	130	----
		lithium, total	7439-93-2	E420	0.0912 mg/L	0.1 mg/L	91.2	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, total	7439-98-7	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		nickel, total	7440-02-0	E420	0.0357 mg/L	0.04 mg/L	89.2	70.0	130	----
		phosphorus, total	7723-14-0	E420	9.53 mg/L	10 mg/L	95.3	70.0	130	----
		potassium, total	7440-09-7	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		rubidium, total	7440-17-7	E420	0.0192 mg/L	0.02 mg/L	96.2	70.0	130	----
		selenium, total	7782-49-2	E420	0.0424 mg/L	0.04 mg/L	106	70.0	130	----
		silicon, total	7440-21-3	E420	9.12 mg/L	10 mg/L	91.2	70.0	130	----
		silver, total	7440-22-4	E420	0.00390 mg/L	0.004 mg/L	97.6	70.0	130	----
		sodium, total	7440-23-5	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	ND mg/L	20 mg/L	ND	70.0	130	----
		tellurium, total	13494-80-9	E420	0.0400 mg/L	0.04 mg/L	100.0	70.0	130	----
		thallium, total	7440-28-0	E420	0.00367 mg/L	0.004 mg/L	91.8	70.0	130	----
		thorium, total	7440-29-1	E420	0.0191 mg/L	0.02 mg/L	95.6	70.0	130	----
		tin, total	7440-31-5	E420	0.0187 mg/L	0.02 mg/L	93.7	70.0	130	----
		titanium, total	7440-32-6	E420	0.0394 mg/L	0.04 mg/L	98.5	70.0	130	----
		tungsten, total	7440-33-7	E420	0.0194 mg/L	0.02 mg/L	96.8	70.0	130	----
		uranium, total	7440-61-1	E420	0.00369 mg/L	0.004 mg/L	92.3	70.0	130	----
		vanadium, total	7440-62-2	E420	0.0971 mg/L	0.1 mg/L	97.1	70.0	130	----
		zinc, total	7440-66-6	E420	0.351 mg/L	0.4 mg/L	87.8	70.0	130	----
		zirconium, total	7440-67-7	E420	0.0395 mg/L	0.04 mg/L	98.7	70.0	130	----
<b>Aggregate Organics (QCLot: 451612)</b>										

Page : 14 of 14  
 Work Order : VA22A6903  
 Client : Regional District of Kitimat-Stikine  
 Project : Forceman Facility Sand Filter



Sub-Matrix: **Water**

					<i>Matrix Spike (MS) Report</i>					
					<i>Spike</i>		<i>Recovery (%)</i>	<i>Recovery Limits (%)</i>		
<i>Laboratory sample ID</i>	<i>Client sample ID</i>	<i>Analyte</i>	<i>CAS Number</i>	<i>Method</i>	<i>Concentration</i>	<i>Target</i>	<i>MS</i>	<i>Low</i>	<i>High</i>	<i>Qualifier</i>
<b>Aggregate Organics (QCLot: 451612) - continued</b>										
FJ2200815-002	Anonymous	chemical oxygen demand [COD]	----	E559	116 mg/L	100 mg/L	116	75.0	125	----







**CERTIFICATE OF ANALYSIS**

**Work Order** : **VA22A6906**  
**Client** : **Regional District of Kitimat-Stikine**  
**Contact** : Hannah Shinton  
**Address** : # 300 - 4545 Lazelle Avenue  
Terrace BC Canada V8G 4E1  
**Telephone** : ----  
**Project** : **Forceman Soil-Phyto-Remediation**  
**PO** : ----  
**C-O-C number** : ----  
**Sampler** : Hannah Shinton  
**Site** :  
**Quote number** : Q62338  
**No. of samples received** : 1  
**No. of samples analysed** : 1

**Page** : 1 of 4  
**Laboratory** : Vancouver - Environmental  
**Account Manager** : Amber Springer  
**Address** : 8081 Lougheed Highway  
Burnaby BC Canada V5A 1W9  
**Telephone** : +1 604 253 4188  
**Date Samples Received** : 01-Apr-2022 22:00  
**Date Analysis Commenced** : 19-Apr-2022  
**Issue Date** : 20-Apr-2022 16:11

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

**Signatories**

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

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Caleb Deroche	Lab Analyst	Metals, Burnaby, British Columbia
Janice Leung	Supervisor - Organics Instrumentation	Organics, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics, Burnaby, British Columbia



## General Comments

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

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

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

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

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

<i>Unit</i>	<i>Description</i>
%	percent
mg/kg	milligrams per kilogram
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

Sub-Matrix: Soil					Client sample ID	Phytoremediation	----	----	----	----
(Matrix: Soil/Solid)					Client sampling date / time	31-Mar-2022 15:18	----	----	----	----
Analyte	CAS Number	Method	LOR	Unit	VA22A6906-001	-----	-----	-----	-----	
					Result	----	----	----	----	
<b>Physical Tests</b>										
% saturation	----	E141	1.0	%	81.7	----	----	----	----	
pH (1:2 soil:water)	----	E108	0.10	pH units	6.08	----	----	----	----	
<b>Saturated Paste Extractables</b>										
chloride, soluble ion content	16887-00-6	EC239A.Cl	1.0	mg/kg	<16.3	----	----	----	----	
chloride, soluble ion content	16887-00-6	E239.Cl	20	mg/L	<20	----	----	----	----	
sodium, soluble ion content	17341-25-2	EC442	1.00	mg/kg	8.01	----	----	----	----	
sodium, soluble ion content	17341-25-2	E442	2.0	mg/L	9.8	----	----	----	----	
<b>Metals</b>										
aluminum	7429-90-5	E440	50	mg/kg	28100	----	----	----	----	
antimony	7440-36-0	E440	0.10	mg/kg	0.34	----	----	----	----	
arsenic	7440-38-2	E440	0.10	mg/kg	5.26	----	----	----	----	
barium	7440-39-3	E440	0.50	mg/kg	49.3	----	----	----	----	
beryllium	7440-41-7	E440	0.10	mg/kg	0.32	----	----	----	----	
bismuth	7440-69-9	E440	0.20	mg/kg	<0.20	----	----	----	----	
boron	7440-42-8	E440	5.0	mg/kg	<5.0	----	----	----	----	
cadmium	7440-43-9	E440	0.020	mg/kg	0.066	----	----	----	----	
calcium	7440-70-2	E440	50	mg/kg	2440	----	----	----	----	
chromium	7440-47-3	E440	0.50	mg/kg	28.4	----	----	----	----	
cobalt	7440-48-4	E440	0.10	mg/kg	7.65	----	----	----	----	
copper	7440-50-8	E440	0.50	mg/kg	19.4	----	----	----	----	
iron	7439-89-6	E440	50	mg/kg	37200	----	----	----	----	
lead	7439-92-1	E440	0.50	mg/kg	6.90	----	----	----	----	
lithium	7439-93-2	E440	2.0	mg/kg	12.6	----	----	----	----	
magnesium	7439-95-4	E440	20	mg/kg	6000	----	----	----	----	
manganese	7439-96-5	E440	1.0	mg/kg	508	----	----	----	----	
mercury	7439-97-6	E510	0.0500	mg/kg	0.0512	----	----	----	----	
molybdenum	7439-98-7	E440	0.10	mg/kg	0.74	----	----	----	----	
nickel	7440-02-0	E440	0.50	mg/kg	16.6	----	----	----	----	
phosphorus	7723-14-0	E440	50	mg/kg	1000	----	----	----	----	
potassium	7440-09-7	E440	100	mg/kg	720	----	----	----	----	



## Analytical Results

Sub-Matrix: Soil (Matrix: Soil/Solid)					Client sample ID	Phytoremediation	---	---	---	---
Client sampling date / time					31-Mar-2022 15:18	---	---	---	---	
Analyte	CAS Number	Method	LOR	Unit	VA22A6906-001	-----	-----	-----	-----	
					Result	---	---	---	---	
<b>Metals</b>										
selenium	7782-49-2	E440	0.20	mg/kg	0.22	---	---	---	---	
silver	7440-22-4	E440	0.10	mg/kg	0.12	---	---	---	---	
sodium	7440-23-5	E440	50	mg/kg	161	---	---	---	---	
strontium	7440-24-6	E440	0.50	mg/kg	25.7	---	---	---	---	
sulfur	7704-34-9	E440	1000	mg/kg	<1000	---	---	---	---	
thallium	7440-28-0	E440	0.050	mg/kg	0.069	---	---	---	---	
tin	7440-31-5	E440	2.0	mg/kg	<2.0	---	---	---	---	
titanium	7440-32-6	E440	1.0	mg/kg	922	---	---	---	---	
tungsten	7440-33-7	E440	0.50	mg/kg	<0.50	---	---	---	---	
uranium	7440-61-1	E440	0.050	mg/kg	0.436	---	---	---	---	
vanadium	7440-62-2	E440	0.20	mg/kg	80.2	---	---	---	---	
zinc	7440-66-6	E440	2.0	mg/kg	67.7	---	---	---	---	
zirconium	7440-67-7	E440	1.0	mg/kg	9.8	---	---	---	---	

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



## QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: <b>VA22A6906</b>	Page	: 1 of 6
Client	: <b>Regional District of Kitimat-Stikine</b>	Laboratory	: Vancouver - Environmental
Contact	: Hannah Shinton	Account Manager	: Amber Springer
Address	: # 300 - 4545 Lazelle Avenue Terrace BC Canada V8G 4E1	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: Forceman Soil-Phyto-Remediation	Date Samples Received	: 01-Apr-2022 22:00
PO	: ----	Issue Date	: 20-Apr-2022 16:10
C-O-C number	: ----		
Sampler	: Hannah Shinton		
Site	:		
Quote number	: Q62338		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

### Key

**Anonymous:** Refers to samples which are not part of this work order, but which formed part of the QC process lot.

**CAS Number:** Chemical Abstracts Services number is a unique identifier assigned to discrete substances.

**DQO:** Data Quality Objective.

**LOR:** Limit of Reporting (detection limit).

**RPD:** Relative Percent Difference.

### **Workorder Comments**

Holding times are displayed as "----" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

### **Summary of Outliers**

#### **Outliers : Quality Control Samples**

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

#### **Outliers: Reference Material (RM) Samples**

- No Reference Material (RM) Sample outliers occur.

#### **Outliers : Analysis Holding Time Compliance (Breaches)**

- No Analysis Holding Time Outliers exist.

## ***Outliers : Frequency of Quality Control Samples***

- No Quality Control Sample Frequency Outliers occur.



## Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Soil/Solid**

Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
Glass soil jar/Teflon lined cap Phytoremediation	E510	31-Mar-2022	19-Apr-2022	----	----		19-Apr-2022	28 days	19 days	✓
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>										
Glass soil jar/Teflon lined cap Phytoremediation	E440	31-Mar-2022	19-Apr-2022	----	----		19-Apr-2022	180 days	19 days	✓
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>										
Glass soil jar/Teflon lined cap Phytoremediation	E108	31-Mar-2022	19-Apr-2022	----	----		19-Apr-2022	30 days	18 days	✓
<b>Physical Tests : Saturation Percentage</b>										
Glass soil jar/Teflon lined cap Phytoremediation	E141	31-Mar-2022	----	----	----		19-Apr-2022	----	0 days	
<b>Saturated Paste Extractables : Ca, K, Mg, and Na by CRC ICPMS (Saturated Paste, mg/L)</b>										
Glass soil jar/Teflon lined cap Phytoremediation	E442	31-Mar-2022	----	----	----		19-Apr-2022	365 days	19 days	✓
<b>Saturated Paste Extractables : Chloride by IC (Saturated Paste)</b>										
Glass soil jar/Teflon lined cap Phytoremediation	E239.Cl	31-Mar-2022	----	----	----		19-Apr-2022	365 days	19 days	✓

### Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).



## Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Soil/Solid**

Evaluation: ✖ = QC frequency outside specification; ✔ = QC frequency within specification.

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		Evaluation
			QC	Regular	Actual	Expected	
<b>Analytical Methods</b>							
<b>Laboratory Duplicates (DUP)</b>							
Ca, K, Mg, and Na by CRC ICPMS (Saturated Paste, mg/L)	E442	460993	1	2	50.0	5.0	✔
Chloride by IC (Saturated Paste)	E239.Cl	460992	1	2	50.0	5.0	✔
Mercury in Soil/Solid by CVAAS	E510	460995	1	17	5.8	5.0	✔
Metals in Soil/Solid by CRC ICPMS	E440	460996	1	17	5.8	5.0	✔
pH by Meter (1:2 Soil:Water Extraction)	E108	460994	1	18	5.5	5.0	✔
Saturation Percentage	E141	460991	1	5	20.0	5.0	✔
<b>Laboratory Control Samples (LCS)</b>							
Ca, K, Mg, and Na by CRC ICPMS (Saturated Paste, mg/L)	E442	460993	2	2	100.0	10.0	✔
Chloride by IC (Saturated Paste)	E239.Cl	460992	2	2	100.0	10.0	✔
Mercury in Soil/Solid by CVAAS	E510	460995	2	17	11.7	10.0	✔
Metals in Soil/Solid by CRC ICPMS	E440	460996	2	17	11.7	10.0	✔
pH by Meter (1:2 Soil:Water Extraction)	E108	460994	1	18	5.5	5.0	✔
Saturation Percentage	E141	460991	2	5	40.0	10.0	✔
<b>Method Blanks (MB)</b>							
Ca, K, Mg, and Na by CRC ICPMS (Saturated Paste, mg/L)	E442	460993	1	2	50.0	5.0	✔
Chloride by IC (Saturated Paste)	E239.Cl	460992	1	2	50.0	5.0	✔
Mercury in Soil/Solid by CVAAS	E510	460995	1	17	5.8	5.0	✔
Metals in Soil/Solid by CRC ICPMS	E440	460996	1	17	5.8	5.0	✔
Saturation Percentage	E141	460991	1	5	20.0	5.0	✔



## Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
pH by Meter (1:2 Soil:Water Extraction)	E108  Vancouver - Environmental	Soil/Solid	BC Lab Manual	pH is determined by potentiometric measurement with a pH electrode at ambient laboratory temperature (normally 20 ± 5°C), and is carried out in accordance with procedures described in the BC Lab Manual (prescriptive method). The procedure involves mixing the dried (at <60 °C) and sieved (10mesh/2mm) sample with ultra pure water at a 1:2 ratio of sediment to water. The pH is then measured by a standard pH probe.
Saturation Percentage	E141  Vancouver - Environmental	Soil/Solid	CSSS Ch. 15 (mod)/AER D50	Saturation Percentage (SP) is determined as the total volume of water present in a saturated paste (in mL) divided by the dry weight of the sample (in grams), expressed as a percentage.
Chloride by IC (Saturated Paste)	E239.Cl  Vancouver - Environmental	Soil/Solid	CSSS Ch. 15 (mod)/EPA 300.1 (mod)	Inorganic anions are analyzed by obtaining a soil extract produced by the saturated paste extraction procedure which is then analyzed by Ion Chromatography with conductivity and/or UV detection.
Metals in Soil/Solid by CRC ICPMS	E440  Vancouver - Environmental	Soil/Solid	EPA 6020B (mod)	This method is intended to liberate metals that may be environmentally available. Samples are dried, then sieved through a 2 mm sieve, and digested with HNO <sub>3</sub> and HCl.  Dependent on sample matrix, some metals may be only partially recovered, including Al, Ba, Be, Cr, Sr, Ti, Tl, V, W, and Zr. Silicate minerals are not solubilized. Volatile forms of sulfur (including sulfide) may not be captured, as they may be lost during sampling, storage, or digestion. This method does not adequately recover elemental sulfur, and is unsuitable for assessment of elemental sulfur standards or guidelines.  Analysis is by Collision/Reaction Cell ICPMS.
Ca, K, Mg, and Na by CRC ICPMS (Saturated Paste, mg/L)	E442  Vancouver - Environmental	Soil/Solid	CSSS CH15/EPA 6020B (mod)	A soil extract produced by the saturated paste extraction procedure is analyzed for Calcium, Magnesium, Potassium and Sodium by Collision/Reaction Cell ICPMS as per "Soil Sampling Methods of Analysis" By M Carter.
Mercury in Soil/Solid by CVAAS	E510  Vancouver - Environmental	Soil/Solid	EPA 200.2/1631 Appendix (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with HNO <sub>3</sub> and HCl, followed by CVAAS analysis.
Chloride by IC (Saturated Paste) (mg/kg)	EC239A.Cl  Vancouver - Environmental	Soil/Solid	CSSS Ch. 15 (mod)/EPA 300.1 (mod)	Inorganic anions are analyzed by obtaining a soil extract produced by the saturated paste extraction procedure which is then analyzed by Ion Chromatography with conductivity and/or UV detection.
Ca, K, Mg, Na by ICPMS (Saturated Paste, mg/kg)	EC442  Vancouver - Environmental	Soil/Solid	CSSS CH15/EPA 6020B (mod)	A soil extract produced by the saturated paste extraction procedure is analyzed for Calcium, Magnesium, Potassium, Sodium by ICPMS.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
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<i>Preparation Methods</i>	<i>Method / Lab</i>	<i>Matrix</i>	<i>Method Reference</i>	<i>Method Descriptions</i>
Leach 1:2 Soil:Water for pH/EC	EP108  Vancouver - Environmental	Soil/Solid	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL	The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water.
Digestion for Metals and Mercury	EP440  Vancouver - Environmental	Soil/Solid	EPA 200.2 (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with HNO <sub>3</sub> and HCl. This method is intended to liberate metals that may be environmentally available.

## QUALITY CONTROL REPORT

**Work Order** : **VA22A6906**

**Page** : 1 of 10

**Client** : Regional District of Kitimat-Stikine  
**Contact** : Hannah Shinton  
**Address** : # 300 - 4545 Lazelle Avenue  
 Terrace BC Canada V8G 4E1  
**Telephone** : ----  
**Project** : Forceman Soil-Phyto-Remediation  
**PO** : ----  
**C-O-C number** : ----  
**Sampler** : Hannah Shinton  
**Site** :  
**Quote number** : Q62338  
**No. of samples received** : 1  
**No. of samples analysed** : 1

**Laboratory** : Vancouver - Environmental  
**Account Manager** : Amber Springer  
**Address** : 8081 Lougheed Highway  
 Burnaby, British Columbia Canada V5A 1W9  
**Telephone** : +1 604 253 4188  
**Date Samples Received** : 01-Apr-2022 22:00  
**Date Analysis Commenced** : 19-Apr-2022  
**Issue Date** : 20-Apr-2022 16:10

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

### Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Caleb Deroche	Lab Analyst	Metals, Burnaby, British Columbia
Janice Leung	Supervisor - Organics Instrumentation	Organics, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics, Burnaby, British Columbia

Page : 2 of 10  
Work Order : VA22A6906  
Client : Regional District of Kitimat-Stikine  
Project : Forceman Soil-Phyto-Remediation

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## **General Comments**

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.

CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.

DQO = Data Quality Objective.

LOR = Limit of Reporting (detection limit).

RPD = Relative Percentage Difference

# = Indicates a QC result that did not meet the ALS DQO.

## **Workorder Comments**

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Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

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### Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Physical Tests (QC Lot: 460994)</b>											
VA22A6817-011	Anonymous	pH (1:2 soil:water)	----	E108	0.10	pH units	4.96	5.00	0.8%	5%	----
<b>Saturated Paste Extractables (QC Lot: 460991)</b>											
VA22A6906-001	Phytoremediation	% saturation	----	E141	1.0	%	81.7	70.6	14.5%	20%	----
<b>Saturated Paste Extractables (QC Lot: 460992)</b>											
VA22A6906-001	Phytoremediation	chloride, soluble ion content	16887-00-6	E239.Cl	20	mg/L	<20	<20	0	Diff <2x LOR	----
<b>Saturated Paste Extractables (QC Lot: 460993)</b>											
VA22A6906-001	Phytoremediation	sodium, soluble ion content	17341-25-2	E442	2.0	mg/L	9.8	10.0	0.2	Diff <2x LOR	----
<b>Metals (QC Lot: 460995)</b>											
VA22A6817-011	Anonymous	mercury	7439-97-6	E510	0.0500	mg/kg	0.0654	0.0662	0.0008	Diff <2x LOR	----
<b>Metals (QC Lot: 460996)</b>											
VA22A6817-011	Anonymous	aluminum	7429-90-5	E440	50	mg/kg	26100	27100	3.85%	40%	----
		antimony	7440-36-0	E440	0.10	mg/kg	0.66	0.66	0.008	Diff <2x LOR	----
		arsenic	7440-38-2	E440	0.10	mg/kg	16.3	16.4	0.809%	30%	----
		barium	7440-39-3	E440	0.50	mg/kg	68.4	71.1	3.93%	40%	----
		beryllium	7440-41-7	E440	0.10	mg/kg	0.59	0.60	0.004	Diff <2x LOR	----
		bismuth	7440-69-9	E440	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	----
		boron	7440-42-8	E440	5.0	mg/kg	<5.0	<5.0	0	Diff <2x LOR	----
		cadmium	7440-43-9	E440	0.020	mg/kg	0.271	0.267	1.66%	30%	----
		calcium	7440-70-2	E440	50	mg/kg	5050	5130	1.63%	30%	----
		chromium	7440-47-3	E440	0.50	mg/kg	52.8	54.7	3.45%	30%	----
		cobalt	7440-48-4	E440	0.10	mg/kg	10.5	10.7	1.36%	30%	----
		copper	7440-50-8	E440	0.50	mg/kg	42.4	43.7	2.97%	30%	----
		iron	7439-89-6	E440	50	mg/kg	28300	28400	0.244%	30%	----
		lead	7439-92-1	E440	0.50	mg/kg	19.6	19.6	0.176%	40%	----
		lithium	7439-93-2	E440	2.0	mg/kg	33.4	34.2	2.28%	30%	----
		magnesium	7439-95-4	E440	20	mg/kg	9590	9770	1.88%	30%	----
		manganese	7439-96-5	E440	1.0	mg/kg	268	272	1.55%	30%	----
		molybdenum	7439-98-7	E440	0.10	mg/kg	4.66	4.66	0.0626%	40%	----
		nickel	7440-02-0	E440	0.50	mg/kg	37.7	38.3	1.77%	30%	----
		phosphorus	7723-14-0	E440	50	mg/kg	1170	1180	0.575%	30%	----
		potassium	7440-09-7	E440	100	mg/kg	1880	1970	4.52%	40%	----



Sub-Matrix: **Soil/Solid**

*Laboratory Duplicate (DUP) Report*

<i>Laboratory sample ID</i>	<i>Client sample ID</i>	<i>Analyte</i>	<i>CAS Number</i>	<i>Method</i>	<i>LOR</i>	<i>Unit</i>	<i>Original Result</i>	<i>Duplicate Result</i>	<i>RPD(%) or Difference</i>	<i>Duplicate Limits</i>	<i>Qualifier</i>
<b>Metals (QC Lot: 460996) - continued</b>											
VA22A6817-011	Anonymous	selenium	7782-49-2	E440	0.20	mg/kg	0.61	0.56	0.04	Diff <2x LOR	----
		silver	7440-22-4	E440	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	----
		sodium	7440-23-5	E440	50	mg/kg	412	432	4.79%	40%	----
		strontium	7440-24-6	E440	0.50	mg/kg	40.4	40.7	0.756%	40%	----
		sulfur	7704-34-9	E440	1000	mg/kg	<1000	<1000	0	Diff <2x LOR	----
		thallium	7440-28-0	E440	0.050	mg/kg	0.125	0.125	0.0005	Diff <2x LOR	----
		tin	7440-31-5	E440	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	----
		titanium	7440-32-6	E440	1.0	mg/kg	834	879	5.18%	40%	----
		tungsten	7440-33-7	E440	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	----
		uranium	7440-61-1	E440	0.050	mg/kg	7.83	7.84	0.0960%	30%	----
		vanadium	7440-62-2	E440	0.20	mg/kg	69.1	71.1	2.86%	30%	----
		zinc	7440-66-6	E440	2.0	mg/kg	80.7	81.0	0.416%	30%	----
		zirconium	7440-67-7	E440	1.0	mg/kg	2.4	1.7	0.7	Diff <2x LOR	----





## Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

### Sub-Matrix: Soil/Solid

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Saturated Paste Extractables (QCLot: 460991)</b>						
% saturation	----	E141	1	%	50.0	----
<b>Saturated Paste Extractables (QCLot: 460992)</b>						
chloride, soluble ion content	16887-00-6	E239.Cl	20	mg/L	<20	----
<b>Saturated Paste Extractables (QCLot: 460993)</b>						
sodium, soluble ion content	17341-25-2	E442	2	mg/L	<2.0	----
<b>Metals (QCLot: 460995)</b>						
mercury	7439-97-6	E510	0.005	mg/kg	<0.0050	----
<b>Metals (QCLot: 460996)</b>						
aluminum	7429-90-5	E440	50	mg/kg	<50	----
antimony	7440-36-0	E440	0.1	mg/kg	<0.10	----
arsenic	7440-38-2	E440	0.1	mg/kg	<0.10	----
barium	7440-39-3	E440	0.5	mg/kg	<0.50	----
beryllium	7440-41-7	E440	0.1	mg/kg	<0.10	----
bismuth	7440-69-9	E440	0.2	mg/kg	<0.20	----
boron	7440-42-8	E440	5	mg/kg	<5.0	----
cadmium	7440-43-9	E440	0.02	mg/kg	<0.020	----
calcium	7440-70-2	E440	50	mg/kg	<50	----
chromium	7440-47-3	E440	0.5	mg/kg	<0.50	----
cobalt	7440-48-4	E440	0.1	mg/kg	<0.10	----
copper	7440-50-8	E440	0.5	mg/kg	<0.50	----
iron	7439-89-6	E440	50	mg/kg	<50	----
lead	7439-92-1	E440	0.5	mg/kg	<0.50	----
lithium	7439-93-2	E440	2	mg/kg	<2.0	----
magnesium	7439-95-4	E440	20	mg/kg	<20	----
manganese	7439-96-5	E440	1	mg/kg	<1.0	----
molybdenum	7439-98-7	E440	0.1	mg/kg	<0.10	----
nickel	7440-02-0	E440	0.5	mg/kg	<0.50	----
phosphorus	7723-14-0	E440	50	mg/kg	<50	----
potassium	7440-09-7	E440	100	mg/kg	<100	----
selenium	7782-49-2	E440	0.2	mg/kg	<0.20	----
silver	7440-22-4	E440	0.1	mg/kg	<0.10	----
sodium	7440-23-5	E440	50	mg/kg	<50	----
strontium	7440-24-6	E440	0.5	mg/kg	<0.50	----



Sub-Matrix: **Soil/Solid**

<i>Analyte</i>	<i>CAS Number</i>	<i>Method</i>	<i>LOR</i>	<i>Unit</i>	<i>Result</i>	<i>Qualifier</i>
<b>Metals (QCLot: 460996) - continued</b>						
sulfur	7704-34-9	E440	1000	mg/kg	<1000	----
thallium	7440-28-0	E440	0.05	mg/kg	<0.050	----
tin	7440-31-5	E440	2	mg/kg	<2.0	----
titanium	7440-32-6	E440	1	mg/kg	<1.0	----
tungsten	7440-33-7	E440	0.5	mg/kg	<0.50	----
uranium	7440-61-1	E440	0.05	mg/kg	<0.050	----
vanadium	7440-62-2	E440	0.2	mg/kg	<0.20	----
zinc	7440-66-6	E440	2	mg/kg	<2.0	----
zirconium	7440-67-7	E440	1	mg/kg	<1.0	----



## Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
Analyte	CAS Number	Method	LOR	Unit	Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
<b>Physical Tests (QCLot: 460994)</b>									
pH (1:2 soil:water)	---	E108	---	pH units	6 pH units	100	95.0	105	---
<b>Saturated Paste Extractables (QCLot: 460991)</b>									
% saturation	---	E141	1	%	100 %	100	80.0	120	---
<b>Saturated Paste Extractables (QCLot: 460992)</b>									
chloride, soluble ion content	16887-00-6	E239.Cl	20	mg/L	100 mg/L	106	80.0	120	---
<b>Saturated Paste Extractables (QCLot: 460993)</b>									
sodium, soluble ion content	17341-25-2	E442	2	mg/L	50 mg/L	106	80.0	120	---
<b>Metals (QCLot: 460995)</b>									
mercury	7439-97-6	E510	0.005	mg/kg	0.1 mg/kg	108	80.0	120	---
<b>Metals (QCLot: 460996)</b>									
aluminum	7429-90-5	E440	50	mg/kg	200 mg/kg	106	80.0	120	---
antimony	7440-36-0	E440	0.1	mg/kg	100 mg/kg	100	80.0	120	---
arsenic	7440-38-2	E440	0.1	mg/kg	100 mg/kg	105	80.0	120	---
barium	7440-39-3	E440	0.5	mg/kg	25 mg/kg	109	80.0	120	---
beryllium	7440-41-7	E440	0.1	mg/kg	10 mg/kg	100	80.0	120	---
bismuth	7440-69-9	E440	0.2	mg/kg	100 mg/kg	95.7	80.0	120	---
boron	7440-42-8	E440	5	mg/kg	100 mg/kg	99.2	80.0	120	---
cadmium	7440-43-9	E440	0.02	mg/kg	10 mg/kg	105	80.0	120	---
calcium	7440-70-2	E440	50	mg/kg	5000 mg/kg	103	80.0	120	---
chromium	7440-47-3	E440	0.5	mg/kg	25 mg/kg	102	80.0	120	---
cobalt	7440-48-4	E440	0.1	mg/kg	25 mg/kg	101	80.0	120	---
copper	7440-50-8	E440	0.5	mg/kg	25 mg/kg	100	80.0	120	---
iron	7439-89-6	E440	50	mg/kg	100 mg/kg	105	80.0	120	---
lead	7439-92-1	E440	0.5	mg/kg	50 mg/kg	98.4	80.0	120	---
lithium	7439-93-2	E440	2	mg/kg	25 mg/kg	93.0	80.0	120	---
magnesium	7439-95-4	E440	20	mg/kg	5000 mg/kg	111	80.0	120	---
manganese	7439-96-5	E440	1	mg/kg	25 mg/kg	102	80.0	120	---
molybdenum	7439-98-7	E440	0.1	mg/kg	25 mg/kg	96.4	80.0	120	---
nickel	7440-02-0	E440	0.5	mg/kg	50 mg/kg	103	80.0	120	---
phosphorus	7723-14-0	E440	50	mg/kg	1000 mg/kg	112	80.0	120	---
potassium	7440-09-7	E440	100	mg/kg	5000 mg/kg	102	80.0	120	---
selenium	7782-49-2	E440	0.2	mg/kg	100 mg/kg	99.5	80.0	120	---



Sub-Matrix: Soil/Solid

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
<b>Metals (QCLot: 460996) - continued</b>									
silver	7440-22-4	E440	0.1	mg/kg	10 mg/kg	87.9	80.0	120	----
sodium	7440-23-5	E440	50	mg/kg	5000 mg/kg	104	80.0	120	----
strontium	7440-24-6	E440	0.5	mg/kg	25 mg/kg	102	80.0	120	----
sulfur	7704-34-9	E440	1000	mg/kg	5000 mg/kg	103	80.0	120	----
thallium	7440-28-0	E440	0.05	mg/kg	100 mg/kg	100	80.0	120	----
tin	7440-31-5	E440	2	mg/kg	50 mg/kg	98.5	80.0	120	----
titanium	7440-32-6	E440	1	mg/kg	25 mg/kg	102	80.0	120	----
tungsten	7440-33-7	E440	0.5	mg/kg	10 mg/kg	100	80.0	120	----
uranium	7440-61-1	E440	0.05	mg/kg	0.5 mg/kg	101	80.0	120	----
vanadium	7440-62-2	E440	0.2	mg/kg	50 mg/kg	105	80.0	120	----
zinc	7440-66-6	E440	2	mg/kg	50 mg/kg	95.8	80.0	120	----
zirconium	7440-67-7	E440	1	mg/kg	10 mg/kg	95.6	80.0	120	----



## Reference Material (RM) Report

A Reference Material (RM) is a homogenous material with known and well-established analyte concentrations. RMs are processed in an identical manner to test samples, and are used to monitor and control the accuracy and precision of a test method for a typical sample matrix. RM results are expressed as percent recovery of the target analyte concentration. RM targets may be certified target concentrations provided by the RM supplier, or may be ALS long-term mean values (for empirical test methods).

Sub-Matrix: **Soil/Solid**

Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Reference Material (RM) Report				
					RM Target Concentration	Recovery (%) RM	Recovery Limits (%)		Qualifier
							Low	High	
<b>Saturated Paste Extractables (QCLot: 460991)</b>									
QC-460991-003	RM	% saturation	----	E141	48.3 %	101	70.0	130	----
<b>Saturated Paste Extractables (QCLot: 460992)</b>									
QC-460992-003	RM	chloride, soluble ion content	16887-00-6	E239.Cl	1237 mg/L	90.0	70.0	130	----
<b>Saturated Paste Extractables (QCLot: 460993)</b>									
QC-460993-003	RM	sodium, soluble ion content	17341-25-2	E442	330 mg/L	90.5	70.0	130	----
<b>Metals (QCLot: 460995)</b>									
QC-460995-003	SCP SS-2	mercury	7439-97-6	E510	0.059 mg/kg	105	70.0	130	----
<b>Metals (QCLot: 460996)</b>									
QC-460996-003	SCP SS-2	aluminum	7429-90-5	E440	9817 mg/kg	115	70.0	130	----
QC-460996-003	SCP SS-2	antimony	7440-36-0	E440	3.99 mg/kg	121	70.0	130	----
QC-460996-003	SCP SS-2	arsenic	7440-38-2	E440	3.73 mg/kg	119	70.0	130	----
QC-460996-003	SCP SS-2	barium	7440-39-3	E440	105 mg/kg	118	70.0	130	----
QC-460996-003	SCP SS-2	beryllium	7440-41-7	E440	0.349 mg/kg	114	70.0	130	----
QC-460996-003	SCP SS-2	boron	7440-42-8	E440	8.5 mg/kg	125	40.0	160	----
QC-460996-003	SCP SS-2	cadmium	7440-43-9	E440	0.91 mg/kg	110	70.0	130	----
QC-460996-003	SCP SS-2	calcium	7440-70-2	E440	31082 mg/kg	108	70.0	130	----
QC-460996-003	SCP SS-2	chromium	7440-47-3	E440	101 mg/kg	118	70.0	130	----
QC-460996-003	SCP SS-2	cobalt	7440-48-4	E440	6.9 mg/kg	112	70.0	130	----
QC-460996-003	SCP SS-2	copper	7440-50-8	E440	123 mg/kg	110	70.0	130	----
QC-460996-003	SCP SS-2	iron	7439-89-6	E440	23558 mg/kg	110	70.0	130	----
QC-460996-003	SCP SS-2	lead	7439-92-1	E440	267 mg/kg	108	70.0	130	----
QC-460996-003	SCP SS-2	lithium	7439-93-2	E440	9.5 mg/kg	101	70.0	130	----
QC-460996-003	SCP SS-2	magnesium	7439-95-4	E440	5509 mg/kg	112	70.0	130	----
QC-460996-003	SCP SS-2	manganese	7439-96-5	E440	269 mg/kg	112	70.0	130	----
QC-460996-003	SCP SS-2	molybdenum	7439-98-7	E440	1.03 mg/kg	109	70.0	130	----
QC-460996-003	SCP SS-2	nickel	7440-02-0	E440	26.7 mg/kg	112	70.0	130	----
QC-460996-003	SCP SS-2	phosphorus	7723-14-0	E440	752 mg/kg	110	70.0	130	----
QC-460996-003	SCP SS-2	potassium	7440-09-7	E440	1587 mg/kg	115	70.0	130	----
QC-460996-003	SCP SS-2	sodium	7440-23-5	E440	797 mg/kg	115	70.0	130	----





Sub-Matrix: **Soil/Solid**

Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Reference Material (RM) Report				
					RM Target Concentration	Recovery (%) RM	Recovery Limits (%)		Qualifier
							Low	High	
<b>Metals (QCLot: 460996) - continued</b>									
QC-460996-003	SCP SS-2	strontium	7440-24-6	E440	86.1 mg/kg	107	70.0	130	----
QC-460996-003	SCP SS-2	thallium	7440-28-0	E440	0.0786 mg/kg	106	40.0	160	----
QC-460996-003	SCP SS-2	tin	7440-31-5	E440	10.6 mg/kg	106	70.0	130	----
QC-460996-003	SCP SS-2	titanium	7440-32-6	E440	839 mg/kg	120	70.0	130	----
QC-460996-003	SCP SS-2	uranium	7440-61-1	E440	0.52 mg/kg	117	70.0	130	----
QC-460996-003	SCP SS-2	vanadium	7440-62-2	E440	32.7 mg/kg	115	70.0	130	----
QC-460996-003	SCP SS-2	zinc	7440-66-6	E440	297 mg/kg	104	70.0	130	----
QC-460996-003	SCP SS-2	zirconium	7440-67-7	E440	5.73 mg/kg	110	70.0	130	----





## CERTIFICATE OF ANALYSIS

<p><b>Work Order</b> : <b>VA22C9420</b></p> <p><b>Client</b> : <b>Regional District of Kitimat-Stikine</b></p> <p><b>Contact</b> : Hannah Shinton</p> <p><b>Address</b> : # 300 - 4545 Lazelle Avenue Terrace BC Canada V8G 4E1</p> <p><b>Telephone</b> : ----</p> <p><b>Project</b> : Forceman Ridge Groundwater</p> <p><b>PO</b> : ----</p> <p><b>C-O-C number</b> : ----</p> <p><b>Sampler</b> : H Shinton</p> <p><b>Site</b> :</p> <p><b>Quote number</b> : Default Water Testing (Q62338)</p> <p><b>No. of samples received</b> : 9</p> <p><b>No. of samples analysed</b> : 9</p>	<p><b>Page</b> : 1 of 8</p> <p><b>Laboratory</b> : Vancouver - Environmental</p> <p><b>Account Manager</b> : Amber Springer</p> <p><b>Address</b> : 8081 Lougheed Highway Burnaby BC Canada V5A 1W9</p> <p><b>Telephone</b> : +1 604 253 4188</p> <p><b>Date Samples Received</b> : 03-Dec-2022 11:30</p> <p><b>Date Analysis Commenced</b> : 05-Dec-2022</p> <p><b>Issue Date</b> : 12-Dec-2022 11:10</p>
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This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

### Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Ann Joby	Lab Assistant	Metals, Burnaby, British Columbia
Caitlin Macey	Team Leader - Inorganics	Inorganics, Burnaby, British Columbia
Erin Sanchez		Metals, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Inorganics, Burnaby, British Columbia
Qammar Almas	Lab Assistant	Metals, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia



## General Comments

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

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

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

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

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

<i>Unit</i>	<i>Description</i>
-	no units
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.

## Qualifiers

<i>Qualifier</i>	<i>Description</i>
RRV	Reported result verified by repeat analysis.



## Analytical Results

Sub-Matrix: Water					Client sample ID				
(Matrix: Water)					MW-13	MW-22	MW-02	MW-01	MW-03
Client sampling date / time					30-Nov-2022 11:00	30-Nov-2022 12:00	30-Nov-2022 12:17	30-Nov-2022 13:30	01-Dec-2022 10:39
Analyte	CAS Number	Method	LOR	Unit	VA22C9420-001	VA22C9420-002	VA22C9420-003	VA22C9420-004	VA22C9420-005
					Result	Result	Result	Result	Result
<b>Physical Tests</b>									
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	10.1	10.3	22.8	12.8	66.2
conductivity	----	E100	2.0	µS/cm	26.1	25.7	52.0	32.6	129
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L	9.68	9.73	20.4	11.9	57.9
pH	----	E108	0.10	pH units	6.09	6.11	6.14	6.28	7.82
<b>Anions and Nutrients</b>									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	0.0077	<0.0050	<0.0050
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	<0.50	<0.50	<0.50	<0.50	<0.50
fluoride	16984-48-8	E235.F	0.020	mg/L	0.026	0.022	<0.020	0.047	0.036
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	<0.050	<0.050	0.175	0.082	<0.050
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.110	0.110	0.423	0.183	0.0252
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	<0.0010	<0.0010	<0.0010	0.0024	<0.0010
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	0.53	0.52	0.73	0.72	1.21
<b>Organic / Inorganic Carbon</b>									
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	0.96	1.01	<0.50	0.52	<0.50
carbon, total organic [TOC]	----	E355-L	0.50	mg/L	0.82	0.80	1.20	1.72	<0.50
<b>Dissolved Metals</b>									
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0168	0.0181	0.0021	0.0031	0.0033
antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	0.00036
barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0158	0.0164	0.00997	0.00407	0.0102
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	<0.010	<0.010	<0.010	<0.010	<0.010
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	0.0000087	0.0000096	0.0000166	0.0000111	<0.0000050
calcium, dissolved	7440-70-2	E421	0.050	mg/L	3.39	3.40	7.19	4.15	20.6
cesium, dissolved	7440-46-2	E421	0.000010	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
chromium, dissolved	7440-47-3	E421	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050





## Analytical Results

Sub-Matrix: Water					Client sample ID				
(Matrix: Water)					MW-13	MW-22	MW-02	MW-01	MW-03
Client sampling date / time					30-Nov-2022 11:00	30-Nov-2022 12:00	30-Nov-2022 12:17	30-Nov-2022 13:30	01-Dec-2022 10:39
Analyte	CAS Number	Method	LOR	Unit	VA22C9420-001	VA22C9420-002	VA22C9420-003	VA22C9420-004	VA22C9420-005
					Result	Result	Result	Result	Result
<b>Dissolved Metals</b>									
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	0.00363
iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	0.074	<0.010	0.017
lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	0.296	0.301	0.588	0.380	1.58
manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00074	0.00075	0.0206	0.00104	0.0143
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.050	mg/L	0.206	0.213	0.429	0.253	0.588
rubidium, dissolved	7440-17-7	E421	0.00020	mg/L	0.00036	0.00041	0.00047	0.00034	0.00031
selenium, dissolved	7782-49-2	E421	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	0.000053
silicon, dissolved	7440-21-3	E421	0.050	mg/L	3.38	3.43	6.71	5.61	4.96
silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L	0.969	0.982	1.97	1.49	1.98
strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.0411	0.0424	0.0615	0.0389	0.0907
sulfur, dissolved	7704-34-9	E421	0.50	mg/L	<0.50	<0.50	<0.50	<0.50	0.59
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	<0.000010	<0.000010	<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	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
tungsten, dissolved	7440-33-7	E421	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	0.00052
uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.000040	0.000043	<0.000010	<0.000010	0.000022
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	0.0093
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



## Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	MW-13	MW-22	MW-02	MW-01	MW-03
Client sampling date / time					30-Nov-2022 11:00	30-Nov-2022 12:00	30-Nov-2022 12:17	30-Nov-2022 13:30	01-Dec-2022 10:39	
Analyte	CAS Number	Method	LOR	Unit	VA22C9420-001	VA22C9420-002	VA22C9420-003	VA22C9420-004	VA22C9420-005	
					Result	Result	Result	Result	Result	
<b>Dissolved Metals</b>										
dissolved metals filtration location	----	EP421	-	-	Field	Field	Field	Field	Field	
<b>Aggregate Organics</b>										
chemical oxygen demand [COD]	----	E559-L	10	mg/L	<10	<10	<10	<10	<10	

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



## Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	MW-04	MW-09	Field Blank	Trip Blank	----
Client sampling date / time					30-Nov-2022 09:15	30-Nov-2022 10:00	01-Dec-2022 13:21	01-Dec-2022	----	
Analyte	CAS Number	Method	LOR	Unit	VA22C9420-006	VA22C9420-007	VA22C9420-008	VA22C9420-009	-----	
					Result	Result	Result	Result	----	
<b>Physical Tests</b>										
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	33.6	35.6	<1.0	<1.0	----	
conductivity	----	E100	2.0	µS/cm	70.4	77.0	<2.0	<2.0	----	
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L	27.2	25.5	<0.60	<0.60	----	
pH	----	E108	0.10	pH units	8.38	7.15	5.51	5.43	----	
<b>Anions and Nutrients</b>										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	----	
bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	<0.050	<0.050	----	----	
chloride	16887-00-6	E235.Cl	0.50	mg/L	0.51	1.14	<0.50	----	----	
fluoride	16984-48-8	E235.F	0.020	mg/L	0.080	0.075	<0.020	----	----	
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	0.060	<0.050	----	----	----	
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.0075	0.0374	<0.0050	----	----	
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	<0.0010	----	----	
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	<0.0010	0.0038	----	----	----	
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	1.24	1.10	<0.30	----	----	
<b>Organic / Inorganic Carbon</b>										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	<0.50	0.56	<0.50	----	----	
carbon, total organic [TOC]	----	E355-L	0.50	mg/L	0.81	0.70	----	----	----	
<b>Dissolved Metals</b>										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0084	0.0012	0.0028 <sup>RRV</sup>	<0.0010	----	
antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	----	
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	<0.00010	0.00040	<0.00010	<0.00010	----	
barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.00730	0.00659	0.00016 <sup>RRV</sup>	<0.00010	----	
beryllium, dissolved	7440-41-7	E421	0.000100	mg/L	<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	----	
boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	----	
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	0.0000258	0.0000105	0.0000984 <sup>RRV</sup>	<0.0000050	----	
calcium, dissolved	7440-70-2	E421	0.050	mg/L	9.31	8.87	<0.050	<0.050	----	
cesium, dissolved	7440-46-2	E421	0.000010	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	----	
chromium, dissolved	7440-47-3	E421	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----	
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	----	



## Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	MW-04	MW-09	Field Blank	Trip Blank	----
Client sampling date / time					30-Nov-2022 09:15	30-Nov-2022 10:00	01-Dec-2022 13:21	01-Dec-2022	----	
Analyte	CAS Number	Method	LOR	Unit	VA22C9420-006	VA22C9420-007	VA22C9420-008	VA22C9420-009	-----	
					Result	Result	Result	Result	----	
<b>Dissolved Metals</b>										
copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00046	<0.00020	<0.00020	<0.00020	----	
iron, dissolved	7439-89-6	E421	0.010	mg/L	0.179	<0.010	<0.010	<0.010	----	
lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	----	
lithium, dissolved	7439-93-2	E421	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	----	
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	0.964	0.818	<0.0050	<0.0050	----	
manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.0194	<0.00010	0.00018 <sup>RRV</sup>	<0.00010	----	
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	----	
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.000094	0.000060	<0.000050	<0.000050	----	
nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----	
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	<0.050	<0.050	----	
potassium, dissolved	7440-09-7	E421	0.050	mg/L	0.670	0.418	<0.050	<0.050	----	
rubidium, dissolved	7440-17-7	E421	0.00020	mg/L	<0.00020	0.00020	<0.00020	<0.00020	----	
selenium, dissolved	7782-49-2	E421	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	----	
silicon, dissolved	7440-21-3	E421	0.050	mg/L	1.77	5.46	<0.050	<0.050	----	
silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	----	
sodium, dissolved	7440-23-5	E421	0.050	mg/L	1.70	5.28	<0.050	<0.050	----	
strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.0567	0.0432	<0.00020	<0.00020	----	
sulfur, dissolved	7704-34-9	E421	0.50	mg/L	0.79	0.64	<0.50	<0.50	----	
tellurium, dissolved	13494-80-9	E421	0.00020	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	----	
thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	----	
thorium, dissolved	7440-29-1	E421	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	----	
tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	----	
titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	<0.00030	<0.00030	----	
tungsten, dissolved	7440-33-7	E421	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	----	
uranium, dissolved	7440-61-1	E421	0.000010	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	----	
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----	
zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0016	<0.0010	0.0017 <sup>RRV</sup>	<0.0010	----	
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	----	
dissolved mercury filtration location	----	EP509	-	-	Field	Field	Field	Field	----	
dissolved metals filtration location	----	EP421	-	-	Field	Field	Field	Field	----	



## Analytical Results

Sub-Matrix: Water					Client sample ID	MW-04	MW-09	Field Blank	Trip Blank	----
(Matrix: Water)					Client sampling date / time	30-Nov-2022 09:15	30-Nov-2022 10:00	01-Dec-2022 13:21	01-Dec-2022	----
Analyte	CAS Number	Method	LOR	Unit	VA22C9420-006	VA22C9420-007	VA22C9420-008	VA22C9420-009	-----	
Aggregate Organics					Result	Result	Result	Result	----	
chemical oxygen demand [COD]	----	E559-L	10	mg/L	<10	<10	----	----	----	

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





## QUALITY CONTROL INTERPRETIVE REPORT

<p><b>Work Order</b> : <b>VA22C9420</b></p> <p><b>Client</b> : <b>Regional District of Kitimat-Stikine</b></p> <p><b>Contact</b> : Hannah Shinton</p> <p><b>Address</b> : # 300 - 4545 Lazelle Avenue Terrace BC Canada V8G 4E1</p> <p><b>Telephone</b> : ----</p> <p><b>Project</b> : Forceman Ridge Groundwater</p> <p><b>PO</b> : ----</p> <p><b>C-O-C number</b> : ----</p> <p><b>Sampler</b> : H Shinton</p> <p><b>Site</b> :</p> <p><b>Quote number</b> : Default Water Testing (Q62338)</p> <p><b>No. of samples received</b> : 9</p> <p><b>No. of samples analysed</b> : 9</p>	<p><b>Page</b> : 1 of 23</p> <p><b>Laboratory</b> : Vancouver - Environmental</p> <p><b>Account Manager</b> : Amber Springer</p> <p><b>Address</b> : 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9</p> <p><b>Telephone</b> : +1 604 253 4188</p> <p><b>Date Samples Received</b> : 03-Dec-2022 11:30</p> <p><b>Issue Date</b> : 12-Dec-2022 11:11</p>
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This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

**Key**

- Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
- CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
- DQO: Data Quality Objective.
- LOR: Limit of Reporting (detection limit).
- RPD: Relative Percent Difference.

### ***Workorder Comments***

Holding times are displayed as "----" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

### ***Summary of Outliers***

#### ***Outliers : Quality Control Samples***

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

#### ***Outliers: Reference Material (RM) Samples***

- No Reference Material (RM) Sample outliers occur.

***Outliers : Analysis Holding Time Compliance (Breaches)***

- Analysis Holding Time Outliers exist - please see following pages for full details.

***Outliers : Frequency of Quality Control Samples***

- No Quality Control Sample Frequency Outliers occur.



## Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Aggregate Organics : Chemical Oxygen Demand by Colourimetry (Low Level)</b>										
<b>Amber glass total (sulfuric acid)</b> MW-03	E559-L	01-Dec-2022	----	----	----		08-Dec-2022	28 days	7 days	✓
<b>Aggregate Organics : Chemical Oxygen Demand by Colourimetry (Low Level)</b>										
<b>Amber glass total (sulfuric acid)</b> MW-01	E559-L	30-Nov-2022	----	----	----		08-Dec-2022	28 days	8 days	✓
<b>Aggregate Organics : Chemical Oxygen Demand by Colourimetry (Low Level)</b>										
<b>Amber glass total (sulfuric acid)</b> MW-02	E559-L	30-Nov-2022	----	----	----		08-Dec-2022	28 days	8 days	✓
<b>Aggregate Organics : Chemical Oxygen Demand by Colourimetry (Low Level)</b>										
<b>Amber glass total (sulfuric acid)</b> MW-04	E559-L	30-Nov-2022	----	----	----		08-Dec-2022	28 days	8 days	✓
<b>Aggregate Organics : Chemical Oxygen Demand by Colourimetry (Low Level)</b>										
<b>Amber glass total (sulfuric acid)</b> MW-09	E559-L	30-Nov-2022	----	----	----		08-Dec-2022	28 days	8 days	✓
<b>Aggregate Organics : Chemical Oxygen Demand by Colourimetry (Low Level)</b>										
<b>Amber glass total (sulfuric acid)</b> MW-13	E559-L	30-Nov-2022	----	----	----		08-Dec-2022	28 days	8 days	✓
<b>Aggregate Organics : Chemical Oxygen Demand by Colourimetry (Low Level)</b>										
<b>Amber glass total (sulfuric acid)</b> MW-22	E559-L	30-Nov-2022	----	----	----		08-Dec-2022	28 days	8 days	✓



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Ammonia by Fluorescence</b>											
Amber glass total (sulfuric acid) MW-03	E298	01-Dec-2022	05-Dec-2022	----	----		07-Dec-2022	28 days	6 days	✓	
<b>Anions and Nutrients : Ammonia by Fluorescence</b>											
Amber glass total (sulfuric acid) MW-01	E298	30-Nov-2022	05-Dec-2022	----	----		07-Dec-2022	28 days	7 days	✓	
<b>Anions and Nutrients : Ammonia by Fluorescence</b>											
Amber glass total (sulfuric acid) MW-02	E298	30-Nov-2022	05-Dec-2022	----	----		07-Dec-2022	28 days	7 days	✓	
<b>Anions and Nutrients : Ammonia by Fluorescence</b>											
Amber glass total (sulfuric acid) MW-04	E298	30-Nov-2022	05-Dec-2022	----	----		07-Dec-2022	28 days	7 days	✓	
<b>Anions and Nutrients : Ammonia by Fluorescence</b>											
Amber glass total (sulfuric acid) MW-09	E298	30-Nov-2022	05-Dec-2022	----	----		07-Dec-2022	28 days	7 days	✓	
<b>Anions and Nutrients : Ammonia by Fluorescence</b>											
Amber glass total (sulfuric acid) MW-13	E298	30-Nov-2022	05-Dec-2022	----	----		07-Dec-2022	28 days	7 days	✓	
<b>Anions and Nutrients : Ammonia by Fluorescence</b>											
Amber glass total (sulfuric acid) MW-22	E298	30-Nov-2022	05-Dec-2022	----	----		07-Dec-2022	28 days	7 days	✓	
<b>Anions and Nutrients : Ammonia by Fluorescence</b>											
Amber glass total (lab preserved) Field Blank	E298	01-Dec-2022	05-Dec-2022	3 days	4 days	* EHT	07-Dec-2022	28 days	2 days	✓	
<b>Anions and Nutrients : Ammonia by Fluorescence</b>											
Amber glass total (lab preserved) Trip Blank	E298	01-Dec-2022	05-Dec-2022	3 days	5 days	* EHT	07-Dec-2022	28 days	2 days	✓	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Bromide in Water by IC (Low Level)</b>											
HDPE Field Blank	E235.Br-L	01-Dec-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	4 days	✔	
<b>Anions and Nutrients : Bromide in Water by IC (Low Level)</b>											
HDPE MW-03	E235.Br-L	01-Dec-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	4 days	✔	
<b>Anions and Nutrients : Bromide in Water by IC (Low Level)</b>											
HDPE MW-01	E235.Br-L	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✔	
<b>Anions and Nutrients : Bromide in Water by IC (Low Level)</b>											
HDPE MW-02	E235.Br-L	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✔	
<b>Anions and Nutrients : Bromide in Water by IC (Low Level)</b>											
HDPE MW-04	E235.Br-L	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✔	
<b>Anions and Nutrients : Bromide in Water by IC (Low Level)</b>											
HDPE MW-09	E235.Br-L	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✔	
<b>Anions and Nutrients : Bromide in Water by IC (Low Level)</b>											
HDPE MW-13	E235.Br-L	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✔	
<b>Anions and Nutrients : Bromide in Water by IC (Low Level)</b>											
HDPE MW-22	E235.Br-L	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✔	
<b>Anions and Nutrients : Chloride in Water by IC</b>											
HDPE Field Blank	E235.Cl	01-Dec-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	4 days	✔	





Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Chloride in Water by IC</b>											
HDPE MW-03	E235.Cl	01-Dec-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	4 days	✓	
<b>Anions and Nutrients : Chloride in Water by IC</b>											
HDPE MW-01	E235.Cl	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✓	
<b>Anions and Nutrients : Chloride in Water by IC</b>											
HDPE MW-02	E235.Cl	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✓	
<b>Anions and Nutrients : Chloride in Water by IC</b>											
HDPE MW-04	E235.Cl	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✓	
<b>Anions and Nutrients : Chloride in Water by IC</b>											
HDPE MW-09	E235.Cl	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✓	
<b>Anions and Nutrients : Chloride in Water by IC</b>											
HDPE MW-13	E235.Cl	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✓	
<b>Anions and Nutrients : Chloride in Water by IC</b>											
HDPE MW-22	E235.Cl	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✓	
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001</b>											
HDPE MW-03	E378-U	01-Dec-2022	05-Dec-2022	----	----		05-Dec-2022	3 days	4 days	* EHT	
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001</b>											
HDPE MW-01	E378-U	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	3 days	5 days	* EHTL	



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001)</b>										
HDPE MW-02	E378-U	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	3 days	5 days	* EHTL
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001)</b>										
HDPE MW-04	E378-U	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	3 days	5 days	* EHTL
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001)</b>										
HDPE MW-09	E378-U	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	3 days	5 days	* EHTL
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001)</b>										
HDPE MW-13	E378-U	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	3 days	5 days	* EHTL
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001)</b>										
HDPE MW-22	E378-U	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	3 days	5 days	* EHTL
<b>Anions and Nutrients : Fluoride in Water by IC</b>										
HDPE Field Blank	E235.F	01-Dec-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	4 days	✓
<b>Anions and Nutrients : Fluoride in Water by IC</b>										
HDPE MW-03	E235.F	01-Dec-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	4 days	✓
<b>Anions and Nutrients : Fluoride in Water by IC</b>										
HDPE MW-01	E235.F	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✓



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Fluoride in Water by IC</b>											
HDPE MW-02	E235.F	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✓	
<b>Anions and Nutrients : Fluoride in Water by IC</b>											
HDPE MW-04	E235.F	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✓	
<b>Anions and Nutrients : Fluoride in Water by IC</b>											
HDPE MW-09	E235.F	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✓	
<b>Anions and Nutrients : Fluoride in Water by IC</b>											
HDPE MW-13	E235.F	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✓	
<b>Anions and Nutrients : Fluoride in Water by IC</b>											
HDPE MW-22	E235.F	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✓	
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>											
HDPE Field Blank	E235.NO3-L	01-Dec-2022	05-Dec-2022	3 days	4 days	* EHT	05-Dec-2022	3 days	0 days	✓	
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>											
HDPE MW-03	E235.NO3-L	01-Dec-2022	05-Dec-2022	3 days	4 days	* EHT	05-Dec-2022	3 days	0 days	✓	
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>											
HDPE MW-01	E235.NO3-L	30-Nov-2022	05-Dec-2022	3 days	5 days	* EHTL	05-Dec-2022	3 days	0 days	✓	
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>											
HDPE MW-02	E235.NO3-L	30-Nov-2022	05-Dec-2022	3 days	5 days	* EHTL	05-Dec-2022	3 days	0 days	✓	



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>											
HDPE MW-04	E235.NO3-L	30-Nov-2022	05-Dec-2022	3 days	5 days	* EHTL	05-Dec-2022	3 days	0 days	✓	
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>											
HDPE MW-09	E235.NO3-L	30-Nov-2022	05-Dec-2022	3 days	5 days	* EHTL	05-Dec-2022	3 days	0 days	✓	
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>											
HDPE MW-13	E235.NO3-L	30-Nov-2022	05-Dec-2022	3 days	5 days	* EHTL	05-Dec-2022	3 days	0 days	✓	
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>											
HDPE MW-22	E235.NO3-L	30-Nov-2022	05-Dec-2022	3 days	5 days	* EHTL	05-Dec-2022	3 days	0 days	✓	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
HDPE Field Blank	E235.NO2-L	01-Dec-2022	05-Dec-2022	----	----		05-Dec-2022	3 days	4 days	* EHT	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
HDPE MW-03	E235.NO2-L	01-Dec-2022	05-Dec-2022	----	----		05-Dec-2022	3 days	4 days	* EHT	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
HDPE MW-01	E235.NO2-L	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	3 days	5 days	* EHTL	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
HDPE MW-02	E235.NO2-L	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	3 days	5 days	* EHTL	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
HDPE MW-04	E235.NO2-L	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	3 days	5 days	* EHTL	



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
HDPE MW-09	E235.NO2-L	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	3 days	5 days	*	EHTL
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
HDPE MW-13	E235.NO2-L	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	3 days	5 days	*	EHTL
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
HDPE MW-22	E235.NO2-L	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	3 days	5 days	*	EHTL
<b>Anions and Nutrients : Sulfate in Water by IC</b>											
HDPE Field Blank	E235.SO4	01-Dec-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	4 days	✓	
<b>Anions and Nutrients : Sulfate in Water by IC</b>											
HDPE MW-03	E235.SO4	01-Dec-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	4 days	✓	
<b>Anions and Nutrients : Sulfate in Water by IC</b>											
HDPE MW-01	E235.SO4	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✓	
<b>Anions and Nutrients : Sulfate in Water by IC</b>											
HDPE MW-02	E235.SO4	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✓	
<b>Anions and Nutrients : Sulfate in Water by IC</b>											
HDPE MW-04	E235.SO4	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✓	
<b>Anions and Nutrients : Sulfate in Water by IC</b>											
HDPE MW-09	E235.SO4	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✓	





Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Sulfate in Water by IC</b>											
HDPE MW-13	E235.SO4	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✔	
<b>Anions and Nutrients : Sulfate in Water by IC</b>											
HDPE MW-22	E235.SO4	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✔	
<b>Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)</b>											
Amber glass total (sulfuric acid) MW-03	E318	01-Dec-2022	05-Dec-2022	----	----		08-Dec-2022	28 days	7 days	✔	
<b>Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)</b>											
Amber glass total (sulfuric acid) MW-01	E318	30-Nov-2022	05-Dec-2022	----	----		08-Dec-2022	28 days	8 days	✔	
<b>Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)</b>											
Amber glass total (sulfuric acid) MW-02	E318	30-Nov-2022	05-Dec-2022	----	----		08-Dec-2022	28 days	8 days	✔	
<b>Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)</b>											
Amber glass total (sulfuric acid) MW-04	E318	30-Nov-2022	05-Dec-2022	----	----		08-Dec-2022	28 days	8 days	✔	
<b>Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)</b>											
Amber glass total (sulfuric acid) MW-09	E318	30-Nov-2022	05-Dec-2022	----	----		08-Dec-2022	28 days	8 days	✔	
<b>Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)</b>											
Amber glass total (sulfuric acid) MW-13	E318	30-Nov-2022	05-Dec-2022	----	----		08-Dec-2022	28 days	8 days	✔	
<b>Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)</b>											
Amber glass total (sulfuric acid) MW-22	E318	30-Nov-2022	05-Dec-2022	----	----		08-Dec-2022	28 days	8 days	✔	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Dissolved Metals : Dissolved Mercury in Water by CVAAS</b>											
Glass vial dissolved (hydrochloric acid) Field Blank	E509	01-Dec-2022	06-Dec-2022	----	----		06-Dec-2022	28 days	5 days	✔	
<b>Dissolved Metals : Dissolved Mercury in Water by CVAAS</b>											
Glass vial dissolved (hydrochloric acid) MW-03	E509	01-Dec-2022	06-Dec-2022	----	----		06-Dec-2022	28 days	5 days	✔	
<b>Dissolved Metals : Dissolved Mercury in Water by CVAAS</b>											
Glass vial - dissolved (lab preserved) Trip Blank	E509	01-Dec-2022	06-Dec-2022	----	----		06-Dec-2022	28 days	5 days	✔	
<b>Dissolved Metals : Dissolved Mercury in Water by CVAAS</b>											
Glass vial dissolved (hydrochloric acid) MW-01	E509	30-Nov-2022	06-Dec-2022	----	----		06-Dec-2022	28 days	6 days	✔	
<b>Dissolved Metals : Dissolved Mercury in Water by CVAAS</b>											
Glass vial dissolved (hydrochloric acid) MW-02	E509	30-Nov-2022	06-Dec-2022	----	----		06-Dec-2022	28 days	6 days	✔	
<b>Dissolved Metals : Dissolved Mercury in Water by CVAAS</b>											
Glass vial dissolved (hydrochloric acid) MW-04	E509	30-Nov-2022	06-Dec-2022	----	----		06-Dec-2022	28 days	6 days	✔	
<b>Dissolved Metals : Dissolved Mercury in Water by CVAAS</b>											
Glass vial dissolved (hydrochloric acid) MW-09	E509	30-Nov-2022	06-Dec-2022	----	----		06-Dec-2022	28 days	6 days	✔	
<b>Dissolved Metals : Dissolved Mercury in Water by CVAAS</b>											
Glass vial dissolved (hydrochloric acid) MW-13	E509	30-Nov-2022	06-Dec-2022	----	----		06-Dec-2022	28 days	6 days	✔	
<b>Dissolved Metals : Dissolved Mercury in Water by CVAAS</b>											
Glass vial dissolved (hydrochloric acid) MW-22	E509	30-Nov-2022	06-Dec-2022	----	----		06-Dec-2022	28 days	6 days	✔	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Dissolved Metals : Dissolved Metals in Water by CRC ICPMS</b>											
HDPE dissolved (nitric acid) Field Blank	E421	01-Dec-2022	05-Dec-2022	----	----		07-Dec-2022	180 days	6 days	✔	
<b>Dissolved Metals : Dissolved Metals in Water by CRC ICPMS</b>											
HDPE dissolved (nitric acid) MW-03	E421	01-Dec-2022	05-Dec-2022	----	----		07-Dec-2022	180 days	6 days	✔	
<b>Dissolved Metals : Dissolved Metals in Water by CRC ICPMS</b>											
HDPE dissolved (nitric acid) MW-01	E421	30-Nov-2022	05-Dec-2022	----	----		07-Dec-2022	180 days	7 days	✔	
<b>Dissolved Metals : Dissolved Metals in Water by CRC ICPMS</b>											
HDPE dissolved (nitric acid) MW-02	E421	30-Nov-2022	05-Dec-2022	----	----		07-Dec-2022	180 days	7 days	✔	
<b>Dissolved Metals : Dissolved Metals in Water by CRC ICPMS</b>											
HDPE dissolved (nitric acid) MW-04	E421	30-Nov-2022	05-Dec-2022	----	----		07-Dec-2022	180 days	7 days	✔	
<b>Dissolved Metals : Dissolved Metals in Water by CRC ICPMS</b>											
HDPE dissolved (nitric acid) MW-09	E421	30-Nov-2022	05-Dec-2022	----	----		07-Dec-2022	180 days	7 days	✔	
<b>Dissolved Metals : Dissolved Metals in Water by CRC ICPMS</b>											
HDPE dissolved (nitric acid) MW-13	E421	30-Nov-2022	05-Dec-2022	----	----		07-Dec-2022	180 days	7 days	✔	
<b>Dissolved Metals : Dissolved Metals in Water by CRC ICPMS</b>											
HDPE dissolved (nitric acid) MW-22	E421	30-Nov-2022	05-Dec-2022	----	----		07-Dec-2022	180 days	7 days	✔	
<b>Dissolved Metals : Dissolved Metals in Water by CRC ICPMS</b>											
HDPE - dissolved (lab preserved) Trip Blank	E421	01-Dec-2022	06-Dec-2022	----	----		07-Dec-2022	180 days	7 days	✔	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)</b>											
<b>Amber glass dissolved (sulfuric acid)</b> Field Blank	E358-L	01-Dec-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	4 days	✔	
<b>Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)</b>											
<b>Amber glass dissolved (sulfuric acid)</b> MW-03	E358-L	01-Dec-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	4 days	✔	
<b>Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)</b>											
<b>Amber glass dissolved (sulfuric acid)</b> MW-01	E358-L	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✔	
<b>Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)</b>											
<b>Amber glass dissolved (sulfuric acid)</b> MW-02	E358-L	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✔	
<b>Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)</b>											
<b>Amber glass dissolved (sulfuric acid)</b> MW-04	E358-L	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✔	
<b>Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)</b>											
<b>Amber glass dissolved (sulfuric acid)</b> MW-09	E358-L	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✔	
<b>Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)</b>											
<b>Amber glass dissolved (sulfuric acid)</b> MW-13	E358-L	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✔	
<b>Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)</b>											
<b>Amber glass dissolved (sulfuric acid)</b> MW-22	E358-L	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✔	
<b>Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)</b>											
<b>Amber glass total (sulfuric acid)</b> MW-03	E355-L	01-Dec-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	4 days	✔	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)</b>											
Amber glass total (sulfuric acid) MW-01	E355-L	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✔	
<b>Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)</b>											
Amber glass total (sulfuric acid) MW-02	E355-L	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✔	
<b>Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)</b>											
Amber glass total (sulfuric acid) MW-04	E355-L	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✔	
<b>Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)</b>											
Amber glass total (sulfuric acid) MW-09	E355-L	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✔	
<b>Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)</b>											
Amber glass total (sulfuric acid) MW-13	E355-L	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✔	
<b>Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)</b>											
Amber glass total (sulfuric acid) MW-22	E355-L	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✔	
<b>Physical Tests : Alkalinity Species by Titration</b>											
HDPE Field Blank	E290	01-Dec-2022	05-Dec-2022	----	----		05-Dec-2022	14 days	4 days	✔	
<b>Physical Tests : Alkalinity Species by Titration</b>											
HDPE MW-03	E290	01-Dec-2022	05-Dec-2022	----	----		05-Dec-2022	14 days	4 days	✔	
<b>Physical Tests : Alkalinity Species by Titration</b>											
HDPE MW-01	E290	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	14 days	5 days	✔	





Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Physical Tests : Alkalinity Species by Titration</b>											
HDPE MW-02	E290	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	14 days	5 days	✔	
<b>Physical Tests : Alkalinity Species by Titration</b>											
HDPE MW-04	E290	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	14 days	5 days	✔	
<b>Physical Tests : Alkalinity Species by Titration</b>											
HDPE MW-09	E290	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	14 days	5 days	✔	
<b>Physical Tests : Alkalinity Species by Titration</b>											
HDPE MW-13	E290	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	14 days	5 days	✔	
<b>Physical Tests : Alkalinity Species by Titration</b>											
HDPE MW-22	E290	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	14 days	5 days	✔	
<b>Physical Tests : Alkalinity Species by Titration</b>											
HDPE Trip Blank	E290	01-Dec-2022	05-Dec-2022	----	----		05-Dec-2022	14 days	5 days	✔	
<b>Physical Tests : Conductivity in Water</b>											
HDPE Field Blank	E100	01-Dec-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	4 days	✔	
<b>Physical Tests : Conductivity in Water</b>											
HDPE MW-03	E100	01-Dec-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	4 days	✔	
<b>Physical Tests : Conductivity in Water</b>											
HDPE MW-01	E100	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✔	



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Physical Tests : Conductivity in Water</b>											
HDPE MW-02	E100	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✓	
<b>Physical Tests : Conductivity in Water</b>											
HDPE MW-04	E100	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✓	
<b>Physical Tests : Conductivity in Water</b>											
HDPE MW-09	E100	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✓	
<b>Physical Tests : Conductivity in Water</b>											
HDPE MW-13	E100	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✓	
<b>Physical Tests : Conductivity in Water</b>											
HDPE MW-22	E100	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✓	
<b>Physical Tests : Conductivity in Water</b>											
HDPE Trip Blank	E100	01-Dec-2022	05-Dec-2022	----	----		05-Dec-2022	28 days	5 days	✓	
<b>Physical Tests : pH by Meter</b>											
HDPE Field Blank	E108	01-Dec-2022	05-Dec-2022	----	----		05-Dec-2022	0.25 hrs	0.39 hrs	* EHTR-FM	
<b>Physical Tests : pH by Meter</b>											
HDPE MW-01	E108	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	0.25 hrs	0.39 hrs	* EHTR-FM	
<b>Physical Tests : pH by Meter</b>											
HDPE MW-02	E108	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	0.25 hrs	0.39 hrs	* EHTR-FM	



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Physical Tests : pH by Meter</b>											
HDPE MW-03	E108	01-Dec-2022	05-Dec-2022	----	----		05-Dec-2022	0.25 hrs	0.39 hrs	*	EHTR-FM
<b>Physical Tests : pH by Meter</b>											
HDPE MW-04	E108	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	0.25 hrs	0.39 hrs	*	EHTR-FM
<b>Physical Tests : pH by Meter</b>											
HDPE MW-09	E108	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	0.25 hrs	0.39 hrs	*	EHTR-FM
<b>Physical Tests : pH by Meter</b>											
HDPE MW-13	E108	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	0.25 hrs	0.39 hrs	*	EHTR-FM
<b>Physical Tests : pH by Meter</b>											
HDPE MW-22	E108	30-Nov-2022	05-Dec-2022	----	----		05-Dec-2022	0.25 hrs	0.39 hrs	*	EHTR-FM
<b>Physical Tests : pH by Meter</b>											
HDPE Trip Blank	E108	01-Dec-2022	05-Dec-2022	----	----		05-Dec-2022	0.25 hrs	0.39 hrs	*	EHTR-FM

**Legend & Qualifier Definitions**

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended  
 EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.  
 EHT: Exceeded ALS recommended hold time prior to analysis.  
 Rec. HT: ALS recommended hold time (see units).



## Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water** Evaluation: \* = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		
			QC	Regular	Actual	Expected	Evaluation
<b>Analytical Methods</b>							
<b>Laboratory Duplicates (DUP)</b>							
Alkalinity Species by Titration	E290	767874	1	9	11.1	5.0	✓
Ammonia by Fluorescence	E298	768029	1	15	6.6	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	767877	1	8	12.5	5.0	✓
Chemical Oxygen Demand by Colourimetry (Low Level)	E559-L	771895	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	767876	1	8	12.5	5.0	✓
Conductivity in Water	E100	767873	1	10	10.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	769067	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	768025	2	30	6.6	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	768027	1	14	7.1	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	767881	1	7	14.2	5.0	✓
Fluoride in Water by IC	E235.F	767875	1	10	10.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	767878	1	10	10.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	767879	1	8	12.5	5.0	✓
pH by Meter	E108	767872	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	767880	1	8	12.5	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	768026	1	9	11.1	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	768028	1	13	7.6	5.0	✓
<b>Laboratory Control Samples (LCS)</b>							
Alkalinity Species by Titration	E290	767874	1	9	11.1	5.0	✓
Ammonia by Fluorescence	E298	768029	1	15	6.6	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	767877	1	8	12.5	5.0	✓
Chemical Oxygen Demand by Colourimetry (Low Level)	E559-L	771895	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	767876	1	8	12.5	5.0	✓
Conductivity in Water	E100	767873	1	10	10.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	769067	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	768025	2	30	6.6	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	768027	1	14	7.1	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	767881	1	7	14.2	5.0	✓
Fluoride in Water by IC	E235.F	767875	1	10	10.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	767878	1	10	10.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	767879	1	8	12.5	5.0	✓
pH by Meter	E108	767872	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	767880	1	8	12.5	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	768026	1	9	11.1	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	768028	1	13	7.6	5.0	✓



Matrix: **Water**

Evaluation: ✖ = QC frequency outside specification; ✔ = QC frequency within specification.

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		
			QC	Regular	Actual	Expected	Evaluation
<b>Analytical Methods</b>							
<b>Method Blanks (MB)</b>							
Alkalinity Species by Titration	E290	767874	1	9	11.1	5.0	✔
Ammonia by Fluorescence	E298	768029	1	15	6.6	5.0	✔
Bromide in Water by IC (Low Level)	E235.Br-L	767877	1	8	12.5	5.0	✔
Chemical Oxygen Demand by Colourimetry (Low Level)	E559-L	771895	1	20	5.0	5.0	✔
Chloride in Water by IC	E235.Cl	767876	1	8	12.5	5.0	✔
Conductivity in Water	E100	767873	1	10	10.0	5.0	✔
Dissolved Mercury in Water by CVAAS	E509	769067	1	20	5.0	5.0	✔
Dissolved Metals in Water by CRC ICPMS	E421	768025	2	30	6.6	5.0	✔
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	768027	1	14	7.1	5.0	✔
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	767881	1	7	14.2	5.0	✔
Fluoride in Water by IC	E235.F	767875	1	10	10.0	5.0	✔
Nitrate in Water by IC (Low Level)	E235.NO3-L	767878	1	10	10.0	5.0	✔
Nitrite in Water by IC (Low Level)	E235.NO2-L	767879	1	8	12.5	5.0	✔
Sulfate in Water by IC	E235.SO4	767880	1	8	12.5	5.0	✔
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	768026	1	9	11.1	5.0	✔
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	768028	1	13	7.6	5.0	✔
<b>Matrix Spikes (MS)</b>							
Ammonia by Fluorescence	E298	768029	1	15	6.6	5.0	✔
Bromide in Water by IC (Low Level)	E235.Br-L	767877	1	8	12.5	5.0	✔
Chemical Oxygen Demand by Colourimetry (Low Level)	E559-L	771895	1	20	5.0	5.0	✔
Chloride in Water by IC	E235.Cl	767876	1	8	12.5	5.0	✔
Dissolved Mercury in Water by CVAAS	E509	769067	1	20	5.0	5.0	✔
Dissolved Metals in Water by CRC ICPMS	E421	768025	2	30	6.6	5.0	✔
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	768027	1	14	7.1	5.0	✔
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	767881	1	7	14.2	5.0	✔
Fluoride in Water by IC	E235.F	767875	1	10	10.0	5.0	✔
Nitrate in Water by IC (Low Level)	E235.NO3-L	767878	1	10	10.0	5.0	✔
Nitrite in Water by IC (Low Level)	E235.NO2-L	767879	1	8	12.5	5.0	✔
Sulfate in Water by IC	E235.SO4	767880	1	8	12.5	5.0	✔
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	768026	1	9	11.1	5.0	✔
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	768028	1	13	7.6	5.0	✔





## Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Bromide in Water by IC (Low Level)	E235.Br-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Chloride in Water by IC	E235.Cl Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Fluoride in Water by IC	E235.F Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - Environmental	Water	Method Fialab 100, 2018	Ammonia in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021)



Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318 Vancouver - Environmental	Water	Method Fialab 100, 2018	TKN in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021).
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L Vancouver - Environmental	Water	APHA 5310 B (mod)	Total Organic Carbon (Non-Purgeable), also known as NPOC (total), is a direct measurement of TOC after an acidified sample has been purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of total carbon (TC) is comprised of IC (which is common), this method is more accurate and more reliable than the TOC by subtraction method (i.e. TC minus TIC).
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Vancouver - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U Vancouver - Environmental	Water	APHA 4500-P F (mod)	Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.  Field filtration is recommended to ensure test results represent conditions at time of sampling.
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS.  Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Chemical Oxygen Demand by Colourimetry (Low Level)	E559-L Vancouver - Environmental	Water	APHA 5220 D (mod)	Samples are analyzed using the closed reflux colourimetric method.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
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<i>Preparation Methods</i>	<i>Method / Lab</i>	<i>Matrix</i>	<i>Method Reference</i>	<i>Method Descriptions</i>
Preparation for Ammonia	EP298  Vancouver - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Digestion for TKN in water	EP318  Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested at high temperature using Sulfuric Acid with Copper catalyst, which converts organic nitrogen sources to Ammonia, which is then quantified by the analytical method as TKN. This method is unsuitable for samples containing high levels of nitrate. If nitrate exceeds TKN concentration by ten times or more, results may be biased low.
Preparation for Total Organic Carbon by Combustion	EP355  Vancouver - Environmental	Water		Preparation for Total Organic Carbon by Combustion
Preparation for Dissolved Organic Carbon for Combustion	EP358  Vancouver - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Dissolved Metals Water Filtration	EP421  Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509  Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

## QUALITY CONTROL REPORT

<b>Work Order</b>	<b>: VA22C9420</b>	<b>Page</b>	: 1 of 18
<b>Client</b>	: Regional District of Kitimat-Stikine	<b>Laboratory</b>	: Vancouver - Environmental
<b>Contact</b>	: Hannah Shinton	<b>Account Manager</b>	: Amber Springer
<b>Address</b>	: # 300 - 4545 Lazelle Avenue Terrace BC Canada V8G 4E1	<b>Address</b>	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
<b>Telephone</b>	:	<b>Telephone</b>	: +1 604 253 4188
<b>Project</b>	: Forceman Ridge Groundwater	<b>Date Samples Received</b>	: 03-Dec-2022 11:30
<b>PO</b>	: ----	<b>Date Analysis Commenced</b>	: 05-Dec-2022
<b>C-O-C number</b>	: ----	<b>Issue Date</b>	: 12-Dec-2022 11:11
<b>Sampler</b>	: H Shinton ----		
<b>Site</b>	:		
<b>Quote number</b>	: Default Water Testing (Q62338)		
<b>No. of samples received</b>	: 9		
<b>No. of samples analysed</b>	: 9		

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

### 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.

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Ann Joby	Lab Assistant	Vancouver Metals, Burnaby, British Columbia
Caitlin Macey	Team Leader - Inorganics	Vancouver Inorganics, Burnaby, British Columbia
Erin Sanchez		Vancouver Metals, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Vancouver Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Vancouver Metals, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Vancouver Inorganics, Burnaby, British Columbia
Qammar Almas	Lab Assistant	Vancouver Metals, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Vancouver Metals, Burnaby, British Columbia

Page : 2 of 18  
Work Order : VA22C9420  
Client : Regional District of Kitimat-Stikine  
Project : Forceman Ridge Groundwater

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## General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

### Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.  
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.  
DQO = Data Quality Objective.  
LOR = Limit of Reporting (detection limit).  
RPD = Relative Percent Difference  
# = Indicates a QC result that did not meet the ALS DQO.

## Workorder Comments

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Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

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### Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: <b>Water</b>					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Physical Tests (QC Lot: 767872)</b>											
VA22C9420-003	MW-02	pH	----	E108	0.10	pH units	6.14	6.17	0.487%	4%	----
<b>Physical Tests (QC Lot: 767873)</b>											
VA22C9420-003	MW-02	conductivity	----	E100	2.0	µS/cm	52.0	52.1	0.192%	10%	----
<b>Physical Tests (QC Lot: 767874)</b>											
VA22C9420-003	MW-02	alkalinity, total (as CaCO <sub>3</sub> )	----	E290	1.0	mg/L	22.8	22.6	0.889%	20%	----
<b>Anions and Nutrients (QC Lot: 767875)</b>											
VA22C9420-001	MW-13	fluoride	16984-48-8	E235.F	0.020	mg/L	0.026	0.022	0.004	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 767876)</b>											
VA22C9420-001	MW-13	chloride	16887-00-6	E235.Cl	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 767877)</b>											
VA22C9420-001	MW-13	bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 767878)</b>											
VA22C9420-001	MW-13	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.110	0.110	0.172%	20%	----
<b>Anions and Nutrients (QC Lot: 767879)</b>											
VA22C9420-001	MW-13	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 767880)</b>											
VA22C9420-001	MW-13	sulfate (as SO <sub>4</sub> )	14808-79-8	E235.SO4	0.30	mg/L	0.53	0.53	0.007	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 767881)</b>											
VA22C9420-001	MW-13	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 768026)</b>											
VA22C9420-001	MW-13	Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 768029)</b>											
VA22C9416-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.238	0.230	3.38%	20%	----
<b>Organic / Inorganic Carbon (QC Lot: 768027)</b>											
VA22C9416-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.13	1.01	0.12	Diff <2x LOR	----
<b>Organic / Inorganic Carbon (QC Lot: 768028)</b>											
VA22C9416-001	Anonymous	carbon, total organic [TOC]	----	E355-L	0.50	mg/L	0.93	0.96	0.04	Diff <2x LOR	----
<b>Dissolved Metals (QC Lot: 768025)</b>											
VA22C9420-001	MW-13	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0168	0.0166	1.33%	20%	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----



Sub-Matrix: **Water**

Laboratory Duplicate (DUP) Report

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Dissolved Metals (QC Lot: 768025) - continued</b>											
VA22C9420-001	MW-13	arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0158	0.0167	5.62%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	0.0000087	0.0000098	0.0000010	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	3.39	3.43	1.28%	20%	----
		cesium, dissolved	7440-46-2	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		chromium, dissolved	7440-47-3	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	0.296	0.295	0.240%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00074	0.00078	0.00004	Diff <2x LOR	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	0.206	0.218	0.012	Diff <2x LOR	----
		rubidium, dissolved	7440-17-7	E421	0.00020	mg/L	0.00036	0.00045	0.00009	Diff <2x LOR	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	3.38	3.37	0.467%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	7440-23-5	E421	0.050	mg/L	0.969	0.987	1.83%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.0411	0.0422	2.85%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	----
		tellurium, dissolved	13494-80-9	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		thorium, dissolved	7440-29-1	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		tungsten, dissolved	7440-33-7	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.000040	0.000044	0.000003	Diff <2x LOR	----



Sub-Matrix: Water					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Dissolved Metals (QC Lot: 768025) - continued</b>											
VA22C9420-001	MW-13	vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
<b>Dissolved Metals (QC Lot: 768302)</b>											
YL2202065-002	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0200	mg/L	<0.0200	<0.0200	0	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00200	mg/L	0.684	0.713	4.07%	20%	----
		arsenic, dissolved	7440-38-2	E421	0.00200	mg/L	25.0	25.0	0.113%	20%	----
		barium, dissolved	7440-39-3	E421	0.00200	mg/L	0.0372	0.0376	1.17%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000400	mg/L	<0.000400	<0.000400	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.200	mg/L	0.294	0.301	0.007	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.000100	mg/L	0.000315	0.000389	0.0000740	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	1.00	mg/L	318	325	2.04%	20%	----
		cesium, dissolved	7440-46-2	E421	0.000200	mg/L	0.000458	0.000496	0.000038	Diff <2x LOR	----
		chromium, dissolved	7440-47-3	E421	0.0100	mg/L	<0.0100	<0.0100	0	Diff <2x LOR	----
		cobalt, dissolved	7440-48-4	E421	0.00200	mg/L	0.0354	0.0344	3.00%	20%	----
		copper, dissolved	7440-50-8	E421	0.00400	mg/L	0.00556	0.00527	0.00029	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.200	mg/L	<0.200	<0.200	0	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.00100	mg/L	0.00382	0.00377	0.000049	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0200	mg/L	0.0305	0.0311	0.0006	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.100	mg/L	87.8	91.6	4.26%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00200	mg/L	0.513	0.509	0.785%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.00100	mg/L	0.0153	0.0155	1.18%	20%	----
		nickel, dissolved	7440-02-0	E421	0.0100	mg/L	0.0390	0.0400	0.00098	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	1.00	mg/L	<1.00	<1.00	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	1.00	mg/L	10.6	10.7	1.46%	20%	----
		rubidium, dissolved	7440-17-7	E421	0.00400	mg/L	0.00886	0.00777	0.00109	Diff <2x LOR	----
		selenium, dissolved	7782-49-2	E421	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
silicon, dissolved	7440-21-3	E421	1.00	mg/L	5.12	5.14	0.019	Diff <2x LOR	----		
silver, dissolved	7440-22-4	E421	0.000200	mg/L	<0.000200	<0.000200	0	Diff <2x LOR	----		
sodium, dissolved	7440-23-5	E421	1.00	mg/L	155	157	1.39%	20%	----		
strontium, dissolved	7440-24-6	E421	0.00400	mg/L	3.95	3.98	0.791%	20%	----		
sulfur, dissolved	7704-34-9	E421	10.0	mg/L	269	270	0.440%	20%	----		
tellurium, dissolved	13494-80-9	E421	0.00400	mg/L	<0.00400	<0.00400	0	Diff <2x LOR	----		



Sub-Matrix: Water					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Dissolved Metals (QC Lot: 768302) - continued</b>											
YL2202065-002	Anonymous	thallium, dissolved	7440-28-0	E421	0.000200	mg/L	<0.000200	<0.000200	0	Diff <2x LOR	----
		thorium, dissolved	7440-29-1	E421	0.00200	mg/L	<0.00200	<0.00200	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00200	mg/L	<0.00200	<0.00200	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00600	mg/L	<0.00600	<0.00600	0	Diff <2x LOR	----
		tungsten, dissolved	7440-33-7	E421	0.00200	mg/L	<0.00200	<0.00200	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000200	mg/L	0.00545	0.00546	0.0612%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.0100	mg/L	<0.0100	<0.0100	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0200	mg/L	0.0562	0.0573	0.0011	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00600	mg/L	<0.00600	<0.00600	0	Diff <2x LOR	----
<b>Dissolved Metals (QC Lot: 769067)</b>											
VA22C9416-004	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
<b>Aggregate Organics (QC Lot: 771895)</b>											
VA22C9303-010	Anonymous	chemical oxygen demand [COD]	----	E559-L	10	mg/L	12	14	2	Diff <2x LOR	----



## Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Physical Tests (QCLot: 767873)</b>						
conductivity	---	E100	1	µS/cm	1.6	---
<b>Physical Tests (QCLot: 767874)</b>						
alkalinity, total (as CaCO3)	---	E290	1	mg/L	<1.0	---
<b>Anions and Nutrients (QCLot: 767875)</b>						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	---
<b>Anions and Nutrients (QCLot: 767876)</b>						
chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	---
<b>Anions and Nutrients (QCLot: 767877)</b>						
bromide	24959-67-9	E235.Br-L	0.05	mg/L	<0.050	---
<b>Anions and Nutrients (QCLot: 767878)</b>						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	---
<b>Anions and Nutrients (QCLot: 767879)</b>						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	---
<b>Anions and Nutrients (QCLot: 767880)</b>						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	---
<b>Anions and Nutrients (QCLot: 767881)</b>						
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	---
<b>Anions and Nutrients (QCLot: 768026)</b>						
Kjeldahl nitrogen, total [TKN]	---	E318	0.05	mg/L	<0.050	---
<b>Anions and Nutrients (QCLot: 768029)</b>						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	---
<b>Organic / Inorganic Carbon (QCLot: 768027)</b>						
carbon, dissolved organic [DOC]	---	E358-L	0.5	mg/L	<0.50	---
<b>Organic / Inorganic Carbon (QCLot: 768028)</b>						
carbon, total organic [TOC]	---	E355-L	0.5	mg/L	<0.50	---
<b>Dissolved Metals (QCLot: 768025)</b>						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	MBRR
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	---
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	---
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	---
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	---
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	---





Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Dissolved Metals (QCLot: 768025) - continued</b>						
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cesium, dissolved	7440-46-2	E421	0.00001	mg/L	<0.000010	----
chromium, dissolved	7440-47-3	E421	0.0005	mg/L	<0.00050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
rubidium, dissolved	7440-17-7	E421	0.0002	mg/L	<0.00020	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	<0.00020	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
thorium, dissolved	7440-29-1	E421	0.0001	mg/L	<0.00010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
tungsten, dissolved	7440-33-7	E421	0.0001	mg/L	<0.00010	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----
<b>Dissolved Metals (QCLot: 768302)</b>						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----



Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Dissolved Metals (QCLot: 768302) - continued</b>						
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cesium, dissolved	7440-46-2	E421	0.00001	mg/L	<0.000010	----
chromium, dissolved	7440-47-3	E421	0.0005	mg/L	<0.00050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
rubidium, dissolved	7440-17-7	E421	0.0002	mg/L	<0.00020	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	<0.00020	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
thorium, dissolved	7440-29-1	E421	0.0001	mg/L	<0.00010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
tungsten, dissolved	7440-33-7	E421	0.0001	mg/L	<0.00010	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----



Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Dissolved Metals (QCLot: 768302) - continued</b>						
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----
<b>Dissolved Metals (QCLot: 769067)</b>						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----
<b>Aggregate Organics (QCLot: 771895)</b>						
chemical oxygen demand [COD]	----	E559-L	10	mg/L	<10	----

**Qualifiers**

Qualifier	Description
MBRR	Initial MB for this submission had positive results for flagged analyte (data not shown). Low level samples were repeated with new QC (2nd MB results shown). High level results (>5x initial MB level) and non-detect results were reported and are defensible



## Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: Water					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		Qualifier
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	
<b>Physical Tests (QCLot: 767872)</b>									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
<b>Physical Tests (QCLot: 767873)</b>									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	100	90.0	110	----
<b>Physical Tests (QCLot: 767874)</b>									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	103	85.0	115	----
<b>Anions and Nutrients (QCLot: 767875)</b>									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	100	90.0	110	----
<b>Anions and Nutrients (QCLot: 767876)</b>									
chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	101	90.0	110	----
<b>Anions and Nutrients (QCLot: 767877)</b>									
bromide	24959-67-9	E235.Br-L	0.05	mg/L	0.5 mg/L	99.4	85.0	115	----
<b>Anions and Nutrients (QCLot: 767878)</b>									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	103	90.0	110	----
<b>Anions and Nutrients (QCLot: 767879)</b>									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	100	90.0	110	----
<b>Anions and Nutrients (QCLot: 767880)</b>									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	103	90.0	110	----
<b>Anions and Nutrients (QCLot: 767881)</b>									
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.03 mg/L	98.7	80.0	120	----
<b>Anions and Nutrients (QCLot: 768026)</b>									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	91.5	75.0	125	----
<b>Anions and Nutrients (QCLot: 768029)</b>									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	92.4	85.0	115	----
<b>Organic / Inorganic Carbon (QCLot: 768027)</b>									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	99.6	80.0	120	----
<b>Organic / Inorganic Carbon (QCLot: 768028)</b>									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	8.57 mg/L	101	80.0	120	----
<b>Dissolved Metals (QCLot: 768025)</b>									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	102	80.0	120	----



Sub-Matrix: **Water**

Laboratory Control Sample (LCS) Report

Analyte	CAS Number	Method	LOR	Unit	Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
<b>Dissolved Metals (QCLot: 768025) - continued</b>									
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	102	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	105	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	98.6	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	99.5	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	97.5	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	98.4	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	99.3	80.0	120	----
cesium, dissolved	7440-46-2	E421	0.00001	mg/L	0.05 mg/L	101	80.0	120	----
chromium, dissolved	7440-47-3	E421	0.0005	mg/L	0.25 mg/L	101	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	99.6	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	100	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	106	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	101	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	98.5	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	104	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	99.0	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	99.7	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	101	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	102	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	106	80.0	120	----
rubidium, dissolved	7440-17-7	E421	0.0002	mg/L	0.1 mg/L	105	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	102	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	105	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	94.0	80.0	120	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	110	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	103	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	104	80.0	120	----
tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	0.1 mg/L	103	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	105	80.0	120	----
thorium, dissolved	7440-29-1	E421	0.0001	mg/L	0.1 mg/L	98.7	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	96.9	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	100	80.0	120	----
tungsten, dissolved	7440-33-7	E421	0.0001	mg/L	0.1 mg/L	96.7	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	104	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	103	80.0	120	----





Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
<b>Dissolved Metals (QCLot: 768025) - continued</b>									
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	104	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	95.4	80.0	120	----
<b>Dissolved Metals (QCLot: 768302)</b>									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	105	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	98.2	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	108	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	103	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	99.5	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	97.9	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	103	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	101	80.0	120	----
cesium, dissolved	7440-46-2	E421	0.00001	mg/L	0.05 mg/L	98.0	80.0	120	----
chromium, dissolved	7440-47-3	E421	0.0005	mg/L	0.25 mg/L	102	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	100	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	105	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	101	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	105	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	108	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	99.7	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	103	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	113	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	109	80.0	120	----
rubidium, dissolved	7440-17-7	E421	0.0002	mg/L	0.1 mg/L	106	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	103	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	104	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	96.7	80.0	120	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	105	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	103	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	103	80.0	120	----
tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	0.1 mg/L	99.0	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	104	80.0	120	----
thorium, dissolved	7440-29-1	E421	0.0001	mg/L	0.1 mg/L	87.5	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	97.8	80.0	120	----



Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
<b>Dissolved Metals (QCLot: 768302) - continued</b>									
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	97.8	80.0	120	----
tungsten, dissolved	7440-33-7	E421	0.0001	mg/L	0.1 mg/L	97.9	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	106	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	103	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	105	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	95.3	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	98.4	80.0	120	----
<b>Aggregate Organics (QCLot: 771895)</b>									
chemical oxygen demand [COD]	----	E559-L	10	mg/L	100 mg/L	105	85.0	115	----



## Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
<b>Anions and Nutrients (QCLot: 767875)</b>										
VA22C9420-002	MW-22	fluoride	16984-48-8	E235.F	1.01 mg/L	1 mg/L	101	75.0	125	----
<b>Anions and Nutrients (QCLot: 767876)</b>										
VA22C9420-002	MW-22	chloride	16887-00-6	E235.Cl	102 mg/L	100 mg/L	102	75.0	125	----
<b>Anions and Nutrients (QCLot: 767877)</b>										
VA22C9420-002	MW-22	bromide	24959-67-9	E235.Br-L	0.504 mg/L	0.5 mg/L	101	75.0	125	----
<b>Anions and Nutrients (QCLot: 767878)</b>										
VA22C9420-002	MW-22	nitrate (as N)	14797-55-8	E235.NO3-L	2.59 mg/L	2.5 mg/L	104	75.0	125	----
<b>Anions and Nutrients (QCLot: 767879)</b>										
VA22C9420-002	MW-22	nitrite (as N)	14797-65-0	E235.NO2-L	0.505 mg/L	0.5 mg/L	101	75.0	125	----
<b>Anions and Nutrients (QCLot: 767880)</b>										
VA22C9420-002	MW-22	sulfate (as SO4)	14808-79-8	E235.SO4	103 mg/L	100 mg/L	103	75.0	125	----
<b>Anions and Nutrients (QCLot: 767881)</b>										
VA22C9420-002	MW-22	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0293 mg/L	0.03 mg/L	97.7	70.0	130	----
<b>Anions and Nutrients (QCLot: 768026)</b>										
VA22C9420-002	MW-22	Kjeldahl nitrogen, total [TKN]	----	E318	2.21 mg/L	2.5 mg/L	88.4	70.0	130	----
<b>Anions and Nutrients (QCLot: 768029)</b>										
VA22C9416-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0937 mg/L	0.1 mg/L	93.7	75.0	125	----
<b>Organic / Inorganic Carbon (QCLot: 768027)</b>										
VA22C9416-002	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	5.40 mg/L	5 mg/L	108	70.0	130	----
<b>Organic / Inorganic Carbon (QCLot: 768028)</b>										
VA22C9416-002	Anonymous	carbon, total organic [TOC]	----	E355-L	4.21 mg/L	5 mg/L	84.2	70.0	130	----
<b>Dissolved Metals (QCLot: 768025)</b>										
VA22C9420-002	MW-22	aluminum, dissolved	7429-90-5	E421	0.194 mg/L	0.2 mg/L	97.3	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0198 mg/L	0.02 mg/L	99.3	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0198 mg/L	0.02 mg/L	99.0	70.0	130	----
		barium, dissolved	7440-39-3	E421	0.0192 mg/L	0.02 mg/L	96.2	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0393 mg/L	0.04 mg/L	98.3	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00936 mg/L	0.01 mg/L	93.6	70.0	130	----



Sub-Matrix: Water

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
<b>Dissolved Metals (QCLot: 768025) - continued</b>										
VA22C9420-002	MW-22	boron, dissolved	7440-42-8	E421	0.095 mg/L	0.1 mg/L	95.4	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00403 mg/L	0.004 mg/L	101	70.0	130	----
		calcium, dissolved	7440-70-2	E421	3.86 mg/L	4 mg/L	96.4	70.0	130	----
		cesium, dissolved	7440-46-2	E421	0.0101 mg/L	0.01 mg/L	101	70.0	130	----
		chromium, dissolved	7440-47-3	E421	0.0394 mg/L	0.04 mg/L	98.6	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0199 mg/L	0.02 mg/L	99.3	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0199 mg/L	0.02 mg/L	99.3	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.95 mg/L	2 mg/L	97.6	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0201 mg/L	0.02 mg/L	100	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0956 mg/L	0.1 mg/L	95.6	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	0.993 mg/L	1 mg/L	99.3	70.0	130	----
		manganese, dissolved	7439-96-5	E421	0.0198 mg/L	0.02 mg/L	99.2	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0196 mg/L	0.02 mg/L	98.2	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0400 mg/L	0.04 mg/L	99.9	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	9.70 mg/L	10 mg/L	97.0	70.0	130	----
		potassium, dissolved	7440-09-7	E421	4.07 mg/L	4 mg/L	102	70.0	130	----
		rubidium, dissolved	7440-17-7	E421	0.0205 mg/L	0.02 mg/L	102	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0405 mg/L	0.04 mg/L	101	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.75 mg/L	10 mg/L	97.5	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00400 mg/L	0.004 mg/L	100	70.0	130	----
		sodium, dissolved	7440-23-5	E421	2.12 mg/L	2 mg/L	106	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	20.1 mg/L	20 mg/L	100	70.0	130	----
		tellurium, dissolved	13494-80-9	E421	0.0404 mg/L	0.04 mg/L	101	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00396 mg/L	0.004 mg/L	99.0	70.0	130	----
		thorium, dissolved	7440-29-1	E421	0.0208 mg/L	0.02 mg/L	104	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0195 mg/L	0.02 mg/L	97.3	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0398 mg/L	0.04 mg/L	99.4	70.0	130	----
		tungsten, dissolved	7440-33-7	E421	0.0193 mg/L	0.02 mg/L	96.7	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00406 mg/L	0.004 mg/L	101	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.0998 mg/L	0.1 mg/L	99.8	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.423 mg/L	0.4 mg/L	106	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0399 mg/L	0.04 mg/L	99.7	70.0	130	----
<b>Dissolved Metals (QCLot: 768302)</b>										
YL2202065-003	Anonymous	aluminum, dissolved	7429-90-5	E421	0.193 mg/L	0.2 mg/L	96.6	70.0	130	----



Sub-Matrix: Water

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
<b>Dissolved Metals (QCLot: 768302) - continued</b>										
YL2202065-003	Anonymous	antimony, dissolved	7440-36-0	E421	0.0191 mg/L	0.02 mg/L	95.4	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0192 mg/L	0.02 mg/L	96.0	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0384 mg/L	0.04 mg/L	96.1	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00825 mg/L	0.01 mg/L	82.5	70.0	130	----
		boron, dissolved	7440-42-8	E421	ND mg/L	0.1 mg/L	ND	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00386 mg/L	0.004 mg/L	96.4	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cesium, dissolved	7440-46-2	E421	0.0100 mg/L	0.01 mg/L	100	70.0	130	----
		chromium, dissolved	7440-47-3	E421	0.0380 mg/L	0.04 mg/L	94.9	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0192 mg/L	0.02 mg/L	95.8	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0186 mg/L	0.02 mg/L	92.8	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.84 mg/L	2 mg/L	92.0	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0182 mg/L	0.02 mg/L	91.2	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0931 mg/L	0.1 mg/L	93.1	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0198 mg/L	0.02 mg/L	99.2	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0381 mg/L	0.04 mg/L	95.2	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	10.4 mg/L	10 mg/L	104	70.0	130	----
		potassium, dissolved	7440-09-7	E421	3.96 mg/L	4 mg/L	99.0	70.0	130	----
		rubidium, dissolved	7440-17-7	E421	0.0193 mg/L	0.02 mg/L	96.5	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0378 mg/L	0.04 mg/L	94.6	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.10 mg/L	10 mg/L	91.0	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00325 mg/L	0.004 mg/L	81.4	70.0	130	----
		sodium, dissolved	7440-23-5	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	20.9 mg/L	20 mg/L	105	70.0	130	----
		tellurium, dissolved	13494-80-9	E421	0.0392 mg/L	0.04 mg/L	98.0	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00367 mg/L	0.004 mg/L	91.7	70.0	130	----
		thorium, dissolved	7440-29-1	E421	0.0188 mg/L	0.02 mg/L	93.9	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0195 mg/L	0.02 mg/L	97.6	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0387 mg/L	0.04 mg/L	96.7	70.0	130	----
		tungsten, dissolved	7440-33-7	E421	0.0184 mg/L	0.02 mg/L	92.2	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00386 mg/L	0.004 mg/L	96.5	70.0	130	----





Sub-Matrix: **Water**

					<i>Matrix Spike (MS) Report</i>					
					<i>Spike</i>		<i>Recovery (%)</i>	<i>Recovery Limits (%)</i>		
<i>Laboratory sample ID</i>	<i>Client sample ID</i>	<i>Analyte</i>	<i>CAS Number</i>	<i>Method</i>	<i>Concentration</i>	<i>Target</i>	<i>MS</i>	<i>Low</i>	<i>High</i>	<i>Qualifier</i>
<b>Dissolved Metals (QCLot: 768302) - continued</b>										
YL2202065-003	Anonymous	vanadium, dissolved	7440-62-2	E421	0.0974 mg/L	0.1 mg/L	97.4	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.398 mg/L	0.4 mg/L	99.5	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0410 mg/L	0.04 mg/L	102	70.0	130	----
<b>Dissolved Metals (QCLot: 769067)</b>										
VA22C9417-002	Anonymous	mercury, dissolved	7439-97-6	E509	0.000100 mg/L	0.0001 mg/L	100	70.0	130	----
<b>Aggregate Organics (QCLot: 771895)</b>										
VA22C9303-011	Anonymous	chemical oxygen demand [COD]	----	E559-L	108 mg/L	100 mg/L	108	75.0	125	----



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Canada Toll Free: 1 800 668 9878

<b>Report To</b> Contact and company name below will appear on the final report Company: Regional District of Kitimat-Stikine Contact: Hannah Shinton Phone: 250-615-6100 Company address below will appear on the final report		<b>Report Format / Distribution</b> Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input checked="" type="checkbox"/> EDD (DIGITAL) Quality Control (QC) Report with Report <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> Compare Results to Criteria on Report - provide details below if box checked Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX		Select Service Level Below - Contact your AM to confirm all E&P <b>Regular [R]</b> <input checked="" type="checkbox"/> Standard TAT if received by 3 pm - business day <b>EMERGENCY</b> 4 day [P4-20%] <input type="checkbox"/> 3 day [P3-25%] <input type="checkbox"/> 2 day [P2-50%] <input type="checkbox"/> 1 Business day [E1 - 10] Same Day, Weekend or (Laboratory opening fee)																																	
Street: 4545 Lazelle Avenue City/Province: Terrace/BC Postal Code: V8G4E1		Email 1 or Fax: enviro.dept@rdks.bc.ca Email 2: hshinton@rdks.bc.ca Email 3:		Date and Time Required for all E&P TATs: Telephone: +1 604 253 4188																																	
<b>Invoice To</b> Same as Report To <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO Copy of Invoice with Report <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO Company: Regional District of Kitimat-Stikine Contact: Hannah Shinton		<b>Invoice Distribution</b> Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX Email 1 or Fax: anne-maries@rdks.bc.ca Email 2: hshinton@rdks.bc.ca; enviro.dept@rdks.bc.ca		<b>Analysis Request</b> Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below																																	
<b>Project Information</b> ALS Account # / Quote #: VA19-RDKS100-001 Job #: Forceman Ridge Groundwater PO / AFE: LSD:		<b>Oil and Gas Required Fields (client use)</b> AFE/Cost Center: PO# Major/Minor Code: Routing Code: Requisitioner: Location:		<table border="1"> <tr> <td>F/P</td> <td></td> <td></td> <td>P</td> <td></td> <td>P</td> <td>P</td> <td>P</td> <td>P</td> <td>P</td> <td>P</td> <td>P</td> <td></td> <td></td> <td>P</td> <td>F/P</td> </tr> <tr> <td>Disolved metals</td> <td>alkalinity</td> <td>chloride</td> <td>fluoride</td> <td>sulphate</td> <td>hardness</td> <td>ammonia</td> <td>nitrate, nitrite</td> <td>orthophosphate</td> <td>TOC</td> <td>COO</td> <td>Conductivity</td> <td>pH</td> <td>Total Kjeldahl Nitrogen</td> <td>Dissolved Organic Carbon</td> <td>SAMPLES ON HOLD</td> </tr> </table>		F/P			P		P	P	P	P	P	P	P			P	F/P	Disolved metals	alkalinity	chloride	fluoride	sulphate	hardness	ammonia	nitrate, nitrite	orthophosphate	TOC	COO	Conductivity	pH	Total Kjeldahl Nitrogen	Dissolved Organic Carbon	SAMPLES ON HOLD
F/P			P		P	P	P	P	P	P	P			P	F/P																						
Disolved metals	alkalinity	chloride	fluoride	sulphate	hardness	ammonia	nitrate, nitrite	orthophosphate	TOC	COO	Conductivity	pH	Total Kjeldahl Nitrogen	Dissolved Organic Carbon	SAMPLES ON HOLD																						
<b>ALS Lab Work Order # (lab use only):</b>		<b>ALS Contact:</b>		<b>Sampler:</b> H. Shinton																																	
<b>ALS Sample # (lab use only)</b>		<b>Sample Identification and/or Coordinates (This description will appear on the report)</b>		<b>Date (dd-mmm-yy)</b>		<b>Time (hh:mm)</b>		<b>Sample Type</b>																													
		MW-13		30-Nov-22		11:00		Water																													
		MW-22		30-Nov-22		12:00		Water																													
		MW-02		30-Nov-22		12:17		Water																													
		MW-01		30-Nov-22		13:30		Water																													
		MW-03		1-Dec-22		10:39		Water																													
		MW-04		30-Nov-22		9:15		Water																													
		MW-09		30-Nov-22		10:00		Water																													
		Field Blank		1-Dec-22		13:21		Water																													
		Trip Blank		1-Dec-22		--		Water																													
<b>Drinking Water (DW) Samples<sup>1</sup> (client use)</b>		<b>Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)</b>		<b>SAMPLE CONDITION AS RECEIVED (lab use only)</b> Frozen <input type="checkbox"/> SIF Observations Yes <input type="checkbox"/> No <input type="checkbox"/> Ice Packs <input type="checkbox"/> Ice Cubes <input type="checkbox"/> Custody seal intact Yes <input type="checkbox"/> No <input type="checkbox"/> Cooling Initiated <input type="checkbox"/>																																	
Are samples taken from a Regulated DW System? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		British Columbia Approved and Working Water Quality Guidelines (MAY, 2015)		INITIAL COOLER TEMPERATURES °C: 0.1 5.4 8.8 FINAL COOLER TEMPERATURES °C: 10																																	
Are samples for human consumption/ use? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		<b>SHIPMENT RELEASE (client use)</b> Released by: Hannah Shinton Date: December 2nd, 2022 Time:		<b>INITIAL SHIPMENT RECEPTION (lab use only)</b> Received by: [Signature] Date: DEC 2/22 Time: 09:41		<b>FINAL SHIPMENT RECEPTION (lab use only)</b> Received by: JC Date: 3 Dec 22 Time: 11:30am																															

**Terrace Shipping**  
 # 1 Coolers Ground   
 # Carbouys Air   
 SFX



## CERTIFICATE OF ANALYSIS

**Work Order** : **VA22C0792**  
**Client** : **Regional District of Kitimat-Stikine**  
**Contact** : Hannah Shinton  
**Address** : # 300 - 4545 Lazelle Avenue  
Terrace BC Canada V8G 4E1  
**Telephone** : ----  
**Project** : Foreceman Facility Sand Cyclone  
**PO** : ----  
**C-O-C number** : ----  
**Sampler** : HS  
**Site** :  
**Quote number** : Default Water Testing (Q62338)  
**No. of samples received** : 4  
**No. of samples analysed** : 4

**Page** : 1 of 5  
**Laboratory** : Vancouver - Environmental  
**Account Manager** : Amber Springer  
**Address** : 8081 Lougheed Highway  
Burnaby BC Canada V5A 1W9  
**Telephone** : +1 604 253 4188  
**Date Samples Received** : 01-Sep-2022 21:15  
**Date Analysis Commenced** : 02-Sep-2022  
**Issue Date** : 14-Sep-2022 12:21

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

### Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Inorganics, Burnaby, British Columbia
Qammar Almas	Lab Assistant	Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics, Burnaby, British Columbia



## General Comments

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

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

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

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

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

<i>Unit</i>	<i>Description</i>
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.

## Qualifiers

<i>Qualifier</i>	<i>Description</i>
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
TKNI	TKN result may be biased low due to Nitrate interference. Nitrate-N is > 10x TKN.



## Analytical Results

Sub-Matrix: Water					Client sample ID	F5- Sand Cyclone	Facility 21	Field Blank	Travel Blank	----
(Matrix: Water)					Client sampling date / time	31-Aug-2022 09:28	31-Aug-2022 12:00	31-Aug-2022 09:08	31-Aug-2022	----
Analyte	CAS Number	Method	LOR	Unit	VA22C0792-001	VA22C0792-002	VA22C0792-003	VA22C0792-004	-----	
					Result	Result	Result	Result	----	
<b>Physical Tests</b>										
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	263	265	1.0	----	----	
conductivity	----	E100	2.0	µS/cm	1130	1130	<2.0	----	----	
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L	229	234	<0.60	<0.60	----	
pH	----	E108	0.10	pH units	8.44	8.43	----	----	----	
<b>Anions and Nutrients</b>										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	1.81	1.80	<0.0050	<0.0050	----	
bromide	24959-67-9	E235.Br-L	0.050	mg/L	0.360	0.347	----	----	----	
chloride	16887-00-6	E235.Cl	0.50	mg/L	120	120	----	----	----	
fluoride	16984-48-8	E235.F	0.020	mg/L	<0.100 <sup>DLDS</sup>	<0.100 <sup>DLDS</sup>	----	----	----	
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	3.64 <sup>TKNI</sup>	3.19 <sup>TKNI</sup>	<0.050	----	----	
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	37.2	37.2	<0.0050	----	----	
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	0.141	0.141	<0.0010	----	----	
nitrogen, total	7727-37-9	E366	0.030	mg/L	40.6	37.9	<0.030	----	----	
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	0.0963	0.0947	<0.0010	----	----	
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	4.34	4.25	<0.30	----	----	
<b>Organic / Inorganic Carbon</b>										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	17.5	18.1	----	----	----	
carbon, total organic [TOC]	----	E355-L	0.50	mg/L	17.5	18.2	<0.50	----	----	
<b>Total Metals</b>										
aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0129	0.0132	<0.0030	----	----	
antimony, total	7440-36-0	E420	0.00010	mg/L	0.00058	0.00059	<0.00010	----	----	
arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00103	0.00107	<0.00010	----	----	
barium, total	7440-39-3	E420	0.00010	mg/L	0.0494	0.0500	<0.00010	----	----	
beryllium, total	7440-41-7	E420	0.000100	mg/L	<0.000100	<0.000100	<0.000100	----	----	
bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	<0.000050	----	----	
boron, total	7440-42-8	E420	0.010	mg/L	0.940	0.971	<0.010	----	----	
cadmium, total	7440-43-9	E420	0.0000050	mg/L	0.000300	0.000291	<0.0000050	----	----	
calcium, total	7440-70-2	E420	0.050	mg/L	61.2	62.7	<0.050	<0.050	----	
cesium, total	7440-46-2	E420	0.000010	mg/L	0.000241	0.000243	<0.000010	----	----	
chromium, total	7440-47-3	E420	0.00050	mg/L	0.00075	0.00072	<0.00050	----	----	





## Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	F5- Sand Cyclone	Facility 21	Field Blank	Travel Blank	----
Client sampling date / time					31-Aug-2022 09:28	31-Aug-2022 12:00	31-Aug-2022 09:08	31-Aug-2022	----	
Analyte	CAS Number	Method	LOR	Unit	VA22C0792-001	VA22C0792-002	VA22C0792-003	VA22C0792-004	-----	
					Result	Result	Result	Result	---	
<b>Total Metals</b>										
cobalt, total	7440-48-4	E420	0.00010	mg/L	0.00098	0.00100	<0.00010	----	----	
copper, total	7440-50-8	E420	0.00050	mg/L	0.00558	0.00560	<0.00050	----	----	
iron, total	7439-89-6	E420	0.010	mg/L	0.136	0.126	<0.010	----	----	
lead, total	7439-92-1	E420	0.000050	mg/L	0.000282	0.000284	<0.000050	----	----	
lithium, total	7439-93-2	E420	0.0010	mg/L	<0.0010	<0.0010	<0.0010	----	----	
magnesium, total	7439-95-4	E420	0.0050	mg/L	18.6	18.8	<0.0050	<0.0050	----	
manganese, total	7439-96-5	E420	0.00010	mg/L	0.379	0.381	<0.00010	----	----	
mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	----	----	
molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.000322	0.000323	<0.000050	----	----	
nickel, total	7440-02-0	E420	0.00050	mg/L	0.00625	0.00635	<0.00050	----	----	
phosphorus, total	7723-14-0	E420	0.050	mg/L	0.168	0.174	<0.050	----	----	
potassium, total	7440-09-7	E420	0.050	mg/L	51.8	52.8	<0.050	----	----	
rubidium, total	7440-17-7	E420	0.00020	mg/L	0.0496	0.0496	<0.00020	----	----	
selenium, total	7782-49-2	E420	0.000050	mg/L	0.000113	0.000074	<0.000050	----	----	
silicon, total	7440-21-3	E420	0.10	mg/L	2.79	2.80	<0.10	----	----	
silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	<0.000010	----	----	
sodium, total	7440-23-5	E420	0.050	mg/L	116	117	<0.050	----	----	
strontium, total	7440-24-6	E420	0.00020	mg/L	0.368	0.372	<0.00020	----	----	
sulfur, total	7704-34-9	E420	0.50	mg/L	2.47	2.70	<0.50	----	----	
tellurium, total	13494-80-9	E420	0.00020	mg/L	<0.00020	<0.00020	<0.00020	----	----	
thallium, total	7440-28-0	E420	0.000010	mg/L	0.000026	0.000030	<0.000010	----	----	
thorium, total	7440-29-1	E420	0.00010	mg/L	<0.00010	<0.00010	<0.00010	----	----	
tin, total	7440-31-5	E420	0.00010	mg/L	0.00010	0.00012	<0.00010	----	----	
titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	<0.00030	<0.00030	----	----	
tungsten, total	7440-33-7	E420	0.00010	mg/L	<0.00010	<0.00010	<0.00010	----	----	
uranium, total	7440-61-1	E420	0.000010	mg/L	0.000070	0.000069	<0.000010	----	----	
vanadium, total	7440-62-2	E420	0.00050	mg/L	0.00102	0.00102	<0.00050	----	----	
zinc, total	7440-66-6	E420	0.0030	mg/L	0.0049	0.0049	<0.0030	----	----	
zirconium, total	7440-67-7	E420	0.00020	mg/L	<0.00020	<0.00020	<0.00020	----	----	
<b>Aggregate Organics</b>										
biochemical oxygen demand [BOD]	----	E550	2.0	mg/L	<2.0	<2.0	----	----	----	



## Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	F5- Sand Cyclone	Facility 21	Field Blank	Travel Blank	----
Client sampling date / time					31-Aug-2022 09:28	31-Aug-2022 12:00	31-Aug-2022 09:08	31-Aug-2022	----	
Analyte	CAS Number	Method	LOR	Unit	VA22C0792-001	VA22C0792-002	VA22C0792-003	VA22C0792-004	-----	
					Result	Result	Result	Result	----	
<b>Aggregate Organics</b>										
chemical oxygen demand [COD]	----	E559-L	10	mg/L	58	84	<10	----	----	

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

## QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: <b>VA22C0792</b>	Page	: 1 of 15
Client	: <b>Regional District of Kitimat-Stikine</b>	Laboratory	: Vancouver - Environmental
Contact	: Hannah Shinton	Account Manager	: Amber Springer
Address	: # 300 - 4545 Lazelle Avenue Terrace BC Canada V8G 4E1	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: Foreceman Facility Sand Cyclone	Date Samples Received	: 01-Sep-2022 21:15
PO	: ----	Issue Date	: 14-Sep-2022 12:21
C-O-C number	: ----		
Sampler	: HS		
Site	:		
Quote number	: Default Water Testing (Q62338)		
No. of samples received	: 4		
No. of samples analysed	: 4		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

### Key

**Anonymous:** Refers to samples which are not part of this work order, but which formed part of the QC process lot.

**CAS Number:** Chemical Abstracts Service number is a unique identifier assigned to discrete substances.

**DQO:** Data Quality Objective.

**LOR:** Limit of Reporting (detection limit).

**RPD:** Relative Percent Difference.

### **Workorder Comments**

Holding times are displayed as "----" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

### **Summary of Outliers**

#### **Outliers : Quality Control Samples**

- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- Method Blank value outliers occur - please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

#### **Outliers: Reference Material (RM) Samples**

- No Reference Material (RM) Sample outliers occur.

#### **Outliers : Analysis Holding Time Compliance (Breaches)**

- Analysis Holding Time Outliers exist - please see following pages for full details.

#### **Outliers : Frequency of Quality Control Samples**

- No Quality Control Sample Frequency Outliers occur.





**Outliers : Quality Control Samples**

*Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes*

Matrix: **Water**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
<b>Method Blank (MB) Values</b>								
Physical Tests	QC-MRG2-6315840 01	----	alkalinity, total (as CaCO3)	----	E290	1.7 mg/L <sup>B</sup>	1.5 mg/L	Blank result exceeds permitted value

**Result Qualifiers**

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.



## Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Aggregate Organics : Biochemical Oxygen Demand - 5 day</b>											
<b>HDPE [BOD HT 3d]</b> F5- Sand Cyclone	E550	31-Aug-2022	----	----	----		03-Sep-2022	3 days	3 days	✓	
<b>Aggregate Organics : Biochemical Oxygen Demand - 5 day</b>											
<b>HDPE [BOD HT 3d]</b> Facility 21	E550	31-Aug-2022	----	----	----		03-Sep-2022	3 days	3 days	✓	
<b>Aggregate Organics : Chemical Oxygen Demand by Colourimetry (Low Level)</b>											
<b>Amber glass total (sulfuric acid)</b> F5- Sand Cyclone	E559-L	31-Aug-2022	----	----	----		09-Sep-2022	28 days	9 days	✓	
<b>Aggregate Organics : Chemical Oxygen Demand by Colourimetry (Low Level)</b>											
<b>Amber glass total (sulfuric acid)</b> Facility 21	E559-L	31-Aug-2022	----	----	----		09-Sep-2022	28 days	9 days	✓	
<b>Aggregate Organics : Chemical Oxygen Demand by Colourimetry (Low Level)</b>											
<b>Amber glass total (sulfuric acid)</b> Field Blank	E559-L	31-Aug-2022	----	----	----		09-Sep-2022	28 days	9 days	✓	
<b>Anions and Nutrients : Ammonia by Fluorescence</b>											
<b>Amber glass total (sulfuric acid)</b> F5- Sand Cyclone	E298	31-Aug-2022	09-Sep-2022	----	----		13-Sep-2022	28 days	13 days	✓	
<b>Anions and Nutrients : Ammonia by Fluorescence</b>											
<b>Amber glass total (sulfuric acid)</b> Facility 21	E298	31-Aug-2022	09-Sep-2022	----	----		13-Sep-2022	28 days	13 days	✓	





Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Ammonia by Fluorescence</b>											
<b>Amber glass total (sulfuric acid)</b> Field Blank	E298	31-Aug-2022	09-Sep-2022	----	----		13-Sep-2022	28 days	13 days	✓	
<b>Anions and Nutrients : Ammonia by Fluorescence</b>											
<b>Amber glass total (sulfuric acid)</b> Travel Blank	E298	31-Aug-2022	09-Sep-2022	----	----		13-Sep-2022	28 days	13 days	✓	
<b>Anions and Nutrients : Bromide in Water by IC (Low Level)</b>											
<b>HDPE</b> F5- Sand Cyclone	E235.Br-L	31-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	28 days	2 days	✓	
<b>Anions and Nutrients : Bromide in Water by IC (Low Level)</b>											
<b>HDPE</b> Facility 21	E235.Br-L	31-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	28 days	2 days	✓	
<b>Anions and Nutrients : Chloride in Water by IC</b>											
<b>HDPE</b> F5- Sand Cyclone	E235.Cl	31-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	28 days	2 days	✓	
<b>Anions and Nutrients : Chloride in Water by IC</b>											
<b>HDPE</b> Facility 21	E235.Cl	31-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	28 days	2 days	✓	
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001)</b>											
<b>HDPE</b> F5- Sand Cyclone	E378-U	31-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	3 days	2 days	✓	
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001)</b>											
<b>HDPE</b> Facility 21	E378-U	31-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	3 days	2 days	✓	
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001)</b>											
<b>HDPE</b> Field Blank	E378-U	31-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	3 days	2 days	✓	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Fluoride in Water by IC</b>											
HDPE F5- Sand Cyclone	E235.F	31-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	28 days	2 days	✔	
<b>Anions and Nutrients : Fluoride in Water by IC</b>											
HDPE Facility 21	E235.F	31-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	28 days	2 days	✔	
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>											
HDPE F5- Sand Cyclone	E235.NO3-L	31-Aug-2022	02-Sep-2022	3 days	2 days	✔	02-Sep-2022	3 days	0 days	✔	
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>											
HDPE Facility 21	E235.NO3-L	31-Aug-2022	02-Sep-2022	3 days	2 days	✔	02-Sep-2022	3 days	0 days	✔	
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>											
HDPE Field Blank	E235.NO3-L	31-Aug-2022	02-Sep-2022	3 days	2 days	✔	02-Sep-2022	3 days	0 days	✔	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
HDPE F5- Sand Cyclone	E235.NO2-L	31-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	3 days	2 days	✔	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
HDPE Facility 21	E235.NO2-L	31-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	3 days	2 days	✔	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
HDPE Field Blank	E235.NO2-L	31-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	3 days	2 days	✔	
<b>Anions and Nutrients : Sulfate in Water by IC</b>											
HDPE F5- Sand Cyclone	E235.SO4	31-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	28 days	2 days	✔	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Sulfate in Water by IC</b>											
<b>HDPE</b> Facility 21	E235.S04	31-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	28 days	2 days	✔	
<b>Anions and Nutrients : Sulfate in Water by IC</b>											
<b>HDPE</b> Field Blank	E235.S04	31-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	28 days	2 days	✔	
<b>Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)</b>											
<b>Amber glass total (sulfuric acid)</b> F5- Sand Cyclone	E318	31-Aug-2022	09-Sep-2022	----	----		11-Sep-2022	28 days	11 days	✔	
<b>Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)</b>											
<b>Amber glass total (sulfuric acid)</b> Facility 21	E318	31-Aug-2022	09-Sep-2022	----	----		11-Sep-2022	28 days	11 days	✔	
<b>Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)</b>											
<b>Amber glass total (sulfuric acid)</b> Field Blank	E318	31-Aug-2022	09-Sep-2022	----	----		11-Sep-2022	28 days	11 days	✔	
<b>Anions and Nutrients : Total Nitrogen by Colourimetry</b>											
<b>Amber glass total (sulfuric acid)</b> F5- Sand Cyclone	E366	31-Aug-2022	09-Sep-2022	----	----		12-Sep-2022	28 days	12 days	✔	
<b>Anions and Nutrients : Total Nitrogen by Colourimetry</b>											
<b>Amber glass total (sulfuric acid)</b> Facility 21	E366	31-Aug-2022	09-Sep-2022	----	----		12-Sep-2022	28 days	12 days	✔	
<b>Anions and Nutrients : Total Nitrogen by Colourimetry</b>											
<b>Amber glass total (sulfuric acid)</b> Field Blank	E366	31-Aug-2022	09-Sep-2022	----	----		12-Sep-2022	28 days	12 days	✔	
<b>Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)</b>											
<b>Amber glass dissolved (sulfuric acid)</b> F5- Sand Cyclone	E358-L	31-Aug-2022	09-Sep-2022	----	----		09-Sep-2022	28 days	9 days	✔	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)</b>											
<b>Amber glass dissolved (sulfuric acid)</b> Facility 21	E358-L	31-Aug-2022	09-Sep-2022	----	----		09-Sep-2022	28 days	9 days	✔	
<b>Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)</b>											
<b>Amber glass total (sulfuric acid)</b> F5- Sand Cyclone	E355-L	31-Aug-2022	09-Sep-2022	----	----		09-Sep-2022	28 days	9 days	✔	
<b>Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)</b>											
<b>Amber glass total (sulfuric acid)</b> Facility 21	E355-L	31-Aug-2022	09-Sep-2022	----	----		09-Sep-2022	28 days	9 days	✔	
<b>Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)</b>											
<b>Amber glass total (sulfuric acid)</b> Field Blank	E355-L	31-Aug-2022	09-Sep-2022	----	----		09-Sep-2022	28 days	9 days	✔	
<b>Physical Tests : Alkalinity Species by Titration</b>											
<b>HDPE</b> F5- Sand Cyclone	E290	31-Aug-2022	02-Sep-2022	----	----		03-Sep-2022	14 days	3 days	✔	
<b>Physical Tests : Alkalinity Species by Titration</b>											
<b>HDPE</b> Facility 21	E290	31-Aug-2022	02-Sep-2022	----	----		03-Sep-2022	14 days	3 days	✔	
<b>Physical Tests : Alkalinity Species by Titration</b>											
<b>HDPE</b> Field Blank	E290	31-Aug-2022	02-Sep-2022	----	----		03-Sep-2022	14 days	3 days	✔	
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE</b> F5- Sand Cyclone	E100	31-Aug-2022	02-Sep-2022	----	----		03-Sep-2022	28 days	3 days	✔	
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE</b> Facility 21	E100	31-Aug-2022	02-Sep-2022	----	----		03-Sep-2022	28 days	3 days	✔	



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE</b> Field Blank	E100	31-Aug-2022	02-Sep-2022	----	----		03-Sep-2022	28 days	3 days		✓
<b>Physical Tests : pH by Meter</b>											
<b>HDPE</b> F5- Sand Cyclone	E108	31-Aug-2022	02-Sep-2022	----	----		03-Sep-2022	0.25 hrs	13.25 hrs		* EHTR-FM
<b>Physical Tests : pH by Meter</b>											
<b>HDPE</b> Facility 21	E108	31-Aug-2022	02-Sep-2022	----	----		03-Sep-2022	0.25 hrs	13.25 hrs		* EHTR-FM
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> F5- Sand Cyclone	E508	31-Aug-2022	09-Sep-2022	----	----		09-Sep-2022	28 days	9 days		✓
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> Facility 21	E508	31-Aug-2022	09-Sep-2022	----	----		09-Sep-2022	28 days	9 days		✓
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> Field Blank	E508	31-Aug-2022	09-Sep-2022	----	----		09-Sep-2022	28 days	9 days		✓
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>											
<b>HDPE total (nitric acid)</b> F5- Sand Cyclone	E420	31-Aug-2022	09-Sep-2022	----	----		09-Sep-2022	180 days	10 days		✓
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>											
<b>HDPE total (nitric acid)</b> Facility 21	E420	31-Aug-2022	09-Sep-2022	----	----		09-Sep-2022	180 days	10 days		✓
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>											
<b>HDPE total (nitric acid)</b> Field Blank	E420	31-Aug-2022	09-Sep-2022	----	----		09-Sep-2022	180 days	10 days		✓



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>										
<b>HDPE - total (lab preserved)</b> Travel Blank	E420	31-Aug-2022	09-Sep-2022	----	----		10-Sep-2022	180 days	11 days	✔

**Legend & Qualifier Definitions**

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

Rec. HT: ALS recommended hold time (see units).





## Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water** Evaluation: \* = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		Evaluation
			QC	Regular	Actual	Expected	
<b>Analytical Methods</b>							
<b>Laboratory Duplicates (DUP)</b>							
Alkalinity Species by Titration	E290	631586	1	11	9.0	5.0	✓
Ammonia by Fluorescence	E298	638887	1	17	5.8	5.0	✓
Biochemical Oxygen Demand - 5 day	E550	632161	1	8	12.5	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	631583	1	2	50.0	5.0	✓
Chemical Oxygen Demand by Colourimetry (Low Level)	E559-L	639896	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	631582	1	10	10.0	5.0	✓
Conductivity in Water	E100	631584	1	14	7.1	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	638888	1	11	9.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	631587	1	3	33.3	5.0	✓
Fluoride in Water by IC	E235.F	631581	1	2	50.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	631579	1	19	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	631580	1	19	5.2	5.0	✓
pH by Meter	E108	631585	1	13	7.6	5.0	✓
Sulfate in Water by IC	E235.SO4	631578	1	19	5.2	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	638889	1	3	33.3	5.0	✓
Total Mercury in Water by CVAAS	E508	639917	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	636327	2	38	5.2	5.0	✓
Total Nitrogen by Colourimetry	E366	638886	1	14	7.1	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	638885	1	14	7.1	5.0	✓
<b>Laboratory Control Samples (LCS)</b>							
Alkalinity Species by Titration	E290	631586	1	11	9.0	5.0	✓
Ammonia by Fluorescence	E298	638887	1	17	5.8	5.0	✓
Biochemical Oxygen Demand - 5 day	E550	632161	1	8	12.5	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	631583	1	2	50.0	5.0	✓
Chemical Oxygen Demand by Colourimetry (Low Level)	E559-L	639896	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	631582	1	10	10.0	5.0	✓
Conductivity in Water	E100	631584	1	14	7.1	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	638888	1	11	9.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	631587	1	3	33.3	5.0	✓
Fluoride in Water by IC	E235.F	631581	1	2	50.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	631579	1	19	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	631580	1	19	5.2	5.0	✓
pH by Meter	E108	631585	1	13	7.6	5.0	✓
Sulfate in Water by IC	E235.SO4	631578	1	19	5.2	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	638889	1	3	33.3	5.0	✓
Total Mercury in Water by CVAAS	E508	639917	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	636327	2	38	5.2	5.0	✓



Matrix: **Water**

Evaluation: \* = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		Evaluation
			QC	Regular	Actual	Expected	
<b>Analytical Methods</b>							
<b>Laboratory Control Samples (LCS) - Continued</b>							
Total Nitrogen by Colourimetry	E366	638886	1	14	7.1	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	638885	1	14	7.1	5.0	✓
<b>Method Blanks (MB)</b>							
Alkalinity Species by Titration	E290	631586	1	11	9.0	5.0	✓
Ammonia by Fluorescence	E298	638887	1	17	5.8	5.0	✓
Biochemical Oxygen Demand - 5 day	E550	632161	1	8	12.5	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	631583	1	2	50.0	5.0	✓
Chemical Oxygen Demand by Colourimetry (Low Level)	E559-L	639896	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	631582	1	10	10.0	5.0	✓
Conductivity in Water	E100	631584	1	14	7.1	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	638888	1	11	9.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	631587	1	3	33.3	5.0	✓
Fluoride in Water by IC	E235.F	631581	1	2	50.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	631579	1	19	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	631580	1	19	5.2	5.0	✓
Sulfate in Water by IC	E235.SO4	631578	1	19	5.2	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	638889	1	3	33.3	5.0	✓
Total Mercury in Water by CVAAS	E508	639917	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	636327	2	38	5.2	5.0	✓
Total Nitrogen by Colourimetry	E366	638886	1	14	7.1	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	638885	1	14	7.1	5.0	✓
<b>Matrix Spikes (MS)</b>							
Ammonia by Fluorescence	E298	638887	1	17	5.8	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	631583	1	2	50.0	5.0	✓
Chemical Oxygen Demand by Colourimetry (Low Level)	E559-L	639896	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	631582	1	10	10.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	638888	1	11	9.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	631587	1	3	33.3	5.0	✓
Fluoride in Water by IC	E235.F	631581	1	2	50.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	631579	1	19	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	631580	1	19	5.2	5.0	✓
Sulfate in Water by IC	E235.SO4	631578	1	19	5.2	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	638889	1	3	33.3	5.0	✓
Total Mercury in Water by CVAAS	E508	639917	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	636327	2	38	5.2	5.0	✓
Total Nitrogen by Colourimetry	E366	638886	1	14	7.1	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	638885	1	14	7.1	5.0	✓



## Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Bromide in Water by IC (Low Level)	E235.Br-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Chloride in Water by IC	E235.Cl Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Fluoride in Water by IC	E235.F Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - Environmental	Water	Method Fialab 100, 2018	Ammonia in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021)



Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318  Vancouver - Environmental	Water	Method Fialab 100, 2018	TKN in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021).
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L  Vancouver - Environmental	Water	APHA 5310 B (mod)	Total Organic Carbon (Non-Purgeable), also known as NPOC (total), is a direct measurement of TOC after an acidified sample has been purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO <sub>2</sub> . NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of total carbon (TC) is comprised of IC (which is common), this method is more accurate and more reliable than the TOC by subtraction method (i.e. TC minus TIC).
Dissolved Organic Carbon by Combustion (Low Level)	E358-L  Vancouver - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO <sub>2</sub> . NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Nitrogen by Colourimetry	E366  Vancouver - Environmental	Water	APHA 4500-P J (mod)	Total Nitrogen is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U  Vancouver - Environmental	Water	APHA 4500-P F (mod)	Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.  Field filtration is recommended to ensure test results represent conditions at time of sampling.
Total Metals in Water by CRC ICPMS	E420  Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.  Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Mercury in Water by CVAAS	E508  Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS
Biochemical Oxygen Demand - 5 day	E550  Vancouver - Environmental	Water	APHA 5210 B (mod)	Samples are diluted and incubated for a specified time period, after which the oxygen depletion is measured using a dissolved oxygen meter.  Free chlorine is a negative interference in the BOD method; please advise ALS when free chlorine is present in samples.
Chemical Oxygen Demand by Colourimetry (Low Level)	E559-L  Vancouver - Environmental	Water	APHA 5220 D (mod)	Samples are analyzed using the closed reflux colourimetric method.



<i>Analytical Methods</i>	<i>Method / Lab</i>	<i>Matrix</i>	<i>Method Reference</i>	<i>Method Descriptions</i>
Hardness (Calculated) from Total Ca/Mg	EC100A  Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO <sub>3</sub> ), from total Ca/Mg" is calculated from the sum of total Calcium and Magnesium concentrations, expressed in CaCO <sub>3</sub> equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations. Hardness from total Ca/Mg is normally comparable to Dissolved Hardness in non-turbid waters.
<i>Preparation Methods</i>	<i>Method / Lab</i>	<i>Matrix</i>	<i>Method Reference</i>	<i>Method Descriptions</i>
Preparation for Ammonia	EP298  Vancouver - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Digestion for TKN in water	EP318  Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested at high temperature using Sulfuric Acid with Copper catalyst, which converts organic nitrogen sources to Ammonia, which is then quantified by the analytical method as TKN. This method is unsuitable for samples containing high levels of nitrate. If nitrate exceeds TKN concentration by ten times or more, results may be biased low.
Preparation for Total Organic Carbon by Combustion	EP355  Vancouver - Environmental	Water		Preparation for Total Organic Carbon by Combustion
Preparation for Dissolved Organic Carbon for Combustion	EP358  Vancouver - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Digestion for Total Nitrogen in water	EP366  Vancouver - Environmental	Water	APHA 4500-P J (mod)	Samples are heated with a persulfate digestion reagent.



## QUALITY CONTROL REPORT

**Work Order** : **VA22C0792**

Client : Regional District of Kitimat-Stikine  
Contact : Hannah Shinton  
Address : # 300 - 4545 Lazelle Avenue  
Terrace BC Canada V8G 4E1

Telephone : ----

Project : Foreceman Facility Sand Cyclone  
PO : ----  
C-O-C number : ----  
Sampler : HS  
Site :  
Quote number : Default Water Testing (Q62338)  
No. of samples received : 4  
No. of samples analysed : 4

Page : 1 of 18

Laboratory : Vancouver - Environmental  
Account Manager : Amber Springer  
Address : 8081 Lougheed Highway  
Burnaby, British Columbia Canada V5A 1W9

Telephone : +1 604 253 4188  
Date Samples Received : 01-Sep-2022 21:15  
Date Analysis Commenced : 02-Sep-2022  
Issue Date : 14-Sep-2022 12:21

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

### 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.

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Kim Jensen	Department Manager - Metals	Vancouver Metals, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Vancouver Inorganics, Burnaby, British Columbia
Qammar Almas	Lab Assistant	Vancouver Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Vancouver Inorganics, Burnaby, British Columbia



Page : 2 of 18  
Work Order : VA22C0792  
Client : Regional District of Kitimat-Stikine  
Project : Foreceman Facility Sand Cyclone

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## **General Comments**

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.

CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.

DQO = Data Quality Objective.

LOR = Limit of Reporting (detection limit).

RPD = Relative Percent Difference

# = Indicates a QC result that did not meet the ALS DQO.

## **Workorder Comments**

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Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

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### Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: <b>Water</b>					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Physical Tests (QC Lot: 631584)</b>											
VA22C0788-006	Anonymous	conductivity	----	E100	2.0	µS/cm	<2.0	<2.0	0	Diff <2x LOR	----
<b>Physical Tests (QC Lot: 631585)</b>											
VA22C0788-006	Anonymous	pH	----	E108	0.10	pH units	5.43	5.44	0.184%	4%	----
<b>Physical Tests (QC Lot: 631586)</b>											
VA22C0792-003	Field Blank	alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	1.0	1.0	0	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 631578)</b>											
VA22C0792-001	F5- Sand Cyclone	sulfate (as SO4)	14808-79-8	E235.SO4	1.50	mg/L	4.34	4.27	0.07	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 631579)</b>											
VA22C0792-001	F5- Sand Cyclone	nitrate (as N)	14797-55-8	E235.NO3-L	0.0250	mg/L	37.2	37.2	0.190%	20%	----
<b>Anions and Nutrients (QC Lot: 631580)</b>											
VA22C0792-001	F5- Sand Cyclone	nitrite (as N)	14797-65-0	E235.NO2-L	0.0050	mg/L	0.141	0.141	0.164%	20%	----
<b>Anions and Nutrients (QC Lot: 631581)</b>											
VA22C0792-001	F5- Sand Cyclone	fluoride	16984-48-8	E235.F	0.100	mg/L	<0.100	<0.100	0	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 631582)</b>											
VA22C0792-001	F5- Sand Cyclone	chloride	16887-00-6	E235.Cl	2.50	mg/L	120	120	0.0861%	20%	----
<b>Anions and Nutrients (QC Lot: 631583)</b>											
VA22C0792-001	F5- Sand Cyclone	bromide	24959-67-9	E235.Br-L	0.250	mg/L	0.360	0.349	0.011	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 631587)</b>											
VA22C0792-001	F5- Sand Cyclone	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0100	mg/L	0.0963	0.0970	0.0007	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 638886)</b>											
VA22C0792-001	F5- Sand Cyclone	nitrogen, total	7727-37-9	E366	1.50	mg/L	40.6	41.3	1.60%	20%	----
<b>Anions and Nutrients (QC Lot: 638887)</b>											
FJ2202476-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0250	mg/L	0.185	0.195	0.0097	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 638889)</b>											
VA22C0792-001	F5- Sand Cyclone	Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	3.64	3.88	6.35%	20%	----
<b>Organic / Inorganic Carbon (QC Lot: 638885)</b>											
VA22C0792-001	F5- Sand Cyclone	carbon, total organic [TOC]	----	E355-L	0.50	mg/L	17.5	18.3	4.45%	20%	----
<b>Organic / Inorganic Carbon (QC Lot: 638888)</b>											
FJ2202476-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	2.59	2.77	0.18	Diff <2x LOR	----
<b>Total Metals (QC Lot: 636327)</b>											
VA22C1078-002	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0927	0.0955	3.02%	20%	----



Sub-Matrix: **Water**

Laboratory Duplicate (DUP) Report

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Total Metals (QC Lot: 636327) - continued</b>											
VA22C1078-002	Anonymous	antimony, total	7440-36-0	E420	0.00010	mg/L	0.00555	0.00570	2.68%	20%	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00384	0.00368	4.07%	20%	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.0490	0.0485	1.08%	20%	----
		beryllium, total	7440-41-7	E420	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.010	mg/L	0.050	0.050	0.0001	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0000050	mg/L	0.0000130	0.0000125	0.0000005	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.050	mg/L	17.1	17.0	0.278%	20%	----
		cesium, total	7440-46-2	E420	0.000010	mg/L	0.00103	0.00107	4.09%	20%	----
		chromium, total	7440-47-3	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, total	7440-48-4	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.010	mg/L	0.054	0.052	0.002	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000050	mg/L	0.000401	0.000419	0.000018	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0330	0.0342	3.76%	20%	----
		magnesium, total	7439-95-4	E420	0.0050	mg/L	1.09	1.08	0.971%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.0140	0.0136	3.09%	20%	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00477	0.00493	3.26%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E420	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.050	mg/L	6.70	6.59	1.61%	20%	----
		rubidium, total	7440-17-7	E420	0.00020	mg/L	0.00893	0.00874	2.11%	20%	----
		selenium, total	7782-49-2	E420	0.000050	mg/L	0.000628	0.000546	14.0%	20%	----
		silicon, total	7440-21-3	E420	0.10	mg/L	1.29	1.30	0.978%	20%	----
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, total	7440-23-5	E420	0.050	mg/L	18.3	18.2	1.02%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.319	0.317	0.441%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	13.4	13.4	0.241%	20%	----
		tellurium, total	13494-80-9	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		thallium, total	7440-28-0	E420	0.000010	mg/L	0.000030	0.000028	0.000003	Diff <2x LOR	----
		thorium, total	7440-29-1	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	0.00089	0.00088	0.000006	Diff <2x LOR	----
		tungsten, total	7440-33-7	E420	0.00010	mg/L	0.00052	0.00052	0.000004	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.000272	0.000282	3.87%	20%	----



Sub-Matrix: **Water**

Laboratory Duplicate (DUP) Report

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Total Metals (QC Lot: 636327) - continued</b>											
VA22C1078-002	Anonymous	vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	----
		zirconium, total	7440-67-7	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
<b>Total Metals (QC Lot: 638035)</b>											
KS2203287-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0078	0.0088	0.0009	Diff <2x LOR	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00145	0.00151	4.21%	20%	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.0217	0.0214	1.68%	20%	----
		beryllium, total	7440-41-7	E420	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0000050	mg/L	0.0000093	0.0000096	0.0000003	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.050	mg/L	45.5	44.9	1.50%	20%	----
		cesium, total	7440-46-2	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		chromium, total	7440-47-3	E420	0.00050	mg/L	0.00064	0.00062	0.00001	Diff <2x LOR	----
		cobalt, total	7440-48-4	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00050	mg/L	0.0537	0.0535	0.372%	20%	----
		iron, total	7439-89-6	E420	0.010	mg/L	0.016	0.016	0.0001	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000050	mg/L	0.000668	0.000664	0.590%	20%	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0022	0.0022	0.00001	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	0.0050	mg/L	20.2	20.2	0.509%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.0206	0.0198	3.57%	20%	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00165	0.00166	0.752%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E420	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.050	mg/L	1.95	1.93	0.788%	20%	----
		rubidium, total	7440-17-7	E420	0.00020	mg/L	0.00078	0.00077	0.00001	Diff <2x LOR	----
		selenium, total	7782-49-2	E420	0.000050	mg/L	0.000236	0.000235	0.0000008	Diff <2x LOR	----
		silicon, total	7440-21-3	E420	0.10	mg/L	8.48	8.19	3.42%	20%	----
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, total	7440-23-5	E420	0.050	mg/L	9.06	8.80	2.96%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.309	0.298	3.38%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	8.17	8.25	0.997%	20%	----
		tellurium, total	13494-80-9	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----



Sub-Matrix: **Water**

Laboratory Duplicate (DUP) Report

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Total Metals (QC Lot: 638035) - continued</b>											
KS2203287-001	Anonymous	thorium, total	7440-29-1	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	0.00054	0.00056	0.00002	Diff <2x LOR	----
		tungsten, total	7440-33-7	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.00192	0.00193	0.563%	20%	----
		vanadium, total	7440-62-2	E420	0.00050	mg/L	0.00095	0.00092	0.00003	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	0.0139	0.0138	0.00003	Diff <2x LOR	----
		zirconium, total	7440-67-7	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
<b>Total Metals (QC Lot: 639917)</b>											
FJ2202417-001	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
<b>Aggregate Organics (QC Lot: 632161)</b>											
VA22C0836-005	Anonymous	biochemical oxygen demand [BOD]	----	E550	2.0	mg/L	<2.0	<2.0	0.0%	30%	----
<b>Aggregate Organics (QC Lot: 639896)</b>											
VA22C0505-001	Anonymous	chemical oxygen demand [COD]	----	E559-L	40	mg/L	3540	3390	4.36%	20%	----



## Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

### Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Physical Tests (QCLot: 631584)</b>						
conductivity	----	E100	1	µS/cm	1.2	----
<b>Physical Tests (QCLot: 631586)</b>						
alkalinity, total (as CaCO3)	----	E290	1	mg/L	# 1.7	B
<b>Anions and Nutrients (QCLot: 631578)</b>						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
<b>Anions and Nutrients (QCLot: 631579)</b>						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
<b>Anions and Nutrients (QCLot: 631580)</b>						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
<b>Anions and Nutrients (QCLot: 631581)</b>						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
<b>Anions and Nutrients (QCLot: 631582)</b>						
chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
<b>Anions and Nutrients (QCLot: 631583)</b>						
bromide	24959-67-9	E235.Br-L	0.05	mg/L	<0.050	----
<b>Anions and Nutrients (QCLot: 631587)</b>						
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	----
<b>Anions and Nutrients (QCLot: 638886)</b>						
nitrogen, total	7727-37-9	E366	0.03	mg/L	<0.030	----
<b>Anions and Nutrients (QCLot: 638887)</b>						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
<b>Anions and Nutrients (QCLot: 638889)</b>						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
<b>Organic / Inorganic Carbon (QCLot: 638885)</b>						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
<b>Organic / Inorganic Carbon (QCLot: 638888)</b>						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
<b>Total Metals (QCLot: 636327)</b>						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----





Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Total Metals (QCLot: 636327) - continued</b>						
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cesium, total	7440-46-2	E420	0.00001	mg/L	<0.000010	----
chromium, total	7440-47-3	E420	0.0005	mg/L	<0.00050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	<0.00020	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	7440-23-5	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	<0.00020	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
thorium, total	7440-29-1	E420	0.0001	mg/L	<0.00010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	<0.00010	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	<0.00020	----
<b>Total Metals (QCLot: 638035)</b>						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----



Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Total Metals (QCLot: 638035) - continued</b>						
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cesium, total	7440-46-2	E420	0.00001	mg/L	<0.000010	----
chromium, total	7440-47-3	E420	0.0005	mg/L	<0.00050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	<0.00020	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	7440-23-5	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	<0.00020	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
thorium, total	7440-29-1	E420	0.0001	mg/L	<0.00010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	<0.00010	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----



Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Total Metals (QCLot: 638035) - continued</b>						
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	<0.00020	----
<b>Total Metals (QCLot: 639917)</b>						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----
<b>Aggregate Organics (QCLot: 632161)</b>						
biochemical oxygen demand [BOD]	----	E550	2	mg/L	<2.0	----
<b>Aggregate Organics (QCLot: 639896)</b>						
chemical oxygen demand [COD]	----	E559-L	10	mg/L	<10	----

**Qualifiers**

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.



## Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: <b>Water</b>					Laboratory Control Sample (LCS) Report				
					Spike Concentration	Recovery (%) LCS	Recovery Limits (%)		Qualifier
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
<b>Physical Tests (QCLot: 631584)</b>									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	99.2	90.0	110	----
<b>Physical Tests (QCLot: 631585)</b>									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
<b>Physical Tests (QCLot: 631586)</b>									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	107	85.0	115	----
<b>Anions and Nutrients (QCLot: 631578)</b>									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	102	90.0	110	----
<b>Anions and Nutrients (QCLot: 631579)</b>									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	101	90.0	110	----
<b>Anions and Nutrients (QCLot: 631580)</b>									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	96.5	90.0	110	----
<b>Anions and Nutrients (QCLot: 631581)</b>									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	93.1	90.0	110	----
<b>Anions and Nutrients (QCLot: 631582)</b>									
chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	100	90.0	110	----
<b>Anions and Nutrients (QCLot: 631583)</b>									
bromide	24959-67-9	E235.Br-L	0.05	mg/L	0.5 mg/L	103	85.0	115	----
<b>Anions and Nutrients (QCLot: 631587)</b>									
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.03 mg/L	103	80.0	120	----
<b>Anions and Nutrients (QCLot: 638886)</b>									
nitrogen, total	7727-37-9	E366	0.03	mg/L	0.5 mg/L	100	75.0	125	----
<b>Anions and Nutrients (QCLot: 638887)</b>									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	97.2	85.0	115	----
<b>Anions and Nutrients (QCLot: 638889)</b>									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	102	75.0	125	----
<b>Organic / Inorganic Carbon (QCLot: 638885)</b>									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	8.57 mg/L	102	80.0	120	----
<b>Organic / Inorganic Carbon (QCLot: 638888)</b>									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	96.5	80.0	120	----
<b>Total Metals (QCLot: 636327)</b>									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	101	80.0	120	----



Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
<b>Total Metals (QCLot: 636327) - continued</b>									
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	102	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	104	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	92.3	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	100.0	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	86.6	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	103	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	97.6	80.0	120	----
cesium, total	7440-46-2	E420	0.00001	mg/L	0.05 mg/L	98.2	80.0	120	----
chromium, total	7440-47-3	E420	0.0005	mg/L	0.25 mg/L	98.1	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	100	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	99.2	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	104	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	102	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	93.9	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	104	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	99.1	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	103	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	99.3	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	103	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	101	80.0	120	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	0.1 mg/L	104	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	98.2	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	99.0	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	98.0	80.0	120	----
sodium, total	7440-23-5	E420	0.05	mg/L	50 mg/L	103	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	104	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	91.7	80.0	120	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	0.1 mg/L	103	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	101	80.0	120	----
thorium, total	7440-29-1	E420	0.0001	mg/L	0.1 mg/L	94.0	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	100	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	97.8	80.0	120	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	0.1 mg/L	98.5	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	102	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	101	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	96.9	80.0	120	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.1 mg/L	99.6	80.0	120	----



Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
<b>Total Metals (QCLot: 638035)</b>									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	97.4	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	105	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	102	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	100	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	102	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	104	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	97.2	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	99.3	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	103	80.0	120	----
cesium, total	7440-46-2	E420	0.00001	mg/L	0.05 mg/L	105	80.0	120	----
chromium, total	7440-47-3	E420	0.0005	mg/L	0.25 mg/L	102	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	99.6	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	97.9	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	102	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	103	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	101	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	100	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	105	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	99.2	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	99.6	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	105	80.0	120	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	0.1 mg/L	100	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	104	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	111	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	99.1	80.0	120	----
sodium, total	7440-23-5	E420	0.05	mg/L	50 mg/L	104	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	104	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	93.8	80.0	120	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	0.1 mg/L	102	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	106	80.0	120	----
thorium, total	7440-29-1	E420	0.0001	mg/L	0.1 mg/L	103	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	99.4	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	99.4	80.0	120	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	0.1 mg/L	101	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	104	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	102	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	102	80.0	120	----





Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				Qualifier
					Spike Concentration	Recovery (%)	Recovery Limits (%)		
					LCS	Low	High		
<b>Total Metals (QCLot: 638035) - continued</b>									
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.1 mg/L	102	80.0	120	----
<b>Total Metals (QCLot: 639917)</b>									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	98.3	80.0	120	----
<b>Aggregate Organics (QCLot: 632161)</b>									
biochemical oxygen demand [BOD]	----	E550	2	mg/L	198 mg/L	93.7	85.0	115	----
<b>Aggregate Organics (QCLot: 639896)</b>									
chemical oxygen demand [COD]	----	E559-L	10	mg/L	100 mg/L	110	85.0	115	----



## Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
<b>Anions and Nutrients (QCLot: 631578)</b>										
VA22C0792-002	Facility 21	sulfate (as SO4)	14808-79-8	E235.SO4	498 mg/L	500 mg/L	99.6	75.0	125	----
<b>Anions and Nutrients (QCLot: 631579)</b>										
VA22C0792-002	Facility 21	nitrate (as N)	14797-55-8	E235.NO3-L	ND mg/L	12.5 mg/L	ND	75.0	125	----
<b>Anions and Nutrients (QCLot: 631580)</b>										
VA22C0792-002	Facility 21	nitrite (as N)	14797-65-0	E235.NO2-L	2.35 mg/L	2.5 mg/L	93.9	75.0	125	----
<b>Anions and Nutrients (QCLot: 631581)</b>										
VA22C0792-002	Facility 21	fluoride	16984-48-8	E235.F	4.76 mg/L	5 mg/L	95.3	75.0	125	----
<b>Anions and Nutrients (QCLot: 631582)</b>										
VA22C0792-002	Facility 21	chloride	16887-00-6	E235.Cl	495 mg/L	500 mg/L	99.1	75.0	125	----
<b>Anions and Nutrients (QCLot: 631583)</b>										
VA22C0792-002	Facility 21	bromide	24959-67-9	E235.Br-L	2.60 mg/L	2.5 mg/L	104	75.0	125	----
<b>Anions and Nutrients (QCLot: 631587)</b>										
VA22C0792-002	Facility 21	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	ND mg/L	0.03 mg/L	ND	70.0	130	----
<b>Anions and Nutrients (QCLot: 638886)</b>										
VA22C0792-002	Facility 21	nitrogen, total	7727-37-9	E366	ND mg/L	20 mg/L	ND	70.0	130	----
<b>Anions and Nutrients (QCLot: 638887)</b>										
FJ2202476-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0883 mg/L	0.1 mg/L	88.3	75.0	125	----
<b>Anions and Nutrients (QCLot: 638889)</b>										
VA22C0792-002	Facility 21	Kjeldahl nitrogen, total [TKN]	----	E318	ND mg/L	2.5 mg/L	ND	70.0	130	----
<b>Organic / Inorganic Carbon (QCLot: 638885)</b>										
VA22C0792-002	Facility 21	carbon, total organic [TOC]	----	E355-L	ND mg/L	5 mg/L	ND	70.0	130	----
<b>Organic / Inorganic Carbon (QCLot: 638888)</b>										
FJ2202476-002	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	5.06 mg/L	5 mg/L	101	70.0	130	----
<b>Total Metals (QCLot: 636327)</b>										
VA22C1078-001	Anonymous	aluminum, total	7429-90-5	E420	0.198 mg/L	0.2 mg/L	99.2	70.0	130	----
		antimony, total	7440-36-0	E420	0.0203 mg/L	0.02 mg/L	102	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0198 mg/L	0.02 mg/L	98.8	70.0	130	----
		barium, total	7440-39-3	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0359 mg/L	0.04 mg/L	89.8	70.0	130	----



Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
<b>Total Metals (QCLot: 636327) - continued</b>										
VA22C1078-001	Anonymous	bismuth, total	7440-69-9	E420	0.00968 mg/L	0.01 mg/L	96.8	70.0	130	----
		boron, total	7440-42-8	E420	0.087 mg/L	0.1 mg/L	86.9	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00400 mg/L	0.004 mg/L	99.9	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cesium, total	7440-46-2	E420	0.0102 mg/L	0.01 mg/L	102	70.0	130	----
		chromium, total	7440-47-3	E420	0.0381 mg/L	0.04 mg/L	95.4	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0196 mg/L	0.02 mg/L	97.9	70.0	130	----
		copper, total	7440-50-8	E420	0.0194 mg/L	0.02 mg/L	97.1	70.0	130	----
		iron, total	7439-89-6	E420	1.90 mg/L	2 mg/L	94.8	70.0	130	----
		lead, total	7439-92-1	E420	0.0197 mg/L	0.02 mg/L	98.6	70.0	130	----
		lithium, total	7439-93-2	E420	0.0862 mg/L	0.1 mg/L	86.2	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	0.0192 mg/L	0.02 mg/L	96.0	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0205 mg/L	0.02 mg/L	102	70.0	130	----
		nickel, total	7440-02-0	E420	0.0386 mg/L	0.04 mg/L	96.6	70.0	130	----
		phosphorus, total	7723-14-0	E420	9.82 mg/L	10 mg/L	98.2	70.0	130	----
		potassium, total	7440-09-7	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		rubidium, total	7440-17-7	E420	0.0195 mg/L	0.02 mg/L	97.6	70.0	130	----
		selenium, total	7782-49-2	E420	0.0382 mg/L	0.04 mg/L	95.5	70.0	130	----
		silicon, total	7440-21-3	E420	9.42 mg/L	10 mg/L	94.2	70.0	130	----
		silver, total	7440-22-4	E420	0.00419 mg/L	0.004 mg/L	105	70.0	130	----
		sodium, total	7440-23-5	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	18.4 mg/L	20 mg/L	91.9	70.0	130	----
		tellurium, total	13494-80-9	E420	0.0401 mg/L	0.04 mg/L	100	70.0	130	----
		thallium, total	7440-28-0	E420	0.00378 mg/L	0.004 mg/L	94.6	70.0	130	----
		thorium, total	7440-29-1	E420	0.0204 mg/L	0.02 mg/L	102	70.0	130	----
		tin, total	7440-31-5	E420	0.0196 mg/L	0.02 mg/L	97.9	70.0	130	----
		titanium, total	7440-32-6	E420	0.0382 mg/L	0.04 mg/L	95.5	70.0	130	----
		tungsten, total	7440-33-7	E420	0.0190 mg/L	0.02 mg/L	95.1	70.0	130	----
		uranium, total	7440-61-1	E420	0.00400 mg/L	0.004 mg/L	100	70.0	130	----
		vanadium, total	7440-62-2	E420	0.0978 mg/L	0.1 mg/L	97.8	70.0	130	----
		zinc, total	7440-66-6	E420	0.386 mg/L	0.4 mg/L	96.5	70.0	130	----
		zirconium, total	7440-67-7	E420	0.0406 mg/L	0.04 mg/L	101	70.0	130	----
<b>Total Metals (QCLot: 638035)</b>										
VA22C0521-008	Anonymous	aluminum, total	7429-90-5	E420	0.973 mg/L	1 mg/L	97.3	70.0	130	----



Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
<b>Total Metals (QCLot: 638035) - continued</b>										
VA22C0521-008	Anonymous	antimony, total	7440-36-0	E420	0.101 mg/L	0.1 mg/L	101	70.0	130	----
		arsenic, total	7440-38-2	E420	ND mg/L	0.1 mg/L	ND	70.0	130	----
		barium, total	7440-39-3	E420	0.0951 mg/L	0.1 mg/L	95.1	70.0	130	----
		beryllium, total	7440-41-7	E420	0.202 mg/L	0.2 mg/L	101	70.0	130	----
		bismuth, total	7440-69-9	E420	0.0467 mg/L	0.05 mg/L	93.4	70.0	130	----
		boron, total	7440-42-8	E420	0.452 mg/L	0.5 mg/L	90.4	70.0	130	----
		cadmium, total	7440-43-9	E420	0.0195 mg/L	0.02 mg/L	97.6	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	20 mg/L	ND	70.0	130	----
		cesium, total	7440-46-2	E420	0.0508 mg/L	0.05 mg/L	102	70.0	130	----
		chromium, total	7440-47-3	E420	0.195 mg/L	0.2 mg/L	97.3	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0970 mg/L	0.1 mg/L	97.0	70.0	130	----
		copper, total	7440-50-8	E420	0.0895 mg/L	0.1 mg/L	89.5	70.0	130	----
		iron, total	7439-89-6	E420	9.55 mg/L	10 mg/L	95.5	70.0	130	----
		lead, total	7439-92-1	E420	0.0948 mg/L	0.1 mg/L	94.8	70.0	130	----
		lithium, total	7439-93-2	E420	0.512 mg/L	0.5 mg/L	102	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	5 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	ND mg/L	0.1 mg/L	ND	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.105 mg/L	0.1 mg/L	105	70.0	130	----
		nickel, total	7440-02-0	E420	0.190 mg/L	0.2 mg/L	94.8	70.0	130	----
		phosphorus, total	7723-14-0	E420	52.5 mg/L	50 mg/L	105	70.0	130	----
		potassium, total	7440-09-7	E420	ND mg/L	20 mg/L	ND	70.0	130	----
		rubidium, total	7440-17-7	E420	0.0948 mg/L	0.1 mg/L	94.8	70.0	130	----
		selenium, total	7782-49-2	E420	0.227 mg/L	0.2 mg/L	114	70.0	130	----
		silicon, total	7440-21-3	E420	53.0 mg/L	50 mg/L	106	70.0	130	----
		silver, total	7440-22-4	E420	0.0197 mg/L	0.02 mg/L	98.6	70.0	130	----
		sodium, total	7440-23-5	E420	ND mg/L	10 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.1 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	ND mg/L	100 mg/L	ND	70.0	130	----
		tellurium, total	13494-80-9	E420	0.210 mg/L	0.2 mg/L	105	70.0	130	----
		thallium, total	7440-28-0	E420	0.0188 mg/L	0.02 mg/L	93.9	70.0	130	----
		thorium, total	7440-29-1	E420	0.104 mg/L	0.1 mg/L	104	70.0	130	----
		tin, total	7440-31-5	E420	0.0981 mg/L	0.1 mg/L	98.1	70.0	130	----
		titanium, total	7440-32-6	E420	0.210 mg/L	0.2 mg/L	105	70.0	130	----
		tungsten, total	7440-33-7	E420	0.0998 mg/L	0.1 mg/L	99.8	70.0	130	----
		uranium, total	7440-61-1	E420	0.0198 mg/L	0.02 mg/L	99.0	70.0	130	----
		vanadium, total	7440-62-2	E420	0.513 mg/L	0.5 mg/L	102	70.0	130	----
		zinc, total	7440-66-6	E420	1.92 mg/L	2 mg/L	96.1	70.0	130	----



Sub-Matrix: **Water**

					<i>Matrix Spike (MS) Report</i>					
					<i>Spike</i>		<i>Recovery (%)</i>	<i>Recovery Limits (%)</i>		
<i>Laboratory sample ID</i>	<i>Client sample ID</i>	<i>Analyte</i>	<i>CAS Number</i>	<i>Method</i>	<i>Concentration</i>	<i>Target</i>	<i>MS</i>	<i>Low</i>	<i>High</i>	<i>Qualifier</i>
<b>Total Metals (QCLot: 638035) - continued</b>										
VA22C0521-008	Anonymous	zirconium, total	7440-67-7	E420	0.209 mg/L	0.2 mg/L	104	70.0	130	----
<b>Total Metals (QCLot: 639917)</b>										
FJ2202417-002	Anonymous	mercury, total	7439-97-6	E508	0.000106 mg/L	0.0001 mg/L	106	70.0	130	----
<b>Aggregate Organics (QCLot: 639896)</b>										
VA22C0681-001	Anonymous	chemical oxygen demand [COD]	----	E559-L	110 mg/L	100 mg/L	110	75.0	125	----







## CERTIFICATE OF ANALYSIS

<p><b>Work Order</b> : <b>VA22C8721</b></p> <p><b>Client</b> : <b>Regional District of Kitimat-Stikine</b></p> <p><b>Contact</b> : Hannah Shinton</p> <p><b>Address</b> : # 300 - 4545 Lazelle Avenue Terrace BC Canada V8G 4E1</p> <p><b>Telephone</b> : ----</p> <p><b>Project</b> : Foreceman Ridge Surface Water</p> <p><b>PO</b> : ----</p> <p><b>C-O-C number</b> :</p> <p><b>Sampler</b> : H.shinton</p> <p><b>Site</b> :</p> <p><b>Quote number</b> : Default Water Testing (Q62338)</p> <p><b>No. of samples received</b> : 8</p> <p><b>No. of samples analysed</b> : 8</p>	<p><b>Page</b> : 1 of 10</p> <p><b>Laboratory</b> : Vancouver - Environmental</p> <p><b>Account Manager</b> : Amber Springer</p> <p><b>Address</b> : 8081 Lougheed Highway Burnaby BC Canada V5A 1W9</p> <p><b>Telephone</b> : +1 604 253 4188</p> <p><b>Date Samples Received</b> : 24-Nov-2022 21:10</p> <p><b>Date Analysis Commenced</b> : 25-Nov-2022</p> <p><b>Issue Date</b> : 05-Dec-2022 09:51</p>
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This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

### Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Alex Thornton	Analyst	Metals, Burnaby, British Columbia
Caitlin Macey	Team Leader - Inorganics	Inorganics, Burnaby, British Columbia
Cindy Tang	Team Leader - Inorganics	Inorganics, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Qammar Almas	Lab Assistant	Metals, Burnaby, British Columbia
Ruby Pham	Lab Assistant	Metals, Burnaby, British Columbia
Sukhman Khosa	Lab Assistant	Metals, Burnaby, British Columbia



## General Comments

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

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

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

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

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

<i>Unit</i>	<i>Description</i>
-	no units
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.

## Qualifiers

<i>Qualifier</i>	<i>Description</i>
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
DTMF	Dissolved concentration exceeds total for field-filtered metals sample. Metallic contaminants may have been introduced to dissolved sample during field filtration.
RRV	Reported result verified by repeat analysis.



## Analytical Results

Sub-Matrix: Water					Client sample ID				
(Matrix: Water)					SW-05	SW-22	SW-03	SW-04	SW-01
Client sampling date / time					22-Nov-2022 14:35	22-Nov-2022 12:00	22-Nov-2022 10:40	22-Nov-2022 15:45	22-Nov-2022 09:30
Analyte	CAS Number	Method	LOR	Unit	VA22C8721-001	VA22C8721-002	VA22C8721-003	VA22C8721-004	VA22C8721-005
					Result	Result	Result	Result	Result
<b>Physical Tests</b>									
conductivity	----	E100	2.0	µS/cm	155	155	155	74.4	47.1
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L	74.8	72.5	74.4	31.0	5.87
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L	90.1	86.2	86.9	33.0	6.07
pH	----	E108	0.10	pH units	8.17	8.18	8.15	7.79	6.90
<b>Anions and Nutrients</b>									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	0.0115
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	1.35	1.36	1.22	1.97	10.5
fluoride	16984-48-8	E235.F	0.020	mg/L	0.052	0.052	0.051	0.039	0.027
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	<0.050	0.134	<0.050	<0.050	0.328
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.0297	0.0300	0.0342	0.0116	0.0121
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	0.0039	0.0037	0.0025	0.0059	<0.0010
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	2.80	2.79	2.54	1.45	0.58
<b>Organic / Inorganic Carbon</b>									
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	0.57	0.60	0.67	2.38	1.68
<b>Total Metals</b>									
aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0190	0.0184	0.0047	0.0574	0.0080
antimony, total	7440-36-0	E420	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00200	0.00194	0.00196	0.00214	0.00020
barium, total	7440-39-3	E420	0.00010	mg/L	0.0228	0.0220	0.0231	0.0114	0.0157
beryllium, total	7440-41-7	E420	0.000100	mg/L	<0.000100	<0.000100	<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	<0.010	<0.010	<0.010	<0.010	<0.010
cadmium, total	7440-43-9	E420	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
calcium, total	7440-70-2	E420	0.050	mg/L	32.0	30.6	31.2	11.7	1.95
cesium, total	7440-46-2	E420	0.000010	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
chromium, total	7440-47-3	E420	0.00050	mg/L	0.00068	<0.00050	<0.00050	<0.00050	<0.00050
cobalt, total	7440-48-4	E420	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	0.00015



## Analytical Results

Sub-Matrix: Water					Client sample ID	SW-05	SW-22	SW-03	SW-04	SW-01
(Matrix: Water)					Client sampling date / time	22-Nov-2022 14:35	22-Nov-2022 12:00	22-Nov-2022 10:40	22-Nov-2022 15:45	22-Nov-2022 09:30
Analyte	CAS Number	Method	LOR	Unit	VA22C8721-001	VA22C8721-002	VA22C8721-003	VA22C8721-004	VA22C8721-005	
					Result	Result	Result	Result	Result	
<b>Total Metals</b>										
copper, total	7440-50-8	E420	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
iron, total	7439-89-6	E420	0.010	mg/L	0.022	0.019	<0.010	0.072	0.191	
lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	
lithium, total	7439-93-2	E420	0.0010	mg/L	0.0012	0.0012	0.0011	<0.0010	<0.0010	
magnesium, total	7439-95-4	E420	0.0050	mg/L	2.48	2.37	2.19	0.911	0.292	
manganese, total	7439-96-5	E420	0.00010	mg/L	0.00238	0.00194	0.00135	0.0179	0.178	
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	0.000435	0.000374	0.000308	0.000199	<0.000050	
nickel, total	7440-02-0	E420	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
phosphorus, total	7723-14-0	E420	0.050	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	
potassium, total	7440-09-7	E420	0.050	mg/L	0.956	0.910	0.835	0.565	0.294	
rubidium, total	7440-17-7	E420	0.00020	mg/L	0.00035	0.00034	0.00032	0.00040	0.00043	
selenium, total	7782-49-2	E420	0.000050	mg/L	0.000172	0.000106	0.000150	0.000060	<0.000050	
silicon, total	7440-21-3	E420	0.10	mg/L	5.52	5.33	5.36	4.39	0.44	
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	2.40	2.24	2.00	2.92	6.87	
strontium, total	7440-24-6	E420	0.00020	mg/L	0.119	0.118	0.112	0.0555	0.0161	
sulfur, total	7704-34-9	E420	0.50	mg/L	0.91	0.89	0.78	<0.50	<0.50	
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	<0.00010	<0.00010	<0.00010	<0.00010	
tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	
titanium, total	7440-32-6	E420	0.00030	mg/L	0.00050	0.00061	<0.00030	0.00101	<0.00030	
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	0.000149	0.000146	0.000110	0.000047	<0.000010	
vanadium, total	7440-62-2	E420	0.00050	mg/L	0.00118	0.00110	0.00111	0.00108	<0.00050	
zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	
zirconium, total	7440-67-7	E420	0.00020	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	
<b>Dissolved Metals</b>										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0058	0.0062	0.0051	0.0271	0.0065	



## Analytical Results

Sub-Matrix: Water					Client sample ID	SW-05	SW-22	SW-03	SW-04	SW-01
(Matrix: Water)					Client sampling date / time	22-Nov-2022 14:35	22-Nov-2022 12:00	22-Nov-2022 10:40	22-Nov-2022 15:45	22-Nov-2022 09:30
Analyte	CAS Number	Method	LOR	Unit	VA22C8721-001	VA22C8721-002	VA22C8721-003	VA22C8721-004	VA22C8721-005	
					Result	Result	Result	Result	Result	
<b>Dissolved Metals</b>										
antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00168	0.00174	0.00170	0.00194	0.00016	0.00016
barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0206	0.0208	0.0208	0.0101	0.0140	0.0140
beryllium, dissolved	7440-41-7	E421	0.000100	mg/L	<0.000100	<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	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000062	0.0000062
calcium, dissolved	7440-70-2	E421	0.050	mg/L	26.3	25.4	26.4	11.0	1.91	1.91
cesium, dissolved	7440-46-2	E421	0.000010	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
chromium, dissolved	7440-47-3	E421	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	0.00011	0.00011
copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	<0.010	0.031	0.034	0.034
lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0011	0.0011	0.0011	<0.0010	<0.0010	<0.0010
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	2.21	2.20	2.05	0.850	0.268	0.268
manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00078	0.00081	0.00185 <sup>DTMF</sup>	0.00557	0.158	0.158
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.000348	0.000352	0.000289	0.000182	0.000254 <sup>DTMF</sup>	0.000254 <sup>DTMF</sup>
nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.050	mg/L	0.889	0.900	0.810	0.561	0.282	0.282
rubidium, dissolved	7440-17-7	E421	0.00020	mg/L	0.00028	0.00035	0.00036	0.00034	0.00036	0.00036
selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.000120	0.000153	0.000106	<0.000050	<0.000050	<0.000050
silicon, dissolved	7440-21-3	E421	0.050	mg/L	5.00	5.05	5.04	4.15	0.370	0.370
silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L	2.03	2.01	1.80	2.49	6.00	6.00
strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.104	0.102	0.100	0.0471	0.0161	0.0161
sulfur, dissolved	7704-34-9	E421	0.50	mg/L	0.91	0.87	0.66	<0.50	<0.50	<0.50
tellurium, dissolved	13494-80-9	E421	0.00020	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020



## Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	SW-05	SW-22	SW-03	SW-04	SW-01
Client sampling date / time					22-Nov-2022 14:35	22-Nov-2022 12:00	22-Nov-2022 10:40	22-Nov-2022 15:45	22-Nov-2022 09:30	
Analyte	CAS Number	Method	LOR	Unit	VA22C8721-001	VA22C8721-002	VA22C8721-003	VA22C8721-004	VA22C8721-005	
					Result	Result	Result	Result	Result	
<b>Dissolved Metals</b>										
thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	<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	<0.00010	<0.00010	
titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	<0.00030	0.00036	<0.00030	
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	0.000140	0.000138	0.000102	0.000038	<0.000010	
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	0.00083	0.00082	0.00082	0.00069	<0.00050	
zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0035	0.0095 <sup>DTC</sup>	0.0017	0.0022	<0.0010	
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	
dissolved mercury filtration location	----	EP509	-	-	Field	Field	Field	Field	Field	
dissolved metals filtration location	----	EP421	-	-	Field	Field	Field	Field	Field	
<b>Aggregate Organics</b>										
biochemical oxygen demand [BOD]	----	E550	2.0	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	
chemical oxygen demand [COD]	----	E559-L	10	mg/L	<10	<10	<10	<10	<10	

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





## Analytical Results

Sub-Matrix: Water					Client sample ID	SW-02	Field Blank	Travel Blank	----	----
(Matrix: Water)					Client sampling date / time	22-Nov-2022 12:30	22-Nov-2022 16:22	22-Nov-2022	----	----
Analyte	CAS Number	Method	LOR	Unit	VA22C8721-006	VA22C8721-007	VA22C8721-008	-----	-----	
					Result	Result	Result	----	----	
<b>Physical Tests</b>										
conductivity	----	E100	2.0	µS/cm	160	<2.0	----	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L	77.4	----	----	----	----	----
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L	91.3	<0.60	<0.60	----	----	----
pH	----	E108	0.10	pH units	8.18	5.58	----	----	----	----
<b>Anions and Nutrients</b>										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0185	<0.0050	0.0104 <sup>RRV</sup>	----	----	----
bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	----	----	----	----	----
chloride	16887-00-6	E235.Cl	0.50	mg/L	1.07	<0.50	<0.50	----	----	----
fluoride	16984-48-8	E235.F	0.020	mg/L	0.049	----	----	----	----	----
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	0.072	----	----	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.0346	----	----	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	----	----	----	----	----
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	0.0036	----	----	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	2.56	----	----	----	----	----
<b>Organic / Inorganic Carbon</b>										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	0.52	----	----	----	----	----
<b>Total Metals</b>										
aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0045	<0.0030	<0.0030	----	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L	<0.00010	<0.00010	<0.00010	----	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00204	<0.00010	<0.00010	----	----	----
barium, total	7440-39-3	E420	0.00010	mg/L	0.0241	<0.00010	<0.00010	----	----	----
beryllium, total	7440-41-7	E420	0.000100	mg/L	<0.000100	<0.000100	<0.000100	----	----	----
bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	<0.000050	----	----	----
boron, total	7440-42-8	E420	0.010	mg/L	<0.010	<0.010	<0.010	----	----	----
cadmium, total	7440-43-9	E420	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	----	----	----
calcium, total	7440-70-2	E420	0.050	mg/L	32.8	<0.050	<0.050	----	----	----
cesium, total	7440-46-2	E420	0.000010	mg/L	<0.000010	<0.000010	<0.000010	----	----	----
chromium, total	7440-47-3	E420	0.00050	mg/L	<0.00050	<0.00050	<0.00050	----	----	----
cobalt, total	7440-48-4	E420	0.00010	mg/L	<0.00010	<0.00010	<0.00010	----	----	----
copper, total	7440-50-8	E420	0.00050	mg/L	<0.00050	<0.00050	<0.00050	----	----	----



### Analytical Results

Sub-Matrix: Water					Client sample ID	SW-02	Field Blank	Travel Blank	----	----
(Matrix: Water)					Client sampling date / time	22-Nov-2022 12:30	22-Nov-2022 16:22	22-Nov-2022	----	----
Analyte	CAS Number	Method	LOR	Unit	VA22C8721-006	VA22C8721-007	VA22C8721-008	-----	-----	
					Result	Result	Result	----	----	
<b>Total Metals</b>										
iron, total	7439-89-6	E420	0.010	mg/L	<0.010	<0.010	<0.010	----	----	
lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	<0.000050	<0.000050	----	----	
lithium, total	7439-93-2	E420	0.0010	mg/L	0.0012	<0.0010	<0.0010	----	----	
magnesium, total	7439-95-4	E420	0.0050	mg/L	2.28	<0.0050	<0.0050	----	----	
manganese, total	7439-96-5	E420	0.00010	mg/L	0.00210	<0.00010	<0.00010	----	----	
mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	----	----	
molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.000314	<0.000050	0.000458	----	----	
nickel, total	7440-02-0	E420	0.00050	mg/L	<0.00050	<0.00050	<0.00050	----	----	
phosphorus, total	7723-14-0	E420	0.050	mg/L	<0.050	<0.050	<0.050	----	----	
potassium, total	7440-09-7	E420	0.050	mg/L	0.856	<0.050	<0.050	----	----	
rubidium, total	7440-17-7	E420	0.00020	mg/L	0.00041	<0.00020	<0.00020	----	----	
selenium, total	7782-49-2	E420	0.000050	mg/L	0.000123	<0.000050	<0.000050	----	----	
silicon, total	7440-21-3	E420	0.10	mg/L	5.66	<0.10	<0.10	----	----	
silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	<0.000010	----	----	
sodium, total	7440-23-5	E420	0.050	mg/L	1.96	<0.050	<0.050	----	----	
strontium, total	7440-24-6	E420	0.00020	mg/L	0.117	<0.00020	<0.00020	----	----	
sulfur, total	7704-34-9	E420	0.50	mg/L	0.92	<0.50	<0.50	----	----	
tellurium, total	13494-80-9	E420	0.00020	mg/L	<0.00020	<0.00020	<0.00020	----	----	
thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	<0.000010	----	----	
thorium, total	7440-29-1	E420	0.00010	mg/L	<0.00010	<0.00010	<0.00010	----	----	
tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	<0.00010	----	----	
titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	<0.00030	<0.00030	----	----	
tungsten, total	7440-33-7	E420	0.00010	mg/L	<0.00010	<0.00010	<0.00010	----	----	
uranium, total	7440-61-1	E420	0.000010	mg/L	0.000110	<0.000010	<0.000010	----	----	
vanadium, total	7440-62-2	E420	0.00050	mg/L	0.00117	<0.00050	<0.00050	----	----	
zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	<0.0030	<0.0030	----	----	
zirconium, total	7440-67-7	E420	0.00020	mg/L	<0.00020	<0.00020	<0.00020	----	----	
<b>Dissolved Metals</b>										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0029	----	----	----	----	
antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	----	----	----	----	



### Analytical Results

Sub-Matrix: Water					Client sample ID	SW-02	Field Blank	Travel Blank	----	----
(Matrix: Water)					Client sampling date / time	22-Nov-2022 12:30	22-Nov-2022 16:22	22-Nov-2022	----	----
Analyte	CAS Number	Method	LOR	Unit	VA22C8721-006	VA22C8721-007	VA22C8721-008	-----	-----	
					Result	Result	Result	----	----	
<b>Dissolved Metals</b>										
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00188	---	---	---	---	---
barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0225	---	---	---	---	---
beryllium, dissolved	7440-41-7	E421	0.000100	mg/L	<0.000100	---	---	---	---	---
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	---	---	---	---	---
boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	---	---	---	---	---
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	<0.0000050	---	---	---	---	---
calcium, dissolved	7440-70-2	E421	0.050	mg/L	27.5	---	---	---	---	---
cesium, dissolved	7440-46-2	E421	0.000010	mg/L	<0.000010	---	---	---	---	---
chromium, dissolved	7440-47-3	E421	0.00050	mg/L	<0.00050	---	---	---	---	---
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	<0.00010	---	---	---	---	---
copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00020	---	---	---	---	---
iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	---	---	---	---	---
lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	---	---	---	---	---
lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0012	---	---	---	---	---
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	2.12	---	---	---	---	---
manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00143	---	---	---	---	---
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	---	---	---	---	---
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.000280	---	---	---	---	---
nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	---	---	---	---	---
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	---	---	---	---	---
potassium, dissolved	7440-09-7	E421	0.050	mg/L	0.824	---	---	---	---	---
rubidium, dissolved	7440-17-7	E421	0.00020	mg/L	0.00030	---	---	---	---	---
selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.000138	---	---	---	---	---
silicon, dissolved	7440-21-3	E421	0.050	mg/L	5.37	---	---	---	---	---
silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	---	---	---	---	---
sodium, dissolved	7440-23-5	E421	0.050	mg/L	1.78	---	---	---	---	---
strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.104	---	---	---	---	---
sulfur, dissolved	7704-34-9	E421	0.50	mg/L	0.72	---	---	---	---	---
tellurium, dissolved	13494-80-9	E421	0.00020	mg/L	<0.00020	---	---	---	---	---
thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	---	---	---	---	---



### Analytical Results

Sub-Matrix: Water					Client sample ID	SW-02	Field Blank	Travel Blank	----	----
(Matrix: Water)					Client sampling date / time	22-Nov-2022 12:30	22-Nov-2022 16:22	22-Nov-2022	----	----
Analyte	CAS Number	Method	LOR	Unit	VA22C8721-006	VA22C8721-007	VA22C8721-008	-----	-----	
					Result	Result	Result	----	----	
<b>Dissolved Metals</b>										
thorium, dissolved	7440-29-1	E421	0.00010	mg/L	<0.00010	----	----	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	----	----	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	----	----	----	----	----
tungsten, dissolved	7440-33-7	E421	0.00010	mg/L	<0.00010	----	----	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.000107	----	----	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	0.00092	----	----	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0012	----	----	----	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	<0.00020	----	----	----	----	----
dissolved mercury filtration location	----	EP509	-	-	Field	----	----	----	----	----
dissolved metals filtration location	----	EP421	-	-	Field	----	----	----	----	----
<b>Aggregate Organics</b>										
biochemical oxygen demand [BOD]	----	E550	2.0	mg/L	<2.0	----	----	----	----	----
chemical oxygen demand [COD]	----	E559-L	10	mg/L	<10	----	----	----	----	----

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



## QUALITY CONTROL INTERPRETIVE REPORT

<p><b>Work Order</b> : <b>VA22C8721</b></p> <p><b>Client</b> : <b>Regional District of Kitimat-Stikine</b></p> <p><b>Contact</b> : Hannah Shinton</p> <p><b>Address</b> : # 300 - 4545 Lazelle Avenue Terrace BC Canada V8G 4E1</p> <p><b>Telephone</b> : ----</p> <p><b>Project</b> : Foreceman Ridge Surface Water</p> <p><b>PO</b> : ----</p> <p><b>C-O-C number</b> :</p> <p><b>Sampler</b> : H.shinton</p> <p><b>Site</b> :</p> <p><b>Quote number</b> : Default Water Testing (Q62338)</p> <p><b>No. of samples received</b> : 8</p> <p><b>No. of samples analysed</b> : 8</p>	<p><b>Page</b> : 1 of 22</p> <p><b>Laboratory</b> : Vancouver - Environmental</p> <p><b>Account Manager</b> : Amber Springer</p> <p><b>Address</b> : 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9</p> <p><b>Telephone</b> : +1 604 253 4188</p> <p><b>Date Samples Received</b> : 24-Nov-2022 21:10</p> <p><b>Issue Date</b> : 05-Dec-2022 09:52</p>
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This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

**Key**

- Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
- CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
- DQO: Data Quality Objective.
- LOR: Limit of Reporting (detection limit).
- RPD: Relative Percent Difference.

### Workorder Comments

Holding times are displayed as "----" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

### Summary of Outliers

#### Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Matrix Spike outliers occur.
- Laboratory Control Sample (LCS) outliers occur - please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

#### Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

***Outliers : Analysis Holding Time Compliance (Breaches)***

- Analysis Holding Time Outliers exist - please see following pages for full details.

***Outliers : Frequency of Quality Control Samples***

- No Quality Control Sample Frequency Outliers occur.





**Outliers : Quality Control Samples**

*Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes*

Matrix: **Water**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
<b>Laboratory Control Sample (LCS) Recoveries</b>								
Total Metals	QC-759369-002	----	bismuth, total	7440-69-9	E420	121 % <sup>MES</sup>	80.0-120%	Recovery greater than upper control limit

**Result Qualifiers**

Qualifier	Description
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).



## Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Aggregate Organics : Biochemical Oxygen Demand - 5 day</b>										
HDPE [BOD HT 3d] SW-01	E550	22-Nov-2022	----	----	----		25-Nov-2022	3 days	3 days	✓
<b>Aggregate Organics : Biochemical Oxygen Demand - 5 day</b>										
HDPE [BOD HT 3d] SW-02	E550	22-Nov-2022	----	----	----		25-Nov-2022	3 days	3 days	✓
<b>Aggregate Organics : Biochemical Oxygen Demand - 5 day</b>										
HDPE [BOD HT 3d] SW-03	E550	22-Nov-2022	----	----	----		25-Nov-2022	3 days	3 days	✓
<b>Aggregate Organics : Biochemical Oxygen Demand - 5 day</b>										
HDPE [BOD HT 3d] SW-04	E550	22-Nov-2022	----	----	----		25-Nov-2022	3 days	3 days	✓
<b>Aggregate Organics : Biochemical Oxygen Demand - 5 day</b>										
HDPE [BOD HT 3d] SW-05	E550	22-Nov-2022	----	----	----		25-Nov-2022	3 days	3 days	✓
<b>Aggregate Organics : Biochemical Oxygen Demand - 5 day</b>										
HDPE [BOD HT 3d] SW-22	E550	22-Nov-2022	----	----	----		25-Nov-2022	3 days	3 days	✓
<b>Aggregate Organics : Chemical Oxygen Demand by Colourimetry (Low Level)</b>										
Amber glass total (sulfuric acid) SW-01	E559-L	22-Nov-2022	----	----	----		01-Dec-2022	28 days	9 days	✓



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Aggregate Organics : Chemical Oxygen Demand by Colourimetry (Low Level)</b>										
<b>Amber glass total (sulfuric acid)</b> SW-02	E559-L	22-Nov-2022	----	----	----		01-Dec-2022	28 days	9 days	✔
<b>Aggregate Organics : Chemical Oxygen Demand by Colourimetry (Low Level)</b>										
<b>Amber glass total (sulfuric acid)</b> SW-03	E559-L	22-Nov-2022	----	----	----		01-Dec-2022	28 days	9 days	✔
<b>Aggregate Organics : Chemical Oxygen Demand by Colourimetry (Low Level)</b>										
<b>Amber glass total (sulfuric acid)</b> SW-04	E559-L	22-Nov-2022	----	----	----		01-Dec-2022	28 days	9 days	✔
<b>Aggregate Organics : Chemical Oxygen Demand by Colourimetry (Low Level)</b>										
<b>Amber glass total (sulfuric acid)</b> SW-05	E559-L	22-Nov-2022	----	----	----		01-Dec-2022	28 days	9 days	✔
<b>Aggregate Organics : Chemical Oxygen Demand by Colourimetry (Low Level)</b>										
<b>Amber glass total (sulfuric acid)</b> SW-22	E559-L	22-Nov-2022	----	----	----		01-Dec-2022	28 days	9 days	✔
<b>Anions and Nutrients : Ammonia by Fluorescence</b>										
<b>Amber glass total (sulfuric acid)</b> Field Blank	E298	22-Nov-2022	28-Nov-2022	----	----		29-Nov-2022	28 days	7 days	✔
<b>Anions and Nutrients : Ammonia by Fluorescence</b>										
<b>Amber glass total (sulfuric acid)</b> SW-01	E298	22-Nov-2022	29-Nov-2022	----	----		29-Nov-2022	28 days	7 days	✔
<b>Anions and Nutrients : Ammonia by Fluorescence</b>										
<b>Amber glass total (sulfuric acid)</b> SW-02	E298	22-Nov-2022	29-Nov-2022	----	----		29-Nov-2022	28 days	7 days	✔
<b>Anions and Nutrients : Ammonia by Fluorescence</b>										
<b>Amber glass total (sulfuric acid)</b> SW-03	E298	22-Nov-2022	29-Nov-2022	----	----		29-Nov-2022	28 days	7 days	✔



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Ammonia by Fluorescence</b>											
Amber glass total (sulfuric acid) SW-04	E298	22-Nov-2022	29-Nov-2022	----	----		29-Nov-2022	28 days	7 days	✔	
<b>Anions and Nutrients : Ammonia by Fluorescence</b>											
Amber glass total (sulfuric acid) SW-05	E298	22-Nov-2022	29-Nov-2022	----	----		29-Nov-2022	28 days	7 days	✔	
<b>Anions and Nutrients : Ammonia by Fluorescence</b>											
Amber glass total (sulfuric acid) SW-22	E298	22-Nov-2022	29-Nov-2022	----	----		29-Nov-2022	28 days	7 days	✔	
<b>Anions and Nutrients : Ammonia by Fluorescence</b>											
Amber glass total (sulfuric acid) Travel Blank	E298	22-Nov-2022	28-Nov-2022	----	----		29-Nov-2022	28 days	7 days	✔	
<b>Anions and Nutrients : Bromide in Water by IC (Low Level)</b>											
HDPE [BOD HT 3d] SW-01	E235.Br-L	22-Nov-2022	25-Nov-2022	28 days	3 days	✔	25-Nov-2022	25 days	0 days	✔	
<b>Anions and Nutrients : Bromide in Water by IC (Low Level)</b>											
HDPE [BOD HT 3d] SW-02	E235.Br-L	22-Nov-2022	25-Nov-2022	28 days	3 days	✔	25-Nov-2022	25 days	0 days	✔	
<b>Anions and Nutrients : Bromide in Water by IC (Low Level)</b>											
HDPE [BOD HT 3d] SW-03	E235.Br-L	22-Nov-2022	25-Nov-2022	28 days	3 days	✔	25-Nov-2022	25 days	0 days	✔	
<b>Anions and Nutrients : Bromide in Water by IC (Low Level)</b>											
HDPE [BOD HT 3d] SW-04	E235.Br-L	22-Nov-2022	25-Nov-2022	28 days	3 days	✔	25-Nov-2022	25 days	0 days	✔	
<b>Anions and Nutrients : Bromide in Water by IC (Low Level)</b>											
HDPE [BOD HT 3d] SW-05	E235.Br-L	22-Nov-2022	25-Nov-2022	28 days	3 days	✔	25-Nov-2022	25 days	0 days	✔	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Bromide in Water by IC (Low Level)</b>											
HDPE [BOD HT 3d] SW-22	E235.Br-L	22-Nov-2022	25-Nov-2022	28 days	3 days	✔	25-Nov-2022	25 days	0 days	✔	
<b>Anions and Nutrients : Chloride in Water by IC</b>											
HDPE Travel Blank	E235.Cl	22-Nov-2022	01-Dec-2022	----	----		01-Dec-2022	28 days	10 days	✔	
<b>Anions and Nutrients : Chloride in Water by IC</b>											
HDPE [BOD HT 3d] SW-01	E235.Cl	22-Nov-2022	25-Nov-2022	28 days	3 days	✔	25-Nov-2022	25 days	0 days	✔	
<b>Anions and Nutrients : Chloride in Water by IC</b>											
HDPE [BOD HT 3d] SW-02	E235.Cl	22-Nov-2022	25-Nov-2022	28 days	3 days	✔	25-Nov-2022	25 days	0 days	✔	
<b>Anions and Nutrients : Chloride in Water by IC</b>											
HDPE [BOD HT 3d] SW-03	E235.Cl	22-Nov-2022	25-Nov-2022	28 days	3 days	✔	25-Nov-2022	25 days	0 days	✔	
<b>Anions and Nutrients : Chloride in Water by IC</b>											
HDPE [BOD HT 3d] SW-04	E235.Cl	22-Nov-2022	25-Nov-2022	28 days	3 days	✔	25-Nov-2022	25 days	0 days	✔	
<b>Anions and Nutrients : Chloride in Water by IC</b>											
HDPE [BOD HT 3d] SW-05	E235.Cl	22-Nov-2022	25-Nov-2022	28 days	3 days	✔	25-Nov-2022	25 days	0 days	✔	
<b>Anions and Nutrients : Chloride in Water by IC</b>											
HDPE [BOD HT 3d] SW-22	E235.Cl	22-Nov-2022	25-Nov-2022	28 days	3 days	✔	25-Nov-2022	25 days	0 days	✔	
<b>Anions and Nutrients : Chloride in Water by IC</b>											
HDPE Field Blank	E235.Cl	22-Nov-2022	01-Dec-2022	----	----		01-Dec-2022	28 days	9 days	✔	



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001)</b>										
HDPE SW-01	E378-U	22-Nov-2022	01-Dec-2022	----	----		01-Dec-2022	3 days	9 days	* EHTL
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001)</b>										
HDPE SW-02	E378-U	22-Nov-2022	01-Dec-2022	----	----		01-Dec-2022	3 days	9 days	* EHTL
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001)</b>										
HDPE SW-03	E378-U	22-Nov-2022	01-Dec-2022	----	----		01-Dec-2022	3 days	9 days	* EHTL
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001)</b>										
HDPE SW-04	E378-U	22-Nov-2022	01-Dec-2022	----	----		01-Dec-2022	3 days	9 days	* EHTL
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001)</b>										
HDPE SW-05	E378-U	22-Nov-2022	01-Dec-2022	----	----		01-Dec-2022	3 days	9 days	* EHTL
<b>Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001)</b>										
HDPE SW-22	E378-U	22-Nov-2022	01-Dec-2022	----	----		01-Dec-2022	3 days	9 days	* EHTL
<b>Anions and Nutrients : Fluoride in Water by IC</b>										
HDPE [BOD HT 3d] SW-01	E235.F	22-Nov-2022	25-Nov-2022	28 days	3 days	✓	25-Nov-2022	25 days	0 days	✓
<b>Anions and Nutrients : Fluoride in Water by IC</b>										
HDPE [BOD HT 3d] SW-02	E235.F	22-Nov-2022	25-Nov-2022	28 days	3 days	✓	25-Nov-2022	25 days	0 days	✓





Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Fluoride in Water by IC</b>											
HDPE [BOD HT 3d] SW-03	E235.F	22-Nov-2022	25-Nov-2022	28 days	3 days	✔	25-Nov-2022	25 days	0 days	✔	
<b>Anions and Nutrients : Fluoride in Water by IC</b>											
HDPE [BOD HT 3d] SW-04	E235.F	22-Nov-2022	25-Nov-2022	28 days	3 days	✔	25-Nov-2022	25 days	0 days	✔	
<b>Anions and Nutrients : Fluoride in Water by IC</b>											
HDPE [BOD HT 3d] SW-05	E235.F	22-Nov-2022	25-Nov-2022	28 days	3 days	✔	25-Nov-2022	25 days	0 days	✔	
<b>Anions and Nutrients : Fluoride in Water by IC</b>											
HDPE [BOD HT 3d] SW-22	E235.F	22-Nov-2022	25-Nov-2022	28 days	3 days	✔	25-Nov-2022	25 days	0 days	✔	
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>											
HDPE [BOD HT 3d] SW-01	E235.NO3-L	22-Nov-2022	25-Nov-2022	3 days	3 days	✔	25-Nov-2022	3 days	0 days	✔	
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>											
HDPE [BOD HT 3d] SW-02	E235.NO3-L	22-Nov-2022	25-Nov-2022	3 days	3 days	✔	25-Nov-2022	3 days	0 days	✔	
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>											
HDPE [BOD HT 3d] SW-03	E235.NO3-L	22-Nov-2022	25-Nov-2022	3 days	3 days	✔	25-Nov-2022	3 days	0 days	✔	
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>											
HDPE [BOD HT 3d] SW-04	E235.NO3-L	22-Nov-2022	25-Nov-2022	3 days	3 days	✔	25-Nov-2022	3 days	0 days	✔	
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>											
HDPE [BOD HT 3d] SW-05	E235.NO3-L	22-Nov-2022	25-Nov-2022	3 days	3 days	✔	25-Nov-2022	3 days	0 days	✔	



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>											
HDPE [BOD HT 3d] SW-22	E235.NO3-L	22-Nov-2022	25-Nov-2022	3 days	3 days	✓	25-Nov-2022	3 days	0 days	✓	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
HDPE [BOD HT 3d] SW-01	E235.NO2-L	22-Nov-2022	25-Nov-2022	3 days	3 days	✓	25-Nov-2022	0 days	0 days	* EHTL	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
HDPE [BOD HT 3d] SW-02	E235.NO2-L	22-Nov-2022	25-Nov-2022	3 days	3 days	✓	25-Nov-2022	0 days	0 days	* EHTL	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
HDPE [BOD HT 3d] SW-03	E235.NO2-L	22-Nov-2022	25-Nov-2022	3 days	3 days	✓	25-Nov-2022	0 days	0 days	* EHTL	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
HDPE [BOD HT 3d] SW-04	E235.NO2-L	22-Nov-2022	25-Nov-2022	3 days	3 days	✓	25-Nov-2022	0 days	0 days	* EHTL	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
HDPE [BOD HT 3d] SW-05	E235.NO2-L	22-Nov-2022	25-Nov-2022	3 days	3 days	✓	25-Nov-2022	0 days	0 days	* EHTL	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
HDPE [BOD HT 3d] SW-22	E235.NO2-L	22-Nov-2022	25-Nov-2022	3 days	3 days	✓	25-Nov-2022	0 days	0 days	* EHTL	
<b>Anions and Nutrients : Sulfate in Water by IC</b>											
HDPE [BOD HT 3d] SW-01	E235.SO4	22-Nov-2022	25-Nov-2022	28 days	3 days	✓	25-Nov-2022	25 days	0 days	✓	
<b>Anions and Nutrients : Sulfate in Water by IC</b>											
HDPE [BOD HT 3d] SW-02	E235.SO4	22-Nov-2022	25-Nov-2022	28 days	3 days	✓	25-Nov-2022	25 days	0 days	✓	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Sulfate in Water by IC</b>											
HDPE [BOD HT 3d] SW-03	E235.SO4	22-Nov-2022	25-Nov-2022	28 days	3 days	✔	25-Nov-2022	25 days	0 days	✔	
<b>Anions and Nutrients : Sulfate in Water by IC</b>											
HDPE [BOD HT 3d] SW-04	E235.SO4	22-Nov-2022	25-Nov-2022	28 days	3 days	✔	25-Nov-2022	25 days	0 days	✔	
<b>Anions and Nutrients : Sulfate in Water by IC</b>											
HDPE [BOD HT 3d] SW-05	E235.SO4	22-Nov-2022	25-Nov-2022	28 days	3 days	✔	25-Nov-2022	25 days	0 days	✔	
<b>Anions and Nutrients : Sulfate in Water by IC</b>											
HDPE [BOD HT 3d] SW-22	E235.SO4	22-Nov-2022	25-Nov-2022	28 days	3 days	✔	25-Nov-2022	25 days	0 days	✔	
<b>Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)</b>											
Amber glass total (sulfuric acid) SW-01	E318	22-Nov-2022	29-Nov-2022	----	----		01-Dec-2022	28 days	9 days	✔	
<b>Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)</b>											
Amber glass total (sulfuric acid) SW-02	E318	22-Nov-2022	29-Nov-2022	----	----		01-Dec-2022	28 days	9 days	✔	
<b>Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)</b>											
Amber glass total (sulfuric acid) SW-03	E318	22-Nov-2022	29-Nov-2022	----	----		01-Dec-2022	28 days	9 days	✔	
<b>Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)</b>											
Amber glass total (sulfuric acid) SW-04	E318	22-Nov-2022	29-Nov-2022	----	----		01-Dec-2022	28 days	9 days	✔	
<b>Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)</b>											
Amber glass total (sulfuric acid) SW-05	E318	22-Nov-2022	29-Nov-2022	----	----		01-Dec-2022	28 days	9 days	✔	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)</b>											
<b>Amber glass total (sulfuric acid)</b> SW-22	E318	22-Nov-2022	29-Nov-2022	----	----		01-Dec-2022	28 days	9 days	✔	
<b>Dissolved Metals : Dissolved Mercury in Water by CVAAS</b>											
<b>Glass vial dissolved (hydrochloric acid)</b> SW-01	E509	22-Nov-2022	27-Nov-2022	----	----		27-Nov-2022	28 days	5 days	✔	
<b>Dissolved Metals : Dissolved Mercury in Water by CVAAS</b>											
<b>Glass vial dissolved (hydrochloric acid)</b> SW-02	E509	22-Nov-2022	27-Nov-2022	----	----		27-Nov-2022	28 days	5 days	✔	
<b>Dissolved Metals : Dissolved Mercury in Water by CVAAS</b>											
<b>Glass vial dissolved (hydrochloric acid)</b> SW-03	E509	22-Nov-2022	27-Nov-2022	----	----		27-Nov-2022	28 days	5 days	✔	
<b>Dissolved Metals : Dissolved Mercury in Water by CVAAS</b>											
<b>Glass vial dissolved (hydrochloric acid)</b> SW-04	E509	22-Nov-2022	27-Nov-2022	----	----		27-Nov-2022	28 days	5 days	✔	
<b>Dissolved Metals : Dissolved Mercury in Water by CVAAS</b>											
<b>Glass vial dissolved (hydrochloric acid)</b> SW-05	E509	22-Nov-2022	27-Nov-2022	----	----		27-Nov-2022	28 days	5 days	✔	
<b>Dissolved Metals : Dissolved Mercury in Water by CVAAS</b>											
<b>Glass vial dissolved (hydrochloric acid)</b> SW-22	E509	22-Nov-2022	27-Nov-2022	----	----		27-Nov-2022	28 days	5 days	✔	
<b>Dissolved Metals : Dissolved Metals in Water by CRC ICPMS</b>											
<b>HDPE dissolved (nitric acid)</b> SW-04	E421	22-Nov-2022	29-Nov-2022	----	----		29-Nov-2022	180 days	7 days	✔	
<b>Dissolved Metals : Dissolved Metals in Water by CRC ICPMS</b>											
<b>HDPE dissolved (nitric acid)</b> SW-05	E421	22-Nov-2022	29-Nov-2022	----	----		29-Nov-2022	180 days	7 days	✔	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Dissolved Metals : Dissolved Metals in Water by CRC ICPMS</b>											
HDPE dissolved (nitric acid) SW-01	E421	22-Nov-2022	29-Nov-2022	----	----		29-Nov-2022	180 days	8 days	✔	
<b>Dissolved Metals : Dissolved Metals in Water by CRC ICPMS</b>											
HDPE dissolved (nitric acid) SW-02	E421	22-Nov-2022	29-Nov-2022	----	----		29-Nov-2022	180 days	8 days	✔	
<b>Dissolved Metals : Dissolved Metals in Water by CRC ICPMS</b>											
HDPE dissolved (nitric acid) SW-03	E421	22-Nov-2022	29-Nov-2022	----	----		29-Nov-2022	180 days	8 days	✔	
<b>Dissolved Metals : Dissolved Metals in Water by CRC ICPMS</b>											
HDPE dissolved (nitric acid) SW-22	E421	22-Nov-2022	29-Nov-2022	----	----		29-Nov-2022	180 days	8 days	✔	
<b>Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)</b>											
Amber glass dissolved (sulfuric acid) SW-01	E358-L	22-Nov-2022	29-Nov-2022	----	----		29-Nov-2022	28 days	7 days	✔	
<b>Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)</b>											
Amber glass dissolved (sulfuric acid) SW-02	E358-L	22-Nov-2022	29-Nov-2022	----	----		29-Nov-2022	28 days	7 days	✔	
<b>Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)</b>											
Amber glass dissolved (sulfuric acid) SW-03	E358-L	22-Nov-2022	29-Nov-2022	----	----		29-Nov-2022	28 days	7 days	✔	
<b>Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)</b>											
Amber glass dissolved (sulfuric acid) SW-04	E358-L	22-Nov-2022	29-Nov-2022	----	----		29-Nov-2022	28 days	7 days	✔	
<b>Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)</b>											
Amber glass dissolved (sulfuric acid) SW-05	E358-L	22-Nov-2022	29-Nov-2022	----	----		29-Nov-2022	28 days	7 days	✔	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)</b>											
<b>Amber glass dissolved (sulfuric acid)</b> SW-22	E358-L	22-Nov-2022	29-Nov-2022	----	----		29-Nov-2022	28 days	7 days	✔	
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE [BOD HT 3d]</b> SW-01	E100	22-Nov-2022	25-Nov-2022	28 days	3 days	✔	26-Nov-2022	25 days	1 days	✔	
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE [BOD HT 3d]</b> SW-02	E100	22-Nov-2022	25-Nov-2022	28 days	3 days	✔	26-Nov-2022	25 days	1 days	✔	
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE [BOD HT 3d]</b> SW-03	E100	22-Nov-2022	25-Nov-2022	28 days	3 days	✔	26-Nov-2022	25 days	1 days	✔	
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE [BOD HT 3d]</b> SW-04	E100	22-Nov-2022	25-Nov-2022	28 days	3 days	✔	26-Nov-2022	25 days	1 days	✔	
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE [BOD HT 3d]</b> SW-05	E100	22-Nov-2022	25-Nov-2022	28 days	3 days	✔	26-Nov-2022	25 days	1 days	✔	
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE [BOD HT 3d]</b> SW-22	E100	22-Nov-2022	25-Nov-2022	28 days	3 days	✔	26-Nov-2022	25 days	1 days	✔	
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE</b> Field Blank	E100	22-Nov-2022	25-Nov-2022	----	----		26-Nov-2022	28 days	4 days	✔	
<b>Physical Tests : pH by Meter</b>											
<b>HDPE</b> Field Blank	E108	22-Nov-2022	25-Nov-2022	----	----		26-Nov-2022	0.25 hrs	16.25 hrs	✖ EHTR-FM	





Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Physical Tests : pH by Meter</b>											
HDPE [BOD HT 3d] SW-04	E108	22-Nov-2022	25-Nov-2022	16 hrs	0.25 hrs	* EHTR-FM	26-Nov-2022	-72.07 hrs	16 hrs	* EHTR-FM	
<b>Physical Tests : pH by Meter</b>											
HDPE [BOD HT 3d] SW-05	E108	22-Nov-2022	25-Nov-2022	16 hrs	0.25 hrs	* EHTR-FM	26-Nov-2022	-73.24 hrs	16 hrs	* EHTR-FM	
<b>Physical Tests : pH by Meter</b>											
HDPE [BOD HT 3d] SW-02	E108	22-Nov-2022	25-Nov-2022	16 hrs	0.25 hrs	* EHTR-FM	26-Nov-2022	-75.32 hrs	16 hrs	* EHTR-FM	
<b>Physical Tests : pH by Meter</b>											
HDPE [BOD HT 3d] SW-22	E108	22-Nov-2022	25-Nov-2022	16 hrs	0.25 hrs	* EHTR-FM	26-Nov-2022	-75.82 hrs	16 hrs	* EHTR-FM	
<b>Physical Tests : pH by Meter</b>											
HDPE [BOD HT 3d] SW-03	E108	22-Nov-2022	25-Nov-2022	16 hrs	0.25 hrs	* EHTR-FM	26-Nov-2022	-77.15 hrs	16 hrs	* EHTR-FM	
<b>Physical Tests : pH by Meter</b>											
HDPE [BOD HT 3d] SW-01	E108	22-Nov-2022	25-Nov-2022	16 hrs	0.25 hrs	* EHTR-FM	26-Nov-2022	-78.32 hrs	16 hrs	* EHTR-FM	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
Glass vial total (hydrochloric acid) Field Blank	E508	22-Nov-2022	27-Nov-2022	----	----		27-Nov-2022	28 days	5 days	✓	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
Glass vial total (hydrochloric acid) SW-01	E508	22-Nov-2022	27-Nov-2022	----	----		27-Nov-2022	28 days	5 days	✓	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
Glass vial total (hydrochloric acid) SW-02	E508	22-Nov-2022	27-Nov-2022	----	----		27-Nov-2022	28 days	5 days	✓	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
Glass vial total (hydrochloric acid) SW-03	E508	22-Nov-2022	27-Nov-2022	----	----		27-Nov-2022	28 days	5 days	✔	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
Glass vial total (hydrochloric acid) SW-04	E508	22-Nov-2022	27-Nov-2022	----	----		27-Nov-2022	28 days	5 days	✔	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
Glass vial total (hydrochloric acid) SW-05	E508	22-Nov-2022	27-Nov-2022	----	----		27-Nov-2022	28 days	5 days	✔	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
Glass vial total (hydrochloric acid) SW-22	E508	22-Nov-2022	27-Nov-2022	----	----		27-Nov-2022	28 days	5 days	✔	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
Glass vial total (hydrochloric acid) Travel Blank	E508	22-Nov-2022	28-Nov-2022	----	----		28-Nov-2022	28 days	7 days	✔	
<b>Total Metals : Total metals in Water by CRC ICPMS</b>											
HDPE total (nitric acid) Field Blank	E420	22-Nov-2022	28-Nov-2022	----	----		29-Nov-2022	180 days	7 days	✔	
<b>Total Metals : Total metals in Water by CRC ICPMS</b>											
HDPE total (nitric acid) SW-01	E420	22-Nov-2022	28-Nov-2022	----	----		29-Nov-2022	180 days	7 days	✔	
<b>Total Metals : Total metals in Water by CRC ICPMS</b>											
HDPE total (nitric acid) SW-02	E420	22-Nov-2022	28-Nov-2022	----	----		29-Nov-2022	180 days	7 days	✔	
<b>Total Metals : Total metals in Water by CRC ICPMS</b>											
HDPE total (nitric acid) SW-03	E420	22-Nov-2022	28-Nov-2022	----	----		29-Nov-2022	180 days	7 days	✔	



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Total Metals : Total metals in Water by CRC ICPMS</b>										
HDPE total (nitric acid) SW-04	E420	22-Nov-2022	28-Nov-2022	----	----		29-Nov-2022	180 days	7 days	✓
<b>Total Metals : Total metals in Water by CRC ICPMS</b>										
HDPE total (nitric acid) SW-05	E420	22-Nov-2022	28-Nov-2022	----	----		29-Nov-2022	180 days	7 days	✓
<b>Total Metals : Total metals in Water by CRC ICPMS</b>										
HDPE total (nitric acid) SW-22	E420	22-Nov-2022	28-Nov-2022	----	----		29-Nov-2022	180 days	7 days	✓
<b>Total Metals : Total metals in Water by CRC ICPMS</b>										
HDPE total (nitric acid) Travel Blank	E420	22-Nov-2022	28-Nov-2022	----	----		29-Nov-2022	180 days	8 days	✓

**Legend & Qualifier Definitions**

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended  
 EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.  
 Rec. HT: ALS recommended hold time (see units).



## Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water** Evaluation: ✖ = QC frequency outside specification; ✔ = QC frequency within specification.

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		
			QC	Regular	Actual	Expected	Evaluation
<b>Analytical Methods</b>							
<b>Laboratory Duplicates (DUP)</b>							
Ammonia by Fluorescence	E298	759887	2	23	8.7	5.0	✔
Biochemical Oxygen Demand - 5 day	E550	757494	2	25	8.0	5.0	✔
Bromide in Water by IC (Low Level)	E235.Br-L	758014	1	10	10.0	5.0	✔
Chemical Oxygen Demand by Colourimetry (Low Level)	E559-L	764937	1	20	5.0	5.0	✔
Chloride in Water by IC	E235.Cl	758013	2	20	10.0	5.0	✔
Conductivity in Water	E100	758011	1	14	7.1	5.0	✔
Dissolved Mercury in Water by CVAAS	E509	759547	2	26	7.6	5.0	✔
Dissolved Metals in Water by CRC ICPMS	E421	759494	1	20	5.0	5.0	✔
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	761202	1	7	14.2	5.0	✔
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	764598	1	6	16.6	5.0	✔
Fluoride in Water by IC	E235.F	758012	1	10	10.0	5.0	✔
Nitrate in Water by IC (Low Level)	E235.NO3-L	758015	1	18	5.5	5.0	✔
Nitrite in Water by IC (Low Level)	E235.NO2-L	758016	1	18	5.5	5.0	✔
pH by Meter	E108	758009	1	14	7.1	5.0	✔
Sulfate in Water by IC	E235.SO4	758017	1	18	5.5	5.0	✔
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	761204	1	7	14.2	5.0	✔
Total Mercury in Water by CVAAS	E508	759396	2	31	6.4	5.0	✔
Total metals in Water by CRC ICPMS	E420	759369	1	20	5.0	5.0	✔
<b>Laboratory Control Samples (LCS)</b>							
Ammonia by Fluorescence	E298	759887	2	23	8.7	5.0	✔
Biochemical Oxygen Demand - 5 day	E550	757494	2	25	8.0	5.0	✔
Bromide in Water by IC (Low Level)	E235.Br-L	758014	1	10	10.0	5.0	✔
Chemical Oxygen Demand by Colourimetry (Low Level)	E559-L	764937	1	20	5.0	5.0	✔
Chloride in Water by IC	E235.Cl	758013	2	20	10.0	5.0	✔
Conductivity in Water	E100	758011	1	14	7.1	5.0	✔
Dissolved Mercury in Water by CVAAS	E509	759547	2	26	7.6	5.0	✔
Dissolved Metals in Water by CRC ICPMS	E421	759494	1	20	5.0	5.0	✔
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	761202	1	7	14.2	5.0	✔
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	764598	1	6	16.6	5.0	✔
Fluoride in Water by IC	E235.F	758012	1	10	10.0	5.0	✔
Nitrate in Water by IC (Low Level)	E235.NO3-L	758015	1	18	5.5	5.0	✔
Nitrite in Water by IC (Low Level)	E235.NO2-L	758016	1	18	5.5	5.0	✔
pH by Meter	E108	758009	1	14	7.1	5.0	✔
Sulfate in Water by IC	E235.SO4	758017	1	18	5.5	5.0	✔
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	761204	1	7	14.2	5.0	✔
Total Mercury in Water by CVAAS	E508	759396	2	31	6.4	5.0	✔



Matrix: **Water**

Evaluation: ✖ = QC frequency outside specification; ✔ = QC frequency within specification.

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		
			QC	Regular	Actual	Expected	Evaluation
<b>Analytical Methods</b>							
<b>Laboratory Control Samples (LCS) - Continued</b>							
Total metals in Water by CRC ICPMS	E420	759369	1	20	5.0	5.0	✔
<b>Method Blanks (MB)</b>							
Ammonia by Fluorescence	E298	759887	2	23	8.7	5.0	✔
Biochemical Oxygen Demand - 5 day	E550	757494	2	25	8.0	5.0	✔
Bromide in Water by IC (Low Level)	E235.Br-L	758014	1	10	10.0	5.0	✔
Chemical Oxygen Demand by Colourimetry (Low Level)	E559-L	764937	1	20	5.0	5.0	✔
Chloride in Water by IC	E235.Cl	758013	2	20	10.0	5.0	✔
Conductivity in Water	E100	758011	1	14	7.1	5.0	✔
Dissolved Mercury in Water by CVAAS	E509	759547	2	26	7.6	5.0	✔
Dissolved Metals in Water by CRC ICPMS	E421	759494	1	20	5.0	5.0	✔
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	761202	1	7	14.2	5.0	✔
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	764598	1	6	16.6	5.0	✔
Fluoride in Water by IC	E235.F	758012	1	10	10.0	5.0	✔
Nitrate in Water by IC (Low Level)	E235.NO3-L	758015	1	18	5.5	5.0	✔
Nitrite in Water by IC (Low Level)	E235.NO2-L	758016	1	18	5.5	5.0	✔
Sulfate in Water by IC	E235.SO4	758017	1	18	5.5	5.0	✔
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	761204	1	7	14.2	5.0	✔
Total Mercury in Water by CVAAS	E508	759396	2	31	6.4	5.0	✔
Total metals in Water by CRC ICPMS	E420	759369	1	20	5.0	5.0	✔
<b>Matrix Spikes (MS)</b>							
Ammonia by Fluorescence	E298	759887	2	23	8.7	5.0	✔
Bromide in Water by IC (Low Level)	E235.Br-L	758014	1	10	10.0	5.0	✔
Chemical Oxygen Demand by Colourimetry (Low Level)	E559-L	764937	1	20	5.0	5.0	✔
Chloride in Water by IC	E235.Cl	758013	2	20	10.0	5.0	✔
Dissolved Mercury in Water by CVAAS	E509	759547	2	26	7.6	5.0	✔
Dissolved Metals in Water by CRC ICPMS	E421	759494	1	20	5.0	5.0	✔
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	761202	1	7	14.2	5.0	✔
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	764598	1	6	16.6	5.0	✔
Fluoride in Water by IC	E235.F	758012	1	10	10.0	5.0	✔
Nitrate in Water by IC (Low Level)	E235.NO3-L	758015	1	18	5.5	5.0	✔
Nitrite in Water by IC (Low Level)	E235.NO2-L	758016	1	18	5.5	5.0	✔
Sulfate in Water by IC	E235.SO4	758017	1	18	5.5	5.0	✔
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	761204	1	7	14.2	5.0	✔
Total Mercury in Water by CVAAS	E508	759396	2	31	6.4	5.0	✔
Total metals in Water by CRC ICPMS	E420	759369	1	20	5.0	5.0	✔



## Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Bromide in Water by IC (Low Level)	E235.Br-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Chloride in Water by IC	E235.Cl Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Fluoride in Water by IC	E235.F Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Ammonia by Fluorescence	E298 Vancouver - Environmental	Water	Method Fialab 100, 2018	Ammonia in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021)
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318 Vancouver - Environmental	Water	Method Fialab 100, 2018	TKN in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021).





Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Organic Carbon by Combustion (Low Level)	E358-L  Vancouver - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO <sub>2</sub> . NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U  Vancouver - Environmental	Water	APHA 4500-P F (mod)	Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.  Field filtration is recommended to ensure test results represent conditions at time of sampling.
Total metals in Water by CRC ICPMS	E420  Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.  Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Metals in Water by CRC ICPMS	E421  Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS.  Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Mercury in Water by CVAAS	E508  Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS
Dissolved Mercury in Water by CVAAS	E509  Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Biochemical Oxygen Demand - 5 day	E550  Vancouver - Environmental	Water	APHA 5210 B (mod)	Samples are diluted and incubated for a specified time period, after which the oxygen depletion is measured using a dissolved oxygen meter.  Free chlorine is a negative interference in the BOD method; please advise ALS when free chlorine is present in samples.
Chemical Oxygen Demand by Colourimetry (Low Level)	E559-L  Vancouver - Environmental	Water	APHA 5220 D (mod)	Samples are analyzed using the closed reflux colourimetric method.
Dissolved Hardness (Calculated)	EC100  Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO <sub>3</sub> ), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO <sub>3</sub> equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.



Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Hardness (Calculated) from Total Ca/Mg	EC100A  Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO <sub>3</sub> ), from total Ca/Mg" is calculated from the sum of total Calcium and Magnesium concentrations, expressed in CaCO <sub>3</sub> equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations. Hardness from total Ca/Mg is normally comparable to Dissolved Hardness in non-turbid waters.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298  Vancouver - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Digestion for TKN in water	EP318  Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested at high temperature using Sulfuric Acid with Copper catalyst, which converts organic nitrogen sources to Ammonia, which is then quantified by the analytical method as TKN. This method is unsuitable for samples containing high levels of nitrate. If nitrate exceeds TKN concentration by ten times or more, results may be biased low.
Preparation for Dissolved Organic Carbon for Combustion	EP358  Vancouver - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Dissolved Metals Water Filtration	EP421  Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO <sub>3</sub> .
Dissolved Mercury Water Filtration	EP509  Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

## QUALITY CONTROL REPORT

<b>Work Order</b>	<b>: VA22C8721</b>	<b>Page</b>	: 1 of 18
<b>Client</b>	: Regional District of Kitimat-Stikine	<b>Laboratory</b>	: Vancouver - Environmental
<b>Contact</b>	: Hannah Shinton	<b>Account Manager</b>	: Amber Springer
<b>Address</b>	: # 300 - 4545 Lazelle Avenue Terrace BC Canada V8G 4E1	<b>Address</b>	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
<b>Telephone</b>	:	<b>Telephone</b>	: +1 604 253 4188
<b>Project</b>	: Foreceman Ridge Surface Water	<b>Date Samples Received</b>	: 24-Nov-2022 21:10
<b>PO</b>	: ----	<b>Date Analysis Commenced</b>	: 25-Nov-2022
<b>C-O-C number</b>	:	<b>Issue Date</b>	: 05-Dec-2022 09:52
<b>Sampler</b>	: H.shinton ----		
<b>Site</b>	:		
<b>Quote number</b>	: Default Water Testing (Q62338)		
<b>No. of samples received</b>	: 8		
<b>No. of samples analysed</b>	: 8		

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

### 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.

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Alex Thornton	Analyst	Vancouver Metals, Burnaby, British Columbia
Caitlin Macey	Team Leader - Inorganics	Vancouver Inorganics, Burnaby, British Columbia
Cindy Tang	Team Leader - Inorganics	Vancouver Inorganics, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Vancouver Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Vancouver Metals, Burnaby, British Columbia
Qammar Almas	Lab Assistant	Vancouver Metals, Burnaby, British Columbia
Ruby Pham	Lab Assistant	Vancouver Metals, Burnaby, British Columbia
Sukhman Khosa	Lab Assistant	Vancouver Metals, Burnaby, British Columbia

Page : 2 of 18  
Work Order : VA22C8721  
Client : Regional District of Kitimat-Stikine  
Project : Foreceman Ridge Surface Water

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## General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

### Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.

CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.

DQO = Data Quality Objective.

LOR = Limit of Reporting (detection limit).

RPD = Relative Percent Difference

# = Indicates a QC result that did not meet the ALS DQO.

## Workorder Comments

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Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

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### Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: <b>Water</b>					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Physical Tests (QC Lot: 758009)</b>											
VA22C8701-003	Anonymous	pH	----	E108	0.10	pH units	8.15	7.96	2.36%	4%	----
<b>Physical Tests (QC Lot: 758011)</b>											
VA22C8701-003	Anonymous	conductivity	----	E100	2.0	µS/cm	1140	1150	0.786%	10%	----
<b>Anions and Nutrients (QC Lot: 758012)</b>											
VA22C8721-001	SW-05	fluoride	16984-48-8	E235.F	0.020	mg/L	0.052	0.053	0.001	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 758013)</b>											
VA22C8721-001	SW-05	chloride	16887-00-6	E235.Cl	0.50	mg/L	1.35	1.35	0.002	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 758014)</b>											
VA22C8721-001	SW-05	bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 758015)</b>											
VA22C8721-001	SW-05	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.0297	0.0302	0.0006	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 758016)</b>											
VA22C8721-001	SW-05	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 758017)</b>											
VA22C8721-001	SW-05	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	2.80	2.80	0.002	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 759887)</b>											
VA22C8136-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 761203)</b>											
VA22C8721-001	SW-05	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 761204)</b>											
VA22C8721-001	SW-05	Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 764598)</b>											
VA22C8721-001	SW-05	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	0.0039	0.0037	0.0002	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 764599)</b>											
VA22C8807-001	Anonymous	chloride	16887-00-6	E235.Cl	10.0	mg/L	1280	1290	0.454%	20%	----
<b>Organic / Inorganic Carbon (QC Lot: 761202)</b>											
VA22C8721-001	SW-05	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	0.57	0.60	0.03	Diff <2x LOR	----
<b>Total Metals (QC Lot: 759369)</b>											
VA22C8693-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.111	0.113	1.83%	20%	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	0.00059	0.00061	0.00002	Diff <2x LOR	----



Sub-Matrix: Water

Laboratory Duplicate (DUP) Report

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Total Metals (QC Lot: 759369) - continued</b>											
VA22C8693-001	Anonymous	arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00066	0.00068	0.00002	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.175	0.182	4.13%	20%	----
		beryllium, total	7440-41-7	E420	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.010	mg/L	0.023	0.023	0.0001	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0000100	mg/L	<0.0000100	<0.0000100	0	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.050	mg/L	90.9	91.7	0.853%	20%	----
		cesium, total	7440-46-2	E420	0.000010	mg/L	0.000157	0.000154	1.91%	20%	----
		chromium, total	7440-47-3	E420	0.00050	mg/L	0.00052	0.00060	0.00008	Diff <2x LOR	----
		cobalt, total	7440-48-4	E420	0.00010	mg/L	0.00011	0.00011	0.000006	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.010	mg/L	0.110	0.110	0.0815%	20%	----
		lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0046	0.0046	0.00003	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	0.100	mg/L	33.7	33.3	1.18%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.0132	0.0133	1.47%	20%	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00406	0.00407	0.220%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.00070	0.00071	0.000008	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E420	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.100	mg/L	1.86	1.86	0.0850%	20%	----
		rubidium, total	7440-17-7	E420	0.00020	mg/L	0.00214	0.00211	1.40%	20%	----
		selenium, total	7782-49-2	E420	0.000050	mg/L	0.00135	0.00158	15.4%	20%	----
		silicon, total	7440-21-3	E420	0.10	mg/L	5.12	5.16	0.837%	20%	----
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, total	7440-23-5	E420	0.050	mg/L	14.8	14.6	1.11%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.753	0.735	2.49%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	40.5	40.5	0.0456%	20%	----
		tellurium, total	13494-80-9	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		thorium, total	7440-29-1	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	0.00147	0.00195	0.00047	Diff <2x LOR	----
		tungsten, total	7440-33-7	E420	0.00010	mg/L	0.00016	0.00016	0.000004	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.000835	0.000839	0.535%	20%	----





Sub-Matrix: Water					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Total Metals (QC Lot: 759369) - continued</b>											
VA22C8693-001	Anonymous	vanadium, total	7440-62-2	E420	0.00050	mg/L	0.00051	0.00057	0.00006	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	----
		zirconium, total	7440-67-7	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
<b>Total Metals (QC Lot: 759396)</b>											
VA22C8721-001	SW-05	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
<b>Total Metals (QC Lot: 760598)</b>											
VA22C8705-001	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
<b>Dissolved Metals (QC Lot: 759494)</b>											
VA22C8716-003	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		beryllium, dissolved	7440-41-7	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		cesium, dissolved	7440-46-2	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		chromium, dissolved	7440-47-3	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
potassium, dissolved	7440-09-7	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----		
rubidium, dissolved	7440-17-7	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----		
selenium, dissolved	7782-49-2	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----		
silicon, dissolved	7440-21-3	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----		
silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----		



Sub-Matrix: Water					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Dissolved Metals (QC Lot: 759494) - continued</b>											
VA22C8716-003	Anonymous	sodium, dissolved	7440-23-5	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	----
		tellurium, dissolved	13494-80-9	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		thallium, dissolved	7440-28-0	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		thorium, dissolved	7440-29-1	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		tungsten, dissolved	7440-33-7	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
<b>Dissolved Metals (QC Lot: 759547)</b>											
VA22C8705-005	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
<b>Dissolved Metals (QC Lot: 759548)</b>											
VA22C8721-002	SW-22	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
<b>Aggregate Organics (QC Lot: 757494)</b>											
VA22C8625-002	Anonymous	biochemical oxygen demand [BOD]	----	E550	2.0	mg/L	<2.0	<2.0	0.0%	30%	----
<b>Aggregate Organics (QC Lot: 757911)</b>											
VA22C8721-002	SW-22	biochemical oxygen demand [BOD]	----	E550	2.0	mg/L	<2.0	<2.0	0.0%	30%	----
<b>Aggregate Organics (QC Lot: 764937)</b>											
VA22C8701-001	Anonymous	chemical oxygen demand [COD]	----	E559-L	10	mg/L	21	20	1	Diff <2x LOR	----



## Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Physical Tests (QCLot: 758011)</b>						
conductivity	---	E100	1	µS/cm	1.1	---
<b>Anions and Nutrients (QCLot: 758012)</b>						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	---
<b>Anions and Nutrients (QCLot: 758013)</b>						
chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	---
<b>Anions and Nutrients (QCLot: 758014)</b>						
bromide	24959-67-9	E235.Br-L	0.05	mg/L	<0.050	---
<b>Anions and Nutrients (QCLot: 758015)</b>						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	---
<b>Anions and Nutrients (QCLot: 758016)</b>						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	---
<b>Anions and Nutrients (QCLot: 758017)</b>						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	---
<b>Anions and Nutrients (QCLot: 759887)</b>						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	---
<b>Anions and Nutrients (QCLot: 761203)</b>						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	---
<b>Anions and Nutrients (QCLot: 761204)</b>						
Kjeldahl nitrogen, total [TKN]	---	E318	0.05	mg/L	<0.050	---
<b>Anions and Nutrients (QCLot: 764598)</b>						
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	---
<b>Anions and Nutrients (QCLot: 764599)</b>						
chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	---
<b>Organic / Inorganic Carbon (QCLot: 761202)</b>						
carbon, dissolved organic [DOC]	---	E358-L	0.5	mg/L	<0.50	---
<b>Total Metals (QCLot: 759369)</b>						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	---
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	---
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	---
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	---
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	---
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	---



Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Total Metals (QCLot: 759369) - continued</b>						
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cesium, total	7440-46-2	E420	0.00001	mg/L	<0.000010	----
chromium, total	7440-47-3	E420	0.0005	mg/L	<0.00050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	<0.00020	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	7440-23-5	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	<0.00020	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
thorium, total	7440-29-1	E420	0.0001	mg/L	<0.00010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	<0.00010	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	<0.00020	----
<b>Total Metals (QCLot: 759396)</b>						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----



Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Total Metals (QCLot: 760598)</b>						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----
<b>Dissolved Metals (QCLot: 759494)</b>						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cesium, dissolved	7440-46-2	E421	0.00001	mg/L	<0.000010	----
chromium, dissolved	7440-47-3	E421	0.0005	mg/L	<0.00050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
rubidium, dissolved	7440-17-7	E421	0.0002	mg/L	<0.00020	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	<0.00020	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
thorium, dissolved	7440-29-1	E421	0.0001	mg/L	<0.00010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----



Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Dissolved Metals (QCLot: 759494) - continued</b>						
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
tungsten, dissolved	7440-33-7	E421	0.0001	mg/L	<0.00010	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----
<b>Dissolved Metals (QCLot: 759547)</b>						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----
<b>Dissolved Metals (QCLot: 759548)</b>						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----
<b>Aggregate Organics (QCLot: 757494)</b>						
biochemical oxygen demand [BOD]	----	E550	2	mg/L	<2.0	----
<b>Aggregate Organics (QCLot: 757911)</b>						
biochemical oxygen demand [BOD]	----	E550	2	mg/L	<2.0	----
<b>Aggregate Organics (QCLot: 764937)</b>						
chemical oxygen demand [COD]	----	E559-L	10	mg/L	<10	----





## Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: Water

					Laboratory Control Sample (LCS) Report				
Analyte	CAS Number	Method	LOR	Unit	Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
<b>Physical Tests (QCLot: 758009)</b>									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
<b>Physical Tests (QCLot: 758011)</b>									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	99.9	90.0	110	----
<b>Anions and Nutrients (QCLot: 758012)</b>									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	99.2	90.0	110	----
<b>Anions and Nutrients (QCLot: 758013)</b>									
chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	101	90.0	110	----
<b>Anions and Nutrients (QCLot: 758014)</b>									
bromide	24959-67-9	E235.Br-L	0.05	mg/L	0.5 mg/L	96.5	85.0	115	----
<b>Anions and Nutrients (QCLot: 758015)</b>									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	102	90.0	110	----
<b>Anions and Nutrients (QCLot: 758016)</b>									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	99.1	90.0	110	----
<b>Anions and Nutrients (QCLot: 758017)</b>									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	104	90.0	110	----
<b>Anions and Nutrients (QCLot: 759887)</b>									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	102	85.0	115	----
<b>Anions and Nutrients (QCLot: 761203)</b>									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	95.6	85.0	115	----
<b>Anions and Nutrients (QCLot: 761204)</b>									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	93.8	75.0	125	----
<b>Anions and Nutrients (QCLot: 764598)</b>									
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.03 mg/L	102	80.0	120	----
<b>Anions and Nutrients (QCLot: 764599)</b>									
chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	103	90.0	110	----
<b>Organic / Inorganic Carbon (QCLot: 761202)</b>									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	101	80.0	120	----
<b>Total Metals (QCLot: 759369)</b>									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	107	80.0	120	----



Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
<b>Total Metals (QCLot: 759369) - continued</b>									
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	115	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	110	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	107	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	97.4	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	# 121	80.0	120	MES
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	94.2	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	102	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	102	80.0	120	----
cesium, total	7440-46-2	E420	0.00001	mg/L	0.05 mg/L	105	80.0	120	----
chromium, total	7440-47-3	E420	0.0005	mg/L	0.25 mg/L	107	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	104	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	93.3	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	101	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	99.4	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	108	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	108	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	106	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	104	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	107	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	104	80.0	120	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	0.1 mg/L	113	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	98.0	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	108	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	100	80.0	120	----
sodium, total	7440-23-5	E420	0.05	mg/L	50 mg/L	114	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	101	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	91.6	80.0	120	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	0.1 mg/L	104	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	104	80.0	120	----
thorium, total	7440-29-1	E420	0.0001	mg/L	0.1 mg/L	93.3	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	102	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	107	80.0	120	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	0.1 mg/L	99.4	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	106	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	106	80.0	120	----



Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
<b>Total Metals (QCLot: 759369) - continued</b>									
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	103	80.0	120	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.1 mg/L	104	80.0	120	----
<b>Total Metals (QCLot: 759396)</b>									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	98.3	80.0	120	----
<b>Total Metals (QCLot: 760598)</b>									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	103	80.0	120	----
<b>Dissolved Metals (QCLot: 759494)</b>									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	102	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	107	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	104	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	105	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	102	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	102	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	100	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	103	80.0	120	----
cesium, dissolved	7440-46-2	E421	0.00001	mg/L	0.05 mg/L	102	80.0	120	----
chromium, dissolved	7440-47-3	E421	0.0005	mg/L	0.25 mg/L	100	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	100	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	98.7	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	101	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	104	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	101	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	104	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	103	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	104	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	98.7	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	105	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	106	80.0	120	----
rubidium, dissolved	7440-17-7	E421	0.0002	mg/L	0.1 mg/L	104	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	102	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	109	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	96.1	80.0	120	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	102	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	101	80.0	120	----



Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
<b>Dissolved Metals (QCLot: 759494) - continued</b>									
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	101	80.0	120	----
tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	0.1 mg/L	102	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	106	80.0	120	----
thorium, dissolved	7440-29-1	E421	0.0001	mg/L	0.1 mg/L	98.6	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	100	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	99.2	80.0	120	----
tungsten, dissolved	7440-33-7	E421	0.0001	mg/L	0.1 mg/L	99.3	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	104	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	102	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	102	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	97.6	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	102	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	106	80.0	120	----
<b>Aggregate Organics (QCLot: 757494)</b>									
biochemical oxygen demand [BOD]	----	E550	2	mg/L	198 mg/L	103	85.0	115	----
<b>Aggregate Organics (QCLot: 757911)</b>									
biochemical oxygen demand [BOD]	----	E550	2	mg/L	198 mg/L	100	85.0	115	----
<b>Aggregate Organics (QCLot: 764937)</b>									
chemical oxygen demand [COD]	----	E559-L	10	mg/L	100 mg/L	106	85.0	115	----

**Qualifiers**

Qualifier	Description
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).



## Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level  $\geq 1 \times$  spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
<b>Anions and Nutrients (QCLot: 758012)</b>										
VA22C8721-002	SW-22	fluoride	16984-48-8	E235.F	0.964 mg/L	1 mg/L	96.4	75.0	125	----
<b>Anions and Nutrients (QCLot: 758013)</b>										
VA22C8721-002	SW-22	chloride	16887-00-6	E235.Cl	99.4 mg/L	100 mg/L	99.4	75.0	125	----
<b>Anions and Nutrients (QCLot: 758014)</b>										
VA22C8721-002	SW-22	bromide	24959-67-9	E235.Br-L	0.474 mg/L	0.5 mg/L	94.8	75.0	125	----
<b>Anions and Nutrients (QCLot: 758015)</b>										
VA22C8721-002	SW-22	nitrate (as N)	14797-55-8	E235.NO3-L	2.50 mg/L	2.5 mg/L	100	75.0	125	----
<b>Anions and Nutrients (QCLot: 758016)</b>										
VA22C8721-002	SW-22	nitrite (as N)	14797-65-0	E235.NO2-L	0.480 mg/L	0.5 mg/L	96.0	75.0	125	----
<b>Anions and Nutrients (QCLot: 758017)</b>										
VA22C8721-002	SW-22	sulfate (as SO4)	14808-79-8	E235.SO4	101 mg/L	100 mg/L	101	75.0	125	----
<b>Anions and Nutrients (QCLot: 759887)</b>										
VA22C8136-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.107 mg/L	0.1 mg/L	107	75.0	125	----
<b>Anions and Nutrients (QCLot: 761203)</b>										
VA22C8721-002	SW-22	ammonia, total (as N)	7664-41-7	E298	0.0937 mg/L	0.1 mg/L	93.7	75.0	125	----
<b>Anions and Nutrients (QCLot: 761204)</b>										
VA22C8721-002	SW-22	Kjeldahl nitrogen, total [TKN]	----	E318	2.43 mg/L	2.5 mg/L	97.2	70.0	130	----
<b>Anions and Nutrients (QCLot: 764598)</b>										
VA22C8721-002	SW-22	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0300 mg/L	0.03 mg/L	100	70.0	130	----
<b>Anions and Nutrients (QCLot: 764599)</b>										
VA22C8807-002	Anonymous	chloride	16887-00-6	E235.Cl	2020 mg/L	2000 mg/L	101	75.0	125	----
<b>Organic / Inorganic Carbon (QCLot: 761202)</b>										
VA22C8721-002	SW-22	carbon, dissolved organic [DOC]	----	E358-L	4.65 mg/L	5 mg/L	93.1	70.0	130	----
<b>Total Metals (QCLot: 759369)</b>										
VA22C8708-001	Anonymous	aluminum, total	7429-90-5	E420	0.201 mg/L	0.2 mg/L	100	70.0	130	----
		antimony, total	7440-36-0	E420	0.0194 mg/L	0.02 mg/L	97.0	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0200 mg/L	0.02 mg/L	99.9	70.0	130	----
		barium, total	7440-39-3	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----



Sub-Matrix: Water

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
<b>Total Metals (QCLot: 759369) - continued</b>										
VA22C8708-001	Anonymous	beryllium, total	7440-41-7	E420	0.0389 mg/L	0.04 mg/L	97.2	70.0	130	----
		bismuth, total	7440-69-9	E420	0.00945 mg/L	0.01 mg/L	94.5	70.0	130	----
		boron, total	7440-42-8	E420	0.094 mg/L	0.1 mg/L	94.3	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00400 mg/L	0.004 mg/L	100	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cesium, total	7440-46-2	E420	0.0103 mg/L	0.01 mg/L	103	70.0	130	----
		chromium, total	7440-47-3	E420	0.0412 mg/L	0.04 mg/L	103	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0192 mg/L	0.02 mg/L	96.0	70.0	130	----
		copper, total	7440-50-8	E420	0.0192 mg/L	0.02 mg/L	96.3	70.0	130	----
		iron, total	7439-89-6	E420	2.01 mg/L	2 mg/L	101	70.0	130	----
		lead, total	7439-92-1	E420	0.0183 mg/L	0.02 mg/L	91.7	70.0	130	----
		lithium, total	7439-93-2	E420	0.105 mg/L	0.1 mg/L	105	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0212 mg/L	0.02 mg/L	106	70.0	130	----
		nickel, total	7440-02-0	E420	0.0388 mg/L	0.04 mg/L	97.1	70.0	130	----
		phosphorus, total	7723-14-0	E420	10.2 mg/L	10 mg/L	102	70.0	130	----
		potassium, total	7440-09-7	E420	3.88 mg/L	4 mg/L	97.0	70.0	130	----
		rubidium, total	7440-17-7	E420	0.0202 mg/L	0.02 mg/L	101	70.0	130	----
		selenium, total	7782-49-2	E420	0.0387 mg/L	0.04 mg/L	96.8	70.0	130	----
		silicon, total	7440-21-3	E420	10.1 mg/L	10 mg/L	101	70.0	130	----
		silver, total	7440-22-4	E420	0.00413 mg/L	0.004 mg/L	103	70.0	130	----
		sodium, total	7440-23-5	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	20.6 mg/L	20 mg/L	103	70.0	130	----
		tellurium, total	13494-80-9	E420	0.0401 mg/L	0.04 mg/L	100	70.0	130	----
		thallium, total	7440-28-0	E420	0.00378 mg/L	0.004 mg/L	94.4	70.0	130	----
		thorium, total	7440-29-1	E420	0.0223 mg/L	0.02 mg/L	112	70.0	130	----
		tin, total	7440-31-5	E420	0.0199 mg/L	0.02 mg/L	99.5	70.0	130	----
		titanium, total	7440-32-6	E420	0.0405 mg/L	0.04 mg/L	101	70.0	130	----
		tungsten, total	7440-33-7	E420	0.0194 mg/L	0.02 mg/L	96.8	70.0	130	----
		uranium, total	7440-61-1	E420	0.00390 mg/L	0.004 mg/L	97.4	70.0	130	----
		vanadium, total	7440-62-2	E420	0.101 mg/L	0.1 mg/L	101	70.0	130	----
		zinc, total	7440-66-6	E420	0.385 mg/L	0.4 mg/L	96.3	70.0	130	----
		zirconium, total	7440-67-7	E420	0.0475 mg/L	0.04 mg/L	119	70.0	130	----





Sub-Matrix: Water

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
<b>Total Metals (QCLot: 759396)</b>										
VA22C8721-002	SW-22	mercury, total	7439-97-6	E508	0.0000934 mg/L	0.0001 mg/L	93.4	70.0	130	----
<b>Total Metals (QCLot: 760598)</b>										
VA22C8705-002	Anonymous	mercury, total	7439-97-6	E508	0.0000948 mg/L	0.0001 mg/L	94.8	70.0	130	----
<b>Dissolved Metals (QCLot: 759494)</b>										
VA22C8716-004	Anonymous	aluminum, dissolved	7429-90-5	E421	0.194 mg/L	0.2 mg/L	97.0	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0206 mg/L	0.02 mg/L	103	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0202 mg/L	0.02 mg/L	101	70.0	130	----
		barium, dissolved	7440-39-3	E421	0.0189 mg/L	0.02 mg/L	94.5	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0400 mg/L	0.04 mg/L	100	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00888 mg/L	0.01 mg/L	88.8	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.099 mg/L	0.1 mg/L	99.5	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00379 mg/L	0.004 mg/L	94.7	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cesium, dissolved	7440-46-2	E421	0.0100 mg/L	0.01 mg/L	100	70.0	130	----
		chromium, dissolved	7440-47-3	E421	0.0389 mg/L	0.04 mg/L	97.3	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0190 mg/L	0.02 mg/L	94.8	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0183 mg/L	0.02 mg/L	91.5	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.88 mg/L	2 mg/L	94.1	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0187 mg/L	0.02 mg/L	93.5	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0973 mg/L	0.1 mg/L	97.3	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0372 mg/L	0.04 mg/L	93.0	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	10.2 mg/L	10 mg/L	102	70.0	130	----
		potassium, dissolved	7440-09-7	E421	4.04 mg/L	4 mg/L	101	70.0	130	----
		rubidium, dissolved	7440-17-7	E421	0.0198 mg/L	0.02 mg/L	99.0	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0407 mg/L	0.04 mg/L	102	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.03 mg/L	10 mg/L	90.3	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00384 mg/L	0.004 mg/L	95.9	70.0	130	----
		sodium, dissolved	7440-23-5	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	ND mg/L	20 mg/L	ND	70.0	130	----
		tellurium, dissolved	13494-80-9	E421	0.0407 mg/L	0.04 mg/L	102	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00369 mg/L	0.004 mg/L	92.3	70.0	130	----



Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
<b>Dissolved Metals (QCLot: 759494) - continued</b>										
VA22C8716-004	Anonymous	thorium, dissolved	7440-29-1	E421	0.0211 mg/L	0.02 mg/L	106	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0199 mg/L	0.02 mg/L	99.7	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0399 mg/L	0.04 mg/L	99.7	70.0	130	----
		tungsten, dissolved	7440-33-7	E421	0.0192 mg/L	0.02 mg/L	96.1	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00388 mg/L	0.004 mg/L	97.0	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.100 mg/L	0.1 mg/L	100	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.375 mg/L	0.4 mg/L	93.7	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0410 mg/L	0.04 mg/L	102	70.0	130	----
<b>Dissolved Metals (QCLot: 759547)</b>										
VA22C8706-001	Anonymous	mercury, dissolved	7439-97-6	E509	0.000103 mg/L	0.0001 mg/L	103	70.0	130	----
<b>Dissolved Metals (QCLot: 759548)</b>										
VA22C8721-003	SW-03	mercury, dissolved	7439-97-6	E509	0.0000950 mg/L	0.0001 mg/L	95.0	70.0	130	----
<b>Aggregate Organics (QCLot: 764937)</b>										
VA22C8701-002	Anonymous	chemical oxygen demand [COD]	----	E559-L	107 mg/L	100 mg/L	107	75.0	125	----



Chain of Custody (COC) / Analytical Request Form

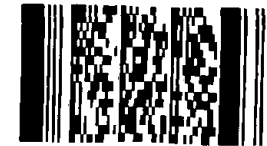
Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 17

Page

Environmental Division  
Vancouver  
Work Order Reference  
**VA22C8721**



Telephone : + 1 604 253 4188

<b>Report To</b> Contact and company name below will appear on the final report Company: Regional District of Kitimat-Stikine Contact: Hannah Shinton Phone: 250-615-6100 Company address below will appear on the final report: Street: 4545 Lazelle Avenue City/Province: Terrace/BC Postal Code: V8G4E1		<b>Report Format / Distribution</b> Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input checked="" type="checkbox"/> EDD (DIGITAL) Quality Control (QC) Report with Report <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> Compare Results to Criteria on Report - provide details below if box checked Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX Email 1 or Fax: hshinton@rdks.bc.ca Email 2: enviro.dept@rdks.bc.ca Email 3:		<b>Select Service Level Below - Contact your AM to confirm</b> Regular [R] <input checked="" type="checkbox"/> Standard TAT if received by 3 pm - bu PRIORITY (Business Day): 4 day [P4-20%] <input type="checkbox"/> 3 day [P3-25%] <input type="checkbox"/> 2 day [P2-50%] <input type="checkbox"/> EMERGENCY: 1 Business day Same Day, Week (Laboratory open)																																																																																																																																																																																																																																																																																														
<b>Invoice To</b> Same as Report To <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO Copy of Invoice with Report <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO Company: Regional District of Kitimat-Stikine Contact: Hannah Shinton		<b>Invoice Distribution</b> Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX Email 1 or Fax: annie-maries@rdks.bc.ca Email 2: hshinton@rdks.bc.ca; enviro.dept@rdks.bc.ca		<b>Analysis Request</b> Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below <table border="1"> <thead> <tr> <th></th> <th>P</th> <th>F/P</th> <th></th> <th></th> <th></th> <th>P</th> <th></th> <th></th> <th>P</th> <th></th> <th></th> <th></th> <th></th> <th>F/P</th> </tr> </thead> <tbody> <tr> <td>Total Metals</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Dissolved Metals</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Chloride</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Fluoride</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Sulphate</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Hardness</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Ammonia</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Nitrate</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Nitrite</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>CO<sub>2</sub></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Total Kjeldahl Nitrogen</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Conductivity</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>pH</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Dissolved Organic Carbon</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>CO<sub>2</sub></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>SAMPLES ON HOLD</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Sample is hazardous (please provide further detail)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>NUMBER OF CONTAINERS</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>			P	F/P				P			P					F/P	Total Metals															Dissolved Metals															Chloride															Fluoride															Sulphate															Hardness															Ammonia															Nitrate															Nitrite															CO <sub>2</sub>															Total Kjeldahl Nitrogen															Conductivity															pH															Dissolved Organic Carbon															CO <sub>2</sub>															SAMPLES ON HOLD															Sample is hazardous (please provide further detail)															NUMBER OF CONTAINERS														
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<b>Project Information</b> ALS Account # / Quote #: VA19-RDKS100-001 Job #: Forceman Ridge Surface Water PO / AFE: LSD:		AFE/Cost Center: Major/Minor Code: Requisitioner: Location:		PO#: Routing Code:																																																																																																																																																																																																																																																																																														
ALS Lab Work Order # (lab use only): <b>872</b>		Contact:		Sampler: H. Shinton																																																																																																																																																																																																																																																																																														
<b>ALS Sample # (lab use only)</b> Sample Identification and/or (This description will appear on report)		<b>Date (dd-mm-yy)</b>		<b>Time (hh:mm)</b>		<b>Sample Type</b>																																																																																																																																																																																																																																																																																												
SW-05		22-Nov-22		14:35		Surface Water																																																																																																																																																																																																																																																																																												
SW-22		22-Nov-22		12:00		Surface Water																																																																																																																																																																																																																																																																																												
SW-03		22-Nov-22		10:40		Surface Water																																																																																																																																																																																																																																																																																												
SW-04		22-Nov-22		15:45		Surface Water																																																																																																																																																																																																																																																																																												
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Field Blank		22-Nov-22		16:22		Surface Water																																																																																																																																																																																																																																																																																												
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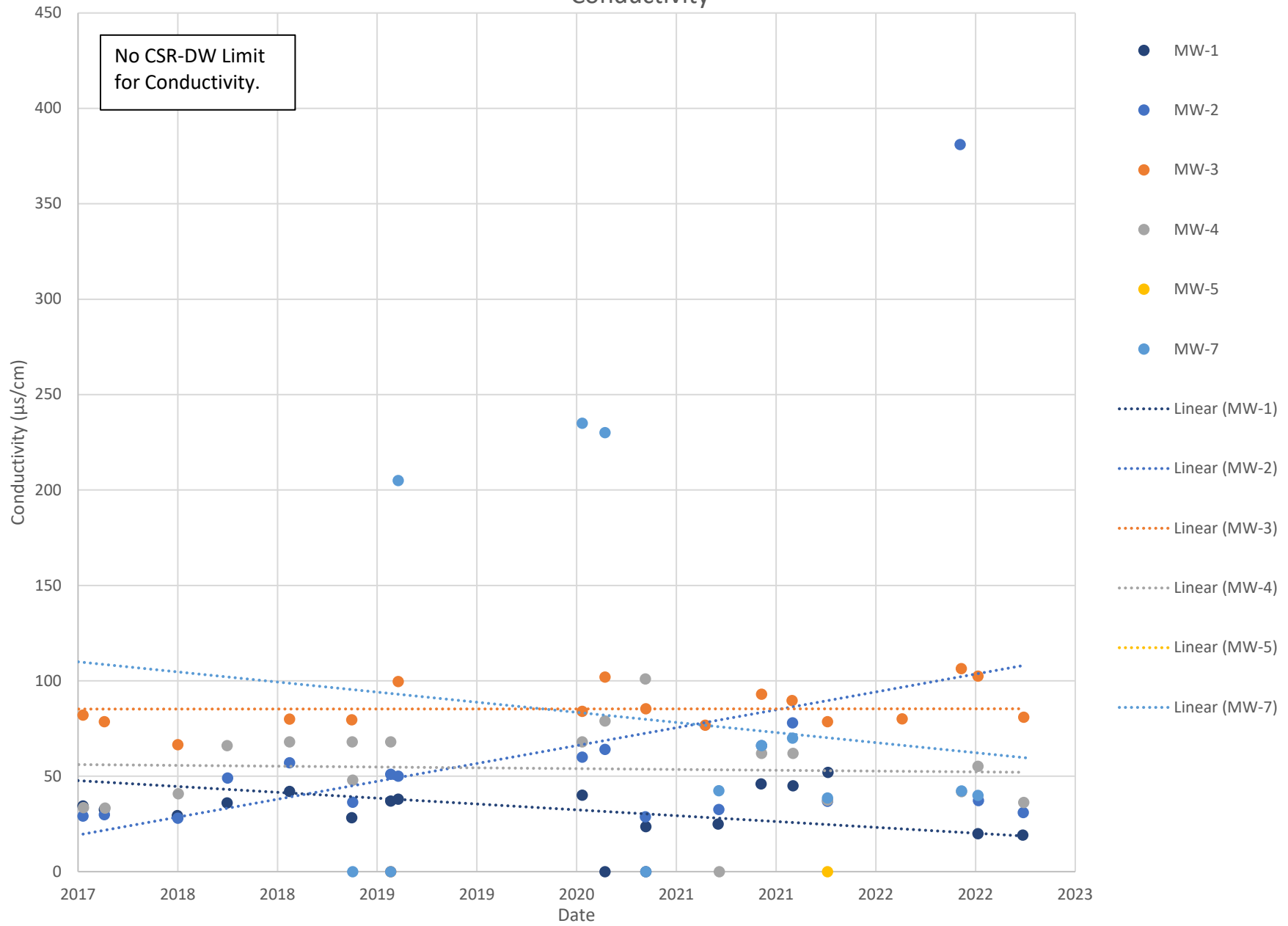
Terrace Shipping #2 Coolers Ground Air SFX  
 Carboys

<b>Drinking Water (DW) Samples<sup>1</sup> (client use)</b> Are samples taken from a Regulated DW System? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO Are samples for human consumption/ use? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		<b>Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)</b> British Columbia Approved and Working Water Quality-Guidelines (MAY, 2015)		<b>SAMPLE CONDITION AS RECEIVED (lab use only)</b> Frozen <input type="checkbox"/> SIF Observations Yes <input type="checkbox"/> No <input type="checkbox"/> Ice Packs <input type="checkbox"/> Ice Cubes <input type="checkbox"/> Custody seal intact Yes <input type="checkbox"/> No <input type="checkbox"/> Cooling Initiated <input type="checkbox"/> INITIAL COOLER TEMPERATURES °C: _____ FINAL COOLER TEMPERATURES °C: <b>4.5</b>			
<b>SHIPMENT RELEASE (client use)</b> Released by: Hannah Shinton Date: November 23rd, 2022 Time:		<b>INITIAL SHIPMENT RECEPTION (lab use only)</b> Received by: <i>[Signature]</i> Date: <b>NOV 23/22</b> Time: <b>2:45</b>		<b>FINAL SHIPMENT RECEPTION (lab use only)</b> Received by: <i>[Signature]</i> Date: <b>NOV 24 2022</b> Time: <b>2:10</b>			

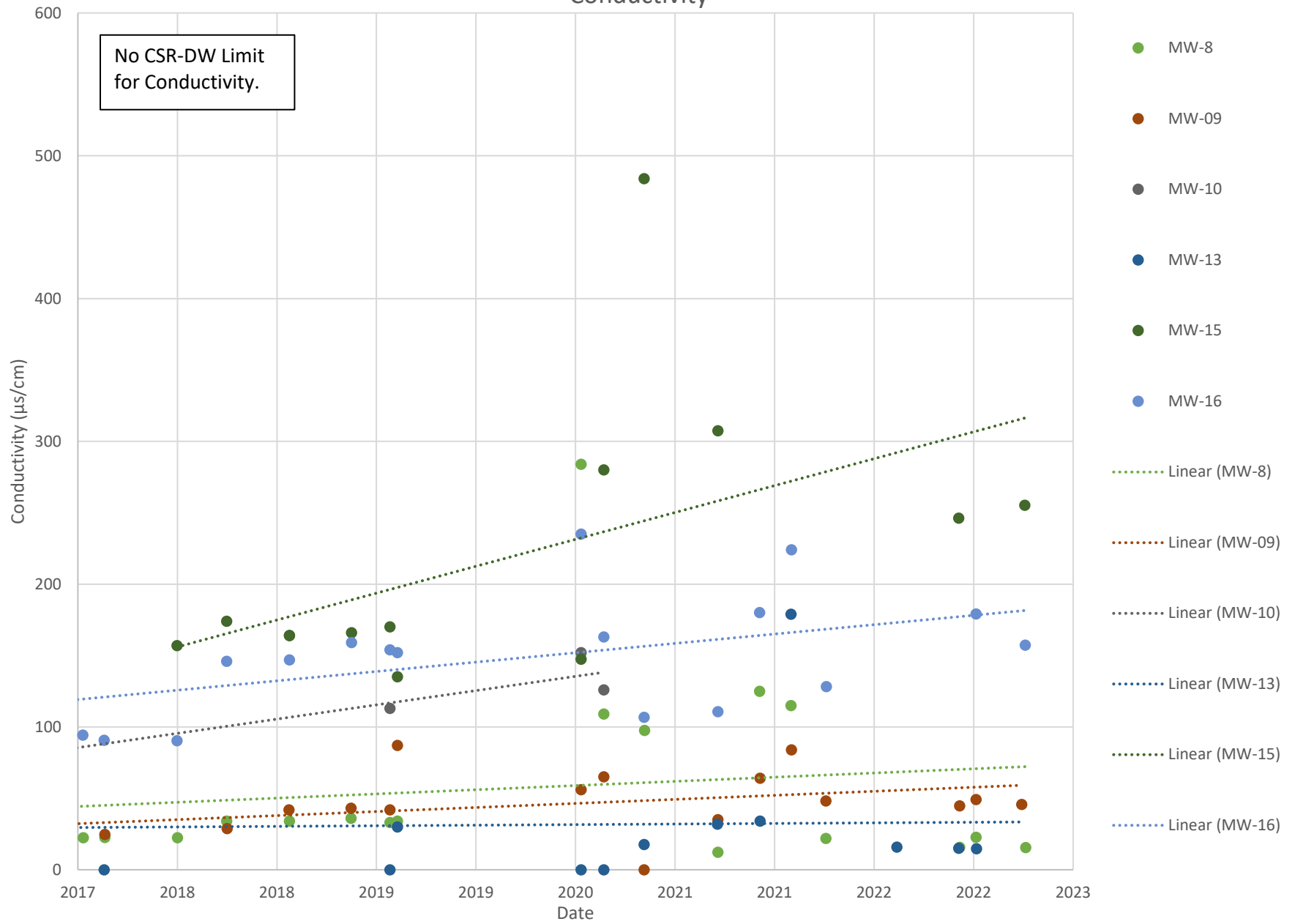
## Appendix G Trend Analysis



# Conductivity

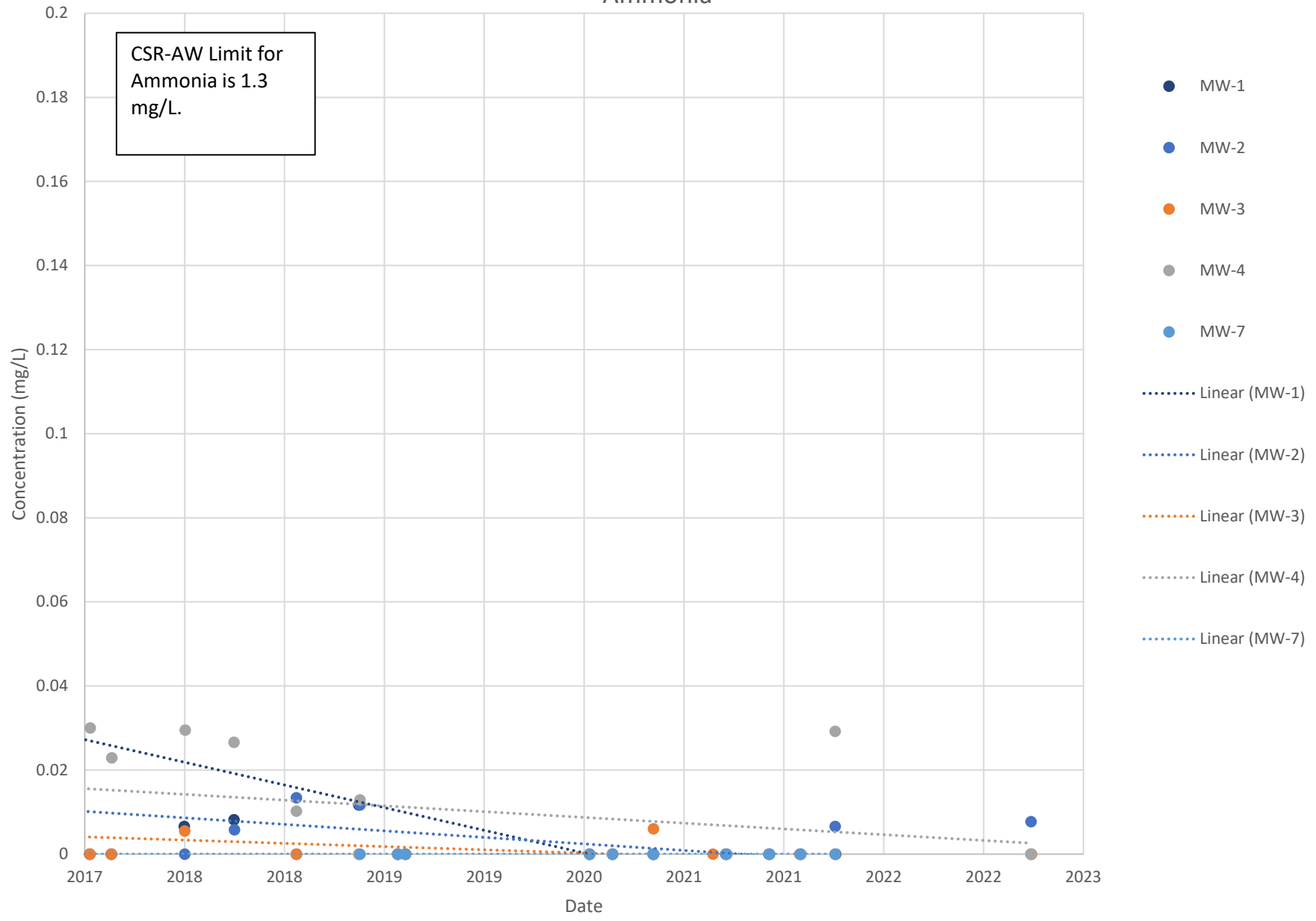


# Conductivity

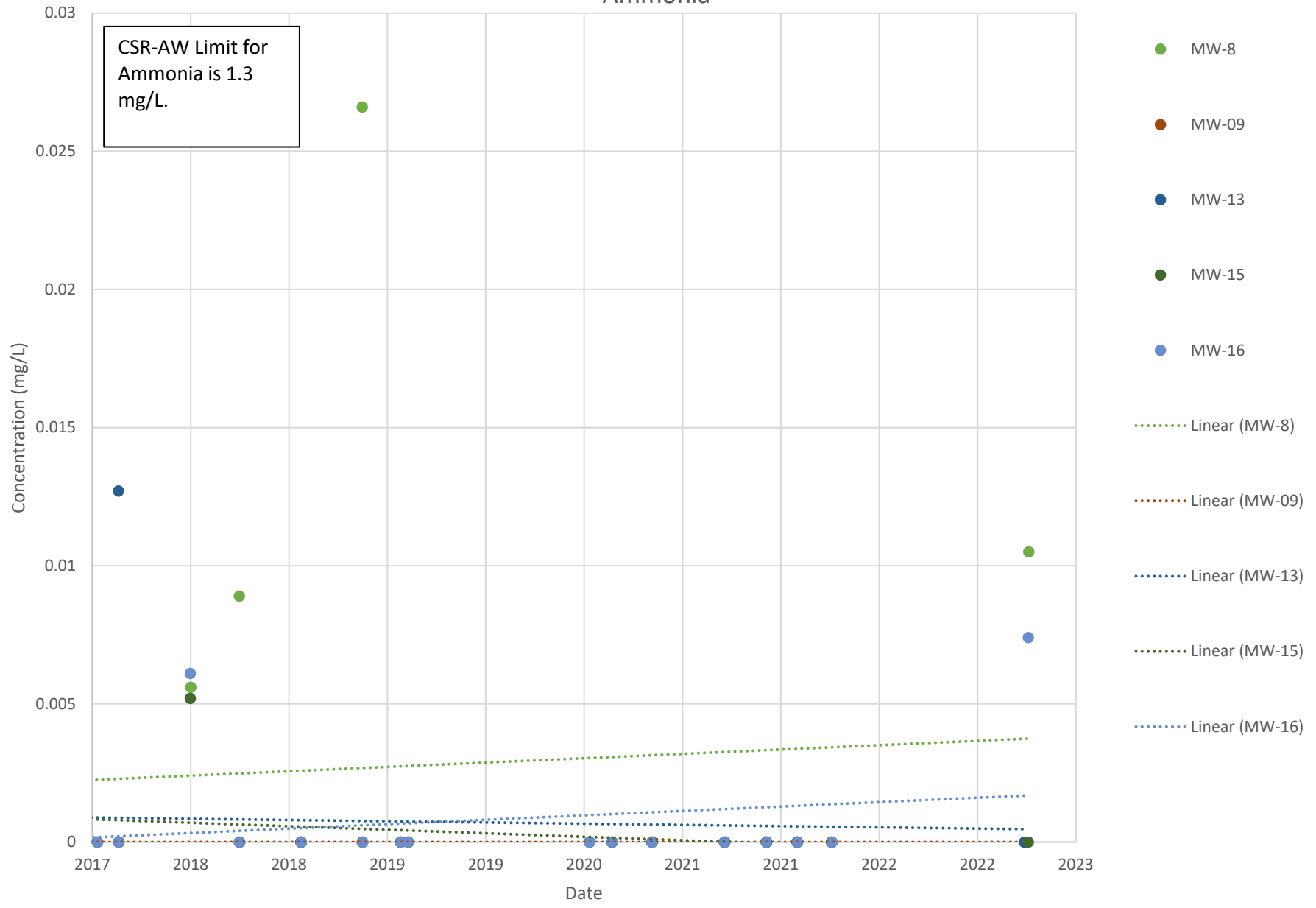




# Ammonia

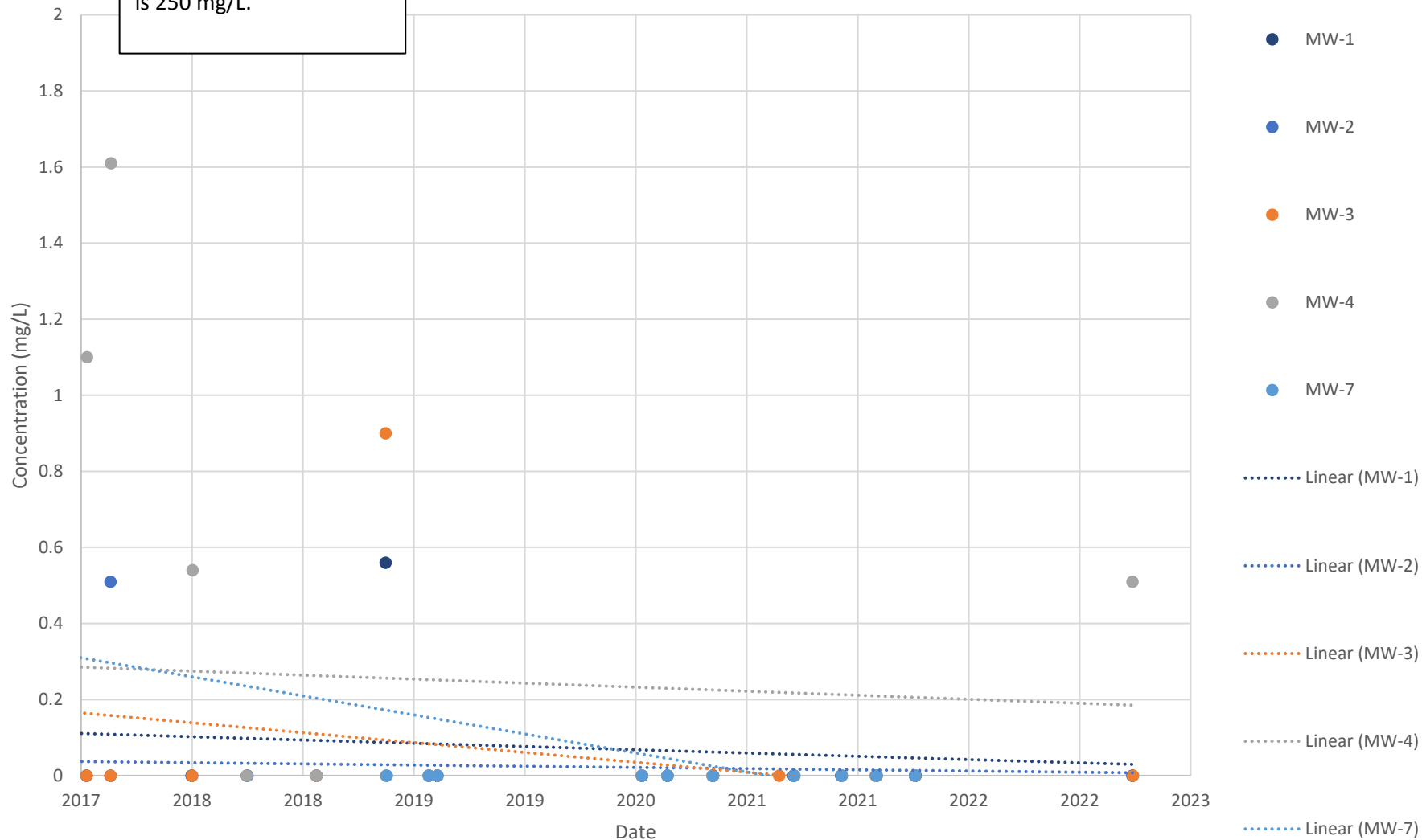


# Ammonia



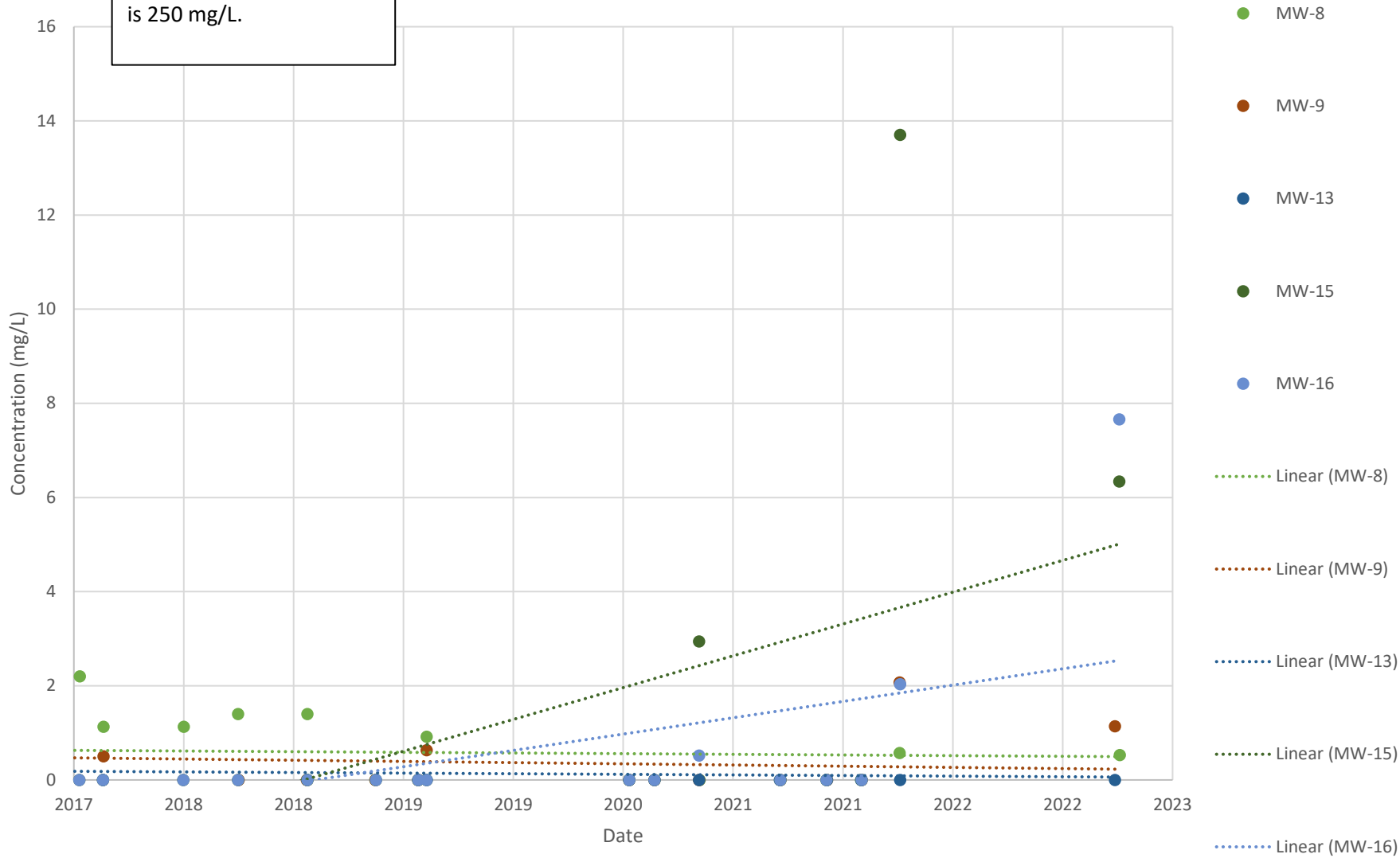
# Chloride

CSR-DW Limit for Chloride is 250 mg/L.

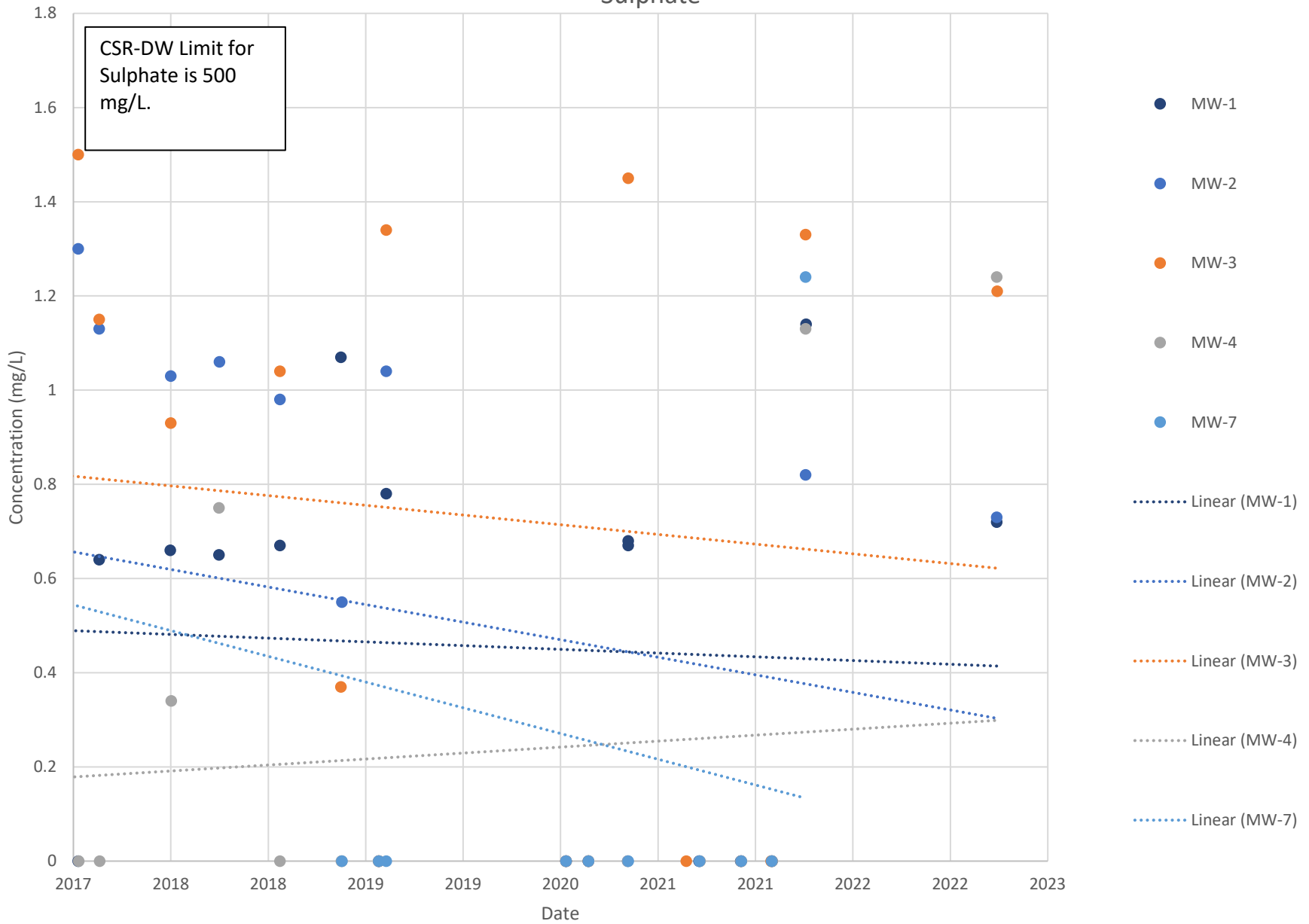


# Chloride

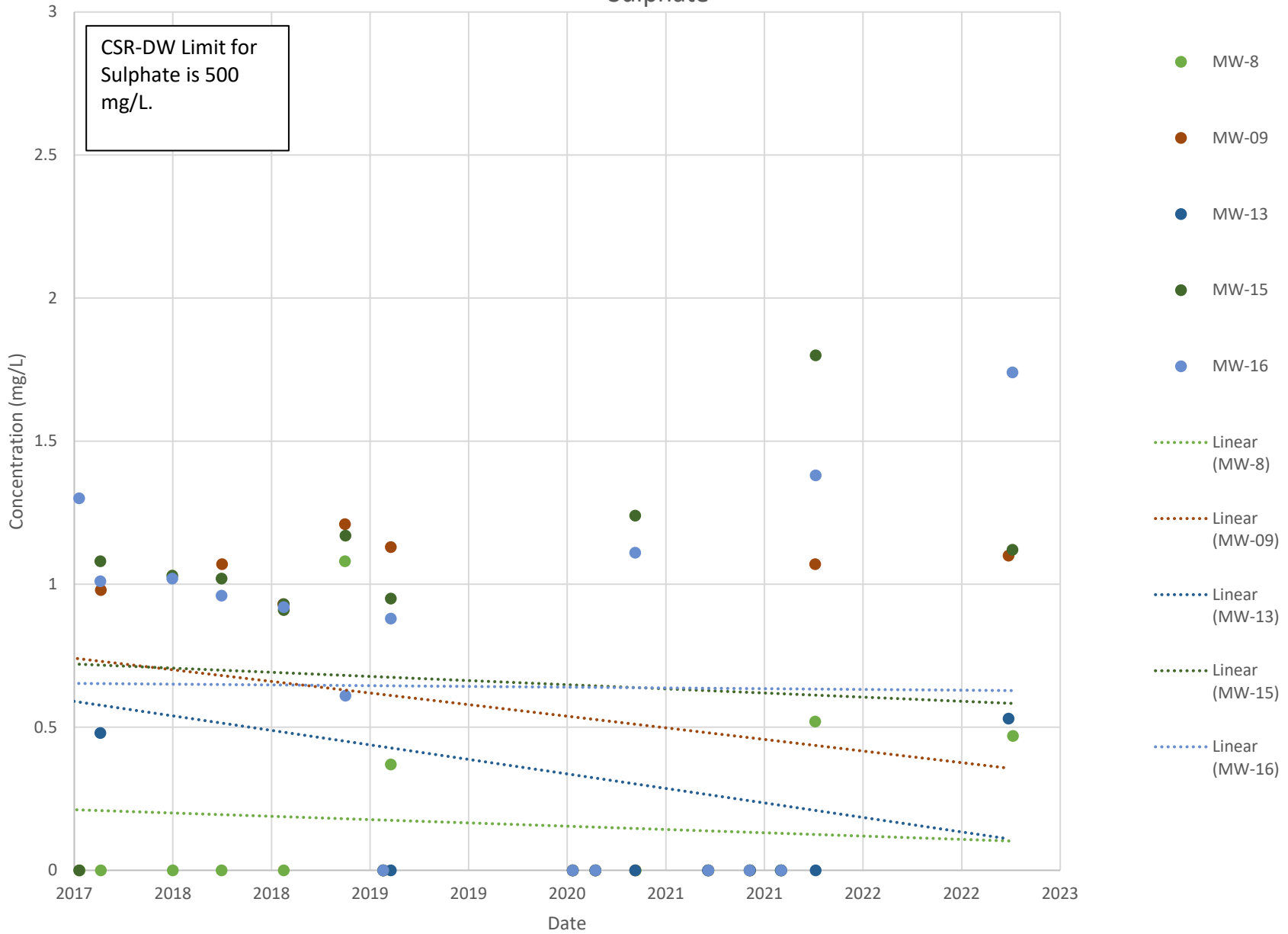
CSR-DW Limit for Chloride is 250 mg/L.



# Sulphate



# Sulphate

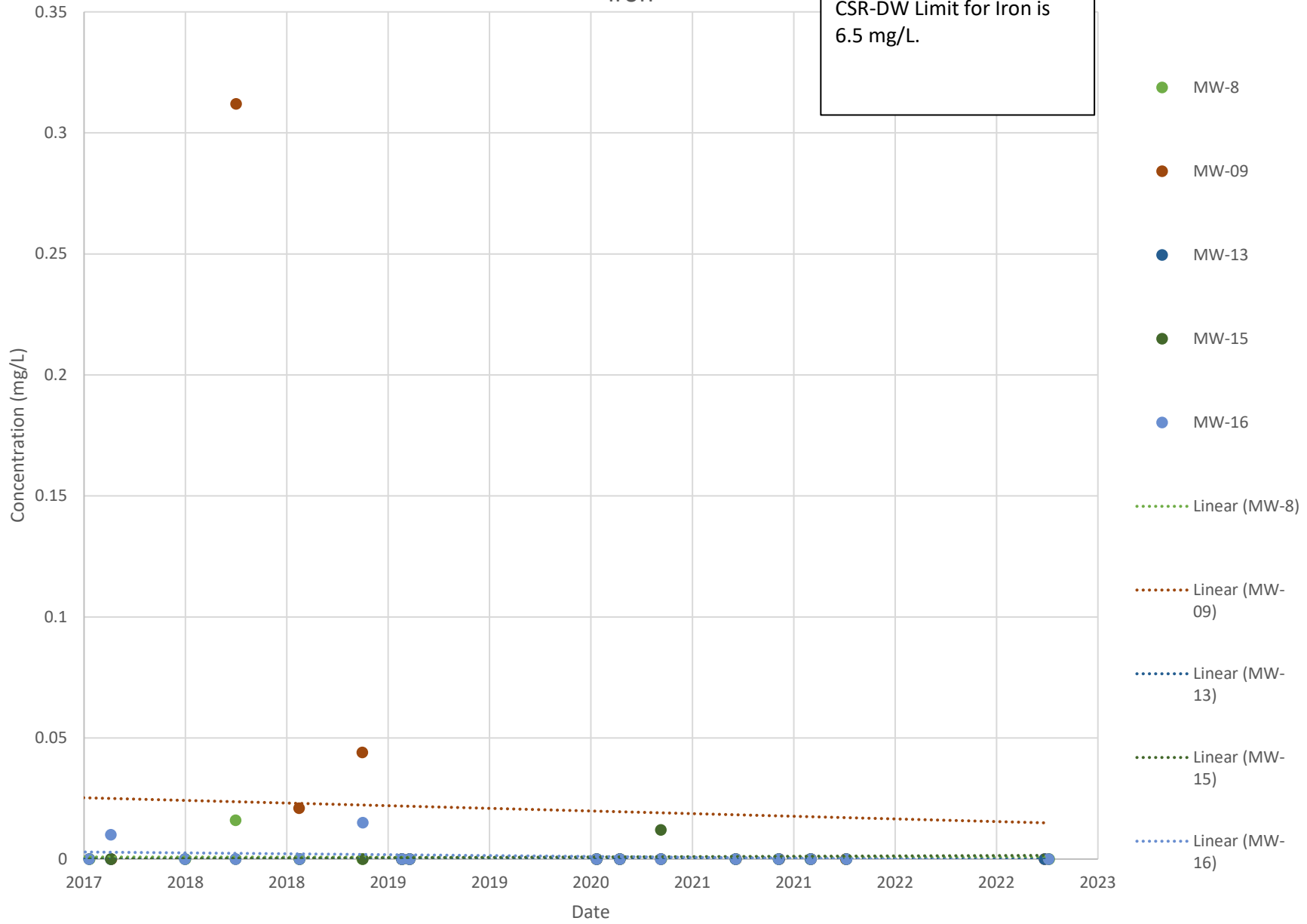




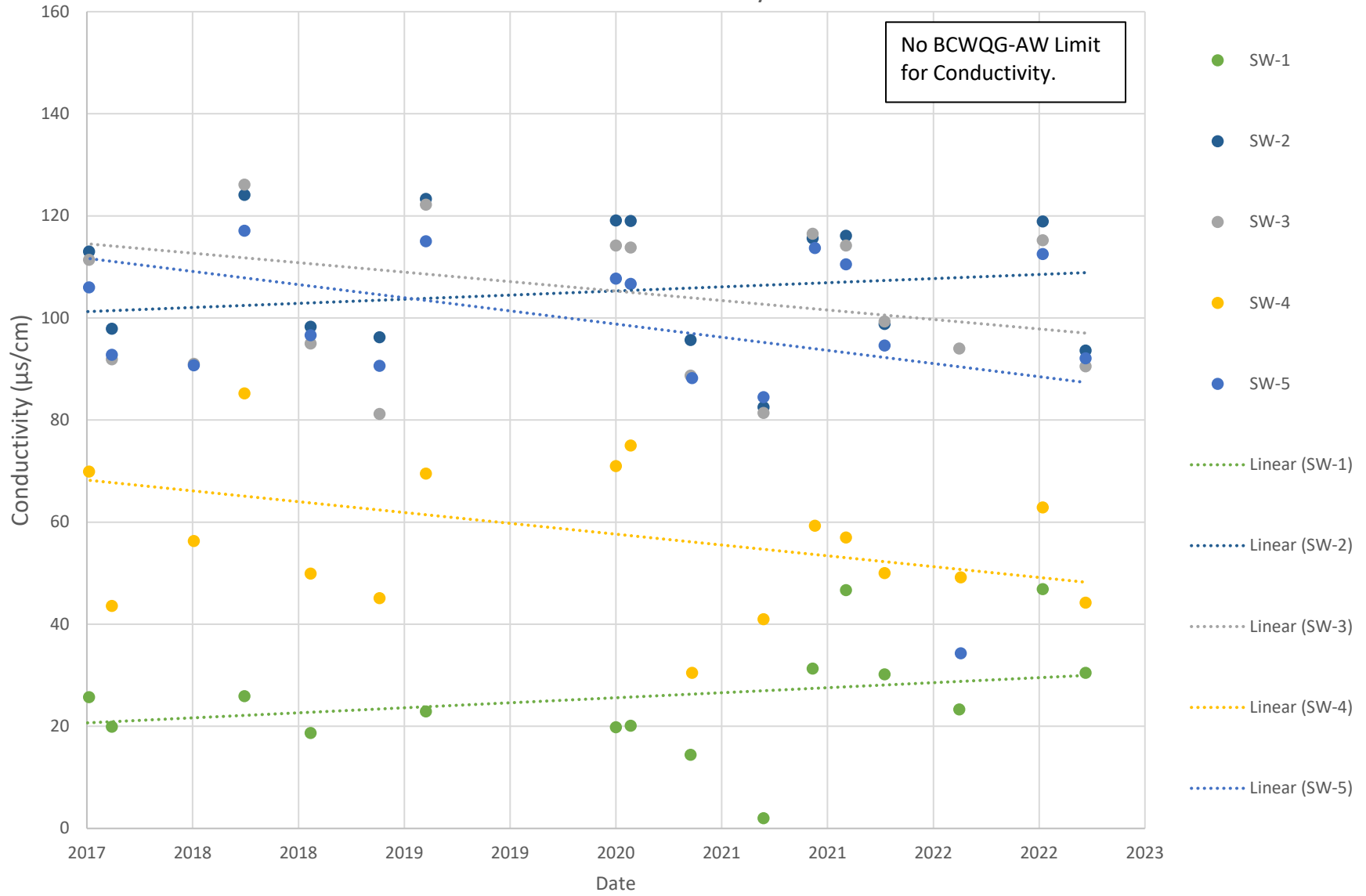


# Iron

CSR-DW Limit for Iron is 6.5 mg/L.

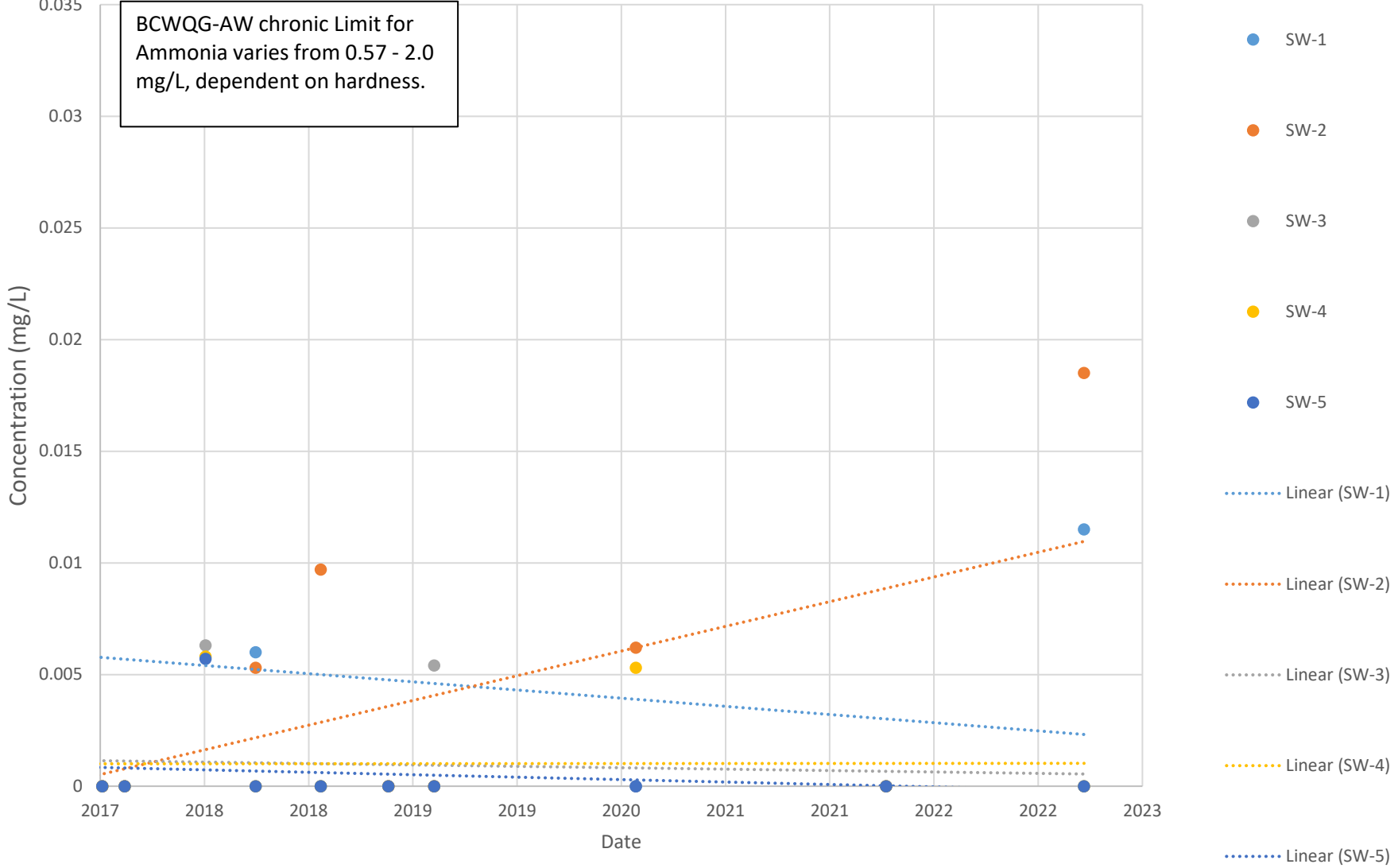


# Conductivity



# Ammonia

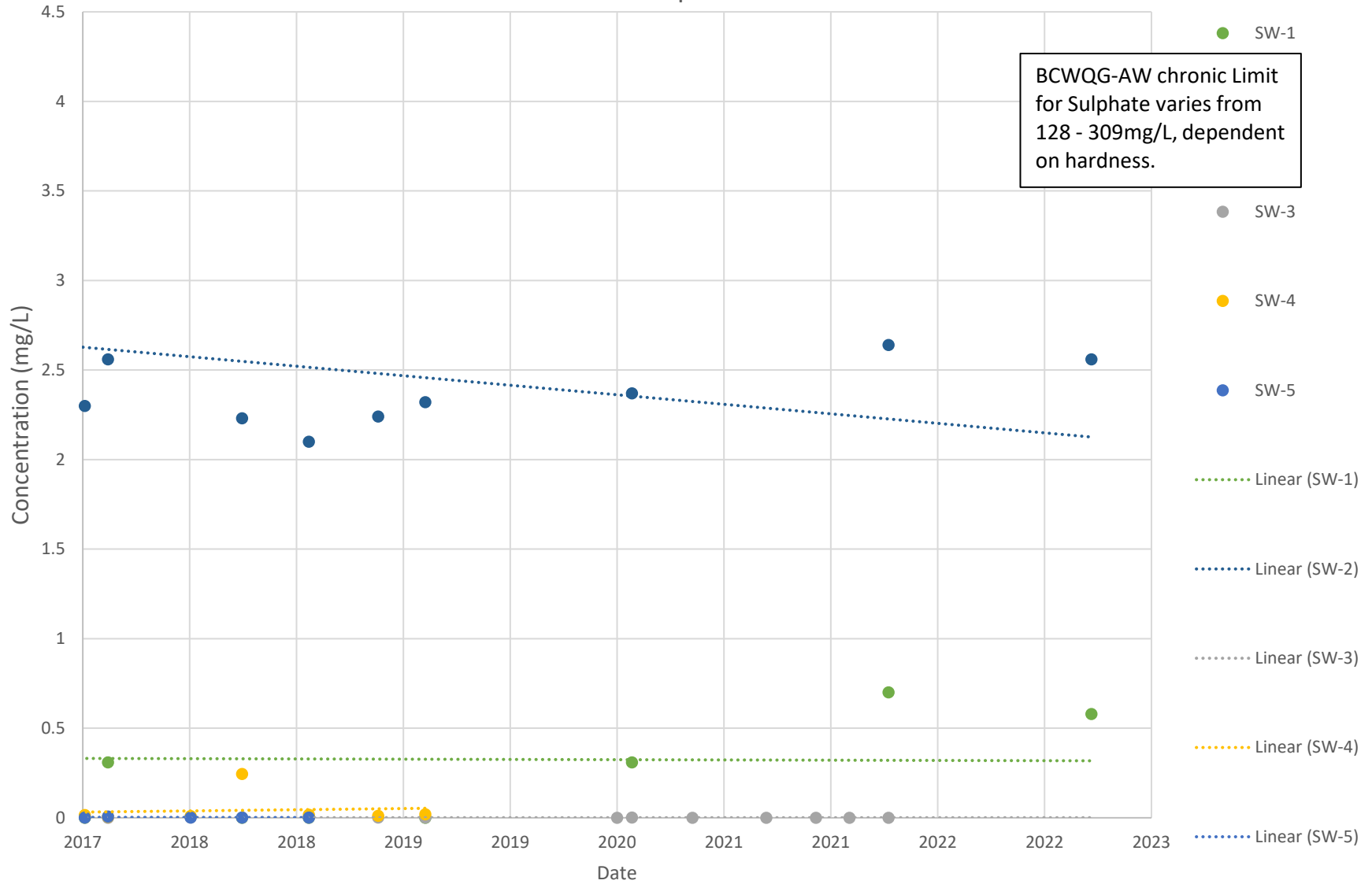
BCWQG-AW chronic Limit for Ammonia varies from 0.57 - 2.0 mg/L, dependent on hardness.



# Chloride



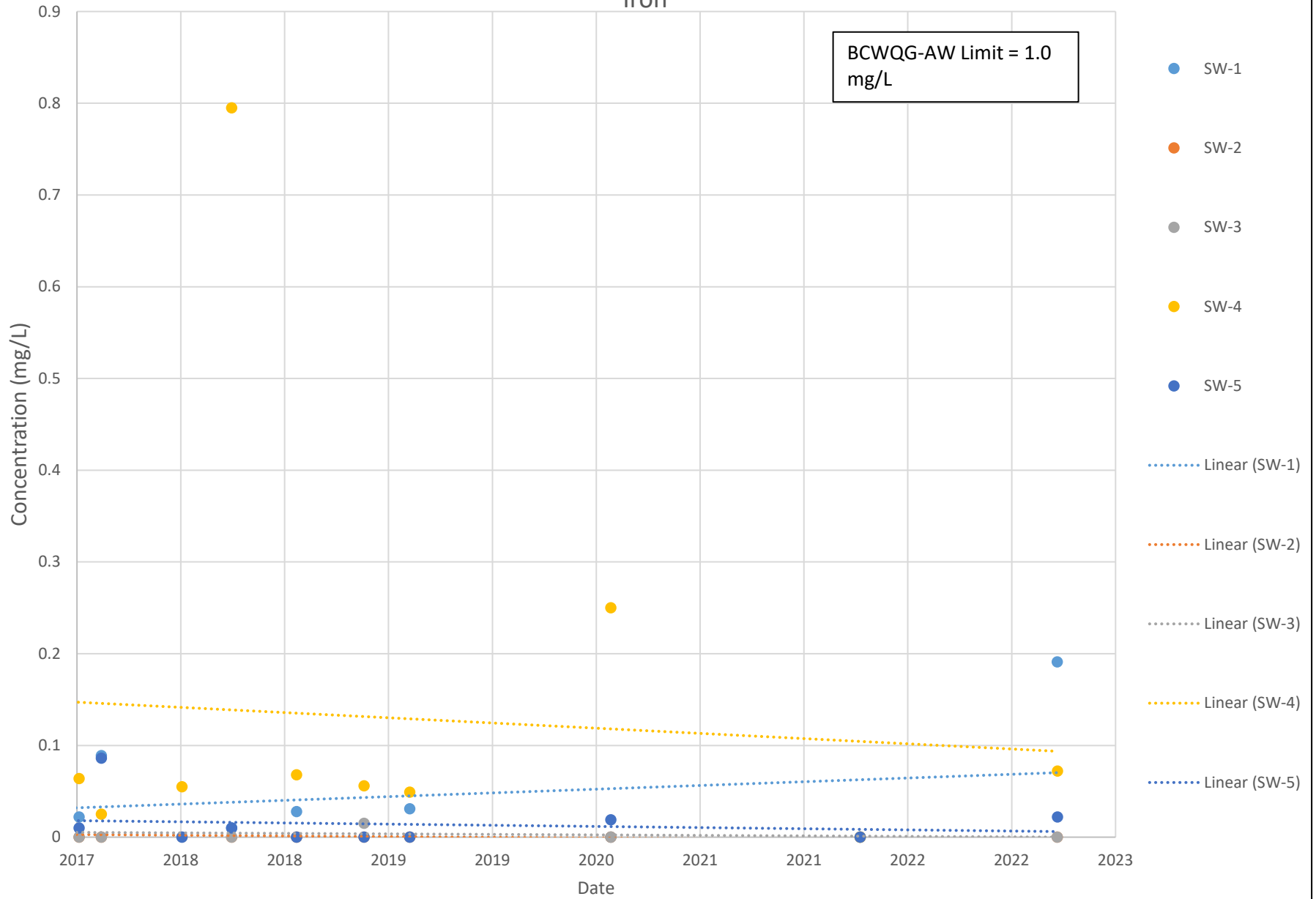
# Sulphate





# Iron

BCWQG-AW Limit = 1.0  
mg/L





Regional District of  
**Kitimat-Stikine**

## **Appendix C Hazardous Waste Regulation Authorization**





February 11, 2021

Tracking Number: 399154  
Authorization Number: 110582

REGIONAL DISTRICT OF KITIMAT-STIKINE  
300-4545 LAZELLE AVENUE  
TERRACE, BC  
V8G 4E1

Dear REGIONAL DISTRICT OF KITIMAT-STIKINE,

Re: Hazardous Waste Regulation Registered Site (RS) Approvals The Regional District of Kitimat Stikine Forceman Ridge Landfill, RS - 110582

The Regional District of Kitimat Stikine submitted an application under HWR to register the Forceman Ridge Landfill on December 14, 2020.

The Regional District of Kitimat Stikine is registered under the HWR with registered site number RS-110582 for the disposal of waste asbestos in the Forceman Ridge Landfill (Authorization 17227) in accordance with HWR section 40, Management of waste asbestos.

Pursuant to HWR section 40(2)(e), the deposit of waste asbestos in the Forceman Ridge landfill Authorization RS-110582 is authorized with the following requirements:

1. The waste asbestos receipt, handling and disposal procedures must be in accordance with HWR section 40, Management of waste asbestos and must be included in the next and subsequent updated Design, Operations and Closure Plans, required by Authorization 17227.
2. The tonnage of waste asbestos received must be included in the next and subsequent Annual Operations and Monitoring Reports, required by Authorization 17227.

This letter is issued pursuant to the provisions of the Environmental Management Act to ensure compliance with section 8 and 120(3) of that Act which make it an offence to construct, establish, alter, enlarge, extend, use or operate a facility for the treatment, recycling, storage, disposal or destruction of a hazardous waste except in accordance with the HWR. Accordingly, contravention of any of the conditions of the HWR, or this letter is a violation of the Environmental Management Act and may result in prosecution and/or administrative penalties.

This letter does not authorize entry upon, crossing over, or use for any purpose of private or Crown lands or works, unless and except as authorized by the owner of such lands or

works. The responsibility for obtaining such authority rests with the Regional District of Kitimat Stikine.

It is also the responsibility of the Regional District of Kitimat Stikine to ensure that all activities conducted in relation to this letter are carried out with regard to the rights of third parties and comply with other applicable legislation that may be in force.

When a spill occurs, or there is an imminent risk of one occurring, the responsible person must ensure that it is reported in accordance with the Spill Reporting Regulation. Additional information on spill reporting requirements is available online at <https://www2.gov.bc.ca/gov/content/environment/air-land-water/spills-environmental-emergencies/report-a-spill>.

This letter includes decisions which may be appealed to the Environmental Appeal Board in accordance with Part 8 of the *Environmental Management Act*. An appeal must be delivered within 30 days from the date that notice of this decision is given. For further information, please contact the Environmental Appeal Board at (250) 387-3464.

Administration of your registration including this letter will be carried out by staff from the Environmental Protection Division's Regional Operations Branch.

For information about how the ministry will assess compliance with your registration, including this letter, and the HWR, please refer to the ministry's Environmental Compliance website <https://www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship/natural-resource-law-enforcement/environmental-compliance>.

For information about how to make changes to your registration and to access registration amendment forms and guidance, please refer to the ministry's Waste Discharge Authorizations website <https://www2.gov.bc.ca/gov/content/environment/waste-management/waste-discharge-authorization>.

Yours truly,



Karen Moores, P.Ag.  
Section Head, North Authorizations, Municipal and Smelter Sectors  
Environmental Protection Division  
Ministry of Environment and Climate Change Strategy  
email: Karen.Moores@gov.bc.ca

February 11, 2021

3

Tracking Number:  
Authorization Number:

399154  
110582





Regional District of  
**Kitimat-Stikine**

## Appendix D Scale Maintenance

# Avery Weigh-Tronix

9111 River Drive  
 Richmond, BC  
 V6X 1Z1  
 Tel. (604) 273-9401  
 Fax (604) 273-8467

T – DATA SHEET REV. 2

M.C. Inspection Certificate No.

Internal Certificate No.

Trade Establishment Name Regional District Kitimat Stikine		Operating as (if different than Trade Name)	
Address Forceman Ridge Landfill site, Hwy 37		City Terrace/Kitimat	Province BC
Contact Name Kelly Brown	Contact Title Accounting Dept.	Telephone Number 250 615-6100	Fax Number
Location Address (if different from Trade Establishment Name Address)		City	Province BC
Legal For Trade Y / N Yes	Sealed on Arrival Y / N Yes	Manufacturer Head: Mettler Toledo Base: Mettler Toledo	Model Head: IND 560 Base: 7600
Device Type: Vehicle scale		Serial Number Head: B604029811 Base: B635969972	
Measurement Canada's Notice of Approval for the device Head: AM-5593                      Base: AM 4900		Capacity (resolution required) 71,730 kg x 10 kg	Seasonal (Open Season) Open

VISUAL INSPECTION	Load cell condition	Good	Junction boxes & connections	Good
	Load cell wiring	Good	Bumper bolt clearance	Good
	Load cell mounting assys	Good	Condition of levers	N/A
	Dirt & debris around cells	Good	Condition of pivots & bearings	N/A

SECTION TESTS		Section 1	Section 2	Section 3	Section 4	Section 5
		BEFORE	22,090	22,090	22,090	22,090
			22,090	22,080	22,090	22,090
AFTER		22,090	22,090	22,090	22,090	
			22,090	22,080	22,090	22,090

STANDARDS USED:	WEIGHT – kg	BEFORE ± GRADUATIONS		AFTER ± GRADUATIONS	
		UP	DOWN	UP	DOWN
10,000 kg	Weights 4,000	0	0	0	0
STRAIN TEST AND LINEARITY TEST	Strain #1 10,000	0	0	0	0
	Strain #2 12,010	0	0	0	0
	Strain #3 43,710	0	0	0	0
	Strain #4				
	Strain #5				

**Scale was calibrated with Weights Traceable to N.I.S.T. and/or Measurement Canada Standards**

Standards Information: 4301-4320 @ 500 kg	<input type="checkbox"/> COMPLIANT <input type="checkbox"/> NON-COMPLIANT <i>THIS SECTION USED ONLY FOR GOVERNMENT INSPECTIONS</i>
Comments (additional notes use back of form): Forceman Ridge scale.	Inspection Type (Initial, Re-Inspection, etc.) Calibration
Scale ID Number:	Work Order Number: 20041
Technician/Inspector's Signature	Inspection Location (Factory, Field, etc.) Field
Print Name Tom Kinvig	Date Mar. 31, 2022





Regional District of  
**Kitimat-Stikine**

## Appendix E Operational Plan



2023 Plan	Description	Strategies	Expected Completion Date	Outcome
Update the Design, Operation and Closure Plan (DOCP)	The DOCP will be updated and will include a review of the Environmental Effects Monitoring Program and a conformance review of the site	Seek input and collaboration with subject experts, stakeholders, and audit records to evaluate effectiveness and compliance	Sep	Updated DOCP that meets regulatory requirements of the site and provides operational and maintenance planning
Construction of Cell1B landfill cell, and design of landfill gas collection system	Cell1B of the landfill completed the initial stages of construction in 2022 and began receiving waste in December. The final stages of construction of Cell1B will be completed in 2023. Landfill gas infrastructure will be incorporated into the lifts of Cell1B during filling, and horizontal wells may be drilled into Cell1A if required.	Develop a project management plan including quality/inspection plan as well as a budget control and direction for the final stages of Cell1B construction.	Jun	Phase 1 B design, construction, fill plan and planned landfill gas collection system
Progressive Closure of Cell1A	Options and costing for progressive closure will be evaluated, and a suitable option will be selected for construction	Solicit options for progressive closure systems, including costing for construction. Solicit quotes for construction after a suitable option has been selected.	Sep	Phase 1A Closure and post Closure Plan
Move Class A Compost from the Site	Under composting regulations, 50% of the compost produced at site must be moved off site each year. The RDKS intends to work towards meeting the requirements of Class A criteria under the regulations and work towards public distribution of compost material.	Improve compost process by acquiring more training, improve pathogen, temperature, and nutrient monitoring, increase public education.	Aug	Class A compost for public use
Evaluating the Capacity of the Leachate Treatment System	With the expansion of Cell1B, an increase of leachate generation is predicted. The capacity of the system requires evaluation to ascertain if increased volumes require upgrades to infrastructure.	Have the Leachate Treatment System Capacity quantified during the DOCP update.	Sep	Maintain compliance with the authorisation discharge limits, confirm infrastructure is adequate for increased effluent volumes associated with landfill expansion.
Danger tree removal outside the facility perimeter	Remove danger trees that are at risk of falling on the wildlife fence, and that are at risk of hitting the utility line along the exit road.	Danger tree assessment and removal by a certified utility arborist	Oct	Protection of the wildlife fence, utility line, and egress road from falling danger trees
Airspace and Compaction Survey	Aerial survey to determine change in volume of landfill	Determine remaining lifespan of the landfill, and evaluate efficiency of landfill operations contractor	July	Airspace survey used in evaluating remaining life of landfill, and contractor efficiency. Well elevation used in Groundwater Model.
Install a new surface water monitoring well	Installation of early detection well MW-17, required under the DOCP with the construction of phase 1b	Monitor for early detection of off-site migration in the inferred flow path from Cell 1B	Jun	Monitoring of Phase 1B, and compost facility
Explore the Feasibility of Updating the Groundwater Model	Update the existing groundwater model and include additional modeling scenarios to better reflect operations and impacts to groundwater from the site operations.	Determine if model can be updated during the DOCP update, or request quotes and budget for 2024	Dec	Model scenarios to inform future decision making, including the scenario of screening, and storing compost on an impervious surface, and the placement of future monitoring wells.
Desludging the aeration lagoon	Required every five years, or when sludge levels exceed 150 mm	Confirmatory testing of sludge completed in 2022 shows the sludge is not hazardous waste, request authorisation to decant on site, dispose of dewatered sludge in the landfill.	Dec	Increased hydraulic retention of the aeration lagoon.



